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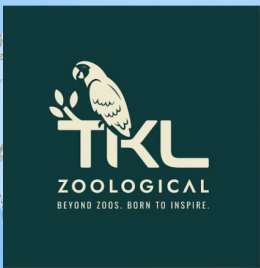
"ONE VOICE, ONE HEALTH, ONE FUTURE"

PROCEEDING BOOK

21 - 23 JULY 2026

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WELCOME MESSAGE



**YBHG. DATUK DR. MOHD NOOR HISHAM
BIN MOHD HARON**

Chairman of GAVIS 2026
Director- General of the Department of Veterinary Services Malaysia

It gives me great pleasure to welcome you to the Global Animal Production and Veterinary Industry Summit (GAVIS) 2026.

This summit is the culmination of an extraordinary collaborative effort, uniting six major professional conferences into a single, powerful platform. I would like to extend my deepest gratitude to the scientific committee members, our sponsors, strategic partners and allied health sectors, whose tireless dedication has made this historic union a reality.

As we gather under the banner of “One Voice, One Health, One Future,” we are here to share insights, showcase technological breakthroughs, and address the evolving challenges facing the animal health and production ecosystem.

As the Organising Chairman, I firmly believe that GAVIS 2026 serves as an ideal platform to nurture leadership, encourage open-minded collaboration and prepare future leaders to face emerging challenges in animal production, veterinary science and food security.

I invite you all to join us in making GAVIS 2026 a meaningful experience and a lasting legacy.

Thank you for being part of this journey.

ONE VOICE. ONE HEALTH. ONE FUTURE.

INTRODUCTION

The Global Animal Production and Veterinary Industry Summit (GAVIS) 2026 represents a historic and powerful union of six major professional conferences that are: 36th Malaysian Veterinary Medical Association (MAVMA) Conference, 45th Malaysian Society of Animal Production (MSAP) Conference, 7th Asian-Australasian Dairy Goat (AADG) Conference, 17th Malaysian Association of Veterinary Pathology (MAVP) Conference, 1st Malaysian Association Companion Animal Medicine Industry (MACAMI) Conference, and 3rd UMK Veterinary International Conference (UVIC).

United under the central theme of *"One Voice, One Health, One Future,"* this summit underscores the pressing global imperative for integrated and multidisciplinary approaches that address the interdependence of animal health, human health, environmental sustainability, and food security to achieve sustainable global health outcomes. Researchers, veterinarians, industry leaders, and policymakers from all over the world have taken this opportunity to share their insights, strengthen collaborations, and address the continuously changing challenges within the global food system.

Aims of the Summit

- **To promote sustainable and resilient animal production systems** while simultaneously strengthening veterinary services and animal health management across the globe.
- **To provide a strategic platform** for advancing forward-looking strategies that enhance the long-term sustainability, resilience, and economic viability of the livestock sector, while addressing the increasing global demand for animal protein and the challenges posed by emerging and re-emerging diseases.
- **To facilitate comprehensive knowledge exchange and technical innovation** across a wide range of topics, including precision livestock farming, biosecurity, animal welfare, education, economics, zoonoses, One Health, digital agriculture, and evidence-based solutions to safeguard public health.
- **To foster global partnerships** by creating valuable networking opportunities that encourage joint research, technology transfer, and collaborative policymaking.

SUMMIT PROCEEDING BOOK

The GAVIS 2026 scientific programme features keynote speeches, plenary sessions, forum, symposiums, oral papers, poster presentations and student innovation competition. The proceeding book brings together a diverse collection of research contributions spanning ten thematic areas that reflect the breadth and interdisciplinary nature of veterinary and animal sciences. These include **Livestock Production, Poultry Production, Swine Production, Small Animal Medicine, Animal Disease and Diagnostics, Aquaculture and Fisheries, Animal Welfare, Economics, Business and Human Welfare, Wildlife and Exotic Animal Management, and Zoonoses, One Health and Antimicrobial Resistance (AMR)**. In addition to these scientific themes, the proceeding book also feature scientific papers and discussion from dedicated symposia, forum and competition tracks: the '***Bicara Tokoh***' **Forum, Malaysian Animal Welfare Regulation Symposium, Education Symposium** and **Student Innovation Competition**. Collectively, these thematic areas highlight current scientific advancements, emerging challenges, policy perspectives, and educational innovations, fostering interdisciplinary collaboration and knowledge exchange to advance sustainable animal health, veterinary practice, and the livestock industry.

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KEYNOTE

ENGINEERING THE AGRIFOOD FUTURE: ONE VOICE, ONE HEALTH, ONE FUTURE

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Abstract

The global livestock and veterinary sectors face unprecedented volatility driven by climate stress, escalating input costs, and emerging zoonotic threats. Despite driving 11.4% of the national GDP (generating RM145.35 billion across integrated services, agriculture, and manufacturing), critical vulnerabilities in the domestic supply chain have exposed a severe RM39 billion agrifood trade deficit. In response, the Ministry of Agriculture and Food Security (KPKM) has initiated the National Food Security Policy (DKMN 2030) to bridge the gap between import dependency and a climate-resilient ecosystem. The policy focuses on Sector-Specific Interventions and Strategic Supply Chains, such as coordinating interconnected supply chain, aiming for upstream input independence and developing a strategic framework for companion animal care as the fastest-growing veterinary segment. Technologies are pivotal in improving food security. The 4-Pillar Technological Frontier, consisting of the Animal (Genomics), the Herd (Precision Livestock Farming), the Feed (Circular Nutrition), and the Market (Traceability), is proposed. Achieving full systemic impact requires orchestrating a co-creation network that breaks down historic operational silos. This Quadruple Helix unifies Government enablers (KPKM, DVS), practicing veterinary bodies (MAVMA, MSAP), academic knowledge generation (UPM, UMK, UMT), and private industry. Through regional institutions like the ASEAN Coordinating Centre for Animal Health and Zoonoses (ACCAHZ) and advanced disease surveillance networks like ZOTRAD, the summit positions the region as a hub for veterinary diplomacy and global trade standard compliance. Safeguarding our collective biosecurity and economic sovereignty requires an ironclad, cross-disciplinary commitment. Hence, GAVIS 2026 establishes a unified national mandate with its theme "One Voice, One Health and One Future".

Keywords: *One Health, food security, precision livestock farming*

OHAS-1

IONOPHORES: CRITICAL TOOLS FOR COCCIDIOSIS PREVENTION AND COMBATING ANTIBIOTIC RESISTANCE

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Abstract

Avian coccidiosis remains a primary disruptor of intestinal integrity in commercial poultry, causing mucosal damage that serves as the main predisposing factor for secondary bacterial infections such as necrotic enteritis. Ionophores are critical tools in managing this threat, providing effective control of *Eimeria* populations while preventing severe epithelial damage. By proactively stopping this initial gut compromise, ionophores eliminate the environment required for *Clostridium perfringens* and other opportunistic bacteria to proliferate. Consequently, breaking this coccidiosis-enteritis disease cascade leads to vastly improved overall gut health and significantly reduces the incidence of clinical bacterial outbreaks. Ultimately, the strategic use of ionophores is not only essential for sustainable coccidiosis prevention, but it also serves as a cornerstone for reducing the industry's reliance on therapeutic antibiotics and supporting global antimicrobial stewardship.

Keywords: *Ionophores, coccidiosis, antimicrobial stewardship*

WHY WE USE VACCINES: A PREVENTIVE APPROACH TO POULTRY HEALTH AND ONE HEALTH

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Abstract

The poultry industry faces the dual challenge of producing safe, affordable, and sustainable protein while addressing growing concerns surrounding antimicrobial resistance (AMR). Although antibiotics remain an essential tool for the treatment of bacterial diseases and the protection of animal welfare, preserving their effectiveness requires a greater emphasis on disease prevention and responsible use. Vaccination is one of the most practical and effective strategies for reducing the need for antibiotic interventions in poultry production. By preventing or reducing the severity of infectious diseases, vaccines help maintain flock health, reduce immunosuppression, and minimise secondary bacterial infections that often result in antibiotic treatments. Healthier birds are more resilient, achieve better performance, and require fewer therapeutic interventions. The success of vaccination, however, extends beyond vaccine selection alone. Effective vaccination programmes depend on choosing the right vaccines, understanding local disease challenges, ensuring proper vaccine handling and administration, and implementing ongoing monitoring and evaluation to verify protection. When integrated into daily operations, vaccination contributes not only to improved health outcomes but also to enhanced productivity and profitability. Reducing antibiotic use should not be interpreted as eliminating antibiotics altogether. Rather, the goal of antimicrobial stewardship (AMS) is to ensure that antibiotics are used judiciously and only when genuinely necessary to safeguard bird health and welfare. Prevention should complement, not replace, appropriate treatment. Vaccination should therefore be viewed as a cornerstone of a comprehensive disease prevention strategy that also includes biosecurity, good husbandry practices, diagnostics, and evidence-based decision-making. Together, these measures reduce disease pressure, support sustainable poultry production, and help preserve the effectiveness of antibiotics for future generations. Ultimately, the objective is not an antibiotic-free poultry industry at all costs, but healthier flocks that require fewer antibiotic interventions. By prioritising prevention through effective vaccination programmes, the poultry industry can make a meaningful contribution to the global fight against AMR.

Keywords: *Poultry, vaccination, antibiotics, antimicrobial resistanceA (AMR), antimicrobial stewardship (AMS), disease prevention*

FUNCTIONAL GUT HEALTH ADDITIVES IN POULTRY AS ALTERNATIVES TO ANTIMICROBIALS (ATA)

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Abstract

Maintaining gut health is essential for achieving optimal performance and health in poultry, particularly with the increasing focus on reducing antimicrobial use. This session will highlight the role of *Bacillus*-based probiotics and the synergistic combination of essential oils and organic acids as functional gut health additives. The presentation will discuss how *Bacillus* probiotics support a balanced gut microbiota by enhancing immune status, strengthening gut barrier function, and helping to control bacterial pathogens. In addition, the benefits of combining essential oils and benzoic acid in promoting gut acidification, improving nutrient utilization, and supporting pathogen control will be explored. Through scientific insights and practical field experiences, participants will gain a better understanding of how these solutions can contribute to improved gut health, enhanced bird performance, and more sustainable poultry production.

Keywords: *Poultry gut health, Bacillus probiotics, antimicrobial alternatives*

OHAS-4

MEASURING WHAT MATTERS: BIOMARKERS FOR ASSESSING LIVESTOCK HEALTH AND NUTRITIONAL INTERVENTIONS

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Abstract

Traditional production performance indicators such as growth rate, feed efficiency, and mortality provide useful information but are often lagging indicators that reflect biological disturbances only after performance has been affected. Biomarkers offer additional insights into physiological processes including gut integrity, immune activation, inflammation, and oxidative stress, which together contribute to overall resilience. This presentation discusses the role of key biomarkers in livestock health and their application in evaluating responses to nutritional interventions. Biomarker-based approaches enable a more mechanistic understanding of host physiology and help bridge the gap between conventional performance measurements and underlying biological processes. Integration of biomarker data allows more accurate interpretation of gut health and immune function, supporting improved evaluation of nutritional strategies aimed at enhancing animal health and production efficiency.

Keywords: *Biomarkers, livestock health, nutritional interventions*

ADVANCING VETERINARY AND ANIMAL SCIENCES IN MALAYSIA: A DISTINGUISHED SPEAKER PERSPECTIVE

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Abstract

The rapid industrialisation of livestock production in Malaysia is very recent compared to the more economically advanced nations. Before independence, livestock was produced mostly by subsistence farmers in the rural area. Soon after independence, the veterinary department formulated a national policy aiming at self-sufficiency in beef needs and a higher level of milk production. The poultry and swine industries were mostly driven by private sector initiatives. Majuternak, a body initiated by the government to spearhead the development of the beef and dairy industries, was subsequently shut down after only a few years of operations. Today, Malaysia has achieved self-sufficiency in poultry and swine production. The local dairy industry is growing rapidly because of increased private investment and effective policy. This paper highlights the historical perspective of the livestock industry in Malaysia and the contributing factors. The paper also highlights the state of veterinary practice and its challenges. The growing popularity of companion animals and rapid increase in their population demand more sophisticated services from the veterinary profession.

Keywords: *Malaysia, livestock production, veterinary practice, companion animals*

FUTURE-READY VETERINARIANS: EDUCATION, INNOVATION AND PROFESSIONAL EXCELLENCE

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Abstract

The veterinary profession is undergoing a profound transformation driven by rapid technological advancement, evolving societal expectations, and increasing global challenges related to animal health, food security, public health, and environmental sustainability. Future veterinarians must possess not only strong clinical competencies but also the ability to adapt to emerging technologies, engage in interdisciplinary collaboration, and demonstrate leadership in a dynamic professional landscape. This highlights the importance of modern veterinary education in preparing graduates for future demands through innovative teaching approaches, digital learning platforms, evidence-based practice, and research integration. The role of innovation, including artificial intelligence, precision skills, genomics, telemedicine, and advanced diagnostic technologies, is discussed as a key driver in enhancing veterinary services and animal welfare. Furthermore, professional excellence is explored through the development of ethical values, communication skills, lifelong learning, and commitment to One Health principles. By embracing education, innovation, and professional excellence, veterinarians can effectively contribute to sustainable animal production, disease prevention, public health protection, and the advancement of the veterinary profession in Malaysia and beyond.

Keywords: *Veterinary education, innovation, One Health, future veterinarians*

TRANSFORMATION OF VETERINARY SERVICES IN MALAYSIA

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Abstract

In general, veterinary services have shown significant transformation in the past 30 years. The pet and avian sectors have attracted the majority of veterinary graduates, contributing to the significant growth of these sectors, while the ruminant sector has remained static. Advancement of the pet industry requires special veterinary services, especially the diagnostic and specialist services. Therefore, veterinary services must transform themselves to fulfil these requirements through enhanced specialist training. This is achieved through residency training. In fact, veterinary special services are usually provided by universities and specific government/private laboratories. On the other hand, many factors influence the development of the ruminant sector, and one of the major contributors is the veterinary services. Currently, veterinary service for the ruminant sector is provided almost entirely by the Department of Veterinary Services thus, 'training for trainers' is crucial and should be consistently offered to extension personnel. Furthermore, the Department should be made attractive enough to attract veterinary graduates to participate since lack of participation by private veterinarians in the ruminant sector is a world-wide phenomenon. These transformations require courage, budget and time.

Keywords: *Veterinary service, transformation, Malaysia*

NOVEL STRATEGIES FOR BIODEGRADATION AND DETOXIFICATION OF MYCOTOXINS

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Abstract

Mycotoxins contamination is a continuing global problem that severely affects animal health and performance and further threatens food safety. This has brought huge economic losses to the agriculture industry. The common aspiration of the feed industry is to eliminate feed mycotoxins contamination and control their hazards. There is a long way to go to prevent mycotoxins hazards. Biodegradation is a promising strategy to eliminate mycotoxins through transforming them into nontoxic or less toxic metabolites by bacteria or enzymes under mild conditions, retaining the sensory quality and nutritional value of agricultural commodities. During the past 23 years, our group had screened out 25 strains capable of degrading aflatoxins, 5 strains for zearalenone degradation, 2 strains for trichothecene degradation, 2 strains for ochratoxin degradation and 1 for fumosin degradation. Some probiotic degrading aflatoxins was chosen to develop the degradation additive as the solution for mycotoxins contamination in feed. The chemical structures of degradation metabolites and biodegradation pathways were elucidated. The biosafety of both degrading strains and their metabolites were verified through animal feeding evaluation trials using mice, rats, chickens, ducks, swine, cattle and fish as test animals. The key technology of biodegradation feed additive development have been shared and the alleviating effects on toxic injury have been reviewed in this presentation.

Keywords: *Biodegradation, mycotoxins, feed additive, aflatoxin, metabolites*

FROM BREEDING BREAKTHROUGHS TO SYSTEMIC WIN-WIN: THE CONTINUOUS INNOVATION AND GLOBAL POULTRY INDUSTRY SYNERGY OF GUANGMING, CHINA

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Abstract

The global poultry industry is undergoing rapid transformation driven by increasing demand for high-quality animal protein, improved production efficiency, enhanced disease resilience, and sustainable agricultural practices. In this evolving landscape, innovation in poultry breeding and integrated production systems has become a critical driver of industry competitiveness and long-term sustainability. Guangming Group, one of China's leading agricultural and food enterprises, has played a significant role in advancing poultry genetics, production technologies, and industry integration to support the modernization of the poultry sector. This presentation explores the Guangming's journey from breeding innovation to the development of a comprehensive and synergistic poultry production ecosystem. Emphasis is placed on advancements in genetic selection, breeding technologies, precision nutrition, health management, and digitalized production systems aimed at improving growth performance, feed efficiency, reproductive capacity, product quality, and disease resistance. Through continuous investment in research and development, Guangming has strengthened the application of science-based breeding programs while promoting sustainable and efficient poultry production practices. The presentation further examines the integration of breeding, hatchery management, feed production, farming operations, processing, logistics, and market distribution within a coordinated value-chain framework. This systemic approach enhanced traceability, biosecurity, operational efficiency, and product consistency while creating mutual benefits for producers, processors, consumers, and industry stakeholders. Particular attention is given to the role of innovation, data-driven management, and strategic partnerships in strengthening industry resilience and responding to emerging challenges such as disease threats, market volatility, and sustainability requirements. In addition, Guangming's collaboration with international research institutions, industry partners, and global poultry networks demonstrated the importance of cross-border knowledge exchange and technology transfer in advancing the poultry sector. The company's experience provided valuable insights into how integrated innovation can generate shared value across the poultry value chain. The Guangming model illustrated that continuous breeding breakthroughs, combined with systemic industry collaboration and technological innovation, can drive productivity, sustainability, and global competitiveness, contributing to a more resilient and future-ready poultry industry.

Keywords: *Poultry, Guangming group, China, breeding, production, precision nutrition*

SOVEREIGNTY UNDER STRAIN; REDEFINING MALAYSIA'S PROTEIN RESILIENCE AMID LOCAL ADVERSITY AND GLOBAL GEOPOLITICAL VOLATILITY

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Abstract

Malaysia's poultry industry, a strategic pillar of food security, faces an existential crisis driven by domestic cost pressures and global geopolitical volatility. This paper examines how Malaysia's protein sovereignty is being redefined as feed constitutes 70% of total production costs. Being almost entirely dependent on imported maize and soybean meal, the industry is highly susceptible to price shocks and supply chain disruptions triggered by conflicts in Europe and the Middle East. These systemic vulnerabilities have a direct, adverse impact on consumers, manifesting as price hikes for retail chicken and eggs, occasional supply shortages, and diminished purchasing power for low-income households. To address these challenges, this paper evaluates a tiered strategic framework. In the short term, the focus remains on stabilizing consumer prices through targeted subsidies and ceiling price mechanisms. Mid-term measures highlighted the diversification of import sources and the commercialization of alternative feedstocks to decouple from global grain markets. Critical to long-term resilience is the urgent need for industrial modernization and advanced technological integration. Transitioning to more advanced closed-house systems and AI-driven technologies is essential to increase production capacity within limited land areas and strict environmental and land use regulations. By optimizing operations, the industry can evolve into a technologically resilient bio-economy, ensuring stable protein affordability and availability for the Malaysian public amid the unpredictable tides of 21st-century geopolitics.

Keywords: *Poultry industry, protein sovereignty, food security, resilient bioeconomy, geo-politic volatility*

PREVENTION AND CONTROL STRATEGIES OF AFRICAN SWINE FEVER IN CHINA

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Abstract

Since its introduction in August 2018, African swine fever virus (ASFV) has inflicted over RMB one trillion in economic losses and fundamentally restructured China's swine industry. In the absence of a broadly deployable vaccine, China has implemented multidimensional control strategies integrating systems-based biosecurity, real-time surveillance (fluorescent PCR, digital PCR for viable virus differentiation, and ELISA), and third-generation whole-genome sequencing to track viral evolution. However, the co-circulation of Genotype I and II strains, followed by the emergence of I/II recombinants has resulted in enhanced virulence, intermittent viral shedding, and evasion of Genotype II attenuated vaccine protection, posing unprecedented challenges, resulting in more difficult for clinical prevention. Although focusing on the development of antiviral strategies, we have screened 138 natural microbial metabolites (Micmets) and identified 23 compounds with >90% inhibition of ASFV replication in PAMs. Four Micmets formulated as an oral feed additive conferred 100% survival in piglets following oral challenge with 500 HAD₅₀ ASFV, with no clinical signs or gross lesions. Mechanistically, arctiin (Ain) and genistein (Gen) competitively bind the ATP-binding pocket of the viral type II topoisomerase P1192R (highly conserved across genotypes I, II, and recombinants; RMSD <1 by AlphaFold2.3), disrupting topoisomerase activity and viral DNA replication. *In vivo*, oral Ain, Gen, or Ain+Gen resulted in 50%, 50%, and 70% survival, respectively, following lethal challenges. Field application across >100 farms reduced outbreak rates from 57.6% (untreated controls) to as low as 2.3–3.3%. However, effective ASF control requires a systematic approach combining stringent biosecurity, continuous surveillance, precise removal of latently infected pigs, and evidence-based functional feed additives, rather than reliance on any single intervention.

Keywords: *African swine fever, China, virus, PCR, prevention, control*

HOW CAN FUNCTIONAL FEEDS IMPROVE GROWTH AND IMMUNITY IN POULTRY PRODUCTION SYSTEMS?

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Abstract

Poultry farms in tropical regions face rising feed costs, disease pressure, heat stress, and concern over antibiotic use. In Malaysia, the continued need to import chicken meat shows the need for local feed solutions that support growth, health, food safety, and food supply. As a result, antibiotics are widely used in poultry production to promote growth and prevent disease, but their extensive application contributes to antimicrobial resistance in animals and humans. Therefore, natural-derived compounds with pharmacological properties offer a viable alternative to antibiotics. Recent research on functional feeds has shown strong potential for improving broiler growth, gut health, and immunity. Plant-based feed additives from local tropical forages such as *Brachiaria decumbens*, *Pennisetum purpureum*, and *Megathyrsus maximus* have gained attention. These plants contain useful compounds such as steroidal saponins, flavonoids, tannins, and alkaloids. These compounds may help control harmful microbes, reduce oxidative stress, lower inflammation, and support digestion. Research on grass meals is especially relevant because these grasses cover more than 70% of Malaysia's pasture land and contain abundant, readily available phytocompounds. Studies suggested that these compounds may improve nutrient uptake, support digestive enzyme activity, increase villus height, reduce crypt depth, and improve gut structure. A healthier gut helps broilers use feed more efficiently and direct more energy toward growth. Other studies have examined probiotics, prebiotics, postbiotics, and feed enzymes as functional feed options. Probiotics help balance gut microbes and support immune health. Prebiotics feed useful gut microbes, while postbiotics provide microbial products that support the gut barrier and immune control. Feed enzymes such as phytase, xylanase, β -glucanase, protease, and amylase help break down feed components. This improves nutrient use, feed conversion, and reduces nutrient waste. Overall, research showed that functional feed supplements, when used at the right dose, offer a useful path to reduce reliance on antibiotic growth promoters in poultry diets. Key issues still need attention, including active compound variation, feed taste, feed stability, nutrient quality, and large-scale supply. Solving these issues will support wider use of functional feeds in tropical poultry farming.

Keywords: Antimicrobial resistance, natural-derived compounds, growth performance, health indices, broiler chickens.

BIG DATA AND PRECISION LIVESTOCK FARMING: TRANSFORMING THE MALAYSIAN LIVESTOCK INDUSTRY

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Abstract

This presentation highlights the transformative role of Big Data and Precision Livestock Farming (PLF) in advancing Malaysia's livestock sector, a critical component of national food security. Despite ambitions to achieve 140% self-sufficiency, the industry remains largely dependent on traditional, labour-intensive practices, particularly among smallholders, resulting in inefficiencies, delayed decision-making, and increased biosecurity risks. The integration of Big Data-through sensors, imaging, acoustic monitoring, and supply chain systems-enables a shift towards data-driven livestock management. PLF technologies, supported by the Internet of Things, artificial intelligence, and cloud-based platforms, allow real-time monitoring of animal health, behaviour, and production performance. Practical insights from Malaysian initiatives demonstrate improvements in efficiency, cost reduction, yield enhancement, and animal welfare. However, adoption challenges such as high costs, infrastructure limitations, and data complexity persist. This presentation emphasizes the need for strategic collaboration, capacity building, and phased implementation to drive sustainable digital transformation in the livestock industry.

Keywords: *Big data, precision livestock farming (PLF), internet of things (IoT), animal welfare, food security*

YOU, ME, AND STREP SUIIS: A LOCAL PERSPECTIVE ON AN UNINVITED GUEST

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Abstract

Streptococcus suis is an emerging zoonotic pathogen causing severe systemic infections in humans and substantial economic losses in the global swine industry. Following recent clinical reports of human infections in Sabah, East Malaysia, understanding regional epidemiological dynamics, human carrier status, and alternative companion animal reservoirs has become an urgent public health priority. A cross-sectional molecular screening of human swine-industry personnel in Peninsular Malaysia and a genomic characterization of a novel feline *S. suis* isolate. Public health surveillance via oral swab screening of high-risk human demographics-including veterinarians, butchers, and farmers-revealed a 0% active nasopharyngeal or oral carriage rate of *S. suis*. Demographically, 92.5% of these workers consume pork, but 100% reject raw or undercooked pork consumption, indicating that human zoonotic acquisition in Malaysia remains strictly driven by percutaneous inoculation via occupational skin abrasions rather than dietary routes. Concurrently, veterinary surveillance expanded the known host range of the pathogen within the country, isolating *S. suis* serotype 8 from the oral cavity of a companion cat in Peninsular Malaysia. Whole-genome sequencing of this feline strain (SS/UPM/MY/F001) revealed a novel, distinct multilocus sequence typing (MLST) profile and identified critical mobile genetic elements, pathogenic determinants matching human/swine virulence factors, and a robust antimicrobial resistance profile including *mefA*, *msrD*, *patA*, *patB*, and *vanY* genes. These findings underscore the necessity of expanding conventional surveillance beyond swine populations to include companion animals, utilizing an integrated One Health molecular framework to manage evolving zoonotic risks.

Keywords: *Streptococcus suis*, swine, public health, One Health, pork

DESIGNING FUNCTIONAL EGGS THROUGH NUTRITIONAL FEED STRATEGIES: OPPORTUNITIES AND CHALLENGES WITHIN THE CAGE-FREE LAYER FARMING TRANSITION IN INDONESIA

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Abstract

The global egg industry has been undergoing two parallel transformations. Firstly, a shift in housing systems from conventional battery cages toward cage-free production, driven by animal welfare regulation and corporate sourcing commitments. Secondly, a shift in product positioning from a commodity protein source toward a functional food vehicle enriched with bioactive nutrients. Indonesia, as the world's third-largest egg producer, occupies a critical position in both transitions, yet empirical and policy-oriented synthesis connecting the two remains limited. This paper reviews the scientific basis for designing functional eggs through nutritional manipulation of laying hen diets. Secondary data were synthesized from peer-reviewed literature, industry surveys, and national regulatory documents, including the newly issued Indonesian Ministry of Agriculture Regulation (Permentan) No. 32 of 2025 on Animal Welfare. Recent studies from our research group illustrate this approach. In a six-week trial involving 1,680 Lohman Brown hens, supplementation with 0.25% mineral mix-enriched essential oil, comprising calcium, sodium, phosphorus, zinc, selenium, and ten botanical oils including *Eucalyptus globulus*, *Origanum vulgare*, and *Cymbopogon citratus*, significantly improved hen-day production and feed conversion ratio, and increased yolk antioxidant activity ($p = 0.03$), without compromising egg quality or fatty acid composition. In a parallel 16-week trial with 3,240 Lohman Brown-Classic hens, combining herbal bioactive compounds with organic Fe and Se significantly enhanced body weight, hen-day production, egg mass, and feed efficiency, while improving albumen and yolk protein content and achieving meaningful mineral biofortification, alongside elevated IgY antibody levels. Findings indicate that functional egg technologies are technically mature and economically viable when supported by adequate feed formulation, while the cage-free transition in Indonesia remains nascent, with cage-free systems accounting for only an estimated five percent of national egg production. Despite growing consumer willingness to pay a premium of ten to forty percent for welfare-certified eggs. The convergence of functional egg design with cage-free production systems is proposed as a strategic pathway for Indonesian layer farmers to differentiate their products, capture premium market segments, and align with both nutritional security and animal welfare policy objectives. Key barriers, including feed cost, disease management in open housing, and certification infrastructure, are discussed alongside recommendations for feed-based research and extension priorities. The role of Indonesian Cage Free Association (ICFA) in the progress of cage free adoption in Indonesia is highly acknowledged and discussed in this paper.

Keywords: *Functional egg, cage-free, laying hen, animal welfare, feed enrichment, Indonesia.*

ADAM 32-LIKE 2 METALLOPEPTIDASES (ADAM32L2) AT THE SPERM ACROSOMAL MEMBRANE MEDIATE INNER PERIVITELLINE LAYER (IPVL) DEGRADATION IN CHICKENS

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Abstract

The phenomenon of unfertilized breeding may contribute to the low growth rate of livestock populations worldwide. Previous studies suggested that subtle dysfunctions in sperm biology may lead to male subfertility, highlighting the importance of molecular approaches in understanding fertility-related issues. In Malaysia, the adoption of assisted reproductive technologies (ART) in livestock production is limited, particularly among small-scale farmers, as reported in the Malaysian National Agro-food Policy (NAP) 2011-2020. Several challenges limit the implementation of these technologies within Malaysia's livestock industry, such as the need for specialized equipment and technical expertise. Chicken fertilization involves several key mechanisms including activation of sperm motility, acrosome reaction (AR) and sperm-egg fusion. Hydrolytic enzymes play a crucial role in the fertilization process. Among these, acrosin and metalloproteinase function synergistically to enhance sperm motility and facilitate sperm-egg penetration in both mammals and avian species. The present study aimed to determine the expression and potential role of the sperm protein ADAM32L2 during the fertilization process in chickens. In avian species, modifications of sperm membrane proteins are essential, as sperm attain full maturity and functionality only after the AR, which occurs immediately following sperm-IPVL binding. Western blot analysis exhibited ADAM32L2 as a high molecular weight protein in chicken sperm. In vitro sperm penetration assays revealed the involvement of ADAM32L2 in sperm-IPVL penetration. In addition, immunohistochemistry analysis revealed that ADAM32L2 is localized exclusively and predominantly at the sperm sacrosome region and the flagellum region, respectively. These findings provide new insights into the function of ADAM proteins in avian species. Understanding the molecular mechanisms underlying sperm-egg interaction may contribute to the development of ART in chickens. Such advancements may support animal production, wildlife conservation, and fertility rehabilitation in avian species.

Keywords: *A Disintegrin and Metalloproteinase (ADAM), sperm-egg penetration, acrosome membrane, degradation, chickens.*

ANIMAL PRODUCTION AND FEED INDUSTRY IN CHINA

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Abstract

China is one of the world's largest producers of livestock products and feed, playing a critical role in global food security and agricultural sustainability. Over the past four decades, China's feed industry has undergone rapid expansion and established a comprehensive industrial system encompassing feed ingredients, feed additives, feed processing, and feed machinery manufacturing. In 2025, China's total feed production exceeded 340 million tons, with the total industrial output value reaching 1.29 trillion RMB. Among the major sectors, swine feed production reached 166.39 million tons, representing a substantial year-on-year increase of 15.6% and serving as the primary driver of overall industry growth. Compound feed continued to dominate the market, with production reaching 319.46 million tons. Meanwhile, the feed additive industry also experienced significant expansion, with total production reaching 17.63 million tons, up 9.4% year-on-year. China's livestock industry likewise achieved remarkable progress in 2025. Total meat production from pigs, cattle, sheep, and poultry exceeded 100 million tons for the first time, reaching 100.72 million tons, representing a 4.2% annual increase. Pork production reached 59.38 million tons, while poultry meat and beef production increased to 28.37 and 8.01 million tons, respectively. Annual pig slaughter reached 719.73 million head, with a year-end inventory of 429.67 million head, indicating continued stability in swine production systems. Looking forward, the integration of artificial intelligence, precision livestock farming, and emerging agricultural technologies is expected to accelerate the development of region-specific modern production systems. To achieve high-quality and sustainable development, China's animal production and feed industries must continue advancing innovation-driven, environmentally sustainable, and resource-efficient production strategies through coordinated collaboration among research institutions, industry stakeholders, and policymakers.

Keywords: *Animal production, feed industry, China, swine, pork*

PRECISION LIVESTOCK NUTRITION AS THE LINCHPIN OF MALAYSIA'S FOOD SOVEREIGNTY

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Abstract

Malaysia's livestock industry currently faces a critical structural challenge characterized by an overwhelming dependency on imported feed grains, particularly grain corn and soybean meal, which significantly inflates production costs and renders the national food supply vulnerable to global market volatility. This systemic fragility is underscored by a persistent market deficit in livestock production and the inability to achieve self-sufficiency in essential animal proteins like beef and mutton. In this context, Precision Livestock Nutrition (PLN) emerges as a transformative mandate for national food sovereignty by shifting from conventional, inefficient management to data-driven, optimized feeding strategies. Central to this approach is the integration of Internet of Things (IoT) technologies and real-time data analytics to precisely match nutrient delivery with individual animal requirements. Implementing sensors for environmental monitoring and health tracking allows for the strategic upcycling of locally available agricultural by-products, such as palm kernel expeller and rice straw, which have historically been underutilized due to nutrient variability. By utilizing advanced biometric sensors and machine learning algorithms to monitor metabolic responses and animal behaviour, Malaysian farmers can maximize nutrient absorption, significantly reduce waste, improve feed conversion ratios and subsequently increase the profitability. Ultimately, PLN serves as the essential technological linchpin that harmonizes animal well-being with economic resilience, securing a stable, sovereign food future for Malaysia by reducing reliance on foreign supply chains.

Keywords: *Precision livestock nutrition, food sovereignty, smart farming technologies*

NAVIGATING CURRENT CHALLENGES IN POULTRY FARMING IN MALAYSIA

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Abstract

The poultry industry is a critical component of Malaysia's food security system, supplying the nation's most widely consumed source of animal protein. Despite maintaining relatively high levels of self-sufficiency in chicken meat and eggs, the sector is currently facing a complex set of economic, environmental, and biosecurity challenges that threaten its long-term sustainability. This review examines the major constraints confronting Malaysian poultry farming in 2025–2026 and highlights potential strategies to strengthen industry resilience. Recent data indicated that Malaysia produced approximately 1.54 million metric tonnes of poultry products in 2023, meeting a major part of the domestic demand. However, the industry remains heavily dependent on imported feed ingredients, particularly corn and soybean meal, exposing producers to fluctuations in global commodity markets and geopolitical disruptions. Feed costs account for approximately 60–75% of total poultry production expenses, making them the single largest determinant of farm profitability. The escalation of global feed, fuel, fertilizer, and utility costs during 2025–2026 has significantly increased production expenditures. Reports from industry associations indicated that some Malaysian poultry farmers have been forced to reduce output, delay chick placements, or temporarily suspend operations due to declining profit margins. Rising costs have been compounded by market volatility, weakened consumer demand in certain regions, and imbalances between farm-gate and retail prices. In some cases, farmers have reportedly sold broilers below production cost to manage oversupply and maintain cash flow. Biosecurity threats remain as another major concern for the industry. The global spread of highly pathogenic avian influenza (HPAI) continues to pose risks to poultry populations and international trade. Although Malaysia has strengthened surveillance and disease-control measures, the potential for outbreaks necessitates continuous monitoring and rapid response systems to prevent production losses and supply disruptions. Furthermore, climate-related challenges, including rising temperatures and extreme weather events, may adversely affect bird health, feed conversion efficiency, and farm productivity. Structural challenges also persist within the industry. Small and medium-scale producers often face difficulties adopting advanced technologies due to capital constraints, while dependence on imported feed ingredients increases vulnerability to currency fluctuations and external supply shocks. Recent studies suggested that profitability margins remain narrow, with an input-output ratio of approximately 1.03, underscoring the need for improved cost management and operational efficiency. To address these challenges, the Malaysian poultry sector must prioritize feed diversification, precision farming technologies, enhanced biosecurity protocols, and greater integration of digital monitoring systems. Emerging artificial intelligence-based tools for flock management, welfare monitoring, and production forecasting offer promising opportunities to improve productivity and sustainability. Strengthening local feed production, investing in climate-resilient farming practices, and fostering public–private collaboration will be essential for maintaining national food security. Overall, navigating current challenges requires a multifaceted approach that balances economic viability, disease prevention, technological innovation, and environmental sustainability to ensure the long-term resilience of Malaysia's poultry industry.

Keywords: *Poultry farming, feed costs, avian influenza, food security, precision livestock farming, poultry industry resilience.*

FROM EUROPEAN PRACTICE TO MALAYSIAN OPPORTUNITY: ADVANCING FEED HYGIENE AND FOOD SAFETY

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Abstract

Feed hygiene is a critical foundation of food safety, animal health, and sustainable livestock production. Contaminated feed ingredients and finished feeds can introduce biological, chemical, and physical hazards into the animal production chain, affecting farm performance, consumer safety, and market confidence. Among these hazards, *Salmonella* remains one of the most important feed-related pathogens because it can survive in raw materials, persist in feed mill environments, and spread through poultry, livestock, aquaculture, and food products. European experience showed that effective feed hygiene requires a systematic approach rather than dependence on a single treatment. Formaldehyde-based products were historically used for microbial control due to their strong antimicrobial activity. However, concerns related to worker safety, irritation, inhalation risk, potential carcinogenicity, Formaldehyde-based products were banned in the EU since 2018. This transition provides an important reference for Malaysia, where high temperature and humidity increase the risk of microbial contamination and mold development in feed ingredients, finished feeds, storage systems, and farm environments. As Malaysia continues to develop its poultry, livestock, aquaculture, and pet food industries, upgrading feed hygiene standards will become increasingly important for food safety, industry competitiveness, and international market access. This presentation reviews major food safety hazards in feed, contamination routes of *Salmonella*, the limitations of formaldehyde, and key lessons from European feed hygiene practices. It also proposes practical solutions for the Malaysian feed industry, including raw material risk classification, feed mill hygiene control, heat treatment, organic acid-based technologies, paraformic acid-based alternatives, routine microbiological monitoring, and farm-level biosecurity integration. The future of food safety begins with safer feed. By adopting science-based, measurable, and safer feed hygiene programs, Malaysia has the opportunity to reduce pathogen risk, improve animal production efficiency, protect consumers, and strengthen the competitiveness of its animal protein and pet food sectors.

Keywords: *Feed hygiene, food safety, Salmonella, formaldehyde alternative, Malaysia, European practice.*

NEW GENERATION ASF VACCINES: SCIENTIFIC ADVANCES, CHALLENGES AND COMMERCIAL PROSPECTS – THE INDONESIA EXPERIENCE

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Abstract

African Swine Fever (ASF) continues to pose a major threat to global pig production, causing substantial economic losses, compromising food security, and challenging the sustainability of the swine industry. Since its emergence in Indonesia in 2019, ASF has significantly affected pig populations, particularly in regions where pig farming plays an important socio-economic role. In the absence of widely available and universally accepted commercial vaccines, the development of new-generation ASF vaccines has become a global research priority. This presentation examines recent scientific advances in ASF vaccine development and their relevance to Indonesia's efforts in disease prevention and control. Current vaccine platforms under investigation include live attenuated vaccines (LAVs), gene-deleted vaccines, viral-vectored vaccines, subunit vaccines, and next-generation molecular approaches. Among these, gene-deleted live attenuated vaccines have demonstrated the most promising protective efficacy under field and experimental conditions, offering potential tools for reducing disease burden in endemic regions. The Indonesian experience highlights both the opportunities and challenges associated with ASF vaccine deployment. While vaccination may complement biosecurity and surveillance measures, significant scientific and regulatory concerns remain, including vaccine safety, genetic stability, duration of immunity, differentiation of infected from vaccinated animals (DIVA), and effectiveness against diverse ASF virus strains circulating in the region. The establishment of robust monitoring systems and science-based regulatory frameworks is essential to ensure safe and effective vaccine implementation. The presentation will also explore the commercial prospects of ASF vaccines, including market demand, production capacity, affordability, and integration into national disease control strategies. Lessons learned from Indonesia underscore the importance of combining vaccination with strengthened biosecurity, disease surveillance, movement control, and stakeholder engagement to achieve sustainable ASF management. The development of new-generation ASF vaccines represents a significant scientific breakthrough with the potential to transform global ASF control. However, successful commercialization and field application will depend on continued research, regulatory oversight, and coordinated collaboration among governments, researchers, vaccine manufacturers, and the swine industry.

Keywords: *African Swine Fever, vaccines, pig, virus, Indonesia*

PRECISION SUPPLEMENTATION: ADVANCING SUSTAINABLE AND CLIMATE-RESILIENT LIVESTOCK PRODUCTION

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Abstract

Sustainable livestock production increasingly depends on precision supplementation strategies that optimise nutrient delivery, improve feed utilisation, and enhance resilience to climate-related production challenges. In tropical production systems, animal productivity is frequently constrained by low-quality feed resources, rising feed costs, heat stress and parasitic burdens, resulting in reduced performance and continued dependence on imported feed ingredients. Precision supplementation offers a practical climate-smart approach by strategically matching nutrient supply with animal requirements while maximising locally available feed resources. This plenary presents the CapriBos Multinutrient Block as a case study of precision supplementation translated from research into validated, field-deployed technology. Formulated from locally sourced agro-industrial by-products, molasses, urea, macro-minerals, and trace elements in a free-access lick-block format, CapriBos was evaluated under tropical field conditions involving 200 ruminants, including dairy and beef cattle and dairy and meat goats, across five farms. Supplementation produced substantial improvements in productivity and health, including a 50% increase in beef calf live weight gain, a 31% improvement in feed conversion ratio, up to 82% higher milk yield in dairy goats, improved milk fat content and reproductive performance in dairy cattle, and a 93–94% reduction in strongyle faecal egg counts, without adverse effects on blood biochemical parameters. Beyond animal performance, CapriBos demonstrates how strategically targeted supplementation can strengthen feed self-sufficiency, improve resource-use efficiency, and support climate-resilient livestock development through local feed resource utilisation. The integration of scientific validation, regulatory compliance, industry collaboration, and technology commercialisation provides a scalable pathway for adoption by smallholder and commercial producers. These findings highlight precision supplementation as a climate-smart feeding strategy for improving productivity, animal health, and sustainability in tropical livestock systems.

Keywords: *Precision supplementation, climate-smart livestock production, multinutrient block technology, sustainable intensification, tropical livestock systems*

AI-POWERED DETECTION OF FEED ADULTERATION FOR SUSTAINABLE LIVESTOCK PRODUCTION

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Abstract

Adulteration of feed ingredients through substitution or dilution with inferior materials remains a persistent challenge that reduces nutrient value, impairs digestibility, and poses risks to both animal health and human consumers. Conventional detection methods such as microscopy, proximate analysis, and chemical assays are reliable but costly, time-consuming, and inaccessible to many farmers and feed millers. To date, no comparable AI-based feed adulteration detection system is commercially available, underscoring the potential impact of this research. Hence, this study aimed to develop a simple, rapid, non-destructive, and cost-effective means of detecting feed adulterants through a smart mobile application and a Single Board Computer (SBC)-based device. An artificial intelligence (AI) system was designed using image-based analysis integrated into mobile and SBC platforms. Feed ingredient images captured via smartphones or smart devices were processed using convolutional neural networks to estimate the likelihood of adulteration. The mobile application was optimized for field use, allowing farmers to conduct on-site feed quality checks before procurement or feeding. In contrast, the SBC device was tailored for feedmill quality control analysts, providing a structured tool for routine inspection and monitoring. The system also supports regulatory oversight and contributes to a database of feed ingredients and adulterants for future research and innovation. This technology offers a practical solution to detect feed adulteration, thereby improving nutrient utilization, livestock performance, and farm profitability. It also strengthens science-based policymaking and promotes sustainable animal agriculture in the Philippines.

Keywords: *Artificial intelligence, feed adulteration, feed quality assurance, image-based detection, livestock production*

PROJECT PROTECT PHIL WARTY: MOBILIZING CITIZEN SCIENCE AND CONSERVATION GENETICS TO PROTECT THE PHILIPPINE WARTY PIGS FROM AFRICAN SWINE FEVER IN LEYTE AND BILIRAN ISLANDS, PHILIPPINES

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Abstract

African Swine Fever (ASF) poses a significant threat to the swine industry and wild pig populations in the Philippines, particularly the Philippine warty pig (*Sus philippensis*), which is classified as "Vulnerable" by the International Union for Conservation of Nature (IUCN). While ASF control efforts primarily target domestic pigs, the risk to endemic wild pigs remains largely unaddressed. This project aimed to assess the impact of ASF on Philippine warty pigs, including the native pig populations in Leyte and Biliran islands by examining their distribution and phylogenetic structure, and the epidemiology of ASF in these areas. Employing a transdisciplinary approach, the study engaged local communities through citizen science approach and conservation genetics, empowering stakeholders in data collection and participation in conservation initiatives. The molecular genetic characterization documented a mosaic signal of ancestry with those from mainland Southeast Asia, suggesting gene flow that may have resulted from human migration and trade. The genetic diversity indices recorded moderate haplotypic and nucleotide diversity reflecting declining genetic variation and possible genetic erosion. Community knowledge of the Philippine warty pig is moderate, especially regarding its ecological role and conservation status, with limited awareness of its vulnerable classification, highlighting the need for targeted education. Attitudes toward conservation are neutral, but support for measures such as hunting restrictions varies, likely influenced by socio-economic factors. Actual conservation practices are fair, suggesting a knowledge–attitude–practice gap. These results underscore the importance of combining education with community engagement to enhance conservation outcomes. These provide crucial insights into the conservation of the Philippine warty pig and native pigs, focusing on biodiversity preservation, community engagement, and sustainable conservation practices.

Keywords: *Conservation genetics, endemic wild pigs, citizen science, Sus philippensis*

OVERVIEW OF ASIAN-AUSTRALASIAN DAIRY GOAT DEVELOPMENT

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Abstract

The dairy goat is one of the very important livestock in the world dairy industry. Goat milk provides proteins and other nutrients to consumers in developing countries especially in Asia and Africa, and at the same time serves as a high-value and functional food for consumers in many countries because of its unique nutritional values. The Asian-Australasian region hosts the largest population of 104 million accounting for 47.7% of total goat numbers, medium and large-scale commercial dairy goat farming proved to be profitable due to the high price and health effects of goat milk. However, the family farms prevailing in the Asian area also have the advantages in management expenses and feeding costs. The dairy goat industry, as one of the sustainable animal agricultures, is still a good business in the world under the current economic and environmental conditions, which could increase the income and improve the life quality of goat producers and meet the niche consumer market needs for functional milk products. In the last few years, most advanced techniques such as molecular breeding, gene editing, sexed semen, MOET, genome-wide association studies and integrated omic analysis, etc. were also partially used in the dairy goat industries, at present, dairy goat industries still face the difficulties of lacking high-producing goats, low kidding rates, shortage of quality forages, seasonal supply of milk, unpredictable epidemic diseases, etc. Thus, in order to promote the dairy goat industry in Asia-Australasia, this presentation will review the current situation, technologies and research progress and also elucidate the opportunities and challenges for dairy goat industries in the future.

Keywords: *Dairy goat, research progress, opportunities, challenges.*

PROTEOMIC CHARACTERISTICS AND THERAPEUTIC FUNCTIONS OF GOAT MILK EXOSOMES: INSIGHTS INTO ENDOGENOUS LOADING, COLITIS PREVENTION AND FATTY LIVER THERAPY

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Abstract

Goat milk exosomes, as natural nanocarriers with good biocompatibility, have attracted increasing attention in the fields of food science and biomedicine. This study characterized the proteomic profile of goat milk exosomes and evaluated their potential therapeutic functions. Firstly, comparative proteomics was employed to analyze the protein compositions of exosomes derived from goat milk, dairy goat plasma, and dairy goat mammary epithelial cells (GMECs). The results indicated that approximately 30% of exosomes in goat milk originated from GMECs. We also identified a novel protein-loading motif, CLDN4, which can effectively enhance the endogenous loading efficiency of GMEC-derived exosomes that are subsequently secreted into milk. Secondly, we investigated the preventive effect of goat milk exosomes on dextran sulfate sodium (DSS)-induced chronic colitis. Goat milk exosomes were found to attenuate intestinal inflammation, partly through inhibition of the NF- κ B and Jun signaling pathways, by modulating the composition of the gut microbiota and its metabolites. We evaluated the therapeutic effect of goat milk exosomes on high-fat diet-induced fatty liver. The results showed that goat milk exosomes could target the liver and activate the Hnf4a signaling pathway, thereby alleviating hepatic lipid accumulation. Collectively, this study elucidated the proteomic characteristics and endogenous loading mechanism of goat milk exosomes and demonstrated their potential applications in the prevention and treatment of intestinal and liver diseases, providing an important theoretical foundation and practical guidance for the development and utilization of goat milk exosomes in functional foods and biomedical applications.

Keywords: *Exosomes, dairy goat mammary epithelial cells, chronic colitis, fatty liver, functional foods*

GLOBAL EVOLUTION AND FUTURE OUTLOOK OF CATTLE RAISING FOR MILK AND MEAT

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Abstract

Structuring cattle populations and evaluating production trends over time is critical for guaranteeing sustainable livestock management, optimizing resource utilization, and increasing economic efficiency. Producers can better manage resources such as feed and land by tracking changes in herd size, breed composition, and geographical differences. It also influences policy decisions and supports breeding initiatives aimed at enhancing cattle genetics for disease resistance and productivity, ultimately contributing to the agricultural as well as livestock sectors long-term sustainability and competitiveness. Over the decades, the cattle trend displayed a varied picture around the world, with the global cattle population under pressure from issues like land degradation, climate change, and disease outbreaks. Recently, the global cattle population was relatively steady or slightly dropping, with major regional variances. While some countries saw herds shrink due to changing fodder trends and policy adjustments, countries in Latin America, Africa, and portions of Asia continued to grow their herds, because of population expansion and rising domestic and international market demands. Since 1960, the world's milk production has made a tremendous increase with the United States, India, and the European Union leading the way. In the early decades, beef output increased steadily, notably in major producing countries such as the United States, Brazil, and Argentina, owing to rising global demand for meat. However, by the 1980s and 1990s, growth in beef output had stalled in many affluent countries, while beef production had soared in Latin America, Africa, and parts of Asia, with Brazil emerging as a global leader. Disease outbreaks, such as BSE (Bovine Spongiform Encephalopathy) in the 1990s, posed further hurdles to beef production, affecting international trade and consumption. To meet expanding global demand while addressing environmental and ethical concerns, the cattle sector will need to change towards more sustainable and efficient operations in the future. Population growth, particularly in developing countries, will drive up demand for beef, milk, and hides. Innovations in breeding, feeding, and farm management will be critical to boosting productivity while maintaining animal welfare and environmental health. Furthermore, technological improvements such as precision livestock farming and regenerative agriculture will contribute to a lower carbon footprint in cow production.

Keywords: *Cattle, population, meat, milk, hide*

ASSESSMENT OF AWARENESS AND ISSUE IDENTIFICATION FOR PROMOTING GOAT CHEESE IN JAPAN

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Abstract

A cheese culture in Japan has developed over the past 30 years, and domestic natural cheeses are now highly regarded both domestically and internationally. Cheese is considered an important product for the future promotion of goat farming. However, there has been almost no discussion regarding Japanese goat cheese production. This stems from the current reality that the volume of goat cheese in the market is low, making it difficult for goat producers to envision the types of products they could develop. On the other hand, it is hoped that opportunities to understand the characteristics of goat cheese will increase. Therefore, this study aimed to assess awareness of goat cheese, provide a tasting experience and identify issues for promoting the goat cheese in Japan. The examination was held at the venue of the 27th conference of the Japanese Society of Goat Science, in which 34 people including goat producers, researchers and enthusiasts participated. An awareness survey was conducted focusing on the items related to the awareness of goat cheese. A goat cheese tasting seminar was hosted after the awareness survey. An explanation of cheese features including texture and flavor was provided, followed by a tasting of 5 varieties of cheese, including cow and goat Gouda, as well as hard and soft goat cheeses. A post-seminar survey was conducted after the tasting. Based on the explanations and tastings provided during the tasting seminar, a survey regarding changes in attitudes toward the development of goat-based products was conducted, such as impressions of each cheese, perceptions of goat cheese (changes from before the tasting), whether there is potential for domestic production of goat cheese, challenges related to goat cheese. Some participants initially had a negative impression of goat cheese, referencing its unique taste, premium pricing, and varying consumer preferences. However, many participants reported having a favorable impression of goat cheese after the tasting. The examination not only confirmed how tasting goat cheese changes people's perceptions but also demonstrated the importance of taste experiences. On the other hand, a lack of information and opportunities to consume goat cheese was identified as a major challenge. The constructive feedback regarding the promotion of goat cheese in Japan was obtained.

Keywords: *Awareness, goat cheese, issue, Japan, promotion*

SUSTAINABLE INTENSIFICATION IN DAIRY GOAT FARMING: A PATHWAY TO GREEN MILK PRODUCTION

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Abstract

The global dairy sector is under increasing pressure to reconcile the growing demand for milk with the urgent need to mitigate its environmental footprint. Conventional dairy farming practices are often associated with significant ecological burdens, including greenhouse gas emissions, land degradation, and water pollution. Within this context, dairy goat farming presents a unique opportunity due to the species' inherent efficiency and lower resource demands compared to cattle. This paper explored the concept of "green dairy goat farming" as a model for sustainable intensification, arguing that the integration of agroecological principles and environmentally sound management practices can simultaneously enhance milk quality, reduce environmental impact, and improve farm profitability. The paper provides a comprehensive analysis of sustainable practices applicable to dairy goat systems. It examined the role of organic feed production, integrated pest management, and soil fertility management in building a resilient agroecosystem. Furthermore, it investigated the strategies for reducing the carbon footprint through renewable energy adoption and advanced waste management, alongside methods for biodiversity conservation. A central focus is the direct correlation between these green practices and superior milk quality, highlighting the nutritional benefits of pasture-based diets and the reduced use of antibiotics and hormones. The analysis extends to the economic and social dimensions, demonstrating that sustainability can be cost-effective through enhanced resource efficiency and can meet the growing consumer demand for eco-certified products, thereby improving rural livelihoods. While acknowledging significant challenges—such as the financial and technical barriers to transitioning from conventional methods—the paper synthesized evidence from case studies to illustrate the practical viability and multifaceted benefits of this approach. It concluded with a call for integrated policy support, technological innovation, and market incentives to foster the widespread adoption of green practices, positioning dairy goat farming at the forefront of a more sustainable and ethical agricultural future.

Keywords: *Sustainable agriculture, dairy goats, milk quality, agroecology, biodiversity*

UNDERSTANDING MAMMARY GLAND DEVELOPMENT TO FACILITATE MILK PRODUCTION IN GOATS

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Abstract

Understanding mammary gland development is critical for improving milk production in dairy animals. In dairy goats, pregnancy frequently overlaps with the typical involution phase, resulting in a unique biological process known as regenerative remodeling. Unlike classical involution, this process is characterized by reduced epithelial cell death, preservation of alveolar structures, and partial functional recovery of the mammary gland. In this study, we applied advanced cellular profiling approaches to identify a key regulatory subpopulation within the mammary epithelium. We found that luminal hormone-responsive cells act as a critical switch that drives the differentiation of luminal secretory precursors, thereby orchestrating mammary gland remodeling during the pregnancy–involution overlap period. Based on this finding, we developed a molecular formulation, NCG, designed to activate this specific cell population. NCG significantly increased circulating estradiol (E2) and insulin-like growth factor-1 levels. Morphological analyses revealed that NCG treatment markedly expanded mammary ductal area and enhanced epithelial cell proliferation. Transcriptomic and pathway analyses further indicated that NCG selectively activated pathways associated with epithelial proliferation, differentiation, branching morphogenesis, and estrogen receptor signaling. Immunohistochemical analysis confirmed a significant increase in the proportion of estrogen receptor-positive luminal cells and elevated progesterone receptor expression following NCG treatment. During the periparturient period, NCG supplementation reduced plasma levels of total protein, glucose, triglycerides, globulin, and very-low-density lipoprotein, while significantly increasing progesterone and prolactin concentrations. Importantly, NCG-treated animals exhibited larger alveolar structures, enhanced lactation capacity, and significantly increased milk yield. Collectively, this study provided new insights into mammary regenerative biology and offers a promising strategy for improving dairy productivity of goats.

Keywords: *Mammary gland, tissue development, milk production, hormone*

GREENHOUSE GAS EMISSIONS, RUMINANT NUTRITIONAL PHYSIOLOGY, AND LIVESTOCK PRODUCTIVITY: A REVIEW OF MITIGATION STRATEGIES

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Abstract

The escalation of global greenhouse gas (GHG) emissions poses a systemic risk. The agricultural sector accounts for 11.0% of this total, with ruminant livestock generating 65% to 70% of all agricultural emissions. Enteric methane (CH₄) production represents a substantial loss of dietary energy for the animal and a major driver of climate change. This review explores the intersection of ruminant nutritional physiology and enteric methane mitigation, evaluating strategies that simultaneously reduce environmental footprints and support animal performance. Ruminant productivity relies on balancing the rumen-microbe-animal system, optimizing nutrient delivery to the small intestine based on the production stage. Theoretically, suppressing methanogenesis redirects dietary energy toward growth, milk, and meat production; however, these responses vary significantly across diverse production systems and environmental conditions. The review synthesizes effective mitigation strategies, analyzing their physiological mechanisms, nutrient utilization impacts, and environmental benefits. It provides actionable insights for researchers and producers aiming to implement sustainable, high-efficiency practices in modern livestock production.

Keywords: *Ruminant, methane, physiology, nutrition, productivity*

NANOEMULSION BSF OIL SUPPLEMENTED WITH HERBS FOR ANIMAL TRANSPORTATION DIET

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Abstract

Transportation stress has a negative effect on animal performance. Some factors which cause animal transportation stress are driver, vehicle, duration, animal status, space and diet. This study was aimed to evaluate the effect of BSF oil nanoemulsion supplemented with herbs as a diet for long trip sheep which were transported in a 670 km range during 14 hours. Around 45 growing male sheep and 45 of ewes were used in a 3×3 factorial completely randomized design. The first factor was dietary treatment: D0 (control, without supplementation), D1 (Diet nanoemulsion BSF oil plus black seed), and D2 (Diet nanoemulsion BSF oil plus curcumin). The second factor was vehicle deck position: U (upper deck), M (middle deck), and L (lower deck). Parameters measured were physiological values, hematology, blood metabolites and performances. Results showed that male sheep with nanoemulsion treatment have higher % recovery (20%) compared to control one (13%). Meanwhile, time recovery in ewes was shorter (9 days) compared to control treatment (12 days). The BSF oil and herbs nanoemulsion treatments had significant effect ($P<0.05$) on leukocyte parameters, particularly neutrophils and lymphocytes. Curcumin-based nanoemulsion (D2) helped stabilize hematological and blood metabolite profiles and reduce leukocyte counts during the recovery time. Deck position influenced animal stress through hemoglobin, hematocrit, and glucose levels, where the lower deck (L) indicated the highest physiological stress, as shown by elevated values in those parameters compared to the upper (U) and middle decks (M). It was concluded that nano BSF oil supplemented with herbs curcumine and black seed could reduce some parameters of stress transportation.

Keywords: *Blood metabolites, ewes, nanoemulsion, stress, transportation*

TOWARDS SUSTAINABLE OIL PALM–CATTLE SYSTEMS: INSIGHTS INTO SOIL COMPACTION AND BIODIVERSITY UNDER ROTATIONAL GRAZING

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Abstract

Malaysia's beef industry faces a critical supply gap, with domestic self-sufficiency declining from 23% in 2019 to 16% in 2023. This decline is primarily driven by land scarcity, positioning the integration of cattle into oil palm plantations as a vital strategy for land use efficiency. However, the ecological trade-offs, specifically soil compaction and biodiversity loss compared to conventional chemical weeding, remain poorly understood. This study evaluated the influence of three vegetation management systems (chemical weeding, free grazing, and rotational grazing) on soil physical conditions and undergrowth diversity across 34 plantations in Peninsular Malaysia. Data from 306 quadrats were analyzed using generalized linear models to assess soil compaction, weed species richness, undergrowth coverage, and vegetation height. Results indicated that management practices significantly influenced soil compaction ($F_{19, 286} = 7.05$, $p < 0.001$), with grazing systems surprisingly recording lower compaction levels than chemically weeded areas (mean = 2.54 kg/cm²). Furthermore, weed species richness was significantly driven by management factors ($\chi^2 = 61.9$, $p < 0.001$). While higher undergrowth coverage promoted diversity ($p < 0.001$), increased soil compaction ($p = 0.041$) and excessive vegetation height ($p = 0.013$) correlated negatively with richness. These findings established a direct linkage between soil health and plant biodiversity, demonstrating that lower compaction levels consistently support higher species richness. Notably, rotational grazing emerged as the superior management model, maintaining the most balanced vegetation structure. This study concluded that managed grazing systems can mitigate soil degradation and enhance biodiversity, offering a sustainable, nature-based alternative to conventional chemical-dependent plantation management.

Keywords: *Oil palm–cattle integration, rotational grazing, soil compaction, biodiversity, sustainable grazing management*

DAIRY GOATS IN INDIA: PAST, PRESENT & FUTURE

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Abstract

India harbours the world's largest goat population, recorded at 148.88 million head in the 20th Livestock Census (2019), representing approximately 26% of the global goat population, and has consistently ranked first globally in goat milk production. Total goat milk production in India reached 7.59 million tonnes in 2023, contributing 3.3% of the country's overall milk output. Historically, goat dairying in India evolved from subsistence-level production, with national output expanding nearly fourteenfold over six decades with average milk yield per animal rising from 100 kg/head in 1961 to 181 kg/head by 2023. The country currently registers 39 recognised goat breeds, of which Jamunapari, Beetal, Barbari, Osmanabadi, and Malabari are the principal dairy breeds. Raw milk at farm gate price ranges from ₹60 to ₹120 per litre, substantially below the ₹200–₹400 per litre commanded in organised urban retail channels. Value-added products, including goat milk powder, artisanal cheese, ghee, paneer, and cosmetic formulations, are gaining commercial traction. The Government of India has incorporated goat milk production as an explicit productivity target under the National Livestock Mission (NLM), providing direct 50% capital subsidies to individuals, SHGs, JLGs, FPOs, and Section 8 companies for establishing goat breed multiplication farms, with ₹105.99 crore released to 498 beneficiaries to date. The Animal Husbandry Infrastructure Development Fund (AHIDF), with a revised corpus of ₹29,610 crore, incentivises private investments. From a genetic improvement standpoint, crossbreeding trials with exotic dairy breeds such as Cyprus Shami, Alpine, and Saanen have demonstrated milk yield improvements of 40–60% over indigenous baselines. Genomic selection, precision livestock farming, and incorporating sensor-based health monitoring and digital market linkages through e-commerce platforms hold promise for transforming productivity and market access at scale. India's per capita protein consumption at 47 g/day remains significantly below the ICMR-recommended 60 g/day. With these convergent interventions, dairy goats can transition from their traditional role as the "poor man's cow" to a commercially viable, climate-resilient, and nutritionally strategic pillar of India's evolving livestock economy.

Keywords: *Small ruminant, Cyprus shami, value addition, cosmetics, National Livestock Mission*

OPTIMISING MEAT GOAT PRODUCTION IN THE TROPICS: EVIDENCE FROM KATJANG × BOER CROSSBREEDING

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Abstract

Goat production plays an important role in supporting the meat supply. However, its development remains constrained by the limited availability of breeds that can achieve both high productivity and good adaptability under challenging environmental conditions. Indigenous breeds such as Katjang are well known for their hardiness, disease tolerance, and ability to thrive under low-input systems. Still, their growth performance and carcass yield are relatively low. In contrast, exotic breeds such as Boer exhibit superior growth rate, body size, and dressing percentage, although their performance is often inconsistent in tropical environments. Therefore, crossbreeding between these two breeds has been widely adopted as a strategic approach to combine the desirable traits of both genetic resources. This study evaluates the potential of Katjang × Boer crossbreeding as an approach to optimise meat goat production under tropical conditions. A structured breeding programme involving multiple generations of Katjang × Boer crossbred goats was implemented to assess key performance indicators, including reproductive performance, growth traits, morphometric characteristics, and carcass quality. In addition, genetic parameters such as heterosis and heritability were evaluated to better understand the genetic dynamics of crossbreeding across generations. The results indicate that crossbreeding significantly improves growth performance and carcass yield while maintaining acceptable levels of reproductive efficiency. First-generation crossbreds demonstrated superior growth and production traits, reflecting strong heterosis, whereas later generations exhibited greater genetic stability, associated with increased additive genetic influence. These findings highlight the trade-off between hybrid vigour and long-term genetic improvement in crossbreeding systems. In conclusion, Katjang × Boer crossbreeding presents a viable strategy for enhancing meat goat production in tropical environments. The integration of performance evaluation and genetic parameters provides a strong basis for developing sustainable breeding programmes to improve productivity, adaptability, and long-term genetic progress in small ruminant systems.

Keywords: *Katjang × Boer, crossbreeding, meat goat production, heterosis, heritability*

EFFECT OF HIGH SULFUR DIET ON RUMEN FERMENTATION AND EPITHELIAL BARRIER FUNCTION IN BEEF CATTLE

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Abstract

The aim of the study was to investigate the mechanism of high-sulfur diet inducing rumen epithelial injury and inflammation. Eight 24-month-old Angus steers (350kg±43kg) fitted with permanent rumen fistulas were used in a repeated 4×4 Latin square design: Cattles in the control group were fed a basal diet (sulfur content was 0.4%, CON), and those in the experimental groups were fed a diet with sulfur content of 0.6% (LSD), 0.8% (MSD) and 1.0% (HSD) with sodium sulfate, respectively. Total gas production and methane gas concentrations decreased linearly with increasing dietary sulfur content ($P < 0.01$), while hydrogen sulfide gas concentration increased significantly ($P < 0.05$). Compared to CON, the concentration of TVFA and the proportion of butyric acid of HSD increased ($P < 0.01$) significantly, but the proportion of propionic acid decreased significantly ($P < 0.01$). The concentration of $\text{NH}_3\text{-N}$ was not significantly different between LSD and MSD, but was significantly lower than that of CON and HSD ($P < 0.01$). Total thickness of rumen epithelium in HSD was significantly higher than that in CON and LSD ($P = 0.01$), but not significantly different from MSD. Specifically, the thickness of the spinous layer and basal layer increased ($P = 0.02$), while there was no significant difference between corneum and granular layer. The degree of peeling and keratinization on the rumen papilla surface was more obvious in the HSD. At the same time, the high-sulfur diet led to the formation of large cracks and sprouting of rumen epithelium. The bacteria attached to the rumen epithelium surface were mainly coccus and bacillus in CON, while the high-sulfur diet showed more fusarium and actinomycetes. qPCR results showed that the mRNA expression levels of TJP1 and CLDN-1 genes in rumen epithelial cells in HSD were significantly lower than those in CON ($P < 0.05$). According to the above results, it can be inferred that dietary excess sulfur can affect rumen fermentation, change the type of rumen fermentation, and damage the integrity of rumen epithelium morphological structure, thereby increasing the permeability of rumen epithelium and destroying barrier function of beef cattle.

Keywords: *High-sulfur diet, rumen fermentation, epithelial barrier, Angus steers, gas production*

DECIPHERING MALAYSIAN LOCAL CATTLE GENOME

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Abstract

Whole-genome sequence data on tropical (zebu) cattle are scarce. Most data in global databases is based on temperate breeds. Comprehensive genomic information is crucial to understand the genetic basis and improve desirable traits in tropical breeds. This information can facilitate the development of a high-density SNP array, aid in conservation efforts, and support cattle breeding programmes. Genome resequencing of selected Malaysian cattle breeds, namely Kedah-Kelantan, Kedah-Kelantan Elit, and Brakmas, was performed using next-generation sequencing and bioinformatics approaches. Single-nucleotide polymorphisms (SNPs) were identified and annotated to uncover their biological insights, revealing several candidate genes linked to economically important traits. A user-friendly database has been developed to provide access to this genomic data. Among the valuable SNP information that is available are distribution across chromosomes, variant consequence types, and the top associated traits across all or specific breeds. In total, 310,453 SNPs linked to 38 traits were identified. The traits with the highest SNP counts are fertility and reproduction (97,293 SNPs), heat stress (38,817 SNPs), and meat quality, particularly intramuscular fat (31,912 SNPs). These traits are important in cattle breeding, and the identified SNPs can be used to develop tropical cattle that are higher in quality and more sustainable in the future.

Keywords: *Genome, next generation sequencing, single nucleotide polymorphism (SNP), Zebu*

STRUCTURAL TRANSFORMATION OF THE MALAYSIAN BEEF INDUSTRY: AN INTEGRATED PORTER–SWOT–TOWS AND GENETIC STRATEGY FRAMEWORK

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Abstract

The Malaysian beef industry continues to face persistent structural, institutional, and production-related challenges that constrain productivity growth, weaken competitiveness, and reinforce long-term dependence on imported beef products. Despite continuous policy interventions, the sector remains dominated by fragmented smallholder production systems characterized by weak breeding structures, low technological adoption, limited managerial capability, and underdeveloped supply chain coordination. In addition, weak governance systems, inconsistent institutional coordination, and uncontrolled crossbreeding practices continue to hinder sustainable industry transformation. Therefore, this study examined the structural transformation pathways of the Malaysian beef industry through an integrated analytical framework combining Porter's Five Forces, SWOT analysis, TOWS strategic analysis, and genetic systems perspectives. The study adopted a qualitative synthesis approach using secondary data sources, including livestock statistics, policy documents, and relevant literature on tropical livestock systems. The findings revealed that the Malaysian beef industry operates in a highly constrained, structurally vulnerable environment characterized by strong supplier dependency, intense market rivalry, high buyer power, and substantial substitution pressure from alternative protein sources. Fragmented governance structures, weak institutional coordination, low productivity, and limited genetic management systems were identified as major barriers to sustainable transformation. Nevertheless, the industry possesses several strategic strengths and opportunities, including a strong halal ecosystem, integrated cattle–oil palm production systems, agro-industrial feed resources, and growing demand for premium halal beef products. The study highlighted that a dual genetic strategy integrating indigenous cattle conservation with structured crossbreeding systems offers a balanced pathway for improving productivity while preserving tropical genetic resilience. Overall, the study concluded that sustainable transformation of the Malaysian beef industry requires coordinated governance reform, stronger managerial capabilities, improved traceability systems, integrated value chain development, enhanced feed security, and structured genetic governance to strengthen long-term industry resilience and competitiveness.

Keywords: *Beef industry transformation, genetic strategy, sustainable livestock governance*

GENETIC VARIATIONS AND EXPRESSION PROFILES OF CANDIDATE GENES ASSOCIATED WITH REPRODUCTIVE AND GROWTH TRAITS IN GOATS

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Abstract

The goat industry plays a vital role in global animal husbandry, particularly in major producing regions like China and Indonesia, providing essential resources such as meat, cashmere, and milk. However, low productivity and slow growth rates remain significant challenges that necessitate the implementation of advanced molecular breeding strategies. Recent advancements in genomic technologies have identified several candidate genes within the Transforming Growth Factor-beta (TGF- β) signaling pathway and other regulatory networks that significantly influence fecundity and body measurements. The identification of DNA markers such as Insertion/Deletions (InDels) and Copy Number Variations (CNVs) has opened new avenues for enhancing livestock productivity through Marker-Assisted Selection (MAS). This study aimed to investigate the mRNA expression profiles and genetic variations, specifically InDels and CNVs within the *SMAD1*, *SMAD2*, and *CLSTN2* genes. Furthermore, the research sought to evaluate the associations of these genetic markers with essential economic traits, including litter size, semen quality, and growth performance in Shaanbei White Cashmere (SBWC) goats, to provide a molecular basis for breeding improvements. Quantitative RT-qPCR analysis revealed that *SMAD1*, *SMAD2*, and *CLSTN2* are significantly expressed across various tissues in female goats, with notably higher expression levels in the ovaries of prolific (multi-lamb) mothers compared to those of single-lamb mothers ($P < 0.05$). Genetic association studies identified: Two InDels (18-bp and 7-bp) in *SMAD1* significantly correlated with litter size ($P < 0.05$). A 12-bp InDel in *SMAD2* was associated with both litter size and growth traits, particularly chest width and cannon circumference ($P < 0.05$). Copy number variation (CNV2) in *SMAD2* showed strong associations with first-born litter size ($P = 3.59 \times 10^{-4}$) and multiple semen quality parameters, including concentration and ejaculation volume. A 16-bp deletion in the *CLSTN2* gene was significantly linked to increased first-born litter size ($P = 0.0001$). The findings demonstrate that genetic variations within the *SMAD1*, *SMAD2*, and *CLSTN2* genes play crucial roles in regulating goat productivity. The differential expression in ovarian tissues and the strong correlation between specific genotypes and reproductive/growth performance highlight these genes as pivotal regulators. These identified InDels and CNVs serve as potent DNA markers for Marker-Assisted Selection (MAS), offering a robust theoretical and practical foundation for improving fertility and growth traits in goat breeding programs globally.

Keywords: Goat, *SMAD* family, *CLSTN2*, InDel, copy number variation, litter size, growth traits.

ENHANCING SUSTAINABLE PALM OIL PRODUCTION THROUGH LIVESTOCK INTEGRATION

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Abstract

The rapid expansion of oil palm (*Elaeis guineensis* Jacq.) plantations have resulted in substantial economic benefits but have also driven significant environmental challenges, including biodiversity loss, soil health degradation, greenhouse gas emissions, and intensive agrochemical use. The integration of livestock into oil palm systems has been identified as a strategy with potential to enhance sustainability through improved resource efficiency and multifunctional land use. This paper synthesized current evidence on oil palm–livestock integration, focusing on its impacts on biodiversity, soil health, livestock management, oil palm yield, and adoption constraints. Research has demonstrated that integrated systems have capacity to enhance biodiversity, promote soil fertility through nutrient cycling, reduce reliance on herbicide, and optimize land-use efficiency. Rotational grazing systems have been shown to exhibit superior performance in terms of weed control and ecosystem service provision when compared with the conventional management practices. Moreover, extant evidence suggested that livestock integration has the capacity to maintain or increase fresh fruit bunch yields whilst improving overall farm productivity and profitability. However, critical analysis revealed that these benefits are highly context-dependent and strongly influenced by management practices. A significant number of studies rely on short-term or site-specific data, with limited long-term and oil palm–specific assessments. Adoption is further constrained by economic, technical, and institutional barriers, including high initial investment costs, system complexity, and inadequate policy support. The present paper contends that oil palm–livestock integration signifies a viable pathway towards sustainable intensification, but not a universal solution. Its success depends on optimized grazing management, context-specific system design, and enabling institutional frameworks. Future research should prioritize long-term, system-level evaluations and address scalability challenges to fully realize the potential of integrated systems within a regenerative agriculture framework.

Keywords: *Oil palm, livestock integration, sustainability, silvopastoral systems, regenerative agriculture, grazing management*

SMART FARMING FOR LIVESTOCK (RUMINANT): TRANSFORMING MALAYSIA'S AGRICULTURE FUTURE

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Abstract

The livestock sector is facing increasing challenges due to several factors including climate change, resource scarcity, an ageing farmer population and sustainability concerns. Persistent issues such as poor record-keeping, labour shortages, rising production costs, inefficient farm management, and delays in early disease detection continue to challenge productivity and sustainability. Smart farming integrates advanced technologies through the application of the Internet of Things (IoT), sensors, drones, robotics, artificial intelligence (AI), machine learning, automation and cloud computing. It provides farmers with automation systems, continuous monitoring, real-time information, early warning systems, data analytics and accurate decision-making. Ultimately, smart farming empowers farmers to manage farms more efficiently, which optimises resources, reduces input costs, boosts yields and minimises environmental impacts. The readiness of smart farming implementation is strongly influenced by the availability of reliable internet connectivity, a stable energy supply, skilled personnel, adequate farm infrastructure, efficient farm operations, and effective animal identification. For an effective approach to implementing smart farming in Malaysia, it should begin with problem-orientated and needs-based solutions that match the farm scale, production system, and farmers' capabilities before introducing advanced technologies. Furthermore, the sustainability of smart farming depends on the development of a strong and integrated ecosystem involving multiple stakeholders across the agricultural and livestock sectors. This includes government agencies, universities, service providers, veterinary services, farmers and financial institutions, all of which are essential to accelerate technology adoption, improve productivity, and strengthen resilience within the farming industry. In this paper, we explore how smart farming can be implemented in Malaysia to transform the future of livestock, positioning the nation towards a sustainable and digitally empowered livestock ecosystem aligned with Industry 4.0 and National Agrofood Policy 2.0.

Keywords: *Challenges, smart farming, Malaysia's approach, future*

AN APPROACH TO COMMON SKIN TUMORS IN CATS AND DOGS WITH SURGICAL MANAGEMENT

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Abstract

Cutaneous and subcutaneous masses are among the most frequently encountered surgical conditions in small animal veterinary medicine, encompassing a wide spectrum of neoplastic and non-neoplastic lesions. Effective surgical management relies on a thorough understanding of tumor biology, including cellular origin, growth behavior, and metastatic potential. Preoperative diagnosis, typically achieved through fine needle aspiration cytology and/or biopsy, is essential for guiding surgical planning and determining appropriate margin selection. Surgical excision remains the primary treatment modality for most skin tumors, with the objective of achieving complete tumor removal while preserving function and minimizing morbidity. Fundamental oncologic surgical principles emphasize en bloc resection, atraumatic tissue handling, and adherence to appropriate lateral and deep margins based on tumor type and grade. Fascial planes serve as critical anatomical barriers and should be incorporated into excision strategies when managing malignant lesions. Histopathological evaluation of excised tissues is indispensable for definitive diagnosis, tumor grading, and assessment of margin completeness, all of which are key prognostic indicators. Inadequate excision is associated with increased risk of local recurrence and may necessitate additional treatments, including revision surgery, chemotherapy, or radiation therapy. Reconstructive techniques, ranging from primary closure to advanced flap or graft procedures, play an important role in managing surgical defects, particularly in anatomically challenging regions. Postoperative care and monitoring are essential to minimize complications such as infection, dehiscence, and seroma formation. In summary, successful surgical management of skin masses in small animals is grounded in evidence-based oncologic principles, careful preoperative assessment, meticulous surgical technique, and appropriate postoperative evaluation. Early and properly planned intervention significantly improves clinical outcomes and long-term prognosis.

Keywords: *Skin tumors, surgical management, small animal*

FROM TRIAGE TO STABILISATION: SMALL ANIMAL EMERGENCY CARE IN PRACTICE

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Abstract

Emergency presentations constitute a significant component of small animal veterinary practice and demand rapid assessment, prioritisation, and intervention to optimise patient survival. In Malaysia, veterinarians frequently encounter emergencies including trauma, heatstroke, respiratory distress, toxicities, seizures, haemorrhagic shock, cardiopulmonary arrest (CPA), and feline urethral obstruction. The successful management of these cases relies on the prompt recognition of life-threatening abnormalities and the implementation of structured emergency care protocols from the moment the patient arrives at the clinic. This presentation provides a practical overview of emergency management in small animal practice, focusing on the continuum from triage to physiological stabilisation. The role of triage as the foundation of emergency care is emphasised, enabling veterinary teams to rapidly identify patients requiring immediate intervention and allocate resources appropriately. Participants will review practical triage techniques and key clinical parameters used to assess urgency, including respiratory effort, cardiovascular status, mentation, perfusion, and evidence of active haemorrhage. A systematic approach to patient assessment using the ABCDE (Airway, Breathing, Circulation, Disability, and Exposure) framework is presented as a structured method for identifying and managing life-threatening conditions. Stabilisation strategies including oxygen supplementation, vascular access, fluid resuscitation, analgesia, haemodynamic support, and continuous monitoring are discussed. The presentation also highlights the value of point-of-care diagnostics such as packed cell volume/total solids (PCV/TS), blood glucose, lactate measurement, electrolyte analysis, blood gas evaluation, and focused assessment with sonography for trauma (FAST) in facilitating rapid clinical decision-making during the stabilisation phase. Recognising that cardiopulmonary arrest represents the ultimate emergency, current evidence-based cardiopulmonary resuscitation (CPR) recommendations advocated by the Reassessment Campaign on Veterinary Resuscitation are incorporated into the emergency management framework. Emphasis is placed on early recognition of CPA, prompt initiation of Basic Life Support (BLS), delivery of high-quality chest compressions, minimisation of interruptions, effective ventilation, Advanced Life Support (ALS) interventions, and post-cardiac arrest care. Beyond clinical management, the presentation explores the practical realities of veterinary emergency practice in Malaysia. Emergency clinicians frequently face situations where the severity of disease, prognosis, available resources, financial limitations, and owner expectations may not align. The importance of transparent communication regarding prognosis, treatment options, anticipated costs, and potential outcomes is discussed as an integral component of emergency case management. Ethical considerations surrounding resuscitation decisions, treatment limitations, quality of life, humane euthanasia, and allocation of finite resources are examined within the context of patient welfare and professional responsibility. Common emergency presentations encountered in Malaysian veterinary practice—including heatstroke associated with tropical climatic conditions, road traffic accidents, respiratory emergencies, toxic exposures, and urinary obstruction—are discussed through clinical scenarios that demonstrate the application of triage, stabilisation, resuscitation principles, and client communication strategies in real-world settings. By integrating structured triage systems, evidence-based stabilisation protocols, contemporary RECOVER CPR guidelines, and ethical decision-making frameworks, this presentation aims to provide veterinary practitioners and support staff with a practical approach to managing small animal emergencies. Ultimately, successful emergency care requires balancing medical priorities, patient welfare, available resources, and realistic client expectations while adhering to the fundamental principle of "treat first what kills first."

Keywords: *Small animal emergency, triage, stabilisation, cardiopulmonary resuscitation, emergency ethics*

EMERGENCY FLUTD: THE FIRST HOUR TO SAVE LIFE

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Abstract

Feline lower urinary tract disease (FLUTD), particularly urethral obstruction, is a common and potentially fatal emergency in small animal practice. Rapid progression to post-renal azotemia, hyperkalaemia, metabolic acidosis, and cardiovascular instability can occur within hours of obstruction, with mortality often linked to early complications rather than the obstruction itself. Despite its frequency, there remains considerable variability in the initial management of these cases, especially in primary care settings. This presentation focuses on the critical first hour of intervention, emphasising a structured and physiologically guided approach to improve patient survival. Key priorities include rapid triage, recognition of life-threatening abnormalities, and timely stabilisation prior to urethral catheterisation. Evidence-based strategies for the management of hyperkalaemia, appropriate fluid therapy, and the role of emergency bladder decompression are discussed to support clinical decision-making in high-pressure scenarios. The importance of adequate analgesia and sedation in facilitating safe and effective catheterisation is also highlighted. Common pitfalls encountered in practice—such as premature catheterisation in unstable patients, inadequate monitoring, and iatrogenic urethral trauma—are addressed with practical recommendations. In addition, the presentation contextualises these approaches within the Malaysian veterinary landscape, acknowledging constraints such as limited access to advanced monitoring equipment, cost considerations, and variability in clinical resources. Pragmatic, minimum-standard protocols are proposed to assist clinicians in delivering effective emergency care across diverse practice settings. By integrating current evidence with clinical experience, this session provides an actionable framework for the early management of obstructive FLUTD. A systematic approach within the first hour of presentation is essential to reduce morbidity and mortality, ultimately improving outcomes for this high-risk patient population.

Keywords: *FLUTD, obstruction, emergency, first hour, survival*

MAKING THE RIGHT IMAGING CHOICE IN VETERINARY PRACTICE: BEYOND IMAGES — SAFETY, COMPLIANCE AND RESPONSIBILITY

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Abstract

Diagnostic imaging is increasingly utilised across veterinary practice in Malaysia, from general clinics to referral and teaching hospitals, as well as research facilities. The growing availability of imaging modalities, ranging from conventional radiography and ultrasound to advanced systems such as computed tomography (CT), micro-computed tomography (micro-CT), and Single-Photon Emission Computed Tomography / Computed Tomography (SPECT/CT), has expanded diagnostic capabilities across diverse settings. However, the choice of imaging modality is no longer based solely on diagnostic accuracy. In current practice, imaging decisions are influenced by multiple factors, including case complexity, resource availability, cost-effectiveness, and long-term sustainability of equipment. In clinical settings, imaging is often driven by investment and return on investment (ROI), while in teaching and research environments, sustainability and operational continuity are key considerations. An imaging modality may therefore function as either a valuable asset or a long-term liability if not appropriately planned and utilised. A structured approach to modality selection across clinical, teaching and research settings is presented, highlighting practical considerations in choosing between commonly available modalities such as radiography, ultrasound, CT and advanced research imaging systems. The relationship between imaging modality and radiation risk is further discussed with reference to BKRP regulatory categorisation, emphasising that increasing imaging capability is accompanied by increasing responsibility for safety and compliance. Common gaps in current veterinary practice include unnecessary repeat exposures, inappropriate modality selection, inconsistent radiation safety practices, and inadequate preparedness in establishing the required systems, documentation and personnel following equipment acquisition. The governance aspect of imaging practice is emphasised, focusing on the roles of the Radiation Protection Officer (RPO) and the Officer-in-Charge of the Licensed Premise (OBTL). Practical considerations for veterinary professionals assuming these responsibilities are outlined, including staff registration, personnel monitoring and regulatory compliance. The choice of imaging modality is therefore not only a clinical decision, but one that carries responsibility towards radiation worker safety, public safety and patient safety, in addition to regulatory compliance and financial sustainability. Practical insights are provided to support safer, more informed and responsible imaging practices across veterinary settings.

Keywords: *Diagnostic imaging, radiation safety, RPO, OBTL, veterinary practice*

FELINE URETHRAL TRAUMA & URETHROSTOMY: 2019 - 2025 INSIGHTS FROM HPVUMK

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Abstract

This retrospective study evaluates the clinical trends, risk factors, and surgical outcomes of feline patients presenting with severe urinary complications at the Hospital Pengajaran Veterinar Universiti Malaysia Kelantan (HPVUMK) between 2019 and 2025. Over this six-year period, medical records show that urethrostomy (specifically perineal urethrostomy) serves as a vital surgical intervention for male felines suffering from severe lower urinary tract issues. The primary predisposing risk factors leading to surgical intervention include Feline Lower Urinary Tract Disease (FLUTD), recurrent obstructive urolithiasis, and pelvic fractures resulting in urethral rupture. Rather than being managed successfully through conservative medical means alone, these critical blockages and traumatic disruptions necessitated a decisive shift to emergency or planned surgical diversion. Post-operative outcome tracking from the HPVUMK registry demonstrates a high survival and success rate following urethrostomy procedures, with patients consistently noted as surviving long-term and exhibiting positive post-operative recovery. For small animal practitioners, these institutional findings underscore that while FLUTD and traumatic pelvic injuries carry a high risk of complete urethral compromise, timely surgical intervention via urethrostomy remains a highly effective salvage procedure that yields excellent long-term prognoses and restores urinary function in feline patients.

Keywords: *Feline, urethrostomy, urinary obstruction, and urethral rupture.*

TROCLEAR GROOVE REPLACEMENT PROSTHESIS FOR THE MANAGEMENT OF SEVERE FEMORALPATELLAR OSTEOARTHRITIS WITH CONCURRENT PATELLAR LUXATION IN A DOG

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Abstract

The objective is to report a novel method of treating femoro-patellar instability in association with severe femoro-patellar osteoarthritis, by substituting the femoral trochlear as an alternative to conventional trochleoplasty with a patellar groove replacement prosthesis. Study design: Prospective case was evaluated. Methods: Scoring of preoperative lameness from 0–4, and radiographic assessment, including orthogonal projections for patellar luxation, was performed to evaluate limb alignment, trochlear morphology, and severity of osteoarthritic changes. The size of the trochlear implant was determined by computer aided templates and confirmed intra-operatively with trial prosthesis. Radiographic findings, along with clinical examinations, were reviewed immediately postoperatively and at two months postoperatively. Following the preparation of distal femur, the groove of the patella was replaced with size ten patella groove prosthesis. Results: The patient presented with grade III–IV patellar luxation and severe degenerative joint changes unsuitable for conventional trochleoplasty. Postoperatively, the dog demonstrated rapid improvement in limb function, weight-bearing, and range of motion. Pain scores were minimal and comparable to normal limb function. Progressive improvement was observed, with complete resolution of subjectively assessed lameness by three months postoperatively. These outcomes were maintained at longer-term follow-up, with no major complications reported. Clinical significance: Trochlear groove replacement represents a shift from cartilage-preserving trochleoplasty to prosthetic resurfacing of the femoral trochlear. This technique may provide improved restoration of joint congruity, enhanced biomechanical alignment of the extensor mechanism, and superior functional outcomes in cases of advanced osteoarthritis where traditional techniques are limited or ineffective.

Keywords: *Patellar luxation, femoropatellar osteoarthritis, trochleoplasty, trochlear replacement, canine orthopaedics*

BREATHING BETTER: SURGICAL MANAGEMENT OF BRACHYCEPHALIC OBSTRUCTIVE AIRWAY SYNDROME (BOAS) — UVH, UPM EXPERIENCE

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Abstract

Brachycephalic Obstructive Airway Syndrome (BOAS) is a chronic, progressive, and potentially debilitating disorder affecting the upper airway of brachycephalic animals, such as the French Bulldog, English Bulldog, Pug, and the Persian cat. This syndrome results from a disproportionate craniofacial conformation, shortening of the skull and the volume of soft tissues, leading to airway obstruction and impaired airflow. Primary anatomical abnormalities are stenotic nares, elongated and thickened soft palate, macroglossia, aberrant nasal turbinates, and hypoplastic larynx and trachea. These primary abnormalities increase airway resistance, leading to secondary changes of everted laryngeal sacculles, everted tonsils, laryngeal collapse, gastroesophageal reflux, and hiatal hernia. Clinically, BOAS manifests as stertor, stridor, exercise intolerance, dyspnea, and in severe cases, cyanosis and syncope. Importantly, BOAS is now recognized as a multisystem disorder, with frequent association with gastrointestinal disease, sleep-disordered breathing, and systemic hypoxia. Diagnosis relies on clinical evaluation, functional grading (The UK Kennel Club and the University of Cambridge run a Respiratory Function Grading Scheme), and upper airway examination, supported by imaging modalities such as radiography and computed tomography. Management includes both conservative and surgical strategies. While weight control, environmental modification, and medical therapy are important, surgical correction (e.g., rhinoplasty, staphylectomy, and even nasal turbinectomy) remains the mainstream treatment. However, surgery will only improve part of the clinical signs, not fully resolving the congenital conformation. BOAS represents a significant global welfare concern linked to selective breeding for extreme conformations. A multidisciplinary approach involving early intervention, client education, and responsible breeding practices is essential to improve brachycephalic breed welfare.

Keywords: *Brachycephalic Obstructive Airway Syndrome (BOAS), rhinoplasty, staphylectomy, nasal turbinectomy*

LISTENING TO THE AIRWAY: LUNG SOUNDS AND BOAS IN ANAESTHESIA

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Abstract

Brachycephalic Obstructive Airway Syndrome (BOAS) is a common and clinically significant condition affecting brachycephalic dog breeds, resulting from a combination of upper airway abnormalities. BOAS is characterized by stenotic nares, an elongated and thickened soft palate, everted laryngeal sacculles, laryngeal collapse, and tracheal hypoplasia. Clinical signs of BOAS vary in severity and include stertorous breathing, stridor, exercise intolerance, dyspnoea, hyperthermia, and syncope when peripheral oxygen saturation falls below 80%. These patients present considerable challenges during anaesthesia, placing them at increased risk of perioperative complications such as hypoxia, hypercapnia, difficult intubation, and post-operative airway obstruction. As a result, careful anaesthetic planning and vigilant management are essential to ensure patient safety. Pre-operative considerations include pre-oxygenation to delay desaturation during difficult intubation, selection of endotracheal tubes two to three sizes smaller than calculated due to tracheal hypoplasia, and administration of antiemetics and gastroprotectants to reduce the risk of regurgitation and aspiration pneumonia. Intraoperatively, capnography is essential to detect endotracheal tube obstruction from excessive secretions, and positive pressure ventilation may be required to manage hypoventilation. Brachycephalic dogs are 1.57 times more likely to experience intra-anaesthetic complications and 4.33 times more likely to have post anaesthetic complications compared to non-brachycephalic dogs. Postoperative complications, including upper airway obstruction, dyspnoea, regurgitation, aspiration pneumonia, and laryngeal oedema, have been reported in 6.5% to 26.2% of cases. The recovery phase is particularly critical, as approximately 50% of peri-anaesthetic deaths in brachycephalic dogs occur during this period. Delayed extubation, sternal recumbency with head elevation, and supplemental oxygen are recommended to maintain airway patency and prevent post-extubation obstruction. Factors associated with complicated perioperative recovery include increasing age, laryngeal collapse grade greater than 2, prolonged general anaesthesia, and pre-existing aspiration pneumonia.

Keywords: *BOAS, perioperative anaesthesia, brachycephalic dogs*

FRIEND, FOE, OR TOOL? ARTIFICIAL INTELLIGENCE IN VETERINARY PRACTICE

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Abstract

Artificial intelligence (AI) is rapidly reshaping veterinary medicine, with small animal practice at the forefront of adoption. This presentation provides a clinically focused overview of current AI applications in companion animal care, spanning diagnostic imaging, clinical decision support, and workflow optimisation. Particular emphasis is placed on the evidence supporting AI-assisted radiograph interpretation, ultrasound image analysis, and pattern recognition in chronic disease monitoring. Attendees will gain practical insight into how AI tools can be critically evaluated and safely integrated into everyday practice. Key considerations include validation of performance, data quality, and the necessity of maintaining clinician oversight within the diagnostic process. The session also explores ethical and professional challenges such as data privacy, algorithmic transparency, and the limitations. Through real-world case examples, this talk highlights both the opportunities and limitations of AI in small animal practice. It aims to equip veterinary professionals with the foundational literacy required to assess emerging technologies and implement them responsibly ensuring that AI serves to augment, rather than replace, clinical judgement and ultimately improves patient outcomes.

Keywords: *Artificial intelligence, veterinary medicine, small animal practice*

EMBRACING DIGITAL PATHOLOGY: APPRECIATING TRADITIONAL FOR MEANINGFUL ADVANCEMENT FOR MITIGATION OF ZOO NOTIC OUTBREAKS

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Abstract

Knowledge in and application of veterinary pathology remain the important present and future diagnostic approach towards mitigation of zoonotic disease outbreaks. This is much relevant to One Health approach in the management of zoonotic cases. In such scenario, understanding the basic concept of lesion development is pertinent in any diagnostic attempts. Zoonotic diseases involve the manifestations of clinical signs, the abnormal functions, which arises from structural changes to cells, tissues and organs (lesions) associated with adverse interaction with pathogens. The application of veterinary pathology in gross morphological and histopathological diagnoses of zoonoses should take into account several basic aspects. These include a complete history of the case, not confusing lesions with post mortem changes, the artefacts of tissue preparations that can be misleading, and misinterpreting normal cells, tissues and organs as lesions. Histopathology remains an important basic diagnostic approach that allows the visualization of abnormal changes unseeable by the naked eyes. However, before any tissue sections for histopathology can be visualized, sound application of best practices on the basic technical aspects in tissue fixation and processing are very essential. Inappropriate tissue sampling, improper preparation of fixatives, expiry of prepared fixatives and errors in fixation techniques can lead to poor quality tissue preparations with subsequent misinterpretation and misdiagnosis. Therefore, when it comes to diagnosis of zoonoses that allows subsequent mitigation of the diseases, knowledge, skills, experiences and application of the basic foundation is pertinent. The present and future advances in diagnostic veterinary pathology of zoonoses, the digital pathology and application of artificial intelligent (machine learning and deep learning) associated with enormous digital image (Big Data), is unavoidable. Such advances, would allow whole slide image analysis at various magnifications for detail observation of lesions on computer screen, with faster and quality diagnosis and also enable teleconsultation for second opinion and teleconferencing for decision making on mitigation of zoonoses outbreaks. However, the sources of digital data of pathological changes do not refrain from the conventional initial preparation of paraffin sections of processed formalin fixed tissues on glass slides. Therefore, for quality diagnosis of any zoonoses outbreaks, mitigations and prevention, the advent and application of present and future advancements in veterinary pathology is inevitable, but along with the basic foundation which remains valid, important and applicable.

Key words: *Basic foundation, advancement, veterinary pathology, zoonotic outbreaks, diagnosis*

EMERGING ZONOSIS SFTS: CURRENT UNDERSTANDING AND CHALLENGES

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Abstract

Severe fever with Thrombocytopenia Syndrome (SFTS) was initially recognized as a tick-borne infectious disease affecting farmers and hunters with frequent exposure to ticks, and was first identified in China in 2011. The disease was subsequently reported in South Korea and Japan, indicating its spread across East Asia. SFTS is associated with a high case fatality rate of up to 30% in humans and has become an important veterinary and public health concern. In this presentation, I will provide an overview of SFTS, including its virology, epidemiology, and clinical features in both humans and animals. I will then present recent findings from Japan demonstrating the expansion of SFTS among companion animals, particularly cats and dogs. Notably, transmission from infected animals to humans has been documented, highlighting the increasing risk of zoonotic infection in close-contact settings such as veterinary practice. In addition, fatality rates in infected cats and dogs can exceed 50%, and high viral loads are present in the blood and bodily fluids of affected animals, further increasing the risk of transmission. To address these challenges, the establishment of diagnostic systems is essential. Early diagnosis not only enables timely treatment for affected patients and animals but is also critical for preventing secondary transmission from infected animals. Therefore, I will introduce our efforts to develop rapid and reliable diagnostic methods and their application in both clinical and field settings. These tools contribute to early detection, improved case management, and enhanced surveillance. This presentation emphasizes the importance of a One Health approach for understanding and controlling SFTS and discusses future perspectives for managing this emerging zoonosis.

Keywords: *SFTS, emerging zoonosis, cats, zoonotic transmission, diagnostics*

OPERATIONALIZATION OF ASEAN COORDINATING CENTRE FOR ANIMAL HEALTH AND ZONOSSES (ACCAHZ) - ROLE OF ACCAHZ IN ASEAN TADs STRATEGIES AND ONE HEALTH IMPLEMENTATION

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Abstract

The ASEAN Coordinating Centre for Animal Health and Zoonoses (ACCAHZ) was established in 2016 and gazetted as an ASEAN International Organization in 2025. Its mandate is to provide a regional framework for cooperation and coordination among ASEAN Member States (AMS), dialogue partners, development partners, and other stakeholders to prevent, control, and eradicate transboundary animal diseases (TADs), emerging infectious diseases (EIDs), and zoonoses. By strengthening regional animal health governance, ACCAHZ also contributes to food security and safety, poverty alleviation, and the livelihoods and well-being of ASEAN populations. As an intergovernmental organization with legal personality, ACCAHZ is empowered to enter into contracts, acquire and dispose of assets, and engage in legal proceedings as required to fulfil its functions. Leveraging its mandate and advocacy capacity, ACCAHZ plays a central role in operationalizing ASEAN TADs strategies and the One Health Joint Plan of Action across the region. Through four core strategic areas, ACCAHZ coordinates implementation of ASEAN frameworks and Strategic Plans of Action (SPAs) on animal health and zoonoses, and harmonizes activities across all relevant working groups and sectoral bodies; facilitates multi-stakeholder collaboration among AMS, partners, and stakeholders to address TADs, EIDs, and zoonoses through disease-specific initiatives that promote regional ownership and sustainability; advances One Health by strengthening collaboration with the Quadripartite organizations - WOA, FAO, WHO, and UNEP - and donors to accelerate regional prevention and control of TADs and zoonoses, while working closely with ASEAN partners such as ACPHEED and ACB to integrate animal, human, and environmental health sectors; and mobilizes resources and streamlines governance by exploring funding support from dialogue and development partners for meetings and workshops, coordinating mechanisms to ensure efficiency and avoid duplication, and facilitating advocacy through the ACCAHZ Governing Board to AMS, SOM-AMAF, and AMAF. By serving as the regional coordination hub, ACCAHZ strengthens ASEAN's collective capacity to respond to animal health and zoonotic threats under a unified One Health approach.

Keywords: *ACCAHZ, ASEAN, Coordination, TADs, One Health*

ONE HEALTH INTELLIGENCE AND EARLY WARNING SYSTEMS FOR EMERGING AND TRANSBOUNDARY ANIMAL DISEASES IN A CHANGING WORLD: FROM DATA TO DECISION IN MALAYSIA AND SOUTHEAST ASIA

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Abstract

The frequency and impact of Emerging and Transboundary Animal Diseases (ETADs) are intensifying globally, driven by climate change, landscape transformation, increased human-animal-environment interactions, and complex livestock value chains. For a dynamic region like Southeast Asia, which includes Malaysia—a country with a rapidly modernising livestock sector, significant wildlife biodiversity, and strategic position in global trade routes—these pressures translate into heightened vulnerability to diseases such as African Swine Fever (ASF), Highly Pathogenic Avian Influenza (HPAI), Nipah virus, and other zoonotic threats. Traditional disease surveillance, focused on detecting clinical cases, is inherently reactive. This plenary presentation advocates for a paradigm shift towards anticipatory early warning systems (EWS) grounded in a One Health intelligence framework. Drawing directly from the FAO's recently published *Framework for Early Warning of Animal Health Threats* (2025) and practical case studies from Africa, this session provides Malaysian and Southeast Asian stakeholders with a blueprint for moving "From Data to Decision." The presentation deconstructs the four core components of an effective EWS: Firstly, surveillance for early detection; moving beyond passive reporting to integrate risk-based, syndromic, and community-based surveillance, as demonstrated in rabies control and anthrax response programmes in Tanzania and Kenya. Secondly, understanding and monitoring risks; establishing systematic monitoring of drivers—environmental (e.g., climate data for Rift Valley Fever), biological (e.g., pathogen evolution), and socio-economic (e.g., livestock trade movements)—that precede disease emergence. Thirdly, communication and information delivery; institutionalising transparent, bi-directional communication flows between field veterinarians, central authorities, the private sector, and regional bodies like ASEAN. The use of digital tools (e.g., EMA-i) for real-time data sharing will be highlighted. Lastly, decision support during interventions; ensuring that data triggers pre-defined, risk-informed actions, including the use of simulation exercises and after-action reviews to build systemic resilience. The presentation concludes with actionable recommendations for Malaysia and the region, focusing on strengthening inter-agency (human health, wildlife, livestock) coordination, leveraging digital innovation for data integration, and advocating for sustainable investment in the "last mile"—empowering local veterinarians and para-veterinarians as the cornerstone of early warning. The goal is to transform the region's capacity from responding to disasters to anticipating and preventing them, safeguarding animal health, public health, and the billions of dollars in trade and food security that depend on a resilient livestock sector.

Keywords: *One Health, early warning system, transboundary animal diseases, Southeast Asia, malaysia, disease intelligence, FAO Framework*

ADVANCING ONE HEALTH THROUGH STRATEGIC PARTNERSHIPS FOR SUSTAINABLE FOOD SYSTEMS

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Abstract

The increasing impacts of climate change, biodiversity loss, environmental degradation, emerging infectious diseases, and antimicrobial resistance (AMR) present significant challenges to global food security and sustainable development. These interconnected threats underscore the need for integrated and collaborative approaches that recognize the interdependence of human, animal, plant, and ecosystem health. The One Health framework offers a valuable platform for addressing these complex challenges and promoting resilient and sustainable food systems. Advancing One Health requires a multidisciplinary workforce equipped with systems thinking, leadership, and cross-sectoral competencies. Integrating One Health principles into veterinary and health professional education, lifelong learning, and community engagement initiatives can strengthen capacities in disease prevention and surveillance, food safety, antimicrobial stewardship, risk communication, and sustainable resource management. Experiential learning and transdisciplinary approaches are essential for preparing future professionals to address increasingly complex global challenges. Strategic partnerships among academia, government agencies, industry stakeholders, and international organizations are fundamental to achieving One Health goals. Intergovernmental cooperation and stronger academia–industry linkages facilitate knowledge exchange, innovation, technology transfer, and capacity building, enabling the translation of scientific evidence into effective policies and practices. Such collaborations are critical for enhancing food security, safeguarding public health, and promoting environmental sustainability. Strengthening these partnerships represents a strategic investment in developing resilient food systems and advancing sustainable development. Through collective action and shared responsibility, One Health provides a pathway toward securing the health and well-being of people, animals, and ecosystems for present and future generations.

Keywords: *One Health, sustainable food systems, strategic partnerships*

CONNECTING LESIONS, PATHOGENS AND POPULATIONS: VETERINARY PATHOLOGY AT THE HEART OF ANIMAL DISEASE INVESTIGATION

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Abstract

Veterinary pathology has traditionally been regarded as the discipline responsible for identifying and characterizing lesions in diseased animals. However, in an increasingly complex animal health landscape shaped by emerging infectious diseases, antimicrobial resistance, globalization, climate change, and evolving livestock production systems, the role of veterinary pathology extends far beyond lesion description. Modern veterinary pathology serves as a critical bridge connecting pathological changes at the individual animal level with pathogen detection, disease surveillance, outbreak investigations, and population health management. Veterinary pathology contributes to every stage of animal disease investigation, from recognizing and interpreting lesions, to guiding laboratory diagnostics, understanding pathogen-host interactions, and generating evidence that supports disease control strategies at herd, regional, and national levels. As diagnostic technologies continue to evolve, veterinary pathology remains uniquely positioned to provide the biological context necessary for meaningful interpretation of laboratory findings and effective disease management. By connecting lesions, pathogens, and populations, veterinary pathology continues to play a pivotal role in advancing animal health, supporting food security, strengthening One Health initiatives, and improving preparedness against future disease threats.

Keywords: *Veterinary pathology, animal disease investigation, diagnostic integration, One Health*

ADD-PL-7

POTENTIAL FOR BACTERIAL TRANSMISSION FROM THE PREPUCE OF ACEH CATTLE: A NEW THREAT FOR ANIMAL REPRODUCTION

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Abstract

Aceh cattle are one of several indigenous Indonesian cattle and are acknowledged as an Indonesian domestic breed. Aceh cattle play a major role for beef production, besides being able to produce milk and also are principle animals for draft work in ricefield. Here, we described the presence of bacteria species in Aceh cattle by means of biochemical and molecular analysis and a phylogenetic tree of each. A phylogenetic tree based on 16S rRNA gene sequences showed that *Acinetobacter soli*, *Bacillus cereus*, *Comamonas kerstersii*, *Escherichia fergusonii*, and *Staphylococcus* species present in prepuce of Aceh cattle. Bacteria can ascend from the preputial area to the urethra, causing urinary tract infection. Inflammation of the glans penis and the prepuce can occur, causing balanoposthitis. Bacteria originating from the prepuce can contaminate semen collected for artificial insemination (AI), causing reduced sperm motility, decreased membrane integrity, and structural abnormalities in the sperm head, mid-piece, and tail. Contaminating bacteria can alter the biochemical properties of semen extenders, reducing the shelf life of the extended semen. Management of preputial infection often focuses on biosecurity and monitoring the health of cattle to prevent spread within the herd. Vaccination and using artificial insemination, are key control strategies. While often self-limiting, infected cattle can be treated with antibiotics applied both systemically and locally into the preputial sheath. However, culling is often recommended to remove the source of infection. While some antibiotics may be used, treatment can be difficult due to the development of resistance and the chronic nature of the infection.

Keywords: *Bacteria, Aceh cattle, prepuce, diseases*

ADVANCED VETERINARY LABORATORY DIAGNOSTICS, KEY TO GLOBAL HEALTH SECURITY

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Abstract

The interconnectedness of animal, human, and environmental health forms the core of the One Health approach, where the security of one is dependent on the stability of the others. Zoonotic diseases, which constitute a significant majority of emerging and re-emerging infections, represent a persistent threat to global health security. As pathogens evolve and host ranges shift due to environmental and social factors, the ability to rapidly identify these threats becomes the primary line of defence. Malaysia has served as a critical landscape for these threats over the last two decades. The 1998 Nipah virus outbreak remains a terrifying example of zoonotic diseases, crippling the swine industry with the culling of 1.1 million pigs and resulting in 105 human deaths. This was followed by the 2004 arrival of Highly Pathogenic Avian Influenza (HPAI-H5N1) and the 2015 re-emergence of Rabies in Sarawak, which has since claimed 33 human lives and necessitated the culling of over 200,000 animals. Simultaneously, the country has faced an unexpected surge in diseases affecting livestock, including African Swine Fever and Lumpy Skin Disease, further threatening food stability and security. The complex challenges in managing these diseases, including microbial evolution and diagnostic gaps, require a shift from reactive measures to proactive surveillance. Advanced veterinary laboratory diagnostics serve as the essential "key" to this transition. Traditional methods often lack the sensitivity and speed required to contain highly infectious agents before they cross the species barrier. Therefore, the advancement of diagnostic techniques, specifically through molecular-based testing, immunological assays, and specialized genomic identification, is paramount. By addressing current limitations in diagnostic capacity and capability, veterinary laboratories can ensure accurate and swift pathogen identification. Strengthening this infrastructure is a fundamental requirement for effective clinical sampling and early detection. Ultimately, investing in advanced veterinary laboratory diagnostics is not merely a technical necessity but a critical pillar in safeguarding the global health architecture, protecting both animal populations and human lives from future pandemic threats.

Keywords: *Advance veterinary laboratory diagnostic, emerging, microbial evolution*

NAVIGATING PRODUCTION-LIMITING AND ZONOTIC CHALLENGES IN TROPICAL LIVESTOCK—THE MALAYSIAN PERSPECTIVE

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Abstract

The Malaysian agricultural sector and its dairy buffalo industry face significant threats from "silent" production-limiting diseases like bubaline subclinical mastitis (SCM) and severe zoonotic pathogens such as *Coxiella burnetii* (Q Fever). Protecting livestock productivity and public health resilience requires a strategic paradigm shift toward integrated surveillance. To map the SCM landscape, a cross-sectional analysis utilizing the California Mastitis Test (CMT) was conducted across 12 buffalo farms in the states of Selangor, Kedah, and Penang. Complementing this production disease data, the diagnostic evolution of Q Fever was evaluated through a review of diagnostic tools, including ELISA, PCR, and metagenomic Next-Generation Sequencing (mNGS). The data revealed a substantial SCM prevalence of 40.1% at the animal level and 29.7% at the quarter level, with regional disparities showing quarter-level prevalence reaching up to 46.3% in Penang. Primary drivers of SCM infection included a history of previous mastitis, high milk yield, failure to implement teat-dipping protocols within 30 seconds post-milking, and a lack of species diversification on farms. Concurrently, zoonotic surveillance data highlighted that Q Fever seropositivity in specific Malaysian dairy goat populations has reached as high as 70%. Managing SCM and Q Fever in isolation is ineffective; safeguarding the tropical livestock sector requires standard, high-sensitivity diagnostic protocols and dual-purpose biosecurity overhauls. Integrating advanced molecular diagnostics with a unified "One Health" mandate is a strategic necessity for mitigating the risks of these silent threats and building a resilient agricultural economy.

Keywords: *Bubaline subclinical mastitis (SCM), Coxiella burnetii (Q fever), One Health, molecular diagnostic, tropical*

MELIOIDOSIS: REVISITING A CENTURY-OLD DISEASE THROUGH THE LENS OF ONE-HEALTH

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Abstract

Melioidosis is a potentially fatal infectious disease caused by *Burkholderia pseudomallei*, a soil- and water-borne bacterium endemic to northern Australia and Southeast Asia, including Malaysia. Human melioidosis presents with diverse clinical manifestations ranging from localized skin infections to pneumonia, visceral abscesses, and fulminant septicemia. Mortality rates remain high, reaching up to 40% in Southeast Asia and as high as 90% in patients with septic shock. Infection is primarily acquired through percutaneous inoculation, inhalation, or ingestion of contaminated soil, water, or aerosols. *B. pseudomallei* is intrinsically resistant to multiple antibiotics, necessitating prolonged biphasic treatment consisting of intensive and eradication phases that may extend up to 20 weeks. Increased awareness, improved diagnostic capabilities, and enhanced surveillance have contributed to the growing recognition of melioidosis globally, with an estimated 165,000 human cases annually across 48 endemic countries. Predictive modelling further suggests that environmental conditions in at least 34 additional countries may support the persistence or future establishment of the organism. Previous genomic studies indicate that *Burkholderia mallei*, the causative agent of glanders, evolved from *B. pseudomallei* through extensive gene loss that facilitated adaptation to equine hosts. This renders *B. mallei* in the ability to survive independently in the environment, unlike *B. pseudomallei*. Historically, the first documented case of animal melioidosis was reported in 1913 at the Institute for Medical Research in Kuala Lumpur involving laboratory guinea pigs and rabbits. Subsequent cases in Malaysia and elsewhere have involved a wide range of species including cats, dogs, horses, goats, pigs, cattle, deer, non-human primates, dolphins, crocodiles, and giant pandas. Cases have been reported in both captive and free-ranging animals across several countries, highlighting the broad host range and ecological complexity of the disease. The diversity of affected species, clinical manifestations, and environmental settings underscores the importance of viewing melioidosis through a One Health lens that integrates human, animal, and environmental health. Although One Health is widely recognized as essential for melioidosis control, stronger interdisciplinary collaboration and coordinated action remain crucial for effective surveillance, prevention, and disease management of this neglected yet significant disease.

Keywords: *Animal melioidosis, One Health*

ADD-PL-11

VETERINARY PATHOLOGY AND ONE HEALTH IN A DYNAMIC INFECTIOUS DISEASE LANDSCAPE

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Abstract

The increasing frequency and complexity of infectious and zoonotic diseases underscore the need to rethink how we integrate veterinary science, human medicine, and ecosystem health. In this keynote, I will present a synthesis of my research and publications in infectious diseases of animals and humans in the context of veterinary pathology, framed within the concept of One Health. My work focuses on the animal–human interface, where pathogens emerge, adapt, and often cross species barriers with significant consequences for global health and food systems. Drawing on my research across multiple species, including small ruminants such as sheep, avian hosts, and selected companion animals, I will highlight how comparative pathology provides critical insights into disease mechanisms, and host responses. Particular emphasis will be placed on the value of veterinary pathology not only as a tool for disease identification, but as a central pillar in understanding pathogenesis, informing surveillance strategies, and guiding translational research. This talk will explore how integrating pathological findings with virological, immunological, and ecological data can strengthen our capacity to detect and respond to emerging infectious diseases. By connecting insights across species and systems, I aim to illustrate how veterinary pathology can act as a unifying discipline within One Health, linking fundamental research with real-world applications.

Keywords: *Veterinary pathology, One Health, infectious diseases*

INTEGRATIVE APPROACHES COMBINING MOLECULAR VIROLOGY AND PATHOLOGY FOR DIAGNOSING EMERGING AND RE-EMERGING VIRAL DISEASES IN ANIMALS

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Abstract

Viral infections in companion animals, particularly dogs and cats, continue to present major challenges in veterinary medicine due to their clinical impact and potential for interspecies transmission, including zoonotic risks. While global attention has focused on high-profile pathogens such as SARS-CoV-2, numerous other viruses circulating in canine populations—such as canine circovirus (CanineCV), carnivore chaphamaparvovirus-1 (CaChPV-1), canine respiratory coronavirus (CRCoV), canine bufavirus (CBuV), canine astrovirus (CaAstV), and canine kobuvirus (CaKoV)—as well as feline-associated viruses including feline bocavirus (FBoV), domestic cat hepadnavirus (DCHBV), feline morbillivirus (FeMV), feline calicivirus (FCV), and feline herpesvirus (FHV), remain under recognized despite their clinical relevance. In addition, increasing human–animal–environment interactions, driven by the rising ownership of exotic pets (e.g., reptiles and small mammals) and the encroachment of urban and agricultural expansion into wildlife habitats have intensified opportunities for viral spillover between wildlife and domestic species. This is particularly important in regions such as Thailand, where epidemiological data for many viral pathogens in wildlife and exotic animals are still scarce. Current research efforts emphasize comprehensive investigation of viral occurrence, transmission dynamics, and genetic diversity across multiple animal populations, including companion animals, exotic species, and wildlife. Our studies incorporate advanced diagnostic and analytical methodologies to improve detection and characterization of viral infections. Molecular tools such as digital PCR (dPCR) and high-resolution melting (HRM) analysis enhance sensitivity and specificity in viral detection, while genomic sequencing enables detailed characterization of viral genomes. In parallel, pathological investigations using *in situ* hybridization (ISH) and immunohistochemistry (IHC) provide insights into viral localization and host–pathogen interactions at the tissue level. Collectively, these integrative approaches reveal substantial viral diversity and variation in pathogenicity among animal populations. Some viruses demonstrate high transmissibility and are associated with significant disease burden. Improved understanding of viral ecology, transmission pathways, and risk factors contributes to more accurate diagnostics and supports the development of effective surveillance systems and control strategies for emerging and re-emerging viral diseases.

Keywords: *Emerging viral diseases, veterinary diagnostics, molecular virology*

NAVIGATING THE CROSSROADS OF VETERINARY DIAGNOSTIC PATHOLOGY IN MALAYSIA: AT THE CROSSROADS OF DEMAND, DIVERSITY, AND DIGITAL TRANSFORMATION

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Abstract

Veterinary diagnostic pathology plays a critical role in supporting animal health, disease surveillance, food security, and biomedical research. In Malaysia, the discipline is evolving within a rapidly changing landscape shaped by growing demands from companion animal practice, livestock production, aquaculture, and wildlife health. At the same time, the profession faces challenges related to workforce capacity, increasing diagnostic workloads, and the need to maintain expertise across a diverse range of animal species. The current state of veterinary diagnostic pathology in Malaysia reflects both opportunities and challenges that influence the profession. Diagnostic service delivery is increasingly shaped by expanding case submissions, evolving industry demands, and the limited availability of specialist expertise. Concurrently, advances in digital pathology and artificial intelligence (AI) are creating new possibilities for improving diagnostic workflows, supporting decision-making, and enhancing access to expertise. Emerging technologies, including large language models and image-based AI systems, have the potential to complement conventional diagnostic practices, although practical considerations related to infrastructure, implementation, and reliability remain important barriers to widespread adoption. As the profession continues to evolve, balancing growing service demands with workforce sustainability and technological innovation will become increasingly important. A forward-looking approach that integrates professional expertise, collaboration, and emerging digital tools may help strengthen the capacity and resilience of veterinary diagnostic pathology in Malaysia, ensuring its continued contribution to animal health, industry development, and society.

Keywords: *Veterinary diagnostic pathology, Digital pathology, Artificial intelligence, Veterinary workforce*

BRIDGING THE WILD-DOMESTIC INTERFACE: DIAGNOSTIC INNOVATIONS AND ONE HEALTH SURVEILLANCE IN LIVESTOCK BIOSECURITY

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Abstract

Emerging infectious diseases continue to pose significant threats to livestock production, food security, public health, and biodiversity worldwide. Many of these diseases originate at the wildlife–livestock interface, where agricultural expansion and habitat fragmentation facilitate frequent interactions among wild reservoirs, domestic animals, and humans. The consequences of pathogen spillover result in devastating economic losses, international trade disruptions, and heightened zoonotic risks, proving that traditional, reactive outbreak responses are no longer sufficient. Proactive biosecurity demands an integrated approach that bridges the institutional gap between field-level wildlife management and commercial livestock production systems. Effective biosecurity therefore requires a paradigm shift from reactive outbreak response to proactive surveillance and early detection. Advances in molecular diagnostics, genomics, metagenomics, and transcriptomics now offer unprecedented opportunities to identify threats before they become major disease events. These technologies enable the rapid detection and characterization of high-risk viral, bacterial, and antimicrobial-resistant (AMR) pathogens circulating in wildlife reservoirs, livestock populations, vectors, and environmental sources, while providing critical insights into host responses and disease susceptibility. Drawing upon research conducted at the wildlife–domestic animal interface, the critical role of wildlife health surveillance as an early warning system for livestock biosecurity is highlighted. The integration of wildlife medicine, veterinary diagnostics, epidemiology, bioinformatics, and livestock health management provides a powerful framework for identifying emerging threats before they result in production losses or public health emergencies. Practical strategies for commercial livestock industries, wildlife veterinarians, and public health agencies to collaborate within a One Health framework to strengthen surveillance networks, enhance data sharing, and deploy innovative diagnostic platforms should be explored. By bridging traditional disciplinary boundaries, One Health surveillance offers a transformative pathway toward sustainable livestock production and more effective management of emerging infectious diseases in an increasingly interconnected world. Particular emphasis will be placed on the application of next-generation sequencing, environmental surveillance, and transcriptomic approaches to improve disease preparedness and resilience. By bridging traditional disciplinary boundaries through cross-disciplinary partnerships, One Health surveillance offers a transformative, actionable pathway toward sustainable livestock production and more effective management of emerging infectious diseases in an increasingly interconnected world.

Keywords: *Inter-agency collaboration, livestock biosecurity, One Health surveillance, pathogen spillover, wildlife-livestock interface*

CHALLENGES AND THE WAY FORWARD FOR UNDERSTANDING AND ACHIEVING ACCURATE DIAGNOSIS OF IMMUNOSUPPRESSIVE DISEASES IN CHICKENS

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Abstract

Immunosuppressive diseases in chickens represent a major constraint and challenges to global chicken's production affecting both chicken health, economic sustainability, food safety and security. The agent causes a state of temporary or permanent dysfunction of the immune response resulting from insults to the immune system with suboptimal antibody production and/or suboptimal innate and/or suboptimal cell-mediated immune responses leading to increased susceptibility to disease. The diversity of immunosuppressive agents with unique clinical and molecular characteristics, and the emergence of variants worldwide call for a better understanding on the complexity of virus host interaction, pathogenicity, pathogenesis, accurate diagnosis for effective prevention and control strategies of these diseases. The most important immunosuppressive diseases in chickens are Infectious bursal disease (IBD), Chicken anemia virus (CAV), Marek's Disease (MD), Avian Leukosis subgroup A, B and J, mycotoxins and recently increasing evident for Fowl adenovirus (FAdV) serotype 4, 8a and 8b. These immunosuppressive viruses' target/tropism and replicate in organs of the immune system especially the bursa of Fabricius, thymus, bone marrow and peripheral lymphoid tissues causes destruction of lymphoid cells or precursors and/or deregulation of cytokine responses. Mycotoxins cause cell death in the primary lymphoid organs and/or reduced gene expression of cytokines. Immunosuppression can also be caused by non-immunosuppressive diseases where these infections cause some immunosuppression as part of the clinical disease. The chickens may recover or die such as in Avian influenza and Infectious bronchitis. Management issues such as stress by overcrowding can also cause immunosuppression. The presence of non-specific clinical signs, subclinical disease or mixed infections are always challenges for accurate diagnosis of immunosuppressive diseases in chickens. Thus, holistic approaches on the principle of diagnosis namely the history, clinical signs, lesions, detection and characterisation of the agent shall be applied. Conventional diagnostic methods have limitations in terms of sensitivity and specificity. Advances in molecular diagnostics techniques such as polymerase chain reaction (PCR), real-time PCR, and next-generation sequencing allow for rapid and highly sensitive and specific detection and characterisation of the agents and could offer promising solutions to diagnostic challenges.

Keywords: *Immunosuppression, immune system organs, immunosuppressive diseases, diagnostic principles and techniques, accurate diagnosis*

PROTECTING CONSUMERS: CCRVDF IN THE CODEX FRAMEWORK WITH INSIGHT INTO DVS MALAYSIA'S ROLE IN FOOD SAFETY IMPLEMENTATION

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Abstract

The Codex Alimentarius serves as the essential global collection of internationally adopted food standards, aiming to protect consumer health and ensure fair practices in the food trade. As a membership body open to all Member Nations of the FAO and WHO, the Codex Alimentarius Commission (CAC) is responsible for implementing the Joint FAO/WHO Food Standards Programme. Central to these efforts is the Codex Committee on Residues of Veterinary Drugs in Foods (CCRVDF), which determines priorities for veterinary drug residues, recommends maximum residue levels (MRLs), and develops codes of practice to assist in the harmonization of international trade. Malaysia actively participates in this global framework through the National Codex Committee (NCC), led by the Food Safety and Quality Programme of the Ministry of Health, which serves as the primary Codex Contact Point (CCP). The Department of Veterinary Services (DVS) plays a critical role as a representative agency within the NCC and specifically chairs the National Codex Sub-Committee on Residues of Veterinary Drugs in Foods. DVS has demonstrated ongoing commitment through its physical and virtual participation in high-level sessions, including the 27th CCRVDF session in Omaha, USA (2024), and various meetings of the CAC and ASEAN Task Force on Codex (ATFC). These involvements allow Malaysia to obtain stakeholder input, discuss national issues, and prepare evidence-based national positions for submission to international bodies. Ultimately, Malaysia's involvement in Codex work is vital for building a science-based foundation for food safety, protecting public health, and ensuring that national food production systems remain competitive and compliant within the global food industry.

Keywords: *Codex Alimentarius, CCRVDF, food safety, DVS Malaysia, veterinary residues*

ADVANCING VETERINARY MEDICINE IN MALAYSIA: ALIGNING EDUCATION, INDUSTRY & ECONOMIC REALITIES

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Abstract

The veterinary profession in Malaysia is undergoing a period of significant transformation, driven by evolving societal expectations, rapid technological advancements, shifting workforce dynamics, and rising economic pressures. To remain relevant and competitive in this evolving landscape, veterinary education and professional development must be strategically aligned with industry demands and economic realities. Veterinary institutions play a pivotal role in preparing future professionals with competencies that extend beyond technical and clinical expertise. Contemporary veterinary graduates must be equipped with essential skills in communication, leadership, entrepreneurship, digital technology adoption, critical thinking, and multidisciplinary collaboration. Simultaneously, veterinary practices and animal-related industries face increasing operational costs, workforce shortages, changing client expectations, and growing demand for specialised services. These economic challenges significantly influence career pathways, workforce retention, and the long-term sustainability of veterinary enterprises. Greater collaboration between academia and industry is therefore necessary to establish effective training pathways, mentorship programmes, and workforce development strategies, including advancing the paraveterinary workforce. Particular attention should be given to the development and standardisation of veterinary paraprofessional education and practice, especially within the companion animal sector. Establishing clear competency standards and regulatory frameworks for veterinary paraprofessionals will enhance service delivery, improve workforce efficiency, and support the profession's growing needs. Furthermore, the expansion of specialist veterinary training programmes within the country is urgently needed to meet the increasing demands for advanced clinical expertise and specialised veterinary services. The future growth and sustainability of veterinary medicine in Malaysia depend on establishing a coordinated ecosystem in which educational excellence, industry requirements, and economic priorities are strategically aligned. Such alignment will be critical in ensuring a sustainable, future-ready, and globally competitive veterinary profession.

Keywords: *Veterinary education, veterinary workforce, industry collaboration, veterinary economics, professional development*

TAX COMPLIANCE FOR VETERINARY CLINICS: E-INVOICING, SST, AND BEYOND

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Abstract

As the veterinary industry evolves, clinical excellence must be matched by robust financial governance. Presented at GAVIS 2026, this session addresses the immediate regulatory shifts impacting veterinary clinic owners, practitioners, and administrators in Malaysia. With the Inland Revenue Board's (LHDN) phased rollout of e-invoicing and the continuous complexities of the Sales and Service Tax (SST), clinics must adapt their operational workflows to remain compliant while protecting their profitability. Led by Sheikh Khuzaifah, Chartered Accountant and SME financial consultant, this session translates complex tax regulations into practical, actionable strategies specifically tailored for veterinary businesses. Key areas covered include e-invoicing readiness, which entails understanding the LHDN mandate, integration timelines, and how e-invoicing will fundamentally change patient billing and supplier transactions within a clinic setting, and SST mechanics for vets, clarifying the distinct SST treatments for professional veterinary services versus the retail sale of pet products, foods, and medications. Furthermore, the session will explore income tax optimization by identifying allowable business expenses specific to veterinary practices, maximizing capital allowances on diagnostic and medical equipment, and structuring for optimal tax efficiency, alongside proactive compliance through practical steps to strengthen daily record-keeping, prevent tax leakage, and navigate future tax audits with confidence. Ultimately, attendees will leave this session with a clear roadmap to upgrade their financial operations, ensuring their practices are fully prepared for Malaysia's changing tax landscape.

Keywords: *Veterinary tax compliance, E-Invoicing, Malaysia SME Accounting, financial governance, SME advisory*

MANAGING INSUBORDINATION

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Abstract

Insubordination can be a serious misconduct, but not every disagreement or refusal amounts to insubordination. This session helps managers understand the key elements of insubordination, recognise potential warning signs, and make fair and defensible disciplinary decisions through practical examples and real Industrial Court cases.

Keywords: *Insubordination, disciplinary management, industrial relations.*

HOW TO PREPARE A SALEABLE VETERINARY BUSINESS

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Abstract

The veterinary industry is undergoing a significant transformation as corporate consolidation has become common in developed countries in recent years, particularly during the pandemic boom of pet industries. In 2026, the consolidation does not slow down but instead the buyers are more cautious in the acquisition. The increasing acquirer's expectations for operational excellence will reshape the profession development. While many veterinary practices are established with a primary focus on delivering high-quality patient care, relatively few develop their businesses to become attractive for potential acquirers or investors. The key principles of building a saleable veterinary business require the shift of business owner's mindset from operating a clinician-dependent practice to creating a scalable, transferable, and sustainable healthcare practice. Practice owners shall be aware that there are some critical factors that could influence a practice's valuation, including financial performance, operational systems, leadership development, clinical governance, regulatory compliance, brand positioning, and growth potential. While transforming or building a saleable practice, the common challenges such as owner dependency, financial compliance and standard of care shall be overcome to optimize the valuation. Various methods such as adopting management software, setting standard operating procedure, embracing new technology or engaging a business mentor could actually accelerate practice's performance and its valuation. The aim of building a saleable business does not restrict for those who plan to exit the business; indeed, it could be part of the succession planning, or it could be used as the strategic move of expansion plan. It is not uncommon to see the consolidators actively doing merging and acquisition or even the public listing that serves as a strong catalyst for their rapid expansion of the business. Whether the ultimate goal is succession planning, attracting strategic investors, or preparing for future mergers, acquisitions, or even public listing, the core principles are similar when one is trying to build a healthy and sustainable practice. The building of a saleable veterinary business is about creating a resilient, high-performing business that consistently delivers value to clients, employees, investors, and the profession itself.

Keywords: *Saleable veterinary business, consolidation, practice's valuation, expansion plan, exit*

STARTING A VETERINARY HOSPITAL – FROM VISION TO REALITY

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Abstract

Launching a veterinary hospital is an exciting venture that combines clinical expertise with sound business strategy. This presentation provides a step-by-step perspective for individuals interested in creating a sustainable and impactful veterinary practice. It will explore important considerations such as choosing a suitable location, navigating legal and licensing procedures, and planning a practical and efficient hospital layout. Beyond the setup phase, the session will address key operational elements, including financial management, equipment selection, and assembling a competent and compassionate team. Attention will also be given to developing strong relationships with clients, maintaining high standards of care, and establishing a trustworthy presence within the community. Participants will gain insight into common obstacles faced during the early stages, such as cost management, workflow challenges, and competition, along with realistic strategies to manage them effectively. With a blend of practical guidance and industry insight, this talk aims to support aspiring veterinary professionals in building a resilient and successful veterinary hospital.

Keywords: *Veterinary hospital, practice management, veterinary business.*

SHARING ON LEGAL CASES IN VETERINARY PRACTICE

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Abstract

The veterinary profession operates within a framework of professional, ethical and legal responsibilities that are designed to protect animal welfare, client interests and public trust. As veterinary services become increasingly sophisticated and client expectations continue to evolve, veterinary practitioners may face a growing number of legal challenges arising from clinical decisions, communication issues, medical records, consent procedures and professional conduct. Understanding the legal aspects of veterinary practice is therefore essential for risk management and professional sustainability. Legal disputes involving veterinary practitioners often arise from misunderstandings regarding treatment outcomes, standards of care, informed consent and communication between veterinarians and pet owners. While many cases can be resolved through effective communication and documentation, some may progress to formal complaints, disciplinary proceedings or legal action. Such cases provide valuable learning opportunities for veterinary professionals to better understand their legal obligations and professional responsibilities. This presentation explores selected legal cases and practical experiences relevant to veterinary practice. Through the examination of real-world scenarios, key lessons relating to documentation, client communication, professional ethics and risk management can be identified. Understanding how legal issues develop and how they are addressed may help practitioners strengthen clinical governance and reduce the likelihood of future disputes. Legal awareness should be considered an important component of professional development within veterinary medicine. By maintaining high standards of clinical practice, adhering to professional guidelines and implementing proactive risk management strategies, veterinarians can better protect their patients, clients and professional reputation while contributing to greater public confidence in the veterinary profession.

Keywords: *Veterinary law, professional liability, risk management, informed consent, veterinary ethics*

FROM PROPERTY TO PATIENT: HOW VETERINARY LIABILITY IS CHANGING, AND WHAT IT MEANS FOR PRACTICE IN ASIA

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Abstract

For most of its history, the veterinary profession was protected by a quiet legal fact: animals were property. A bad outcome was a private loss, not a lawsuit. That assumption is breaking down. Courts in several jurisdictions now recognise animals as sentient beings, owners increasingly view pets as family, and complaints once handled with a refund and an apology are turning into board investigations and civil claims. This talk looks at what's actually driving the shift, and why Asia is feeling it faster than the West did. Four forces matter: the legal reclassification of animals and the wider damages that follow; the growing technical complexity of modern practice, from advanced imaging to oncology to anaesthesia; the rise of telemedicine, mobile clinics and corporate group practice, which spreads duty of care across more parties and more borders; and the role of social media in turning a single dissatisfied client into a regulatory matter. I'll walk through the claim patterns we see most often — misdiagnosis, consent failures, anaesthetic incidents, and animals injured while in care — and what separates the practices that absorb these claims from the ones that don't. Documentation, clinical governance, board-readiness and proper risk transfer are doing more work than most clinicians realise. The aim isn't to scare anyone. It's to give practitioners, owners and regulators a clearer view of where the profession's risk perimeter is moving, before the cases pile up.

Keywords: *Veterinary liability, animal legal reclassification, asian veterinary practice risk*

UNDERSTANDING YOUR WELLBEING WHY RECOVERY, ENERGY & NERVOUS SYSTEM HEALTH MATTER IN VETERINARY WORK

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Abstract

Veterinary professionals dedicate themselves to caring for others, often at the expense of their own wellbeing. This session invites participants to pause and reconnect with the human behind the care. By exploring how stress, emotional load, and constant responsibility affect the nervous system and energy levels, attendees will discover why recovery is not a luxury but a necessity. With relatable insights and simple practices, the session empowers veterinary professionals to cultivate resilience, balance, and sustainable passion for their work.

Keywords: *Veterinary wellbeing, nervous system health, sustainable resilience*

EQUINE IS BUSINESS: EXPLORING THE ROLE OF THE EQUINE INDUSTRY IN HEALTH, EDUCATION AND ECONOMIC DEVELOPMENT

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Abstract

The equine industry is commonly associated with sport and recreation; however, its contributions extend far beyond these traditional roles. This paper explores the multifaceted value of horses in supporting human health, education, research, employment and economic growth. Equine-assisted interventions, including therapeutic riding and equine-assisted therapy, have demonstrated benefits in promoting emotional well-being, confidence-building and social development. The equine sector also provides diverse educational and career pathways, including veterinary medicine, stable management, horse training, riding instruction, farriery and equine entrepreneurship. In addition, the industry creates opportunities for research and innovation through collaborations among universities, veterinary institutions and industry partners. These activities contribute to workforce development and capacity building within the broader agricultural and service sectors. From an economic perspective, the equine ecosystem supports multiple business sectors, including breeding programmes, feed production, nutritional supplements, horse equipment, saddlery, equine tourism and training services. Such activities contribute to rural development, employment generation, agricultural diversification and investment opportunities. Expanding local and international markets further provides potential for sustainable industry growth. The concept of "Equine Is Business" emphasises that horses should not be viewed solely as recreational animals but as valuable assets within an integrated industry that generates social and economic benefits. Greater collaboration among government agencies, academic institutions, investors and industry stakeholders may strengthen Malaysia's equine sector and position it as a contributor to national development and economic resilience.

Keywords: *Equine industry, equine education, equine-assisted therapy, economic development, rural development*

TRANSFORMING LIVESTOCK SYSTEMS FOR A RESILIENT AND HEALTHIER ASIA-PACIFIC REGION

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Abstract

Asia and the Pacific is central to global food and nutrition security. The region is home to about 4.6 billion people, nearly 60 percent of the world's population and around 44% of the global livestock population. Livestock underpins rural economies and supports the livelihoods of hundreds of millions of smallholder farmers and value-chain actors. Yet 285 million people remain undernourished, nearly 40% of the world's hungry live in the region, and healthy diets remain unaffordable for many, particularly in Southern Asia. Livestock and animal-source foods are therefore essential to regional agrifood systems transformation. They provide high-quality protein and bioavailable micronutrients important for child growth, cognitive development, maternal health, and healthy diets. Asia is already the world's largest consumer of animal proteins, and demand for animal-source foods is projected to continue rising toward 2050 due to population growth, urbanization, income growth, and changing diets. At the same time, livestock systems face major sustainability and One Health challenges. The region accounts for an estimated 42% of global livestock-related greenhouse gas emissions, while transboundary animal diseases, zoonotic spillover, antimicrobial resistance, biodiversity loss, and climate shocks threaten food systems and smallholder livelihoods. Feed and animal nutrition are critical entry points: improving feed availability, quality, nutrient balancing, and efficiency can raise productivity, reduce costs and emissions intensity, and strengthen resilience. Regional livestock transformation will require coordinated action across governments, regional economic communities, research institutions, academia, civil society, farmer organizations, the private sector, and development partners. It will also require stronger investment planning, climate-smart production, improved animal health and food safety systems, responsible antimicrobial use, better feed and nutrition strategies, and inclusive value-chain development. FAO and the Animal Production & Health Commission for Asia and the Pacific (APHCA) can support this agenda by serving as a neutral broker, convening countries and partners around shared regional priorities, strengthening technical cooperation, supporting evidence-based policy and investment dialogue, and promoting practical solutions that advance better production, better nutrition, a better environment, and a better life. A Regional Livestock Transformation Plan could align these efforts through a co-designed framework for mobilizing investment, scaling innovation, strengthening resilience, and accelerating sustainable livestock transformation across Asia and the Pacific.

Keywords: *Sustainable livestock transformation, animal-source foods, food and nutrition security, One Health, climate-smart livestock, Asia and the Pacific*

A ONE HEALTH APPROACH TO FOOD SAFETY IN LOW- AND MIDDLE-INCOME COUNTRIES (LMICS)

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Food-borne disease is a major public health issue in low- and middle-income countries (LMICs). Based on the latest report of WHO on the data of 2021, food-borne disease causes an estimated 866 million illnesses, 1.52 million deaths, at a global cost of more than US \$647 billion per year, most of it borne domestically rather than through trade. Around 80% of food in LMICs is produced by smallholders and sold through informal or traditional "wet" markets that combine poor infrastructure and unhygienic conditions with vital livelihoods and affordable food for hundreds of millions of people, and these markets are likely to persist for the foreseeable future. Command-and-control regulation is rarely effective in this context, while risk-based approaches that target resources at the hazards causing the greatest harm remain underused because of limited capacity. Drawing on 20 years of research led by the International Livestock Research Institute (ILRI) and partners, I will present the use of participatory risk assessment to quantify risks along animal-source food and other food value chains, and the evidence-based interventions this generated. I will describe an innovative "three-legged stool" model, combining an enabling policy and infrastructure environment, technology and training, and incentives for behaviour change, tested through randomized controlled trials in Vietnam, Cambodia, Ethiopia, and Kenya. These interventions were low cost but improved hygiene practices, reduced microbial contamination of food and market surfaces, and strengthened business outcomes for vendors. I also discuss how this evidence has shaped food safety curricula, national policies and multi-stakeholder food safety working groups, and reflect on the links between informal food markets, zoonotic disease emergence and One Health, drawing lessons from the COVID-19 pandemic. We conclude by outlining opportunities to scale these innovations across LMICs.

Keywords: *Food safety, risk assessment, traditional markets, intervention*

SHAPING THE FUTURE OF ANIMAL FEED PRODUCTION IN CAMBODIA: POLICY, CHALLENGES AND OPPORTUNITIES

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Abstract

Cambodia's animal feed industry has emerged as a critical pillar supporting the nation's rapidly expanding livestock, poultry, and aquaculture sectors. With total annual market demand estimated at about two million tonnes, the industry stands at a pivotal juncture where domestic production capacity is scaling up to reduce a longstanding reliance on imports. The animal feed industry in Cambodia stands at a pivotal juncture. Currently characterized by significant import reliance and a modernizing production base, the sector is the subject of intense policy focus. With ambitious government targets, strategic foreign investment, and substantial incentives now in effect, the future involves shifting from dependency to self-sufficiency, though it faces considerable challenges in logistics, raw material supply, and farmer education. The livestock sector is rapidly expanding, driven by rising domestic demand for meat, eggs, and dairy, as well as regional market integration. This presentation examines the policy landscape governing animal feed production in Cambodia, highlighting current regulations, trade agreements, and government strategies such as the National Livestock Development Master Plan. Key challenges include limited domestic milling capacity, inconsistent quality control, lack of technical standards for finished feed. At the same time, opportunities are emerging: Cambodia has strong potential for expanding feed crop production, leveraging agro-industrial by-products (e.g., rice bran, cassava residue), and attracting investment in modern feed manufacturing. The presentation concludes with actionable recommendations for policymakers, agribusiness stakeholders, and development partners to foster a resilient, competitive, and sustainable animal feed sector that can support Cambodia's food security and economic diversification goals. Key opportunities include establishing local additive manufacturing plants to reduce import dependency, expanding automated pellet feed production to serve commercial poultry and swine operations, and developing protein-rich aquaculture feed formulations. Emerging trends toward sustainability-utilizing local grains, rice bran, and cassava by-products for eco-friendly feed production-align with both government priorities and international buyer preferences. The government's strategic pivot from import substitution toward value chain integration, linking smallholder farmers directly to feed manufacturers through guaranteed purchase agreements, offers a replicable model for inclusive agricultural development. To conclude, Cambodia's animal feed industry is transitioning from import dependence toward a more resilient, locally integrated production system. Realizing this vision requires sustained public-private collaboration to address infrastructure gaps, strengthen quality assurance mechanisms, and scale farmer technical training. The confluence of tax incentives, development partner financing, and rising domestic demand positions the sector for transformative growth, provided stakeholders navigate raw material seasonality and cost competitiveness challenges effectively. For policymakers and investors, the feed industry represents not merely a supply chain input but a strategic lever for enhancing national food security, rural livelihoods, and agricultural export competitiveness in the Mekong region.

Keywords: *Animal feed production, Cambodia, livestock sector, food security, domesticated industry.*

FEED CONTROL AND INSPECTION TOWARDS FEED SAFETY: VIETNAM EXPERIENCE AND PERSPECTIVES

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Abstract

By 2025, Vietnam's livestock sector demonstrated development with a production value growth rate of 4.3%-4.5%, supplying 8.66 million tonnes of live meat and over 21.4 billion poultry eggs to the market. Concurrently, the volume of the compound feed industry achieved a milestone output of 22.12 million tonnes. These advancements have positioned Vietnam 1st in ASEAN and 12th globally in industrial animal feed production. With a complex supply chain involving 270 feed mills, hundred ingredient importers, ensuring feed safety has become a strategic priority for public health, animal welfare, and sustainable development. Over the past decade, Vietnam has implemented a comprehensive regulatory framework, highlighted by The Law of Animal Husbandry, Decree 13/2020/ND-CP, Decree 46/2022/ND-CP, Circular 21/2019/TT-BNNPTNT, Circular 31/2022/TT-BNNPTNT and National Technical Regulations. These regulations established mandatory GMP, conditions for animal feed production, and HACCP compliance alongside strict maximum residue limits for contaminants, heavy metals, mycotoxins, and prohibited substances. A risk-based inspection system supported by an ISO 17025-accredited laboratory network has significantly reduced non-compliant feed samples. Moving forward, Vietnam is advancing a "smart feed safety" strategy that integrates digital transformation, precision nutrition, and climate-resilient feed formulation. Enhanced regional cooperation through ASEAN mechanisms and bilateral partnerships. This presentation shares practical lessons from Vietnam's journey, highlights successful policy and technical interventions, and proposes collaborative perspectives for strengthening feed safety systems across the region, contributing to a safer and more sustainable livestock production sector in Southeast Asia.

Keywords: *Feed safety, Vietnam, feed industry, feed control, sustainable livestock*

EFFECT OF A PHYTOGENIC FEED ADDITIVE (PFA) ON APPARENT PRECECAL NUTRIENT DIGESTIBILITY

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Abstract

The use of antibiotic growth promoters in livestock has been banned in the European Union since 2006. Numerous alternatives have been evaluated and carefully selected plant derived molecules support animal performance. Thirty-six, one day old Cobb500 broiler chickens with an initial mean body weight of 43.9 ± 1.30 g were randomly assigned to the experimental groups Con (no additive) and PFA (phytogenic feed additive) and placed into 12 pens, with 6 repetitions with 3 birds each. Birds were fed a commercial broiler diet based on maize, soybean meal and wheat, including titanium-IV-oxide as an inert digestibility marker. The trial lasted 21 days and performance (body weight, feed intake) was recorded weekly. On day 21, digesta samples were collected and pooled from the 3 birds of each replication. Digesta samples were analyzed for dry matter, energy, fat, protein, ash, calcium (Ca), phosphorus (P) and titanium concentration. Apparent prececal nutrient digestibility was calculated. All performance and nutrient digestibility parameters were analyzed by unpaired Tukey's t-test. Considering the entire experimental period, statistically significant differences ($p < 0.05$) occurred for cumulative body weight gain (991 ± 8.41 vs. 1006 ± 8.93 g) and FCR (1.267 ± 0.029 vs. 1.244 ± 0.025 g/g) between the groups Con and PFA. Addition of the PFA to diets improved apparent prececal digestibility of protein (79.96 ± 0.71 vs. 81.80 ± 1.30 %), ash (44.22 ± 1.42 vs. 48.73 ± 1.42 %), Ca (45.61 ± 1.43 vs. 50.04 ± 1.47 %) and P (54.20 ± 1.58 vs. 59.17 ± 1.16 %) highly significant ($p < 0.01$) compared to Con broilers. The present study demonstrated that PFA can play an important role as non-antibiotic growth promoters. The particular strong effects of the tested PFA on apparent prececal protein, ash, Ca and P digestibility can be explained by the influence of the selected ingredients on 3 physiological pathways. (1) Phenolic essential oils induce the Nrf2-pathway which in turn up-regulates the gene expression of intestinal amino acid and small peptide-transporters. (2) Saponins increase the gene expression and membrane association of numerous amino acid and small peptide transporters like PEPT1. (3) Pungent substances stimulate the intestinal heat and pungent sensitive Ca channels TRPA1 and TRPV1, followed by serotonin release from enterocytes and the secretion of pancreatic digestive enzymes.

Keywords: *Phytogenics feed additive (PFA), prececal nutrient digestibility, broiler chicken, pancreatic digestive enzymes*

FEED AND NUTRITION CHALLENGES AND OPPORTUNITIES IN INDONESIA: A POULTRY SECTOR PERSPECTIVE

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Abstract

The poultry sector is the largest consumer of compound feed in Indonesia, yet its sustainability is challenged by heavy import dependency, with the majority of Feed Additives/Supplements (FA/FS) and protein feed ingredients. The current feed and nutrition challenges facing Indonesian broiler and layer producers, including raw material price volatility, inconsistent ingredient quality, and feed cost pressure that accounts for 65-70% of total production cost. Additional constraints include post-harvest losses, logistics complexity across the archipelago, and variable adoption of precision nutrition among small to medium-scale farms, contributing in the broiler market to average FCR 20-40 points in more optimized-well equipped closed house systems. However, Indonesia still offers significant opportunities for the poultry feed industry. Abundant local agro-industrial by-products such as palm kernel meal (PKM), cassava, and rice bran remain underutilized. Advances in enzyme technology, precision feeding, and data driven formulation now enable 8-12% cost reduction without compromising performance. Furthermore, growing demand for sustainable and antibiotic-free poultry production is driving innovation in functional feed additives and alternative protein sources including insect meal. Practical case examples from Indonesian poultry operations and outline three actionable strategies: optimizing local ingredient use, implementing phase-specific precision nutrition, and strengthening regional collaboration for feed security. The goal is to share insights that help build a more cost-resilient and sustainable poultry feed chain in the Southeast Asia region.

Keywords: *Poultry nutrition, Indonesia, feed security*

VIETNAM FEED INDUSTRY OUTLOOK: SUSTAINABLE GROWTH, MARKET DYNAMICS AND NEXT GENERATION FEED INNOVATION

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Abstract

Vietnam's feed and livestock sectors are entering a new phase of transformation driven by market consolidation, evolving consumer demand, and increasing emphasis on sustainable production. With total industrial feed output reaching approximately 27.5 millions tons in 2025 including aquaculture. So Vietnam remains one of the most dynamic feed markets in Asia. Growth is supported by the expansion of commercial farms, improved biosecurity practices, and rising expectations for feed efficiency and nutritional precision. This presentation provides a data driven analysis of Vietnam's feed industry outlook from 2025 to 2030, highlighting key market dynamics, structural shifts, and policy directions from the Department of Livestock Production. It examines how sustainability requirements, resource constraints, and global ingredient volatility are reshaping feed formulation strategies and accelerating the adoption of next generation solutions such as functional additives, alternative proteins, and low emission nutrition technologies. By integrating market insights with practical implications for producers, this session aims to offer a forward-looking perspective on how Vietnam can enhance competitiveness, strengthen resilience, and drive innovation across the feed–livestock value chain. The goal is to support industry stakeholders in navigating emerging challenges while capturing new opportunities for sustainable growth.

Keywords: *Feed industry, Vietnam, livestock, feed market, feed innovation*

ADVANCING LIVESTOCK PERFORMANCE THROUGH PRECISION NUTRITION AND FUNCTIONAL FEED ADDITIVES

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Abstract

Feed remains the single most expensive component of today's poultry production systems, often accounting for up to 70% of the total cost of producing eggs and meat. Therefore, it is critical for integrators to provide diets that optimize bird performance and health while remaining responsive to egg and meat market dynamics to ensure Economically viable. Basic nutrients are essential for the bird to meet performance standards, which can change year after year with the advances in bird genetics. Enzymes are key and should play an even greater role in ration formulation by improving digestibility, reducing costs, and supporting gut health. Proteases, carbohydrases, and phytase are now standard inclusions in modern poultry diets. In response to consumer demands for cage-free systems and raised-without-antibiotics (RWA) production, the industry is developing comprehensive programs spanning both feed and water that go beyond basic nutrition to actively support bird health and resilience. Prebiotics, probiotics, postbiotics, fatty acids, phytogenic compounds, and similar functional ingredients offer valuable tools to help birds cope with field challenges. However, the key question remains: how do we select the most effective options and combinations? Integrating these nutritional solutions is also essential for advancing sustainability, as they improve feed efficiency, reduce nutrient excretion into the environment, lower the carbon footprint, and support more responsible use of natural resources. (I added this, but feel free to remove). Additionally, the use of alternative ingredients in antibiotic-free diets raises important questions about how nutrient requirements may shift. Amino acids and energy are two nutrients that can quickly become limiting when the needs of the immune system and other physiological systems are considered. This area of nutrition has not yet been extensively researched but is essential for long-term success in today's poultry production environment.

Keywords: *Enzyme, prebiotics, probiotics, postbiotics, phytogenic*

ENHANCING PERFORMANCE AND SUSTAINABILITY VIA MICROBIOME-DRIVEN APPROACHES

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Abstract

The animal production industry today faces multiple challenges, chief among which are the increasing demand for animal protein, which must be achieved with minimal harmful effects on the environment, on animals, and on humans. Antibiotics and antibiotic growth promoters have been successfully employed for decades to augment growth performance, maintain gut health, optimize nutrient uptake, and ameliorate microbially associated enteric diseases. Unfortunately, this practice has resulted in the concomitant emergence of widespread antimicrobial resistance (AMR). The most recent, peer-reviewed assessment of the impact of AMR on global public health dates from 2022, and uses data gathered in 2019. The quoted figures, therefore, probably underestimate the present-day situation. For 2019, the global deaths directly attributable to bacterial AMR totaled 1.27M, while deaths associated in a significant way with AMR approached 5M. The article projected a figure for the year 2050 of 10M direct deaths, and 50M associated deaths. This clearly demonstrates that bacterial AMR is a grave global health problem and is a major cause of death on all continents. Calls for the development of new classes of antibiotics to combat resistant pathogens are not the answer, and would only exacerbate the problem in the long term as bacteria develop resistance to these agents in turn. Given this background, promising non-pharmaceutical, dietary interventions have emerged that can act as viable alternatives to antibiotics, without the attendant risk of resistance developing to them. One such agent is yeast mannan-rich fraction (MRF). This prebiotic material can remove many important pathogens from the gut through a process of physical agglutination. However, its complex interaction with the gut microbiome has revealed at least three additional mechanisms by which MRF can prevent resistant pathogens from gaining a foothold in the intestine. The first of these is competitive exclusion through the establishment of taxonomic diversity. MRF has been shown to increase alpha and beta microbial diversity. The result is a healthier, self-regulating microbiome which effectively blocks pathogen colonization. The second mechanism involves suppression of antimicrobial resistance gene (ARG) richness. Our data indicate that MRF significantly alters the richness of the resistome, and restricts the amplification of ARGs over time. Finally, our newest data indicate that MRF presents a physical challenge to resistant *Escherichia coli*, resulting in profound changes in bacterial cellular respiration. MRF shifts the oxygen consumption rate (OCR) and extracellular acidification rate (ECAR). This, in turn, elicits increased production of lethal intracellular reactive oxygen species (ROS), and cell death. These data present a strong case for the effective implementation of functional biotics as viable alternatives to growth promoting antibiotics. Such agents can perform the required functions of increasing animal health and performance without the downside of generating multi-drug resistant reservoirs of pathogenic bacteria.

Keywords: *Antimicrobial resistance (AMR), gut microbiome, microbial diversity, mannan-rich fraction (MRF), BIO-MOS*

SUSTAINABLE LIVESTOCK TRANSFORMATION: CLIMATE-SMART PRODUCTION, INVESTMENT CASES AND REGIONAL DEVELOPMENTS

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Abstract

Livestock systems are central to food security, nutrition and rural livelihoods across Asia and the Pacific, a region that holds nearly 44 percent of the world's livestock population and is the largest consumer of animal-source foods globally. As demand for livestock products continues to grow, countries face the challenge of increasing productivity and efficiency while strengthening resilience, improving environmental performance, supporting animal health and welfare, and sustaining rural livelihoods. These challenges underscore the need for sustainable livestock transformation. This presentation will present five regional transformation pathways and two regional platforms that illustrate approaches for sustainable livestock development. Experiences from Mongolia and Cambodia demonstrate how climate-smart livestock development can support adaptation and resilience through sustainable grazing management, landscape restoration, enhanced productivity and stronger natural resource stewardship. These initiatives highlight opportunities to combine livestock development with climate action, ecosystem restoration and rural development. In Iran, community-based conservation and development of indigenous animal genetic resources demonstrate how breeding programmes, reproductive biotechnologies, capacity development and value-chain support can safeguard biodiversity and improve livestock-based livelihoods. In Pakistan, sustainable livestock transformation is being advanced through a One Health approach emphasizing antimicrobial resistance stewardship, responsible use of veterinary medicines, improved biosecurity, and strengthened animal health systems. In Bhutan, livestock investment cases illustrate how targeted investments in sustainable dairy development and poultry intensification can improve productivity, food security and nutrition through enhanced genetics, feeding systems, farm management and value-chain development while generating economic returns. Experiences from the Pacific Islands demonstrate how climate-resilient livestock systems, strengthened animal health and biosecurity, and reduced import dependency through sustainable local production and feed resource development can support food security, livelihoods and resilience in vulnerable island environments. The presentation will also examine the role of the Dairy Asia Platform in advancing sustainable dairy development through innovation, investment facilitation and knowledge exchange, and the Animal Production and Health Commission for Asia and the Pacific (APHCA) in fostering regional cooperation, policy dialogue, technical exchange and capacity development. Together, these examples demonstrate how climate-smart production, animal health, biodiversity conservation, strategic investment and regional collaboration can accelerate the transformation of livestock systems across Asia and the Pacific.

Keywords: *antimicrobial resistance, climate-smart livestock, livestock investment, One Health, sustainable livestock transformation.*

VIETNAM DAIRY INDUSTRY: MARKET OVERVIEW, GROWTH DRIVERS AND FUTURE OUTLOOK

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Abstract

Vietnam's dairy industry has experienced steady growth and structural transformation, supported by strong economic expansion, rising incomes, and increasing nutritional awareness among consumers. With a population of over 103 million and GDP growth of 7.9% in 2025, the country presents a dynamic and expanding dairy market. This presentation provides a comprehensive overview of the Vietnamese dairy sector, covering dairy cattle development, raw milk production, processing capacity, consumption patterns, and international trade. Vietnam currently produces approximately 1.3 million tons of raw milk in 2025, with an average annual growth rate of 5.48%, while liquid milk and milk powder production continue to expand at differentiated rates. Despite these achievements, the industry remains structurally dependent on imports, with dairy import turnover reaching USD 1.437 billion in 2025, reflecting ongoing gaps in feed resources, productivity, and supply chain efficiency. The presentation highlights critical challenges, particularly in feed availability, climate conditions, and limited natural pasture, which directly affect dairy productivity and sustainability. Special emphasis is placed on the role of feed and nutrition in enhancing milk yield, improving product quality, and reducing environmental pressures. The analysis also examines the increasing adoption of international standards, integrated farm–processing systems, and the shift toward premium, functional, and sustainable dairy products. Looking ahead, the presentation outlines strategic directions for Vietnam's dairy industry, including genetic improvement, development of high-quality forage and agro-industrial byproducts, diversification of dairy products, and expansion of both domestic and export markets. The findings provide practical insights for policymakers, industry stakeholders, and international partners seeking to strengthen sustainable dairy development in emerging markets.

Keywords: *Vietnam dairy industry, market overview, dairy sustainability*

FROM FARM TO TABLE: ROLE OF ASOHI IN FOOD SAFETY & AMR MITIGATION IN INDONESIA

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Abstract

Food safety and antimicrobial resistance (AMR) are increasingly interconnected challenges that require coordinated action across the entire food production chain. As one of Southeast Asia's largest livestock-producing countries, Indonesia recognizes the importance of safeguarding animal health, ensuring food safety, and preserving the effectiveness of antimicrobials through a comprehensive One Health approach. This presentation explores the role of the Association of Indonesian Animal Health Companies (ASOHI) in supporting food safety and AMR mitigation from farm to table. ASOHI serves as a key industry partner in promoting responsible antimicrobial stewardship, advancing disease prevention through vaccination and biosecurity, supporting regulatory compliance, and fostering collaboration among government agencies, veterinarians, producers, academia, and the animal health industry. The session will highlight ASOHI's initiatives to encourage the prudent use of antimicrobials, strengthen farmer and veterinarian awareness, support national AMR action plans, and enhance food safety outcomes throughout the livestock value chain. It will also showcase how preventive animal health solutions and science-based regulations contribute to reducing disease burden, improving animal welfare, and minimizing the need for antimicrobial interventions. By sharing Indonesia's experiences and lessons learned, this presentation will demonstrate how industry-government collaboration can help build resilient food systems, protect public health, and address AMR risks without compromising livestock productivity. Participants will gain practical insights into the critical role of the animal health sector in ensuring safe, sustainable, and responsible food production from farm to table, ultimately contributing to greater consumer confidence and long-term food security in the region.

Keywords: *Association of Indonesian Animal Health Companies (ASOHI), food safety, antimicrobial resistance (AMR), food production, food security*

MODULATION OF THE GUT MICROBIOTA IN ANIMAL NUTRITION: MECHANISMS, CONSEQUENCES OF DYSBIOSIS, AND NUTRITIONAL STRATEGIES TO MITIGATE THE DISSEMINATION OF ANTIMICROBIAL RESISTANCE GENES

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Abstract

The gastrointestinal (GI) tract of humans, livestock, and companion animals hosts a complex ecosystem comprising trillions of microbial cells, collectively referred to as the gut microbiota. This microbial community plays an indispensable role in maintaining systemic homeostasis, modulating mucosal immunity, and driving animal production performance. When microbial balance is achieved, it supports the intestinal mucosal barrier, maintains tight junction integrity, limits pathogen colonization, and regulates local immune responses. Conversely, stressors such as weaning in piglets, suboptimal brooding management in poultry, inadequate nutrition, and therapeutic antibiotic administration induce gut dysbiosis. This microbial imbalance disrupts homeostasis and damages villous epithelium, triggering systemic inflammation and reducing performance. Furthermore, these stressors damage gut integrity, creating a perfect environment for pathogenic and antibiotic-resistant bacteria to proliferate. To overcome these negative effects, precision animal nutrition uses functional feed additives to balance the gut microbiota and replace resistant bacteria. Supplementing diets with specific probiotics and prebiotics selectively expands beneficial, butyrogenic taxa such as *Bifidobacterium* and *Lactobacillus* species. Additionally, these functional additives activate toll-like receptor signaling, upregulate tight junction proteins, stimulate secretory immunoglobulin A (sIgA) secretion, and maximize short chain fatty acid production. Through competitive exclusion and enhanced barrier function, these targeted dietary strategies effectively limit the colonization of resistant pathogens and reduce the horizontal dissemination of ARGs. Ultimately, manipulating the gut microbiota through strategic animal nutrition offers a critical, antibiotic-free frontier to enhance host immunity, improve nutrient utilization, and reduce the spread of antibiotic resistance in animal systems.

Keywords: *Gastrointestinal, gut microbiota, microbial community, antimicrobial resistance genes, antibiotic resistance*

PATH OF LEAST RESISTANCE: THE RISE OF ANTIBIOTIC RESISTANCE AND OPPORTUNITIES FOR CONTROL

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Abstract

Antimicrobial resistance (AMR) poses a critical threat to global public health and the sustainability of animal agriculture. Conventional strategies ranging from antibiotic restriction to the development of novel antimicrobials have proven insufficient to eliminate the entrenched reservoir of resistance genes within the gut microbiome of livestock. Inspired by ecological resilience theory, this study proposes a paradigm shift: restoring gut microbial diversity to re-establish ecological balance and thereby reverse AMR. Using integrated approaches including metagenomics, metabolomics, and in vitro validation, we systematically evaluated the effects of mannan rich fraction (MOS/MRF; commercial name: Bio-Mos & Actigen) on gut microbiota structure and function in poultry, swine, and other livestock models. MRF supplementation significantly enhanced α -diversity, rebalanced the Firmicutes-to-Bacteroidetes ratio, and increased production of beneficial short-chain fatty acids (e.g., butyrate), thereby improving host energy metabolism and intestinal barrier integrity. Concurrently, MRF markedly reduced colonization by key pathogens, including *Salmonella*, *Escherichia coli*, *Campylobacter*, *Helicobacter*, and others. Critically, MRF intervention led to significant downregulation of both core and accessory resistomes, encompassing resistance markers for 25 antibiotic classes-including β -lactams, tetracyclines, macrolides, and fluoroquinolones. Mechanistically, MRF may inhibit horizontal transfer of resistance plasmids and induce 'collateral sensitivity', forcing highly resistant strains into an evolutionary trade-off between maintaining resistance and sustaining fitness, thereby resensitizing them to antibiotics. Our findings demonstrate that enhancing the resilience of the gut microbial ecosystem not only substitutes for antibiotic growth promoters but also offers a viable, ecology-based strategy to mitigate and potentially reverse AMR at its source. This approach provides a scientific foundation for sustainable, antibiotic-reduced livestock production and contributes to the global effort against antimicrobial resistance.

Keywords: *Antimicrobial resistance (AMR), gut microbiome, microbial diversity, mannan-rich fraction (MRF), Bio-Mos*

DRIVING PROFITABLE LIVESTOCK SUSTAINABILITY THROUGH RESPONSIBLE MANAGEMENT PRACTICES

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Abstract

The agri-food sector holds one of the most powerful tools for combating climate change — and unlocking this potential requires deep collaboration across the entire value chain, from farm to fork. Sustainability and profitability are not opposing forces but mutually reinforcing goals. Technology, far from being a mere cost center, serves as a catalyst for efficiency gains that make sustainable practices both scalable and profitable. The global emphasis on environmental, social, and governance (ESG) criteria is reshaping the agri-food sector, driving a critical shift toward more responsible and resilient business practices. Companies are navigating this transformation by aligning long-term environmental and social goals with financial performance. Emerging regulatory frameworks, evolving consumer expectations, and cutting-edge innovations are redefining sustainable agriculture. ESG integration is increasingly understood not only as a strategic imperative but also as a competitive advantage. Industry leaders such as Alltech embody the vision of *working together for a planet of plenty* - a philosophy built on three interconnected pillars: sustainability, science, and storytelling. Sustainability provides the environmental foundation; science delivers the data-driven innovations that improve efficiency and reduce impact; and storytelling broadens public understanding, transforming complex agricultural challenges into shared human narratives. This vision comes to life in the documentary *World Without Cows*, which expands the conversation beyond conventional climate debates to explore the profound ecological, economic, and cultural roles of livestock in our global food system. By integrating these three dimensions, Alltech and other forward-thinking companies demonstrate that meaningful climate action in agriculture requires more than technology or regulation. It requires a compelling story that inspires collaboration across the entire food supply chain. Measurable benefits include improved resource efficiency, enhanced brand trust, and long-term risk mitigation. Through real-world applications and a broader, more inclusive discussion of agriculture and climate change, stakeholders can future-proof their agri-food operations and contribute meaningfully to a more sustainable global food system.

Keywords: *Environmental, sustainability, ESG, climate action, agri-food collaboration*

FROM NET ZERO TO NET POSITIVE: SHIFTING THE PARADIGM IN FEED AND LIVESTOCK SUSTAINABILITY

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Abstract

The global livestock industry is under increasing pressure to reduce environmental impact while simultaneously meeting the rising demand for animal protein. Traditionally, sustainability efforts have focused heavily on achieving 'net zero' through emissions reduction and carbon accounting. However, this approach alone may be insufficient to address the broader challenge of building resilient, productive, and regenerative livestock systems. This presentation explores the transition from a 'net zero' mindset toward a 'net positive' framework in feed and livestock production. Rather than viewing sustainability solely as emissions reduction, the presentation will highlight how biological efficiency, nutritional strategies, precision feeding, and data-driven management can transform livestock systems into contributors of greater environmental and economic value. A systems-based perspective will be presented, demonstrating how feed and nutrition influence not only productivity, but also methane intensity, nutrient utilisation, animal health, and overall resource efficiency. The session will examine the critical role of measurement and carbon footprint assessment in identifying inefficiencies and enabling practical interventions across livestock supply chains. Drawing on global sustainability trends, scientific insights, and industry experience, the presentation will discuss how innovation in feed technologies, precision nutrition, and integrated sustainability assessment can support the evolution of livestock systems from carbon reduction targets toward regenerative and net positive outcomes. The session aims to challenge conventional thinking around sustainability and provide a practical framework for aligning productivity, profitability, and environmental stewardship within modern livestock production systems.

Keywords: *Livestock sustainability, livestock production, net zero, net positive, animal protein*

STRAY DOG POPULATION MANAGEMENT: HUMANE SOLUTIONS FOR INDIAN CITIES - INDIA EXPERIENCE

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Abstract

Canine overpopulation and rabies transmission pose significant public health risks. This paper outlines a comprehensive framework for Animal Birth Control and Anti-Rabies (ABC/AR) programs, emphasizing the legal and ethical necessity of humane intervention to manage street dog populations effectively. The program methodology integrates systematic, humane capture techniques with secure kennel management and standardized surgical protocols. Key surgical practices include mandatory pre-operative fasting to minimize anesthetic risk, premedication for safe handling, and rigorous adherence to asepsis. Surgical procedures, including castration and spaying (flank and midline approaches), are executed following stringent sterilization of equipment using autoclaving. Intra-operative protocols emphasize hydration management and the mitigation of complications like hemorrhage. The study indicates that successful population control is contingent upon maintaining high surgical standards, vigilant post-operative monitoring, and responsible pharmaceutical use. Competent surgery, combined with efficient kennel management, reduces recovery times, allowing for the timely return of animals to their original habitats. This approach minimizes social order disruption while mitigating the risks of post-surgical complications in challenging, endemic environments. Rigorous adherence to established surgical principles, consistent sterilization, and compassionate animal handling are fundamental to the efficacy of ABC/AR programs. These guidelines offer a scalable, evidence-based approach to canine population management and zoonotic disease prevention in rabies-endemic regions.

Keywords: *Animal birth control, canine population, rabies prevention, surgical protocol, veterinary ethics*

WHAT IS ANIMAL WELFARE AND WHY DOES IT MATTER?

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Abstract

The World Organisation for Animal Health defines animal welfare as 'a complex and multifaceted subject with scientific, ethical, economic, cultural, social, religious and political dimensions'. Scientifically, animal welfare is 'the physical and mental state of an animal in relation to the conditions in which it lives and dies'. Animal welfare science collects empirical information about the state of the animal and its conditions, which is used to evaluate whether one condition is better than another or more suitable for the animal, because it provides for better physical health and mental well-being. How this information is used is influenced by ethical, economic, cultural and other factors. Initially, most studies of animal welfare focused on avoiding suffering, through assessment of the Five Freedoms. More recently, welfare has been recognised as existing on a continuum from very poor to very good, and the Five Domains framework for animal welfare is increasingly used. This considers that welfare is influenced by five domains – three of which are survival-critical (environment, health and nutrition) and one is situational (behavioural interactions). These interact to affect the fifth domain, mental state, which determines welfare state. Assessments of animal welfare, therefore, rely on measurements taken of the animal's condition, considering the four physical domains, and their mental state inferred. Animal welfare improvements or management can thus be made based on scientifically derived evidence that understands what animals might need for good welfare and evaluates how well current conditions can meet those needs. Providing animals with good welfare conditions has important implications for the expression of key behaviours, such as maternal care, and for immune function, with consequent impacts on disease resilience and susceptibility. Animals provided with enrichments and good welfare have been shown to have better offspring survival and growth, improved maternal care and greater resilience to other stressors, such as heat or transport. With global threats of antimicrobial resistance, food insecurity and climate change, these are increasingly important issues. Good animal welfare, therefore, is not a luxury but an important component of efficient and safe food production and disease resilience.

Keywords: *Animal welfare, five domains framework, disease resilience*

TOWARDS A GOOD LIFE: WHAT NEXT FOR ANIMAL WELFARE?

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Abstract

Ensuring animals experience a good quality of life has become a defining priority for animal industries worldwide, shaping policy, practice and public expectation. Whilst significant progress has been made in identifying and reducing negative affective states such as pain, fear and stress across a range of species, including companion animals, livestock, zoo animals and wildlife, the science of measuring positive welfare remains considerably less developed. This matters because the absence of suffering and negative emotions does not equate to an animal experiencing a 'life worth living', let alone 'a good life'. Addressing this disparity requires both conceptual clarity and methodological innovation. Recent advances are transforming our capacity to assess affective states (animal emotion) and quality of life across species. Validated behavioural indicators, cognitive bias tests, qualitative behaviour assessment, facial action coding systems adapted for non-human species, and novel technologies including wearable biosensors and machine learning-based monitoring tools are expanding what is measurable. Multimodal frameworks that integrate physiological, neurobiological and behavioural data are enabling more nuanced, species-appropriate welfare assessment. Importantly, these approaches are being developed and refined not only in laboratory settings but in the field environments where animals actually live. Yet science alone is not sufficient to advance animal welfare. A gap exists between what research tells us about animal welfare and what happens in practice. Evidence-based knowledge must be translated into meaningful change in how animals are housed, managed, trained and cared for across all sectors. This requires understanding the motivations, beliefs, social norms and structural constraints that shape the behaviour of those responsible for animal care and welfare standards, whether they are farmers, pet owners, veterinary professionals or policy makers. Behaviour change frameworks drawn from social and health psychology offers valuable tools for closing this gap. This talk will present an integrated perspective on what a good life for animals means across different species contexts, examine the current situation with welfare assessment, and make the case for placing human behaviour change at the centre of any credible strategy for improving animal welfare. Science sets the direction, translating science into practice is what determines whether animals live better lives.

Keywords: *Animal welfare, quality of life, affective states, welfare assessment, human behaviour change*

INTEGRITY IN ANIMAL WELFARE: AN ETHICAL AND PUBLIC HEALTH FRAMEWORK FOR MALAYSIA

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Abstract

Malaysia continues to face persistent animal welfare challenges, notably high rates of dog bite incidents and recurrent rabies outbreaks, particularly in Sarawak. Between 2017 and 2020, over 71,000 animal bite cases were recorded nationally, with dogs as the primary vector. Inadequate pet ownership standards and inconsistent enforcement exacerbate these public health risks and animal welfare concerns. This paper explores the concept of integrity within animal welfare and proposes an ethical framework designed to guide key stakeholders, including pet owners, shelters, agricultural entities, researchers, and regulatory agencies. A comprehensive policy and literature review was conducted, incorporating Malaysia's Animal Welfare Act 2015, Section 289 of the Penal Code, Ministry of Health rabies surveillance data, and international standards, including the "5 Freedoms" and "3Rs" principles. Integrity in animal welfare is operationalized through four core principles: honesty in reporting animal conditions, transparency in management practices, accountability for negligence, and compassion in animal handling. Data analysis confirms that poor compliance with licensing, vaccination, and duty-of-care requirements directly correlates with increased human injuries and zoonotic transmission. Evidence from 2024–2025 further highlights critical gaps in enforcement and public awareness. Strengthening integrity through mandatory ethics training, transparent reporting, regular audits, and the robust enforcement of the Animal Welfare Act 2015 is essential to reducing animal cruelty, mitigating dog bite incidents, and controlling rabies. Cultivating a culture of integrity is vital to aligning animal welfare goals with broader public health objectives in Malaysia.

Keywords: *Animal welfare, integrity, Animal Welfare Act 2015, Malaysia, responsible pet ownership*

THE EVOLUTION OF HUMAN-ANIMAL INTERACTION THROUGHOUT THE AGES

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Abstract

Human societies have been dependent on animals for food, shelter, and protection throughout the ages, and shall continue to do so for the foreseeable future. This enduring interdependence forms the bedrock of agricultural civilization and global development. However, while humans have been using animals for these essential needs, the animals' welfare must be safeguarded. Ethical stewardship requires balancing utilitarian utilization with humane treatment. This balance faces severe tests in the modern geopolitical climate. Today, very few nations possess the capacity to feed themselves while simultaneously contributing to the global food supply. Animal products play a vital role in national food security and food sovereignty. This reality is critical in current times of global uncertainty. Volatile supply chain disruptions, rising operational costs, and stringent welfare standards create immense pressure. These factors may unfortunately tempt some industry players to cut corners, compromising the vital standards that protect animal well-being. To navigate these contemporary challenges, it is essential to understand how human-animal interaction has evolved over millennia. This relationship began in the prehistoric era with the domestication of animals. During this phase, traditional husbandry focused on close, individual care of each animal and mutual survival. The advent of the Industrial Age fundamentally transformed this dynamic. It shifted agriculture toward intensive production systems, high-density farming, and a focus on maximizing output and efficiency. This shift often distanced consumers from the biological realities of livestock. Currently, we stand on the brink of the age of Artificial Intelligence (AI) and biotechnology. This modern era introduces revolutionary tools, including automated health monitoring, predictive disease modeling, and precision livestock farming. These technologies offer unprecedented opportunities to optimize production efficiency while simultaneously enhancing individual animal welfare tracking. Looking ahead, animals will remain continuously important to human beings as irreplaceable pillars of nutrition, economic stability, and ecological balance. For Malaysia, a nation actively strengthening its agricultural resilience, sustainable animal industries are directly tied to national well-being. Ensuring high animal welfare standards secures international trade access, boosts public health safety, and builds a resilient food system against future shocks. This is crucial as it is time for all players in the animal industry to prepare for an ethical, technologically advanced framework that honours our historical bonds with animals, while securing a humane future for all creatures large and small.

Keywords: *Human-animal interaction, animal welfare, agricultural resilience, precision livestock farming, food security, food sovereignty*

NON-FEED AQUACULTURE: A SUSTAINABLE ANIMAL PRODUCTION APPROACH

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Abstract

Aquaculture plays a critical role in global food production, yet many conventional farming systems rely heavily on external feed inputs, which can increase costs and environmental impacts. Non-feed aquaculture offers a sustainable alternative by culturing aquatic species that rely primarily on natural food sources within the ecosystem, such as plankton, detritus, and other organic matter. Species including bivalves, sea cucumbers, and certain crustaceans can grow efficiently without formulated feeds, while simultaneously providing ecological benefits such as water filtration and nutrient recycling. This plenary talk will highlight the concept, principles, and global potential of non-feed aquaculture as an environmentally friendly animal production system. It will also discuss its role in supporting sustainable fisheries, enhancing ecosystem health, and contributing to food security and the blue economy.

Keywords: *Non-feed aquaculture, sustainable fisheries, blue economy*

SUCCESS STORY OF THE BLOOD COCKLE (*TEGILLARCA GRANOSA*) INDUCED BREEDING PROJECT IN MALAYSIA

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Abstract

Blood Cockle (*Tegillarca granosa*) landings in Malaysia plummeted from 78,024.70 Mt in 2010 to a rock-bottom 9,596.44 Mt in 2016 due to critical local cockle spat (CS) shortages. This study evaluated the use of coastal oceanographic physical characteristics as tools to induce mass spawning of adult cockles (AC) at Suggested Induced Spawning Grounds (SISG) to restore landings. In October 2018, a pilot project released 10.0 Mt of ACs in Lekir Bay (LB), Perak. This generated 1,861.24 Mt of CS between December 2018 and December 2021. A second project in Pontian, Johor (2019), using 3.0 Mt of ACs, yielded 838.19 Mt of CS through 2024. To sustain production, restocking was executed in LB (2.16 Mt) and Pontian (3.0 Mt). Consequently, CS landings resumed in LB, yielding 3,460.37 Mt from November 2022 to December 2025, supported by subsequent annual restocking (3.0–10.0 Mt). Given this success, the technology was transferred to new SISG sites across the west coast of Peninsular Malaysia. Total regional production reached 10,908.63 Mt of CS and 113,847.28 Mt of ACs for the period. The results indicate that strategic AC restocking at hydrobiologically optimum SISG sites effectively triggers natural mass spawning. This technology provides a scalable, sustainable solution to mitigate localized spat scarcity and successfully rebound wild adult cockle fisheries.

Keywords: *Tegillarca granosa*, induced spawning, cockle spat, stock replenishment, coastal oceanography.

LIPID NUTRITION IN CRUSTACEAN AQUACULTURE

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Abstract

Feed constitutes the highest operational cost in crustacean hatcheries, yet the commercial-scale transition from live feed to formulated diets remains a major bottleneck. Developing effective manufactured diets requires an understanding of feeding behaviours, physiological transitions from pelagic larvae to benthic juveniles, and species-specific nutritional requirements. Studies have been conducted on important nutritional physiology and lipid requirements of important crustacean aquaculture species, focusing on the blue swimmer crab (*Portunus pelagicus*), the orange mud crab (*Scylla olivacea*), and the giant freshwater prawn (*Macrobrachium rosenbergii*). Key insights and findings of the studies reveal that for the blue swimmer crab (*Portunus pelagicus*), carefully calibrated dietary cholesterol and phospholipid supplementation maximizes growth, enhances osmotic shock resistance, and prevents molt death syndrome. Furthermore, blending terrestrial and marine oils provides a balanced fatty acid profile that optimizes survival and shortens intermolt duration. For mud crabs (*Scylla olivacea*), elevated dietary lipids enhance progesterone levels and carotenoid concentrations, fueling vital nutrient mobilization from the hepatopancreas to the ovaries during maturation. In giant freshwater prawns (*Macrobrachium rosenbergii*), microbound diets utilizing optimized lipids and binders significantly advance larval growth stages and post-larval production. In conclusion, implementation of lipid requirements into crustacean feed provides a scalable strategy to maximize hatchery productivity and improve broodstock quality. Building upon the fundamental findings, future research should explore the interactive effects of these lipids alongside cost-effective, locally sourced ingredients like black soldier fly larvae and red palm oil to ensure the economic sustainability of commercial crustacean aquaculture.

Keywords: *Crustacean nutrition, Lipid requirements, Scylla olivacea, Portunus pelagicus, Macrobrachium rosenbergii*

SEAWEED CULTURE AND HYDROCOLLOID PRODUCTION: EMERGING TRENDS AND APPLICATIONS IN THE FOOD INDUSTRY

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Abstract

Seaweed is a superfood that has gained recognition as a sustainable resource due to its high potential for CO₂ reduction, natural abundance, and minimal need for freshwater, fertilizers, or agricultural land. Seaweed farming has become a vital livelihood for coastal communities, due to its simple, low-tech cultivation methods, that offer high returns on investment and contribute significantly to local economies. Seaweed cultivation in ASEAN has grown significantly over the decades, with Indonesia and the Philippines emerging as global leaders in production. Red seaweeds are most cultivated worldwide, accounting for over 99% of the global supply, with species such as *Kappaphycus alvarezii* (*Eucheuma*) and *Gracilaria* spp., primarily for hydrocolloid sources such as carrageenan and agar. Hydrocolloids derived from red seaweed are valued for their thickening, gelling, and stabilizing properties, making them essential in food applications. Seaweed-derived hydrocolloids are increasingly used in functional foods and nutraceuticals due to their bioactive properties, including cholesterol reduction, antioxidant effects, and dietary fibre content. Moreover, emerging markets are exploring seaweed-derived polysaccharides and oligosaccharides for their prebiotic, antioxidant, and dietary fibre benefits, catering to the growing demand for functional and health-focused foods. Furthermore, hydrocolloids extracted from seaweed are reported as biopolymers for developing bioplastics that combine with starch and plasticizer to replace petroleum-based plastics, emphasizing their role in sustainable industries. In summary, the seaweed industry is expanding across food, health, and sustainability sectors, with significant potential for future growth driven by innovation and sustainable practices.

Keywords: *Agriculture innovation, food source, hydrocolloid, seaweed production, sustainable products.*

ENHANCING BIOSECURITY AND SUSTAINABILITY IN MALAYSIA'S FISHERIES INDUSTRY

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Abstract

The fisheries sector is an important component of Malaysia's food system, contributing significantly to national food security, economic development, employment, and rural livelihoods. As demand for aquatic protein continues to increase, sustainable fisheries and aquaculture production have become national priorities. However, the industry faces numerous challenges, including disease outbreaks, climate change, and the emergence of antimicrobial resistance (AMR), all of which threaten productivity, market access, and long-term sustainability. Malaysia has established a comprehensive regulatory framework, including the Fisheries Act (Amendment) 2025 [Act A1780] and related regulations, which provide the legal foundation for fisheries management, aquaculture development, disease control, the movement of aquatic animals, and biosecurity. The Fisheries Biosecurity Division of the Department of Fisheries Malaysia (DOF) plays a critical role in safeguarding aquatic animal health through disease surveillance, aquatic animal health certification, import and export controls, quarantine measures, emergency disease response, and compliance with national and international standards. Biosecurity is widely recognized as the first line of defence against the introduction and spread of diseases within aquaculture systems. Effective biosecurity measures, including farm access control, water quality management, health monitoring, quarantine procedures, sanitation protocols, and traceability systems, are essential for maintaining healthy aquaculture production systems and reducing dependence on antimicrobial use (AMU), thereby mitigating the development and spread of AMR. This presentation examines the current status of Malaysia's fisheries and aquaculture industry, major disease threats, and the importance of integrating biosecurity into sustainable farming practices. Findings from recent studies on AMU and AMR in Malaysian shrimp aquaculture are presented, including evidence of knowledge gaps among farmers and the occurrence of antimicrobial-resistant bacterial isolates. These findings underscore the need for strengthened antimicrobial stewardship, enhanced surveillance systems, and greater awareness among farmers. The presentation further emphasizes the application of the One Health approach, which recognizes the interconnectedness of animal, human, and environmental health. Emerging technologies, national initiatives, and multi-stakeholder collaborations are also discussed as key strategies for strengthening aquatic biosecurity and sustainability. By advancing science-based policies, robust biosecurity systems, and responsible AMU practices, Malaysia can build a resilient fisheries industry that supports public health, environmental protection, food security, and sustainable economic growth.

Keywords: *Biosecurity, Fisheries, Antimicrobial Resistance (AMR), Antimicrobial Use (AMU), One Health, Malaysia.*

MICROPLASTIC CONSUMPTION IN THE DIET OF TILAPIA (*Oreochromis niloticus*) AND ITS EFFECTS ON GLYCEMIA, RED BLOOD CELL MORPHOLOGY AND GUT OBSERVATION

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Abstract

Microplastics, the plastic fragments smaller than 5 mm that now drift through almost every aquatic food web, are easy to overlook precisely because they are so small. Their sub-lethal effects on the fish we farm and eat, however, remain poorly understood. This is not a distant worry. Earlier surveys of Malaysian markets have already found microplastics sitting in the edible flesh of the fish sold to local consumers, which turns the dinner plate into a direct route of human exposure. With that concern in mind, this study set out to trace what dietary polyethylene terephthalate (PET) actually does inside the fish. Tilapia were fed graded PET concentrations of 0%, 5%, 10% and 15% over 21 days, while survival, blood glucose, red blood cell (RBC) morphology and gut weight were tracked as diagnostic markers and compared using analysis of variance. Every group survived the full period, a clean 100%, suggesting the doses were not acutely lethal. Yet beneath that reassuring figure, the fish told a different story. PET exposure raised blood glucose significantly ($p = 0.004$), climbing roughly 72% above baseline at the highest dose, a well-known early sign of metabolic stress in fish. Concentration also shaped RBC abnormalities ($p = 0.025$), which stayed similar through the first two weeks but split apart by week three ($p = 0.022$). Gut weight and the gut-to-body ratio fluctuated across treatments as well, hinting at altered gut development, though these were descriptive trends only, left untested for significance because of the small sample size. Together the results expose a quiet paradox: fish that look healthy on paper are, in truth, metabolically drained and cellularly harmed. Survival rate alone is too blunt a measure of microplastic toxicity, and physiological biomarkers deserve a place as the more honest standard.

Keywords: *Polyethylene terephthalate (PET), microplastic toxicity, Nile tilapia, glycemia, sub-lethal effects*

GENOMIC RESOURCES TO UNDERSTAND ANTIMICROBIAL RESISTANCE IN A ONE HEALTH: APPLICATIONS IN FISHERIES AND AQUACULTURE

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Abstract

Antimicrobial resistance (AMR) is being increasingly recognized as a global health challenge, one that affects the health of humans, terrestrial and aquatic animals, plants, and the environment. The One Health concept recognizes the universality of approaches to manage, and understand the interconnectedness of these sectors and the consequent emphasis on integrated strategies to monitor and control AMR. Aquaculture is one of the fastest-growing food production sectors worldwide, and with intensification in the production of fish to address food and nutritional security, diseases are increasingly reported. This results in the empirical use of antibiotics extensively and contributes significantly to the AMR landscape. The dissemination of antimicrobial resistance genes (ARGs) in aquaculture systems can occur via water, sediments, farmed species, and associated microbial communities, thereby potentially conferring resistance to human and terrestrial animal pathogens. Advancements in genomic technologies have revolutionized the study of AMR by enabling comprehensive detection, characterization, and tracking of resistance determinants across ecosystems. Genomic resources obtained through whole-genome sequencing (WGS), metagenomics deposited in resistome databases, and bioinformatics tools provide high-resolution insights into the diversity, evolution, and transmission pathways of ARGs. Among the most widely used databases, the Comprehensive Antibiotic Resistance Database (CARD) is an expert-curated repository of over 5,000 molecular sequences, Single Nucleotide Polymorphisms (SNPs), and mutations linked to AMR, organized by the Antibiotic Resistance Ontology (ARO). It supports resistome prediction via the Resistance Gene Identifier (RGI), which uses homology models, k-mer algorithms, and SNP mapping for genomes and metagenomes. Developed by NCBI/FDA, AMRFinderPlus identifies ARGs, using hidden Markov models (HMMs). It outperforms others on some benchmarks for comprehensive calling, including those for aquatic bacteria, and integrates with NCBI Pathogen Detection. Among the tools hosted by the Center for Genomic Epidemiology, ResFinder detects acquired ARGs and chromosomal mutations via BLAST against curated databases, predicting phenotypes for antibiotics while PointFinder helps in the identification of point mutations in known ARGs. MEGARes 2.0 is a widely used database for classification. biocide and metal resistance determinants in metagenomic sequence data. In aquaculture environments, these resources facilitate the identification of resistant pathogens, mobile genetic elements, and environmental reservoirs that contribute to the spread of resistance. One health framework allows for integration of genomic surveillance for the monitoring of AMR across aquatic farms, surrounding environments, food chains, and human populations. Comparative genomics and metagenomic analyses can reveal transmission dynamics between aquaculture systems and other sectors, enabling early detection of emerging resistance threats. Strengthening surveillance networks and informing evidence-based antimicrobial stewardship is facilitated by the use of global genomic databases and open-access platforms that support data sharing and collaborative research. The integration of genomic surveillance with One Health strategies allows scientists and all stakeholders, including policymakers to identify resistance hotspots, track transmission pathways, and develop interventions that can help mitigate the spread of AMR. This abstract highlights the importance of leveraging genomic resources to understand AMR within aquaculture systems that lends itself to responsible and sustainable practices and their broader implications for human and environmental health.

Keywords: *Antimicrobial resistance, Resistome databases, NGS, aquaculture, One health*

AQUACULTURE HEALTH MANAGEMENT IN THE ERA OF ANTIMICROBIAL RESISTANCE: CHALLENGES, INNOVATIONS, AND SUSTAINABLE SOLUTIONS

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Abstract

Aquaculture is the fastest-growing animal protein sector and plays a critical role in global food security. However, infectious diseases remain one of the most significant constraints to sustainable aquaculture production, often leading to increased reliance on antibiotics for disease control. The widespread use of antimicrobials has contributed to the emergence and spread of antimicrobial resistance (AMR), posing serious risks to aquatic animal health, environmental sustainability, and public health. The presentation will cover the growing challenge of AMR in aquaculture, its implications for aquatic health management, and key bacterial diseases that drive antibiotic use in aquaculture systems, along with the mechanisms through which antimicrobial resistance develops and spreads within aquatic environments. It also will highlight emerging innovations and sustainable strategies to reduce antibiotic dependency, including probiotics and microbiome management, vaccination approaches, functional nutrition and digital technologies for early disease detection. Emphasis will be placed on integrated fish health management as a preventive framework to enhance disease resilience while supporting responsible aquaculture development in the era of antimicrobial resistance.

Keywords: *Aquaculture, antimicrobial resistance, fish health management*

REPRODUCTIVE TECHNOLOGIES FOR ENDANGERED MARINE FISH IN AQUACULTURE

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Abstract

Marine fisheries worldwide are facing increasing pressure from overexploitation, habitat degradation, climate change, and growing consumer demand for high-value seafood. Many commercially important marine fish species, including several grouper species, wrasse, and other reef-associated fishes, are subjected to population declines, with some now classified as threatened and endangered. Aquaculture has emerged as a sustainable solution to reduce dependence on wild fisheries while ensuring a stable supply of seafood. However, successful aquaculture production of many marine fish species remains constrained by limited knowledge of their reproductive biology and challenges in captive breeding. Recent advances in reproductive biotechnology have significantly improved the understanding and management of fish reproduction in captivity. Both invasive and non-invasive approaches are utilized to evaluate reproductive status, monitor gonadal development, and optimize broodstock performance. Invasive techniques, including gonadal biopsy, histological examination, endocrine profiling, and molecular analyses, provide detailed information into reproductive physiology and maturation processes. Meanwhile, non-invasive technologies such as ultrasonography, morphometric assessments, behavioral monitoring, image analysis, and biochemical biomarkers offer practical alternatives for routine broodstock management with minimal stress to the fish. The integration of these reproductive technologies enables the development of reliable captive breeding protocols, improves spawning success and supports the establishment of sustainable aquaculture systems for endangered and high-value marine species.

Keywords: *Reproductive biotechnology, aquaculture, marine fish reproduction.*

MULTIOMICS AND HOLOGENOMICS APPROACH IN GENETIC IMPROVEMENT FOR CRUSTACEANS FOR FOOD SECURITY AND SAFETY

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Abstract

Sustainable animal production is essential for ensuring global food security and food safety. Aquatic species, including salmon, rainbow trout, carp, and rohu, have undergone domestication over the past five decades, providing valuable models for sustainable aquaculture development. From a Malaysian perspective, this case study highlights how multiomics approaches have contributed to sustainable crustacean breeding programmes. The first strategy involves genomics-assisted breeding through genome-wide association studies (GWAS), which enable the identification and correlation of genotypic variations with economically important phenotypic traits. The second approach employs transcriptomic analyses to elucidate functional traits and determine the association between gene expression profiles and traits of interest, including disease resistance, susceptibility, growth performance, and immune responses. These analyses provide insights into the innate immune mechanisms that enable crustaceans to mount effective defence responses against pathogens. Furthermore, comparative genomics has been applied to investigate innate defence mechanisms and identify antimicrobial peptides, thereby elucidating the evolutionary basis of immune competence in crustaceans. From a genomics and genetics perspective, studies on domestication history and genome evolution among major crustacean species, including marine shrimps and freshwater prawns, have provided important insights into adaptive evolution and long-term sustainability. Ensuring food security and food safety at the global level requires holistic and integrative approaches. The application of hologenomics and other multiomics strategies provides a comprehensive framework to advance sustainable aquaculture, thereby supporting resilient and productive aquatic food systems.

Keywords: *Sustainable aquaculture, Multiomics, Crustacean breeding, Genome-wide association studies (GWAS), Transcriptomics, comparative genomics,*

TOWARDS ENFORCEABLE WELFARE STANDARDS: THE ROLE OF INTEGRATED BIO-CLINICAL INDICATORS IN REGULATING THE ELEPHANT TOURISM INDUSTRY

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Abstract

The welfare of captive elephants represents a significant ethical and conservation concern, driven by the high degree of heterogeneity in management practices and environmental conditions across the tourism sector. While tourism-based facilities have the potential to optimise welfare by addressing the complex physiological and psychological requirements of individual animals, there remains a critical need for standardised, evidence-based oversight. This study seeks to bridge this gap by developing robust, science-based guidelines to inform enforceable governmental regulations for captive elephant management in Asia. To achieve this, a multidimensional assessment was conducted on the captive elephant population, employing a rigorous four-pillar methodology. Firstly, institutional surveys; evaluation of camp-level husbandry protocols and management frameworks. Secondly, clinical assessments; direct physical examinations focusing on Body Condition Scoring (BCS), integumentary health (wounds), and foot pathologies. Thirdly, behavioural observations; quantification of stereotypic behaviours as longitudinal indicators of psychological distress. Lastly, physiological profiling; analysis of metabolic biomarkers (glucose, insulin, and lipid panels) alongside non-invasive endocrinology (faecal glucocorticoid metabolites, fGCM) to evaluate adrenocortical activity and systemic stress levels. The resulting empirical data provide a validated foundation for understanding the impact of tourism-driven husbandry on elephant health. These findings emphasise that the long-term sustainability and viability of captive populations are contingent upon the implementation of "best practice" frameworks. To standardise welfare evaluations, researchers have developed the Elephant Welfare Assessment Tool (EWAT) specifically for the Asian context.

Keywords: *Welfare assessment, captive elephant, management, tourism*

THE ROLE OF VETS IN SYSTEM HEALTH PROMOTION IN A RAPIDLY SHIFTING GEOPOLITICAL AND TECHNICALLY ADVANCING SOCIETY

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Abstract

Disease is an ecological process. Ecological processes and biosystems, such as the disease triad are under stress due to anthropogenic interference. This is a concern for biodiversity resilience and our own species survival. As animal health specialists, what are your responsibilities in promoting health at individual, population and ecosystem levels to play our part in improving this situation? Using examples from ASEAN and Australasia in system health governance, operations and resilience, this presentation will discuss and question systems-level approaches (from technology use to environmental storytelling) to improving health for all, from the perspective of wildlife health. Using proven risk communication techniques, we will highlight evidence-based pipelines for change, from current quadripartite governance processes and guidance and how this links trade and health to frontline capability development case studies driving a positive ground-up approach to ecosystem health challenges. We will prove that both approaches are needed to successfully begin to reverse environmental collapse through understanding human motivations and values to allow animal health professionals to help affect societal behaviour change.

Keywords: *One Health, ecosystem resilience, risk communication, veterinary governance*

ORANGUTAN RESCUE AND REHABILITATION: CONSERVATION MEDICINE AND COEXISTENCE IN SABAH

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Abstract

Sabah is home to a rich diversity of native wildlife species, all protected under the authority of the Sabah Wildlife Department. Orangutan conservation in Sabah includes rescue operations, rehabilitation programmes, and public awareness initiatives aimed at promoting the species itself as well as human–wildlife coexistence. In Sabah, the Bornean orangutan is listed as a Totally Protected Animal under the Wildlife Conservation Enactment 1997 and continues to face threats from habitat loss due to habitat fragmentation and land-use change, injury, illness, and maternal separation. The Sepilok Orangutan Rehabilitation Centre (SORC), established in 1964, is the world's first orangutan rehabilitation centre and has cared for over 800 orangutans to date. These efforts are no longer just about treating individual orangutans but are now part of a wider approach that links animal health, healthy ecosystems, and human well-being. This presentation is based on field experience in orangutan rescue and rehabilitation in Sabah, highlighting the veterinary role from initial response to releasing back the orangutan to the habitat. Rescue operations involve coordination with wildlife authorities, field assessment, capture, and transport of injured, orphaned, or displaced individuals. Veterinary intervention is essential for stabilisation, trauma management and health risk evaluation. Rehabilitation includes quarantine, medical care, husbandry and training to help them learn the forest skills such as foraging, nesting and moving in trees. Before release, they are assessed for readiness, then released and monitored in the wild. From a conservation medicine perspective, orangutan rehabilitation lies at the interface of wildlife and human health. Close contact during rescue and rehabilitation presents zoonotic risks, highlighting the need for strict biosecurity. At the same time, increasing human-wildlife interactions especially in agricultural landscapes further reinforce the importance of coexistence strategies. Despite significant progress, challenges such as delayed response, limited resources, the complexity of rehabilitation, and key human behaviours including misconceptions, risk perception, conflict responses, and compliance with guidelines continue to affect outcomes. These challenges underscore the need for stronger multidisciplinary collaboration across government, non-government, and the private sector. This work demonstrates that orangutan rescue and rehabilitation in Sabah is a practical application of conservation medicine supporting ecosystem health and sustainable coexistence.

Keywords: *Bornean orangutan, coexistence, rehabilitation, veterinary role, zoonotic*

AVIAN CLINICAL PATHOLOGY: PRACTICAL INTERPRETATION FOR VETERINARY DIAGNOSTICS

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Abstract

Accurate interpretation of avian clinical pathology is essential for effective diagnosis yet remains challenging due to species variability and limited standardised reference ranges. This presentation provides a practical, clinically oriented approach to interpreting avian haematology and biochemistry in veterinary practice. Key haematologic parameters, including erythrocytes, leukocytes, and thrombocytes, are reviewed with emphasis on clinically relevant indicators such as packed cell volume (PCV), regenerative responses, and leukocyte differentials. Morphological changes and leukogram patterns are discussed in relation to inflammation, infection, and systemic disease. Biochemical interpretation focuses on the use of decision levels rather than rigid reference ranges. Liver and renal assessment is highlighted through parameters such as AST, LDH, bile acids, and uric acid. The diagnostic value of plasma proteins and electrophoresis in identifying inflammatory and chronic disease states is also emphasised. This presentation aims to enhance clinical decision-making by providing veterinarians with a structured framework to interpret laboratory findings in avian patients.

Keywords: *Avian medicine, clinical pathology, hematology, diagnostics*

EXOTIC ANIMAL MEDICINE MEETS WILDLIFE, ZOO, AND CONSERVATION MEDICINE

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Abstract

Exotic animal medicine is often term interchangeably for exotic pets, wildlife, zoo animals, and conservation medicine. Exotic medicine encompasses a wide array of species, and there are specialities for each distinct field. The work ranges from fieldwork that often necessitates minimal equipment and technology to conservation projects. These projects typically involve multiple professionals, including a veterinarian and a coordinating veterinarian. Additionally, there is zoo animal medicine, where the techniques employed can vary widely depending on the type of zoo and the animals involved. The field of exotic pets is currently expanding. To their owners, these animals are no different from more conventional pets, which means they face similar ethical and economic considerations as they would with a dog or cat. This situation, particularly in some countries, enables exotic animal specialists to propose and often carry out highly advanced diagnostic tests, treatments, and surgeries. In this context, techniques that were considered of limited use for exotic animals just a few years ago—such as ultrasound—have seen significant advancements in both technology and the proficiency of professionals who are committed to advancing ultrasound in exotic animals. Exotic medicine is now at levels that are comparable to more conventional medicines. In today's world, veterinary science has progressed to such an extent that possessing a high level of knowledge and specialisation is essential. There are no boundaries to what can be achieved with animals. While financial constraints may exist, the most significant barrier is the mental one we must overcome: we are doctors capable of utilising technologies employed worldwide at every level. The key is to prepare diligently, study, and immerse ourselves deeply in the subject.

Keywords: *Exotic medicine, specialization, advancement*

FROM NICHE TO NECESSITY: THE EVOLUTION OF EXOTIC ANIMAL MEDICINE IN MALAYSIA

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Abstract

The field of exotic animal medicine in Malaysia has shifted from a marginal, conservation-focused speciality to a growing area of clinical and public health relevance. This evolution has been shaped by rising exotic pet ownership, urbanisation, and changing societal attitudes, alongside greater professional recognition of One Health principles. While previously limited to zoological parks and wildlife, the scope of exotic animal medicine now extends into urban practice, demanding increased clinical expertise and regulatory oversight. The COVID-19 pandemic accelerated these trends but also exposed ongoing challenges, such as gaps in specialist training, limited access to suitable medications, and persistent welfare and zoonotic risks, particularly in the context of illegal wildlife trade and inadequate owner education. In response, Malaysian institutions and professional bodies have begun integrating exotic medicine into curricula and continuing professional development; however, the absence of structured specialisation means most veterinarians rely on self-directed learning. Addressing these gaps through dedicated training, policy reform, collaboration, and public education will be essential to meet future demands and safeguard animal, human, and environmental health. Malaysia's ongoing journey mirrors global trends, highlighting the need for a coordinated "One Voice, One Health, One Future" approach to advance the field ethically and sustainably. With sustained commitment, Malaysia can continue to strengthen responsible exotic animal care and contribute meaningfully to One Health in the region.

Keywords: *Exotic animal medicine, challenges, coordinated approach*

STRENGTHENING ONE HEALTH THROUGH ENHANCED EPIDEMIOLOGICAL & LEADERSHIP CAPACITY IN SE ASIA

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Abstract

Unprecedented threats to the health of people, animals, plants and the environment have renewed focus on the long-standing concept of One Health. Its central and vital contribution to future global health was heralded by the initiation of the Quadripartite partnership of WHO, FAO, WOAH, UN EPA in March 2022, with a commitment to work together on One Health, for which they established a new definition. This presentation will reflect on the Quadripartite definition of One Health and the competencies required by the future OH workforce, with a particular focus on epidemiological and leadership/non-technical competencies. It will consider region-specific challenges posed by the informal food sector and the spread of zoonotic and transboundary animal diseases, to determine the relevant epidemiological and other skills needed to address these challenges and the avenues by which to equip veterinary workers with these skills.

Keywords: *One Health workforce, competency, epidemiology, leadership*

NANOMEDICINE AS A STRATEGIC TOOL IN MANAGING EMERGING ZONOTIC AND TRANSBOUNDARY RISKS

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Abstract

The escalating frequency of emerging zoonotic diseases and transboundary infections poses an unprecedented threat to global health security. Driven by climate change, globalization, and shifting human-wildlife interfaces, these pathogens require proactive and highly adaptable countermeasures. This plenary talk explores the transformative potential of nanomedicine as a strategic tool in predicting, preventing, and managing these complex biological risks. Operating at the molecular scale, nanotechnology offers unparalleled advantages in the rapid development of advanced diagnostics, targeted therapeutics, and next-generation vaccines. We will highlight recent breakthroughs, including lipid nanoparticle (LNP)-based mRNA platforms that have revolutionized outbreak response times, alongside highly sensitive nanosensors capable of real-time, point-of-care pathogen detection in diverse environments. Beyond immediate clinical applications, this presentation addresses the strategic integration of nanomedicine into the global "One Health" framework, bridging human, animal, and environmental health paradigms. By navigating current challenges in scalability, regulatory harmonization, and equitable global access, nanomedicine stands poised to shift our approach from reactive crisis management to a proactive, resilient defense. Ultimately, this talk will outline how nanotechnology can build a safer, more resilient future against the unpredictable infectious threats of tomorrow.

Keywords: *Nanomedicine, zoonotic, transboundary risk*

A ONE HEALTH ROADMAP FOR MALAYSIA'S ZOONOTIC AND PANDEMIC PREPAREDNESS

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Abstract

Malaysia's One Health capacity building remains rooted in the historical lessons of the 1999 Nipah virus outbreak and the containment of H5N1 avian influenza. These events catalyzed intersectoral collaboration, further supported by global frameworks such as the One Health Quadripartite Joint Plan of Action. Despite this, contemporary landscape reveals significant structural strain amidst the triple planetary crises of climate change, biodiversity loss, and pollution, alongside anthropogenic factors. Persistent local challenges include the ongoing rabies outbreaks in Sarawak, leptospirosis, zoonotic malaria, and neglected threats such as sporotrichosis, brucellosis, and toxoplasmosis. Future resilience against "Disease X" and multi-drug resistant (MDR) infections is fundamentally jeopardized by chronic underfunding; as the animal health sector remains a fiscal outlier in global health expenditure. Addressing these vulnerabilities necessitates a paradigm shift from reactive mitigation to prevention through high-level commitment of One Health operationalization enabling resources to be mobilized efficiently across ministries and agencies. Through this, the development of a robust, real-time integrated One Health surveillance across human and animal health sectors, among others, will ensure a proactive approach in emerging zoonotic disease prediction and preventions, as opposed to delayed reactive efforts that could result in the loss of resources, lives and livelihood. Central to this strategy is the mandatory equipping of veterinary graduates with One Health core and technical competencies. This includes fundamentals of infectious diseases, epidemiology, systems thinking, policy advocacy, behaviour change, and communication. Nurturing collaboration and partnership among veterinary students with other health-related study programmes at the university level is imperative. Furthermore, a public-private-academic partnership (PPAP) model is essential in complementing the diversification of funding and supporting the implementation of One Health related policies to safeguard national health and food security. Despite the barriers discussed, there are ample room for growth and opportunities in advancing preparedness and prevention of zoonotic diseases in Malaysia. Recent establishment of the Malaysia One Health Committee under the National Biodiversity Council and active participation in regional initiatives ensures the One Health concept in Malaysia is being translated into action to protect the health and well-being of animals, humans and the environment as a whole.

Keywords: *One Health, veterinarians, competencies, zoonoses, preparedness*

PATHOGENS WITHOUT PASSPORTS: REIMAGINING ZONOTIC AND TRANSBOUNDARY ANIMAL DISEASES IN A CONNECTED WORLD

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Abstract

In recent years, the historical logical borders of countries that defined veterinary services and public health authorities have shifted significantly. Now more than ever before, globalization, livestock industrialization, and the complexification of wildlife/livestock interfaces have changed the dynamics of transmission patterns for zoonotic diseases and transboundary animal diseases (TADs). This article argues that the current structure that handles zoonotic disease risk and TADs is constructed in such a way that it relies on reactionary mitigation at national levels only. By utilizing case studies of recent emergence of diseases such as highly pathogenic avian influenza (HPAI) H5N1 clade 2.3.4.4b spread along migratory bird pathways, endemic foot-and-mouth disease along agroecological interfaces, and wildlife trade markets in Southeast Asia, heightening disease spillover, three primary shortcomings of the system are exposed. First, the time between detecting a disease and responding to it is lengthy because veterinary information-sharing systems among human, animal, and environmental health agencies remain compartmentalized. Second, many middle-income countries with large livestock industries, where disease spillover is likeliest to occur, lack adequate capacity. Lastly, many diseases are underreported because there is no clear incentive to report them. While there are policies in place to notify the World Animal Health Organization (WOAH) and the World Health Organization (WHO) of disease events, these policies still conflict with countries' motivations to protect their markets. To overcome these challenges, this article proposes a solution to examine zoonotic disease risks and TADs through a regional lens, comprising three points. Rapid genomic sequencing to identify pathogens in a timely manner, develop standardized early warning and notification systems throughout the ASEAN region, and align with a "One Health" framework that does not distinguish between livestock, wildlife, and human health data. Malaysia is a crucial case study and a reliable institutional anchor for this change because of its dual role as a megadiverse spillover interface and an increasingly competent regional veterinary authority. In the end, the argument is simple: the pathogens that traverse our interconnected globe function independently of the jurisdictional structures that we have constructed to keep them in check. We must be equally indifferent to those same lines while designing our response mechanisms.

Keywords: *Zoonotic diseases, transboundary animal diseases, One Health, spillover ecology, biosecurity governance*

ANTIMICROBIAL RESISTANCE IN SOUTHEAST ASIA: A VETERINARY PERSPECTIVE ON A SILENT PANDEMIC

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Abstract

Antimicrobial resistance (AMR) is increasingly recognised as a “silent pandemic” threatening global health, food security, and sustainable livestock production. The burden is particularly pronounced in Southeast Asia, where rapid intensification of animal agriculture, expansion of aquaculture, and widespread access to antimicrobials have accelerated the emergence and spread of resistant microorganisms. In veterinary practice, the routine use of antimicrobials for therapeutic, prophylactic, and growth-promotion purposes contributes to sustained selective pressure, facilitating the development and dissemination of resistance across animal, human, and environmental reservoirs. This study aims to synthesize current evidence on the drivers, transmission pathways, and mitigation strategies of AMR in Southeast Asia, with a focus on veterinary systems within a One Health framework. A systematic review approach was employed to analyse relevant literature on antimicrobial use in animal production, resistance mechanisms, and intervention strategies. The review focused on studies addressing livestock and aquaculture systems, environmental dissemination, and cross-sectoral transmission dynamics. AMR in Southeast Asia is driven by inappropriate antimicrobial use, including sub-therapeutic dosing, over-the-counter availability, and limited diagnostic-guided therapy. Contributing factors include inadequate farm biosecurity, high stocking densities, and poor waste management practices, which facilitate environmental contamination and the spread of antimicrobial resistance genes. The interconnectedness of human, animal, and environmental health enables zoonotic transmission and amplifies the regional burden. Consequences include increased treatment failures, reduced productivity in livestock systems, and heightened public health risks. Emerging mitigation strategies include antimicrobial stewardship programs, vaccination, improved husbandry and biosecurity measures, and the development of alternative therapies such as antimicrobial peptides, probiotics and phytobiotics. Advances in molecular diagnostics and artificial intelligence further enhance surveillance and support the discovery of novel antimicrobial agents. AMR represents a complex and evolving One Health challenge in Southeast Asia. Addressing this silent pandemic requires coordinated regional action, including stricter regulation of antimicrobial use in veterinary practice, strengthened surveillance systems, and the adoption of sustainable livestock and aquaculture practices. Integrating innovative therapeutic alternatives with policy-driven interventions is essential to preserve antimicrobial efficacy and protect both animal and public health.

Keywords: *Antimicrobial resistance, Southeast Asia, veterinary medicine*

REGULATION OF SALE AND SUPPLY OF VETERINARY PRODUCTS & ACTION TAKEN AGAINST ILLEGAL PRODUCTS

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Abstract

The global sustainability and integrity of the animal production and veterinary industries are fundamentally driven by comprehensive regulatory frameworks. These frameworks are essential to guarantee the safety, quality, and efficacy standards of every veterinary medicinal product in the market. In Malaysia, this ecosystem is subject to mandatory oversight, with the Ministry of Health Malaysia (MOH) serving as a constituent regulatory entity operating through primary legal instruments: the Poisons Act 1952, the Sale of Drugs Act 1952, and the Control of Drugs and Cosmetics Regulations 1984. This presentation provides a thorough analysis of the dynamic contemporary regulatory landscape and the strategic, holistic approaches applied to curb the distribution of illegal and unregistered veterinary products. The Regulatory Framework and Licensing Protocols section will detail the classification of veterinary substances under the First Schedule of the Poisons Act (Groups A, B, C, D, and Part II) and the legal implications associated with each category. A primary focus will be placed on the 2026 Policy for Strengthening Controls, which mandates a transition for feed millers from the use of raw antibiotic materials (Group A Poisons) to legally registered premix products (Group B Poisons). The implementation of this policy aligns with statutory obligations under the Poisons Act 1952 to ensure that the management of controlled substances is conducted systematically and securely in accordance with existing legislative provisions. Procurement and Sales Controls under the Poisons Act section discusses the governance of supply chain controls for poisons at both wholesale and retail levels through the enforcement of Sections 15, 19, 21, and 22 of the Poisons Act 1952. Discussions will encompass technical requirements for written orders, restrictions on the sale of Part I poisons to livestock farmers, and the accountability of Type A and Type B license holders. Particular emphasis is placed on the necessity of maintaining authentic wholesale sales records and Prescription Books to ensure the traceability of products throughout the supply chain. Strategic interventions by the Pharmacy Enforcement Division (PED) to eradicate counterfeit and unregistered products will be outlined through several key pillars; targeted Enforcement Operations, Border and Point-of-Entry Controls and digitalization of Product Authentication. Through the integration of stringent licensing and the application of modern authentication technologies, the Ministry of Health Malaysia remains committed to contributing to the establishment of a secure veterinary ecosystem, thereby upholding the standards of the national animal production industry in alignment with global benchmarks.

Keywords: *Veterinary products, regulatory framework, pharmacy enforcement*

SYNERGISING REGULATORY STANDARDS & BRIDGING LEGISLATIVE GAPS FOR PET-INCLUSIVE LIVING IN MALAYSIA

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Abstract

Pet ownership in Malaysia is becoming more common, especially in urban areas where many people live in high-rise and stratified housing. However, the legal and management systems for pets in these housing areas do not align well, which leads to conflicts and enforcement problems. The main laws that govern pet ownership in Malaysia are the Animal Welfare Act 2015 (Act 772), the Animals Act 1953 (Act 647), the Strata Management Act 2013 (Act 757) and its regulations, and the Local Government Act 1976 (Act 171). Although these laws are meant to work together, in practice they often overlap or conflict, especially in housing management and enforcement. At the federal level, the Animal Welfare Act focuses on protecting animals and their welfare based on the "Five Freedoms." The Animals Act mainly deals with animal control and disease prevention. At the strata level, the Strata Management Act allows pets as long as they do not cause nuisance, health risks, or break local rules, and it also allows building management to set house rules. At the local authority level, municipal councils can set their own animal rules, but many still impose strict or blanket restrictions. This discussion identifies three main problems. First, some Joint Management Bodies (JMBs) and Management Corporations (MCs) impose total pet bans, which may go beyond their legal authority and can contribute to pet abandonment. Second, the term "nuisance" is not clearly defined, leading to inconsistent and subjective enforcement. Third, enforcement is fragmented among the Department of Veterinary Services (DVS), local councils, and veterinarians, resulting in poor coordination and weak problem-solving. To address these issues, we propose a "regulated integration" approach. This includes replacing pet bans with structured pet agreements, introducing compulsory microchipping and a central registration system, encouraging neutering or spaying, and requiring basic behavioural certification. It also recommends a national guideline for pet-friendly housing and a fair "three-strike" nuisance process before any action is taken against pet owners. Malaysia needs a more coordinated and balanced system for managing pets in housing areas. This will help reduce conflict, prevent unnecessary pet abandonment, and improve both animal welfare and community living conditions.

Keywords: *Pet inclusiveness, regulatory framework, urban pet ownership, animal welfare law, governance and enforcement*

EMBEDDING RESPONSIBLE PET OWNERSHIP INTO HIGH-DENSITY LIVING: POLICY, COMPLIANCE, AND GOVERNANCE FRAMEWORKS

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Abstract

Local governments face increasing pressure to balance urban density with community expectations for pet ownership. This presentation explores how Brisbane City Council (BCC) has developed an integrated, future-focused framework to enable responsible pet ownership, while maintaining public amenity, animal welfare, and regulatory compliance. The first focus area explores high-density development, where Brisbane embeds “pet-friendly” design elements into community spaces. The session highlights the role of councils as both educators and regulators, reducing resident conflict while promoting consistent and enforceable standards. Complementing this is the containment requirements underpinned by legislation requiring animals to always remain on the owner’s property. This approach provides a practical model for reducing wildlife impacts, nuisance complaints and road incidents, supported by targeted enforcement and community education to enhance urban liveability. The presentation also examines Brisbane’s multi-species permit framework. Leveraging the *Animal Management (Cats and Dogs) Act 2008* and the *Animals Local Law 2017*, BCC maintains a unified database that supports compliance tracking, incident response, animal reunification and data-driven decision-making. A key feature is the tiered permit system, including the “Excess Animal Permit”, which allows residents to keep additional animals subject to amenity criteria. This avoids blanket restrictions while addressing community concerns in dense urban settings. BCC’s differential registration fees further encourage responsible ownership by incentivising desexing, reducing unwanted litters and long-term demand on rehoming services. The framework is supported by clear distinctions between working dogs and companion animals, ensuring equitable and context-sensitive regulation across urban areas. Finally, mandatory microchipping compliance ensures a lifelong, traceable link between animals and owners, strengthening accountability and supporting enforcement. Together, these approaches demonstrate how integrated policy, planning and behavioural incentives can support pet-inclusive, high-density communities without compromising safety or amenity, offering practical insights for councils modernising animal management systems.

Keywords: *Responsible pet ownership, compliance, enforcement, registration, permits, microchipping.*

POUND REFORM & STRATEGIC PARTNERSHIPS – LESSONS FROM BRISBANE

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Abstract

Brisbane provides a practical example of how councils can deliver animal impound and rehoming services through established partnership models and operational practices. Brisbane City Council delivers its services through Animal Rehoming Centres at Warra and Willawong under a contracted service delivery model with an external provider, moving away from a traditional council-run pound to an integrated approach supporting reunification and rehoming outcomes. This presentation outlines how the model operates in practice, including intake, assessment, reclaim and rehoming processes, and how responsibilities are shared between council and the external provider. It focuses on how the model functions as a mature service, including what has been sustained over time and where ongoing refinements continue to support service delivery. The presentation will also explore current challenges from a local government perspective, including increasing demand associated with stray and impounded animals, including higher-risk animals, livestock and dangerous dogs. These pressures place additional demands on facilities, staff, and processes, requiring a consistent and efficient approach to intake, assessment, and rehoming. The session will highlight practical observations on managing these pressures within an established operating model. A key component of Brisbane's approach is the consistent use of registration and microchip information to identify owners early and prioritise reclaim. This supports faster reunification, reduces time in care, and improves overall service efficiency. This case study highlights practical lessons from an established model that can support more efficient, coordinated and effective animal management services.

Keywords: *Animal management, rehoming centres, local government, service delivery, partnerships*

IMPORTANCE OF THE CANINE GOOD CITIZEN SOCIALISATION CERTIFICATION PROGRAM FOR DOGGIE OWNERS

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Abstract

The Canine Good Citizen (CGC) was launched by the American Kennel Club in 1989 as a 10-step test of basic manners and temperament for dogs. It was created to promote responsible pet ownership and give dogs a credential which is generally recognized. The 10-step test used covered accepting a friendly stranger, sitting politely for petting, appearance and grooming, out for a walk on loose leash, walking through a crowd, sit and down on cue and to stay, coming when called, reaction to another dog, reaction to distraction and supervised separation. After USA launched CGC in 1989, other countries created their own version of CGC including Canada, Australia, New Zealand and South Africa. Several other countries have since adopted similar programmes including Malaysia. In Malaysia the CGC programme was formally introduced in 2009 by Malaysian National Animal Welfare Foundation which had started a canine training school called Canine Sportzclub (CSC). CSC offered dog owners a 10-week course, the programme of which was very similar to what the American Kennel Club was offering in 1989. CSC has been conducting classes in CGC for 17 years now and a total of more than 4000 dogs have graduated with the Canine Good Citizen certification together with their owners. Although MNAWF's canine training school was formally named Canine Sportzclub in 1989, dog training classes were offered as far back as 1986 using the CGC syllabus. The CGC syllabus was put to the test that year when MNAWF dog training instructors stepped forward to help some 45 stray dogs which were facing euthanasia at the Puchong Pound only to gain reprieve at the eleventh hour when Ti-Ratana Foundation offered to provide shelter for the 45 condemned strays. After the 45 strays were transported to the Ti-Ratana's facility in Desa Petaling with no clear plan for their future, it was decided that it was best to have them adopted into family homes. But who would want to adopt strays many of which were scraggy and malnourished? They also had temperament problems due to fear and not having grown up with human contact. A 3-month comprehensive plan was drawn up for the 45 strays emphasizing on bringing them back to health and conditioning them to be acceptable and safe to be adopted by families. Dr. Siva's Animal Medical Centre offered to take care of their veterinary and nutritional requirements. Some of the dog training instructors from MNAWF offered to oversee their training. Ti-Ratana agreed that selected children from the Ti-Ratana Orphanage would be tutored by MNAWF instructors on how to safely train the dogs using the CGC syllabus. At the end of the three month period most of the dogs were back to optimum health. The three month training program was also a huge success. It was decided to hold an open house during which the Ti-Ratana children would put on a display of the dogs trained by them. Members of the public were invited to this open house and many of the dogs found their forever home. It was not an easy parting for the Ti-Ratana children when the dogs were taken away. As such it was decided to retain some of the unadopted dogs at Ti-Ratana so that the weekly dog training class would be a continuing feature. The Ti-Ratana project was such a success that it was agreed that the CGC program would be permanently featured by CSC.

Keywords: *Canine Sportzclub (CSC), community-based animal welfare, temperament assessment, stray dog rehabilitation, responsible pet ownership*

VES-SYM-1

REINVISIONING EQUINE MEDICINE AND SURGICAL EDUCATION TO TRANSCEND SPECIALIZATION GAP IN SOUTHEAST ASIA

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Abstract

The global equine industry is experiencing constant advancement; however, a significant “specialization gap” remains evident within Southeast Asia. The conventional pathway to achieving medical and surgical expertise, predominantly structured through locally accessible, board-certified residency programmes, continues to be constrained by the limited presence of resident Diplomates in the region. This structural and geographical limitation not only impedes the progression of advanced clinical competencies but also restricts the capacity of regional practitioners to attain greater visibility and influence within the international equine veterinary community. This plenary session presents a strategic model for advancing equine surgical education within Southeast Asia. It aims to shift the prevailing paradigm from reliance on individual apprenticeship toward a collaborative, technology-enabled, and regionally coordinated training ecosystem that overcomes traditional institutional and geographical constraints. The presentation is structured around three interrelated pillars of transformation: (i) Educational Evolution: In the absence of high-density board-certified residency programmes, structured cadaveric laboratories serve as a critical bridge to medical and surgical competency. These platforms enable deliberate, repetitive practice in a controlled environment, free from the ethical and pressures associated with live patients. Emphasis is placed on achieving anatomical precision and refined psychomotor skills prior to progression into clinical surgical settings. (ii) Digital Mentorship: The integration of tele-surgical platforms facilitates real-time intraoperative consultation with international experts, effectively extending Diplomat-level oversight into local operating theatres or procedure rooms. This model enhances clinical decision-making, supports skill transfer, and mitigates the limitations imposed by geographical isolation. (iii) Institutional Initiative: The establishment of a Southeast Asian Equine Surgeons Network among Southeast Asia universities is proposed as a collective of equine surgeons of Southeast Asia, serving as a platform to harmonize training programs and initiatives such as cross-border “flying surgeon” programmes within the ASEAN region. Conclusion and Clinical Significance: Advancement in equine medicine and surgery in Southeast Asia universities requires the deliberate development of a resilient regional ecosystem rather than reliance on external systems. Through structured mentorship, immersive technologies, and institutional collaboration, the specialization gap can be bridged, elevating surgical standards and strengthening the region’s contribution to the global equine veterinary landscape. This session calls for collective commitment to cross-border collaboration, clinical excellence, and regional leadership.

Keywords: *Equine Medicine and Surgery, specialization gap, regional leadership*

**VETERINARY EDUCATION IN INDONESIA: STRENGTHENING
STANDARD AND POLICY TO FULFILL DAY ONE COMPETENCIES**
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Abstract

Veterinary education in Indonesia has evolved in response to national development needs and global standards. Its historical roots date back to 1861 with the establishment of a veterinary school in Surabaya during the Dutch colonial period, followed by the founding of the Netherlands Indische Veeartsenschool (NIVS) in Bogor in 1914. After Indonesia's independence, veterinary education was institutionalized through the establishment of higher education programs, including the transformation into the Faculty of Veterinary Medicine at Universitas Gadjah Mada in 1949, and subsequent expansion to multiple universities nationwide. This growth reflects the critical role of veterinarians in supporting livestock development, food security, zoonotic disease control, environmental health, and the broader One Health agenda. To address increasingly complex national and global challenges, Indonesia has undertaken curriculum reforms aligned with the Day One Competencies established by the World Organisation for Animal Health (WOAH). These competencies emphasize clinical skills, epidemiology, public health, communication, animal welfare, and professional ethics, ensuring that graduates are capable of entering professional practice immediately upon graduation. Veterinary education in Indonesia is also strengthened through comparative studies with veterinary education systems in other countries, including those in ASEAN, Asia, and Western countries. In addition, Indonesian veterinary schools actively participate in regional and international veterinary school associations, such as the South-East Asia Veterinary School Association (SEAVSA) and the Asian Association of Veterinary Schools (AAVS), to build strong academic networks and promote resource sharing. Institutional strengthening has been pursued through professional and academic bodies such as the Indonesian Association of Faculties of Veterinary Medicine (AFKHI) and the Indonesian Veterinary Medical Association (PDHI), which play key roles in harmonizing standards, accreditation, and policy development. Quality assurance has further been reinforced through the National Veterinary Competency Examination and Objective Structured Clinical Examinations (OSCE), which assess both theoretical knowledge and practical skills. In conclusion, strengthening veterinary education in Indonesia requires an integrated approach encompassing historical foundation, policy reform, competency-based curriculum, institutional collaboration, international networking, and robust assessment systems. Such efforts are essential to produce competent veterinarians who can address national priorities and global health challenges in the era of One Health.

Keywords: *Veterinary education, Day One Competencies, Indonesia, competency-based curriculum, veterinary policy*

FUTURE-PROOFING VETERINARY HEALTHCARE IN MALAYSIA: VETERINARY NURSING AS A STRATEGIC WORKFORCE TRANSFORMATION

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Abstract

The global veterinary healthcare landscape is undergoing a profound transformation driven by rising client expectations, technological acceleration, and the urgent demands of the One Health agenda. As caseloads increase and clinical complexity grows, reliance on a veterinarian-only delivery model is becoming increasingly unsustainable, contributing to workforce burnout and limiting access to care. This abstract explores the strategic development of a formal veterinary nursing profession in Malaysia, positioning it as a critical intervention for future-proofing the nation's veterinary healthcare system. Drawing on fifty years of international evidence from the UK, Australia, and the US, this analysis outlines the transition from a fragmented support model to a regulated, competency-based veterinary nursing framework. By leveraging Malaysia's Technical and Vocational Education and Training (T-VET) infrastructure and the National Occupational Skills Standards (NOSS), the proposed model emphasizes clinical competence, workplace-based learning, and a clearly defined scope of practice. Integrating qualified veterinary nurses does not diminish the veterinarian's role; rather, it amplifies it by delegating approximately 70% of routine tasks, enhancing patient throughput, improving clinical outcomes, and significantly reducing occupational stress. Furthermore, this initiative presents broader socio-economic benefits, including improved animal welfare, expanded rural veterinary access, and enhanced capacity for zoonotic disease surveillance within a One Health context. This perspective provides a roadmap for policymakers, educators, and veterinary practitioners to overcome legislative and structural barriers, offering a blueprint for Malaysia to establish itself as an exemplary model of veterinary healthcare in the ASEAN region by 2040. Ultimately, Malaysia's Veterinary Nursing initiative represents a strategic investment in the future resilience, capability, and sustainability of veterinary services rather than merely creating a new qualification.

Keywords: *Veterinary nursing, veterinary workforce development, veterinary paraprofessional*

ADVANCING VETERINARY SPECIALIZATION IN MALAYSIA: THE ROLE AND PROGRESS OF THE MALAYSIAN COLLEGE OF VETERINARY SPECIALISTS (MCVS)

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Abstract

The Malaysian College of Veterinary Specialists (MCVS) was established on 18th March 2009 under the auspices of the Malaysian Veterinary Medical Association (MAVMA), formerly known as the Veterinary Association of Malaysia. The formation of MCVS marked a strategic effort to advance veterinary medicine in line with Malaysia's aspiration to become a developed nation and to meet the demands of an increasingly globalized world. Prior to its establishment, Special Interest Groups (SIGs) were created to nurture an enabling ecosystem for specialist development. Each group, dedicated to a specific discipline within veterinary medicine and the animal industry, provided a platform for members to explore, cultivate, and refine their professional interests. After more than a decade of groundwork, the Malaysian Veterinary Council granted MCVS permission to conduct specialist examinations and evaluations. Senior veterinarians were appointed as founding and fellow members, serving pivotal roles as members of the Board, examiners, registrars, and mentors. Their leadership and commitment were instrumental in driving the recognition and registration of veterinary specialists in Malaysia. At present, MCVS comprises 50 members, including 3 honorary, 11 founding fellows, 23 fellows, and 13 members, representing 33 disciplines. As the College enters a new phase of development, disciplines with sufficient membership are encouraged to form their own colleges or chapters. These entities further advance veterinary specialization through seminars, workshops and mentorship programs aimed at nurturing the next generation of specialists. While MCVS has been central to establishing veterinary specialist services in Malaysia, continuous improvement remains essential. Upholding the integrity of evaluation and recognition processes is of utmost importance, as is ensuring that members commit to lifelong learning. The College's organizational structure and legal framework must also evolve to sustain progress. The veterinary profession in Malaysia has benefited immensely from these efforts, evident in the proliferation of veterinary clinics nationwide and significant advancements within the animal industries. Notably, public sector veterinary services have also progressed. Moving forward, a key aspiration remains—the formal integration of veterinary specialist services within the government structure.

Keywords: *Veterinary specialist, professional college, discipline development, membership, professional recognition*

IT TAKES A VETERINARY VILLAGE: EMPOWERING GENERAL PRACTITIONERS AS WORKPLACE CLINICAL EDUCATORS

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Abstract

Veterinary clinical education has traditionally been centred within university teaching hospitals, where specialist clinicians and academic faculty are viewed as the primary providers of workplace-based training. While this model has undeniable strengths, it can unintentionally reinforce the perception that effective clinical teaching requires advanced academic credentials, specialist status, or a university appointment. As veterinary education evolves to meet growing workforce demands, there is an opportunity to reimagine who can contribute to the development of future veterinarians. This presentation explores how general practitioners in private practice can become confident, effective, and valued clinical educators. Drawing on emerging educational innovations and practical examples, it challenges the myth that excellent teaching is the exclusive domain of specialists or academics. Instead, it highlights the unique strengths that general practitioners bring to clinical training, including broad clinical exposure, real-world decision-making, client communication, business awareness, and the lived experience of everyday veterinary practice. The presentation will examine the factors that foster a culture of teaching within private practice, including professional identity, motivation, mentorship, institutional support, and recognition of educational contributions. It will also present a practical framework for developing workplace clinical educators who may have little or no formal training in education, demonstrating how teaching skills can be nurtured alongside clinical practice. Ultimately, the future of veterinary education depends on broadening participation in clinical teaching and creating partnerships between universities, practices, and practitioners. Just as it takes a village to raise a child, it takes an entire veterinary community to train the next generation of veterinarians. By embracing teaching as a shared professional responsibility, we can build a more sustainable, inclusive, and authentic model of clinical education.

Keywords: *Workplace clinical training, general practitioners, clinical educators*

MIVIS-SYM-1

ADVANCING ONE HEALTH IN MALAYSIA: PROGRESS, GAPS, AND FUTURE DIRECTIONS

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Abstract

Malaysia's tropical climate and immense biodiversity create a natural hotspot for disease emergence, with 75% of new infectious diseases in humans originating from animals. Consequently, early pathogen detection at the animal level is essential to protect public health and national food security. Triggered by the devastating 1998 Nipah outbreak, Malaysia shifted from isolated health management to a legally empowered, unified One Health governance structure. This includes the National Biodiversity Council and the National One Health Steering Committee, supported by strategic frameworks such as the National OH JPA, NSP for Zoonoses, and MyNAPHS. Recent progress includes upgrading intellectual capabilities through the Malaysia One Health University Network (MyOHUN) and enhancing physical infrastructure at the Veterinary Research Institute with high-capacity molecular testing. Furthermore, transitioning to an active, risk-based surveillance paradigm has successfully maintained the nation's Highly Pathogenic Avian Influenza (HPAI) and Nipah free status. Despite these advancements, critical vulnerabilities remain. Institutional data silos fragment preventative baseline coordination, hindering real-time outbreak mapping. Additionally, financial investments favouring commercial livestock create diagnostic blind spots in deep forest and farm-edge spillover zones. There is also a significant point-of-care deficit, with over-reliance on centralised labs delaying results in remote regions. To address these gaps, Malaysia's future roadmap prioritizes genomic diagnostic integration, embedding Next-Generation Sequencing (NGS) into routine veterinary capabilities for rapid mutation detection. The strategy also aims to deploy an AI-driven National One Health Dashboard to replace fragmented databases and enable active outbreak forecasting. Finally, empowering Public-Private Partnerships (PPPs) will be critical to accelerating diagnostic R&D and expanding field surveillance. Ultimately, achieving continuous capacity building and absolute data interoperability is vital for Malaysia's health security.

Keywords: *One Health, zoonosis, predictive surveillance, diagnostic integration, Public-Private Partnerships*

MIVIS-SYM-2

ANIMAL DISEASES AND LIVESTOCK INDUSTRY IN INDONESIA

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Abstract

Indonesia, as one of the world's large archipelagic nations with a population of more than 280 million people, possesses a dynamic and rapidly growing livestock sector that plays a strategic role in national food security, economic development, rural livelihoods, and nutritional improvement. The livestock industry encompasses diverse production systems ranging from smallholder farms to modern commercial enterprises, with poultry serving as the leading contributor to domestic animal protein supply. As demand for animal-source foods continues to increase, maintaining robust animal health systems has become a fundamental prerequisite for sustainable livestock production, food safety, investment confidence, and international trade. Like many other countries, Indonesia faces significant challenges from transboundary and emerging animal diseases, including Foot and Mouth Disease (FMD), African Swine Fever (ASF), Highly Pathogenic Avian Influenza (HPAI) and Lumpy Skin Disease (LSD). These diseases have substantial impacts on animal productivity, food security, farmers' livelihoods, supply chain resilience, and business sustainability. In response, the Government of Indonesia continues to strengthen veterinary services through enhanced disease surveillance, laboratory networks, vaccination programs, biosecurity measures, emergency preparedness, digital disease reporting, and risk-based animal health management aligned with international standards. These efforts aim not only to control animal diseases but also to create a predictable and secure environment for livestock production and agribusiness investment. This presentation provides an overview of the current status of Indonesia's livestock industry, major animal disease challenges, and national strategies for disease prevention, preparedness, response, and recovery. It also highlights Indonesia's commitment to improving the investment climate by strengthening veterinary governance, regulatory transparency, animal health certification systems, and public-private partnerships, while promoting innovation and a One Health approach to address the increasing risks posed by climate change, globalization, antimicrobial resistance, and wildlife–livestock–human interactions. Finally, the presentation emphasizes that sustainable growth of the livestock industry requires strong collaboration among governments, industry, academia, investors, and international organizations. Indonesia welcomes strategic partnerships in animal health, veterinary pharmaceuticals and biologics, vaccines, feed industries, breeding, digital technologies, research, and capacity building. By fostering a resilient animal health system and an enabling investment ecosystem, Indonesia aims to develop a competitive, sustainable, and globally connected livestock industry that contributes to food security, economic growth, and safe international trade.

Keywords: *Livestock industry development, animal disease biosecurity, one health approach*

MIVIS-SYM-3

MALAYSIA AND INDONESIA ROLES IN STRENGTHENING FOOD SECURITY AGENDA IN SOUTH EAST ASIA

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Abstract

Malaysia and Indonesia play pivotal roles in strengthening the food security agenda in Southeast Asia through academic leadership, regional cooperation, and strategic engagement under the ASEAN University Network for Agriculture and Food Security (AUN-AFS). Based on the AUN-AFS framework, Malaysia, through Universiti Putra Malaysia (UPM), provides institutional leadership as the Secretariat, with strong emphasis on research collaboration, capacity building, policy engagement, digital knowledge platforms, and community empowerment. Indonesia, represented through Universitas Gadjah Mada as one of the AUN Core members in the AUN-AFS Advisory Committee, contributes its agricultural expertise, research capacity, and strategic position as one of ASEAN's major agrifood producers. Together, both countries can advance sustainable, resilient, and inclusive agrifood systems by promoting joint research grants, academic mobility, farmer training, technology transfer, policy dialogues, and youth-led research initiatives. The proposed AUN-AFS Blueprint for Food Security further strengthens their shared role in aligning university expertise with ASEAN priorities and global development goals. Malaysia and Indonesia's collaboration is particularly important in addressing climate resilience, biosecurity, sustainable agriculture, digital agrifood innovation, and food system transformation. Through AUN-AFS, both countries can serve as regional anchors for knowledge exchange, evidence-based policy support, and practical solutions to improve food availability, accessibility, utilization, and stability across Southeast Asia.

Keywords: *Food security, Southeast Asia, AUN-AFS*

A 15-YEAR RETROSPECTIVE ON THE IMPACTS OF PARASITISM IN RUMINANTS

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Abstract

Parasitism remains a formidable challenge to livestock health and productivity. Spanning a 15-year retrospective from 2010 to 2025, this synthesis evaluates the epidemiological, immunological, and phenotypic impacts of gastrointestinal nematodes in small ruminants and tick-borne haemoparasites in dairy cattle. In small ruminants, parasitic gastroenteritis is driven predominantly by *Haemonchus contortus*, which led to widespread, severe multiple anthelmintic resistance against commonly used drugs like benzimidazoles and macrocyclic lactones. To mitigate chemical reliance, environmental controls such as aging goat manure for at least 14 days before fertilizer application effectively eliminated infective larvae from pastures. Experimental co-infections in Boer goats revealed complex host-parasite dynamics; the host's Immunoglobulin A (IgA) response provided protection against *T. colubriformis* but unable to regulate the blood-feeding *H. contortus*. Furthermore, goats appear to lack a functional eosinophil response against natural nematode infections, increasing their susceptibility to gastrointestinal nematodes. Nonetheless, the growth of *T. colubriformis* as represented by its length was associated with a reduced number and composite burden of *H. contortus* during co-infection, hence reducing the severity caused by the haematophagous nematode. In large ruminants, specifically Mafriwal dairy cattle, molecular surveillance highlighted a high prevalence of tick-borne co-infections involving *Anaplasma marginale*, *Babesia bigemina*, and *Theileria orientalis*. Mafriwal cattle were more susceptible to hemoparasitism with advancing age, but the younger calves were more prone to be co-infected with multiple hemoparasite species. Additionally, older lactating cows exhibit the highest overall seroprevalence. These parasitic burdens cause substantial economic losses by directly altering key phenotypic markers. Elevated gastrointestinal nematode and coccidia burdens, alongside lowered packed cell volume (PCV), significantly reduced calf body weight. Meanwhile, increased peripheral eosinophil counts (PEC) were significantly associated with severely reduced milk yield in lactating cows. Ultimately, these long-term insights emphasize the urgent need for integrated, non-chemical management and targeted vector control to safeguard ruminant productivity.

Keywords: *Gastrointestinal nematodes, anthelmintic resistance, tick-borne haemoparasites, co-infection, ruminants*

PERFORMANCE ANALYSIS OF ANAEROBIC DIGESTION TECHNOLOGY FOR THE TREATMENT OF DAIRY CATTLE WASTEWATER EFFLUENT

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Abstract

Anaerobic digestion (AD) is highly environmentally friendly technology for treating dairy cattle wastewater and manure on the farm. It is a sustainable waste-to-energy complete process that breaks down organic matter in an oxygen-deficient environment. This method reduces Greenhouse Gas (GHG) emissions that produce biogas for daily electricity. It also generates nutrients with rich digestate for biofertilizer and gives much support to the circular economy on the farm. Effluent from dairy cattle farms consists of the manure and urine excreted in the milking shed and yards, mixed with the wash-down water used to remove the waste from these areas and concrete yard runoff following rainfall. Therefore, there is a need to study the performance analysis of the AD technology for the treatment of dairy cattle farm wastewater effluent and pollutants removal efficiencies. Pollutant parameters such as Biological Oxygen Demand (BOD₅), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS), Volatile Solids (VS) and Ammoniacal Nitrogen (AN) were carried out in this study. Effluent generated from 200 heads of cattle farm was channeled directly into a collection sump through a bar screening process and then the manure slurry was pumped into the inlet chamber from the collection sump once daily. Effluent samples were collected from the manholes on a weekly basis and analysed in the laboratory. Results showed that BOD₅ and COD in the effluent could remove up to 87.4% and 89.8% respectively whereas AN slightly decreased to 47.6%. The performance analysis of TSS and VS was slightly decreased by 36.9% and 52.7% respectively. This study concludes that this method not only enhances biogas production but also improves the quality of effluent from farms. The concentration of Biological Oxygen Demand, Chemical Oxygen Demand, Ammonia Nitrogen, and Total Suspended Solids in the studied effluent quality exceeds the discharge standard requirements set by the Department of Environment Malaysia. Consequently, alternative methods are necessary to treat the effluent to ensure compliance.

Keywords: *Anaerobic digestion, removal efficiencies, farm effluent*

EFFECT OF FLUSHING DIET ON PROGESTERONE LEVEL OF BK DOES

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Abstract

Malaysia's goat population is relatively small and has shown a declining trend in recent years. Fertility is a major concern in the cattle industry, as it is closely influenced by the animal's nutritional status, which plays a key role in regulating reproductive hormones. Flushing diets—nutritional strategies that increase energy intake before breeding—have been shown to improve reproductive performance. These effects are associated with hormonal changes, as progesterone plays a key role in regulating the oestrous cycle and supporting early pregnancy. This paper aims to study the effects of a flushing diet supplemented towards the progesterone level of BK. In this study, the flushing diet was formulated to contain a 13% higher metabolizable energy (ME) level than the commercial diet. For the feeding trial, a total of 14 BK goats (aged 4-7 years) were randomly assigned to two dietary treatment groups: a commercial diet (T1) and an experimental flushing diet (T2), with each group consisting of 7 animals ($n = 7$). Goats were fed once a day at 3% of their body weight on a dry matter (DM) basis in individual pens for 28 days. On day 28, an intramuscular injection of prostaglandin was administered to the goats to induce luteolysis. Then, the animals were randomly grouped into groups of seven does, with one buck assigned to each group. Blood samples were then collected, and progesterone levels were measured on days 7 and 14 after injection to evaluate the effects of the respective diets on progesterone profiles. The data obtained were analysed by t-test. Significance was set at $P < 0.05$. On Day 7, progesterone concentration in T2 (1.48 ± 0.09) was significantly higher than in T1 (1.40 ± 0.04) ($p = 0.0387$). A similar trend was observed on Day 14, where T2 recorded significantly greater progesterone levels than T1 ($p = 0.0113$), with mean values of 1.65 ± 0.15 and 1.45 ± 0.10 , respectively. These findings suggest that the flushing diet might improve progesterone production. It also highlights the importance of dietary formulation in modulating reproductive hormones in BK does, which may have practical implications for improving fertility management in tropical goat production systems.

Keywords: *Fertility, flushing diet, does, progesterone level*

AT A CROSSROADS: ONE HEALTH IMPERATIVES IN RESTRUCTURING MALAYSIA'S PIG INDUSTRY AMID DISEASE, POLICY, AND FOOD SECURITY PRESSURES

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Abstract

Malaysia's pig industry is undergoing significant structural contraction, exposing vulnerabilities in animal health, environmental sustainability, and national food security. From a One Health perspective, the decline reflects challenges in balancing disease control, regulatory policies, and sustainable production. Evidence shows a sustained reduction in production capacity. The national pig population declined from approximately 1.88 million in 2018 to 1.35 million in 2023, with a further contraction of about 25% between 2021 and 2024. The primary driver has been African Swine Fever (ASF), which has resulted in large-scale culling and stricter biosecurity requirements. Rising feed and operational costs have further strained producers, particularly small and medium-sized farms, leading to widespread closures and industry consolidation. Regulatory and socio-environmental pressures have accelerated this trend. Increasing restrictions on pig farms located near residential areas, motivated by environmental and public health concerns, have forced many farms to relocate or cease operations. In Selangor, the halt on new licences and the gradual phase-out of pig farming reflects a major policy shift, while similar pressures are emerging in other densely populated states. These developments have significantly reduced domestic production capacity. The consequences are increasingly evident. Pork self-sufficiency has fallen from more than 90% in 2021 to below 70% in 2024, while reliance on imported pork and live pigs has grown substantially. Greater dependence on external supply chains increases exposure to transboundary disease risks, global market volatility, supply disruptions, and price fluctuations, thereby weakening national food security and resilience. ASF has also highlighted weaknesses in biosecurity compliance, disease surveillance, and coordinated governance. Environmental concerns, particularly waste management and pollution, continue to challenge the sector's sustainability. At the same time, the decline of smallholder participation raises socio-economic and equity concerns for rural communities that depend on pig farming for their livelihoods. Despite these challenges, the current situation presents an opportunity for transformation. Government initiatives promoting closed-house, high-biosecurity production systems and the development of a national sustainability master plan aim to strengthen industry resilience. However, the high capital investment required may limit participation by smaller producers. Meanwhile, Sarawak is emerging as a potential biosecure production hub, with plans to significantly expand output and exports, potentially reshaping Malaysia's pork supply landscape. Without coordinated intervention, Malaysia risks a long-term decline in domestic pig production, increased dependence on imports, and reduced capacity to manage animal disease threats. A comprehensive One Health approach integrating biosecurity, environmental governance, and inclusive economic policies is essential to ensure sustainable food security, public health protection, and national resilience.

Keywords: *Pig farming, peninsular Malaysia, biosecurity, sustainable farming*

DYNAMIC RELATIONSHIPS BETWEEN INTAKE, ENERGY UTILIZATION, AND MILK PRODUCTION ACROSS LACTATION PHASES IN JERSEY-FRIESIAN COWS FED TOTAL MIXED RATIONS

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Abstract

This study evaluated the interrelationships among bodyweight (BW), dry matter intake (DMI), metabolizable energy intake (MEI), fat-corrected milk yield (FCM), milk protein (PRO) and milk fat content (FAT) in milk across early, mid, and late lactation phases in Jersey-Friesian cows. The cows were fed a total mixed ration (25, 30 and 40% forage to concentration ratio respectively), with emphasis on phase-specific correlations and linear trends over days in milk (DIM). In early lactation (n=8), FCM was strongly associated with BW ($r = 0.641$) and FAT ($r = 0.561$), but weakly related to DMI ($r = 0.060$) and MEI ($r = 0.08$), indicating that milk production is largely supported by body reserve mobilization rather than feed intake during this phase. In mid lactation (n=8), correlations became more balanced, with FCM moderately associated with BW ($r = 0.189$), DMI ($r = 0.283$), and FAT ($r = 0.539$), reflecting a transition toward intake-driven production as metabolic stability improves; BW and DMI, were moderately to strongly interrelated ($r = 0.587$). In late lactation (n=8), strong interdependence among BW and DMI ($r = 0.800$) highlighted the increases in nutrient intake that improved bodyweight, while FCM maintained moderate but reduced associations with BW ($r = 0.428$) and DMI ($r = 0.515$), indicating declining production efficiency. However, the restoration of bodyweight of dairy cattle in the late lactation phase is also critical to prepare for the following calving. Overall, the findings demonstrate a shift from reliance on body reserves and fat synthesis in early lactation to increased dependence on feed intake and energy balance in mid-to-late lactation, underpinning dynamic changes in nutrient partitioning and production efficiency.

Keywords: *Lactation phases, dry matter intake, fat-corrected milk yield, nutrient partitioning, dairy cow performance*

LS1-O-6

YIELD AND NUTRITIVE VALUE OF *Trichanthera gigantea* (KETUM AYAM PLANT) AT DIFFERENT CUTTING FREQUENCY

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Abstract

In recent years, Ketum Ayam plant (*Trichanthera gigantea*) has gained attention as a potential alternative feed source for livestock, including poultry. This is attributed to its palatability, nutritional value, rapid growth and yield, and adaptability to tropical conditions. However, the management practices of the plant are not well established and vary. As a perennial plant, Ketum Ayam is harvested when the growth and leaves are deemed suitable. This leaves question whether the nutritive value of the plant changes with cutting frequency and interval. Therefore, this study evaluated the yield and nutritive value of Ketum Ayam leaves at different cutting frequencies. The experiment was conducted using a Randomized Complete Block Design (RCBD) with two cutting frequencies: first cutting (one month after first cutting after transplanting), and second cutting (one month after the first cutting). Yield of the same plant was evaluated, as well as the nutrient content through proximate analysis. Results of the study showed that cutting frequency significantly affected the yield, dry matter and moisture content, while the ash, crude protein, crude fibre, crude fat content were not significantly influenced. The second cutting recorded a higher fresh yield and dry matter yield per hectare (calculated: 987.80 kg/ha). This suggests that one month's cutting interval encourages the regrowth of the plant. Most of the important nutrients were not affected by cutting frequency, however, it is possible that two cutting frequencies were insufficient to evaluate the effect on it. Hence, longer and more cutting frequencies are needed to complement this current study. In conclusion, cutting frequency plays a role in determining the yield of Ketum Ayam, while not affecting the nutritive value of the leaves, which continue to suggest Ketum Ayam as a promising alternative livestock feed.

Keywords: *Alternative animal feed, proximate analysis, nutrient content, harvesting frequency, plant growth yield*

EFFECT OF EXOGENOUS GONADOTROPIN RELEASING HORMONE (GnRH) ON EARLY EMBRYO SURVIVAL AND KIDDING RATE IN SAANEN GOATS

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Abstract

Early embryonic loss represents a major constraint to reproductive efficiency in dairy goats, particularly within intensive production systems. Additionally, insufficient progesterone secretion during early pregnancy constitutes a critical factor limiting reproductive success. This condition, commonly referred to as luteal insufficiency, has been associated with approximately 30–40% of embryonic mortality and contributes significantly to reduced pregnancy rates in small ruminants. This study investigated the effect of exogenous gonadotropin-releasing hormone (GnRH) administered during the early luteal phase on progesterone dynamics, embryo survival, and kidding rate in Saanen goats subjected to a controlled internal drug release (CIDR)-based synchronization protocol. Twenty does were allocated into two groups: Group 1 (n=10) received CIDR for 11 days, while Group 2 (n=10) received CIDR for 11 days followed by a GnRH analogue injection on day 5 post-ovulation. Plasma progesterone concentrations, ovulation rate, embryo loss, and kidding rate were evaluated. GnRH administration significantly increased circulating progesterone levels during the early luteal phase compared to the control group ($p < 0.05$), indicating enhanced luteal function. The ovulation rate did not differ significantly between groups ($p > 0.05$), suggesting that the effect of GnRH was primarily luteotropic rather than ovulatory. Notably, early embryonic loss was markedly reduced in the GnRH-treated group, declining from 33% in the control group to 15% following treatment. This reduction in embryonic mortality translated into a significantly higher kidding rate (from 67% to 85%) in the GnRH-treated group ($p < 0.05$). The improvement in embryo survival is likely associated with increased progesterone availability, which is essential for uterine receptivity, conceptus development, and maternal recognition of pregnancy. Overall, this study provides a practical approach to improving reproductive efficiency in goat production systems.

Keywords: *Embryo survival, goat, kidding rate, progesterone*

CAGE-FREE TRAINING FARM AS A MODEL TO ELEVATE SMALL PRODUCERS

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Abstract

The transition towards more sustainable and welfare-oriented food production systems presents both opportunities and challenges for small and medium-scale egg producers. While market demand for responsibly produced eggs continues to grow, many producers face barriers related to technical knowledge, infrastructure investment, and access to practical implementation models. A dedicated cage-free training farm can serve as an effective platform to address these challenges by providing hands-on learning, demonstration, and capacity-building opportunities. This presentation highlights the role of a cage-free training farm as a model for supporting better welfare production and sustainable farming practices among small producers. The initiative is designed to showcase practical cage-free management systems, including housing design, flock management, biosecurity, feeding strategies, egg handling, and environmental stewardship. Through experiential learning and technical guidance, producers can gain the knowledge and confidence required to adopt welfare-focused production systems while maintaining farm productivity and economic viability. The session will also explore how collaborative partnerships between industry stakeholders, government agencies, academic institutions, and development organisations can accelerate knowledge transfer and strengthen producer capabilities. By demonstrating proven management practices and operational performance, the training farm provides a practical pathway for producers to evaluate and implement cage-free systems that are appropriate for local conditions and market requirements. Drawing on practical experiences and implementation insights, this presentation will discuss how training farms can function as centres of excellence that foster innovation, mentorship, and continuous improvement within the poultry sector. The model offers an inclusive approach to industry development by enabling small producers to participate in the evolving market for sustainably and responsibly produced eggs. A cage-free training farm represents more than a production facility; it serves as a catalyst for industry transformation by empowering producers, advancing better welfare production, and promoting sustainable farming practices. Such initiatives will play an important role in supporting the long-term resilience, competitiveness, and sustainability of Malaysia's poultry industry.

Keywords: *Cage-free training farm, welfare production, small producers, capacity building, poultry industry, Malaysia*

LABOR UTILIZATION ACROSS FARMING SCALES FOR CATTLE-OIL PALM INTEGRATIONS SYSTEMS

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Abstract

A preliminary study was conducted to evaluate the relationship between labor usage and farming scale for cattle-oil palm integrations. A total of 146 respondents were received under the supervision of VetEC in the states of Terengganu (41 people, 28.1%), Pahang (31 people, 21.2%), Johor (29 people, 19.9%), Selangor (13 people, 8.9%), Perak (11 people, 7.5%), Kedah (10 people, 6.8%), Kelantan (1 person, 0.7%), and DVS Sabah (8 people, 5.5%). An assessment of three labor usage variables was carried out: (a) type of labor—self-employed/family or paid; (b) number of laborers—1 to 5 people or 6 to 10 people; and (c) average labor wages. Findings from the analysis showed that 80 respondents (54.8%) used family labor or operated their farming operations independently. Meanwhile, 43 respondents (30.8%) utilized paid labor, while 21 respondents (14.4%) did not specify the type of labor used. Referring to the Department of Veterinary Services' interpretation, ruminant farming scales are divided into three (3) categories: (a) small (< 50 head), (b) medium (50-99 head), and (c) commercial (> 100 head). Analysis indicated that small-scale farms recorded the highest number at 67 farms (45.9%) with an average of 28 head, followed by the commercial scale at 41 farms (28.1%) with an average of 275 head. The medium scale recorded the lowest number at 38 farms (26.0%) with an average of 69 head of livestock. Pearson's Chi-square test showed a significant relationship between the use of labor type and farming scale ($p < 0.05$), where large-scale farming tended to use paid labor, while small-scale farming relied more on family labor. Meanwhile, the Fisher's Exact test found no significant relationship between farming scale and the number of workers ($p = 0.08$). A one-way ANOVA was also conducted to evaluate differences in average labor wages according to farming scale. The results showed that average labor wages differed significantly according to farming scale ($p < 0.05$). In conclusion, the study findings show that the labor structure in the ruminant livestock sector does not demonstrate a linear pattern relative to the production scale; instead, it is influenced by a combination of other factors, including location, type of operation, and level of mechanization.

Keywords: *Cattle-oil palm integration, labor, farming scale*

EFFECT OF SELENIUM AND OMEGA-3 FATTY ACIDS CO-SUPPLEMENTATION ON EGG NUTRITIONAL COMPOSITION AND PHYSICAL QUALITY

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Abstract

Value-added eggs, often recognized as functional foods, offer health benefits beyond basic nutrition through enhanced levels of specific nutrients. These eggs are notable for bioactive nutrients such as omega-3 fatty acids, which play an important role in lowering cardiovascular disease risk and supporting brain health, and selenium, a vital antioxidant that protects against cellular oxidative damage while supporting immune function. To assess the effects of selenium and omega-3 oil co-supplementation on egg nutritional composition and physical quality, a study was conducted using 60 Ayam Saga hens (aged 72 weeks), kept in cages under tropical open housing conditions. Following a four-week adaptation period on commercial feed, the hens were randomly assigned to three dietary treatment groups using a randomized complete block design (RCBD). The blocking factors were rows of cages, with each of the four rows containing all three treatments. Each group consisted of 20 birds, divided into four replications of five birds each. The layers were fed one of three corn-soy-based diets: a control diet (corn-soy diet with palm oil), a treatment diet supplemented with omega-3 fatty acids or a treatment diet supplemented with omega-3 fatty acids and selenium. After three weeks of feeding, eggs from the co-supplemented group contained the highest total omega-3 fatty acids (~881 mg/100 g egg) and selenium (~42 µg/100 g egg), compared to the omega-3-only group (~638 mg/100 g egg omega-3; ~23 µg/100 g egg selenium) and the control group (~181 mg/100 g egg omega-3; ~16 µg/100 g egg selenium). This represents an approximately 38% increase in omega-3 and 80% increase in selenium content in co-supplemented eggs relative to the omega-3-only group ($P < 0.05$). This improvement may be attributed to the antioxidant properties of selenium, which potentially reduce oxidative degradation of omega-3 fatty acids in the egg. However, no significant effects were observed on external and internal egg quality parameters, including shell characteristics, albumen quality or yolk characteristics. In conclusion, dietary co-supplementation of selenium with omega-3 fatty acids effectively increases both omega-3 fatty acid and selenium content in eggs, suggesting that selenium and omega-3 co-supplementation may serve as a practical strategy for producing nutritionally enriched eggs without compromising physical quality.

Keywords: *Co-supplementation, omega-3, physical quality, selenium*

OMEGA FATTY ACID PROFILES IN DIFFERENT CUTS OF VILLAGE CHICKEN FED A FLAXSEED OIL-ENRICHED DIET

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Abstract

Village chicken, an indigenous breed, has recently attracted attention due to its higher nutritional value and lower fat content. While the enrichment of omega fatty acids has been extensively studied in commercial broiler breeds, limited research has been conducted on indigenous chickens. Moreover, there is a lack of information on the distribution of omega fatty acids across edible chicken parts, leaving their deposition within the muscles unclear. Therefore, this study investigated the deposition of omega fatty acids in different chicken cuts following dietary supplementation with an omega-rich source. A total of 120 village chickens (Ayam Saga) aged 7 weeks were randomly allocated to four treatments with different levels of flaxseed oil (FO) inclusion. The treatments were as follows: T0 (control, no FO inclusion); T1 (2.5% FO supplementation); T2 (3.0% FO supplementation); and T3 (4.0% FO supplementation). The chickens were fed with the respective diet for 5 weeks, with water and feed supplied *ad libitum*. At 12 weeks of age, 15 birds from each treatment group were slaughtered, and meat samples from four different cuts were collected (breast, thigh, wing, and drumstick). The samples were subjected to lipid and fatty acid analysis using gas chromatography. Across all treatment groups, a similar trend was observed, where FO supplementation significantly ($p < 0.05$) increased alpha-linolenic acid (ALA) concentration in all chicken parts measured. While ALA increased with higher FO supplementation, linoleic acid (LA) was generally maintained, except in the wing part, which showed a significant decrease ($p < 0.05$). Arachidonic acid (AA), which was derived from LA, showed decreasing value when higher FO was ascertained, except in the drumstick. The ALA concentration was significantly higher in thigh and drumstick muscle, with 279.80-289.62mg/100 and 190.34-213.93mg/100g, respectively. In contrast, ALA content in breast and wing muscle was lower than 70mg/100g. The differences in ALA concentration deposited in these muscles were attributed to the differences in lipid classes and muscle fibre types represented in each chicken cut. This study concludes that flaxseed oil supplementation may improve the nutritional profile of village chickens and that deposition of omega fatty acids varies among different chicken parts.

Keywords: *Deposition, flaxseed oil, muscle, omega fatty acids, village chicken*

SMALL-SCALE CAGE-FREE EGG PRODUCTION: SUPPORTING MID-SIZE RETAILERS AND LOCAL MARKETS

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Abstract

Small and medium-scale poultry farms contribute significantly to Malaysia's agricultural landscape and can play an important role in supporting the growth of cage-free egg production. These farms often operate with greater flexibility and are well positioned to serve niche markets that value ethically produced and locally sourced food. This presentation will explore the operational characteristics of small-scale cage-free egg farming, including housing systems, flock management practices, and welfare monitoring. Small producers can supply eggs to mid-sized retailers, local grocery stores, and specialty markets that prioritise responsibly sourced products. However, small-scale producers also face challenges, including higher production costs, limited access to specialised equipment, and difficulties in scaling operations. The session will examine strategies for overcoming these challenges through farmer training, improved infrastructure, and collaboration with retailers and industry organisations. Small-scale cage-free egg producers can play an important role in diversifying Malaysia's egg supply chain. By strengthening partnerships between producers and retailers, small farms can contribute to the development of a more resilient and welfare-oriented poultry sector.

Keywords: *Cage-free eggs, small-scale farming, poultry production, local markets, Malaysia*

COMPARATIVE ROBUSTICITY AND SEEDOR INDICES OF MAJOR LONG BONES IN BROILERS AND QUAIL

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Abstract

The poultry industry is a cornerstone of the Indonesian livestock sector, with Broiler chickens (*Gallus gallus domesticus*) and Quails (*Coturnix coturnix japonica*) representing the primary commodities for both consumption and experimental research. This study evaluates the comparative osteomorphometry of the humerus, femur, and tibia in these species, specifically focusing on the Seedor Index (SI) as a proxy for bone density and the Robusticity Index (RI) as a measure of bone strength. Statistical analysis was performed using SPSS, employing the Mann-Whitney U test for interspecies comparison ($p < 0.05$). The results demonstrate significant differences in the density and strength indices of major long bones between the two species. Broilers exhibited significantly higher SI and RI values, indicating denser and more robust long bones compared to quails. These findings are likely attributable to biomechanical adaptations required to support the greater body mass of broilers, alongside distinct genetic and nutritional factors. This study establishes foundational reference data for avian osteology, elucidating the specific structural adaptations characterizing these two commercially and scientifically significant poultry species.

Keywords: *Chicken, quail, robusticity index, Seedor Index, long bones*

INFLUENCE OF PARITY ON MILK PRODUCTION PERFORMANCE AND COMPOSITIONAL QUALITY IN SAANEN GOATS: A COMPARATIVE STUDY

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Abstract

Saanen goats are widely recognized for their high milk production potential; however, their performance is significantly influenced by physiological factors and nutritional intake. Understanding variations in milk yield and compositional quality across different parities is essential for optimising herd management and nutritional strategies in the dairy goat industry. This study evaluated the impact of parity on milk yield and composition in Saanen goats managed under a specific dietary protocol. Twenty Saanen goats, aged between 24 to 60 months were utilised in this study. All animals were fed at 4.0% of their body weight in dry matter, consisting of 60% Napier grass and 40% concentrate pellets (15% crude protein: 18.4 MJ energy). Data were collected across three parity groups: Primiparous (P1), Second Parity (P2) and Third Parity (P3). Daily milk yield and daily quality analysis (fat, protein, SNF and lactose) were recorded. Statistical analysis was performed using one-way ANOVA to compare parities, and Pearson correlation was used to assess the relationship between milk yield and its components. Significant differences in milk production were observed across parities ($p < 0.05$). The P2 exhibited the highest mean daily milk yield (967.9 ± 12.5 ml), followed by P3 (862.7 ± 10.7 ml) and P1 (594.2 ± 7.5 ml). Conversely, the highest fat percentage was observed in P1 ($4.12 \pm 0.02\%$), followed by P2 ($4.03 \pm 0.03\%$) and P3 ($3.94 \pm 0.03\%$). Correlation analysis showed a significant negative correlation between milk yield and fat content ($r = -0.33$) and protein content ($r = -0.25$), suggesting a dilution effect as production increases. Strong positive correlations were observed among solid-not-fat, protein, and lactose, suggesting coordinated variation among non-fat milk solids. Parity significantly influenced both milk quantity and compositional quality, with second parity (P2) representing the peak production stage in Saanen goats. Notably, in addition to parity, the high-quality feed uses in this study may also influence the results, suggesting that optimal nutrition is essential to sustain productivity across all lactation stages. The inverse relationship between yield and solid components underscores the importance of precision nutrition for high-yielding goats to maintain milk quality. These findings provide valuable benchmarks for goat breeders and producers in enhancing production efficiency.

Keywords: *Milk quality, milk production, parity, saanen goats*

EFFECT OF SYNTHETIC HEPARIN ON FERTILISATION RATE AND CLEAVAGE RATE AT 24 HOURS POST INCUBATION (H.P.I) IN KEDAH-KELANTAN COWS

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Abstract

In vitro fertilisation (IVF) has become an important tool in modern animal breeding, allowing fertilisation and early embryo development to occur outside the maternal environment. Among the critical determinants of IVF success are sperm capacitation efficiency and early embryonic cleavage kinetics, particularly within 24 hours post-incubation (h.p.i.). Heparin is widely recognised as an effective capacitating agent in bovine IVF systems; however, concerns regarding biological variability, animal-derived and halal status have encouraged the exploration of synthetic alternatives. Therefore, this study aims to evaluate the effect of synthetic heparin in sperm preparation media on fertilisation and cleavage rates of bovine oocytes. Ovaries were obtained from (Kedah-Kelantan) KK mixed-breed cows from the DVS-approved slaughterhouse, utilising the halal slaughter method. Post-slaughter, the ovaries were immediately collected and transported back to the laboratory at 37°C within two hours. The sperm used was from the KK bull collected at IBVK. Synthetic heparin was compared with porcine-derived heparin and a heparin-free control using Brackett–Oliphant (BO) medium. Sperm preparation was conducted in three groups: BO alone (control), BO supplemented with porcine heparin (10 µg/mL), and BO supplemented with synthetic heparin (8 µM/mL). Cleavage rates were recorded at 24 h.p.i., and statistical analysis was performed using one-way ANOVA ($p < 0.05$). High cleavage rates were observed at 24 h.p.i. across all treatments (89–97%), indicating efficient early fertilisation events. No significant differences were detected among the three media at this time point ($p > 0.05$), suggesting comparable performance in supporting early embryonic division. The findings indicate that synthetic heparin can effectively substitute for porcine heparin in sperm capacitation without compromising early cleavage outcomes. Overall, synthetic heparin presents a promising alternative for more standardised and halal bovine IVF systems. Further investigation on later developmental stages, including blastocyst formation and embryo quality, is recommended to fully validate its application in IVP systems.

Keywords: *In-vitro fertilisation, heparin, halal, Kedah-Kelantan cow, sperm capacitation.*

PRE-FREEZING INCUBATION AND CONTROLLED VAPOR IMPROVE POST-THAWED BOVINE SPERM QUALITY

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Abstract

The success of artificial insemination programs in the livestock industry depends heavily on the post-thaw recovery of cryopreserved semen. This study investigated two critical stages of the cryopreservation process: pre-freezing sperm selection and the stabilization of the cooling rate during vaporization. The first phase of the study evaluated the effect of a 15-minute incubation period at 37°C on the quality of fresh semen from four bulls. The results indicated a significant improvement ($P < 0.05$) in total motility, which increased by 11.4% (from $82.0 \pm 2.73\%$ to $91.3 \pm 3.12\%$), along with a corresponding 10.4% increase in progressive motility. This incubation technique effectively enriches high-quality motile sperm while reducing the proportion of immotile sperm by 9.3% prior to the freezing. In the second phase, the study examined the "Open–Closed Box" vaporization technique to mitigate thermal shock during exposure to liquid nitrogen. Two protocols were compared: T1 (fully closed box for 9 minutes) and T2 (open for 5 minutes, then closed for 4 minutes). The T2 protocol yielded significantly higher post-thaw motility (73% vs 53%) and progressive motility (66% vs 38%) compared to T1 ($P < 0.05$), indicating improved preservation of sperm functional integrity under a more gradual cooling regimen. Semen processed using the T2 vaporization protocol exhibited superior post-thaw motility and progressive motility. In conclusion, the integration of a 15-minute pre-freezing incubation period and the T2-controlled vaporization method significantly enhances the recovery rate of bovine spermatozoa. This study demonstrates that optimizing handling procedures during sperm selection and freezing is essential for producing high-quality frozen semen, thereby improving the efficiency of genetic resource management in local cattle populations.

Keywords: *Bovine, cryopreservation, incubation, sperm quality, vaporization*

EFFECTS OF DIETARY CANOLA OIL AND FISH OIL SUPPLEMENTATION ON THE PHYSICAL EGG QUALITY OF SAGA CHICKEN HENS

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Abstract

Egg quality is a key factor influencing consumer preference and market competitiveness within the poultry industry. With increasing demand for functional foods, omega-3 enrichment has become a common strategy to improve egg nutritional value. However, its effects on the physical egg quality of specific poultry breeds, such as the Saga chicken, remain limited. The Saga chicken, a premium indigenous dual-purpose breed developed by the Malaysian Agricultural Research and Development Institute (MARDI), is known for its adaptability and potential in both egg and meat production. This study compared the effects of two omega-3 sources, canola oil and fish oil, on the physical egg quality of Saga chicken hens. A 12-week feeding trial was conducted using 63 hens (29 weeks old) randomly assigned to three dietary treatments: T1 (Control, 0% omega-3), T2 (0.3% omega-3 from canola oil), and T3 (0.3% omega-3 from fish oil). Each treatment had three replicates, with seven hens per replicate. Egg physical attributes, including egg weight (EW), egg shape index (SI), and eggshell thickness (ST), were measured every two weeks. Results indicated that dietary omega-3 supplementation did not significantly alter the physical quality of the eggs ($P > 0.05$). Although not statistically significant, the canola oil group (T2) produced the heaviest eggs (54.44 g). T2 exhibited the highest shape index (76.16%), while the fish oil group (T3) had the highest shell thickness (0.39 mm) by the end of the trial. Notably, Saga chicken eggs across all treatments maintained physical attributes that aligned with international commercial standards, specifically the UNECE Standard No. 42 (EGG-1). Egg weights (50.75–54.44 g) primarily fell within the medium (M) weight grade (≥ 53 g and < 63 g), while the shape index (73.41–76.16%) and shell thickness (0.37–0.39 mm) met the normal physical requirements for Class A commercial eggs. In conclusion, 0.3% omega-3 supplementation from either canola oil or fish oil did not affect the physical quality of Saga chicken eggs. This study highlights the potential of Saga chickens for functional egg production, providing a sustainable strategy to improve the nutritional profile of indigenous poultry products without compromising physical egg quality.

Keywords: *Saga chicken, canola oil, fish oil, omega-3, egg quality.*

MODEL CAGE-FREE FARMS AS DEMONSTRATION HUBS FOR INDUSTRY AWARENESS AND FARMER TRANSITION

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Abstract

One of the major challenges in promoting cage-free egg production in Malaysia is the limited exposure of farmers to alternative housing systems and management practices. Demonstration farms serve as practical learning platforms where farmers, veterinarians, and industry stakeholders can observe the operation of cage-free systems under real-world conditions. This presentation highlights the role of model cage-free farms in supporting knowledge transfer and farmer training. Demonstration farms provide opportunities to showcase modern aviary systems, flock management techniques, nesting systems, litter management, and egg collection technologies. Through guided farm visits, training workshops, and knowledge-sharing initiatives, these farms enable farmers to better understand the operational and welfare aspects of cage-free production. The session also discusses the importance of veterinary support, biosecurity protocols, and farmer capacity building in ensuring the successful implementation of cage-free systems. These elements are critical in maintaining flock health, productivity, and compliance with welfare standards. Model cage-free farms play an essential role in building confidence among producers considering a transition from conventional cage systems. By serving as training and awareness hubs, these farms contribute to the gradual expansion of cage-free egg production in Malaysia.

Keywords: *Cage-free farming, demonstration farms, poultry training, animal welfare, Malaysia*

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RESPONSIBLE FOOD SOURCING AND ESG REPORTING: THE ROLE OF PUBLIC-LISTED COMPANIES IN ANIMAL WELFARE

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Abstract

Environmental, Social, and Governance (ESG) frameworks have become an integral component of corporate sustainability strategies. Public-listed companies are increasingly expected to demonstrate responsible sourcing practices, including the integration of animal welfare standards within their supply chains. This presentation examines the growing importance of responsible food sourcing as part of ESG reporting among publicly listed companies. Corporate procurement policies are increasingly requiring suppliers to adhere to ethical and sustainability standards, including animal welfare considerations. Cage-free egg sourcing is gaining recognition as a measurable indicator of responsible procurement practices within the food, retail, and hospitality sectors. The session will explore how companies can incorporate responsible sourcing policies into their supply chains, including supplier engagement, standard setting, and monitoring mechanisms. It will also highlight the role of transparency and sustainability reporting in strengthening corporate accountability, enhancing investor confidence, and meeting evolving regulatory expectations. As investors, regulators, and consumers place greater emphasis on sustainability, responsible sourcing practices will continue to influence corporate decision-making. Public-listed companies are well positioned to play a leadership role in supporting humane and sustainable egg production systems through responsible procurement policies and ESG integration.

Keywords: *ESG, responsible sourcing, animal welfare, cage-free eggs, corporate sustainability*

ENHANCING BRAKMAS CATTLE POPULATION VIA STRUCTURED BREEDING TO STRENGTHEN LOCAL BEEF SUPPLY

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Abstract

Malaysian Agricultural Research and Development Institute (MARDI) has developed Brakmas cattle to improve local beef production and increase cattle population in Malaysia, as well as to reduce reliance on imported beef. Brakmas are known for their larger body size and higher carcass percentage compared to local Kedah-Kelantan (KK) cattle. Majority of the population are maintained at MARDI Kluang, Johor; MARDI Muadzam Shah, Pahang and a few multiplier herds under research collaboration. The distribution of this breed is crucial for driving progress and strengthening local beef production. An effort was taken to increase Brakmas population in MARDI Kluang via a structured breeding program on grazing conditions under RMK12 (12th Malaysia Development Plan), which also enhanced its capability as a nucleus herd for Brakmas cattle. The breeding activities were carried out in 2023 to 2024 using internal stocks of Brakmas cows. In each breeding cycle, Brakmas bulls were kept with the cows for two months (~60 days) with the ratio male to female of 1:30. Cumulative results of breeding activity conducted in 2023 and 2024 showed a consistent conception rate of 70% for both years, with an annual increase of 20% in Brakmas population. These findings underscore the importance of a proper structured breeding program in strengthening and supporting the development of local beef production in Malaysia.

Keywords: *Brakmas cattle, structured breeding, breeding performance.*

A MALAYSIAN PRACTITIONER'S MODEL FOR REGENERATIVE EGG PRODUCTION ON SMALL ACREAGE

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Abstract

Malaysia imports over 30% of its food supply, while conventional poultry systems remain dependent on imported feed and inputs, a vulnerability highlighted by recent geopolitical disruptions. At the same time, cage-free production is gaining regulatory and market momentum. However, cage-free represents a housing standard rather than a complete farming system. Regenerative pasture-raised production offers a more integrated model that addresses animal welfare, soil health, nutrient density, and farmer economics, which is already being practised in Malaysia. This presentation draws on practical experience operating a myGAP-certified pasture-raised poultry system on a seven-acre farm in Kuala Kangsar, Perak, managing approximately 1,000 layers and meat birds under coconut canopy through rotational grazing with mobile chicken tractors. It examines how poultry can be integrated into existing tree crop systems to enhance soil fertility through managed nutrient cycling while enabling natural animal behaviours. Operational considerations, including fencing, feed formulation, labour systems, and daily management, are discussed to demonstrate the realities of implementing regenerative systems effectively. The presentation also explores the relationship between soil health and egg nutrient density, highlighting how this supports premium market positioning through direct-to-consumer channels. It further outlines how Malaysia's cage-free transition can serve as a foundation for pasture-raised systems, alongside the role of industry bodies and emerging standards in supporting scalable and credible regenerative agriculture. Pasture-raised regenerative poultry represents a viable and scalable model for Malaysia's agricultural future, aligning economic sustainability with environmental stewardship and evolving consumer expectations.

Keywords: *Regenerative agriculture, pasture-raised poultry, cage-free systems, soil health, Malaysia*

GENOMIC PREDICTION OF MILK PRODUCTION AND COMPOSITION TRAITS IN DAIRY GOATS USING ANIMAL AND RANDOM REGRESSION TEST-DAY MODELS

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Abstract

Genomic selection can accelerate genetic improvement in dairy goats, but its efficiency depends on reference population size, marker density and prediction model. This study evaluated genomic prediction for milk production and composition traits in a combined reference population from WeiHe and Heshi dairy goat herds in China. A total of 3,277 lactating does with phenotypic records for nine traits, including milk yield, fat yield, protein yield, fat percentage, protein percentage, lactose percentage, total solids, milk urea nitrogen and somatic cell score, were genotyped using 1x low-depth whole-genome resequencing. After quality control, genomic estimated breeding values were predicted using animal model-based GBLUP and Bayesian methods, including BayesB, BayesCpi, BayesN, BayesR and BayesS. Prediction accuracy was assessed by five-fold cross-validation. In addition, a random regression test-day model was used to integrate longitudinal test-day records and capture lactation-stage-specific genetic effects. Under the animal model, milk component traits generally showed moderate to high heritability and higher prediction accuracy than yield traits. The average prediction accuracy across the nine traits was 0.433, with protein percentage showing the highest accuracy (0.526). Linkage disequilibrium pruning improved computational efficiency while maintaining prediction performance, and the average prediction accuracy reached 0.437 at an LD threshold of 0.10. Among Bayesian methods, BayesB and BayesN improved prediction for several traits, with average accuracies of 0.451 and 0.448, respectively, whereas GBLUP remained stable across traits. Compared with the animal model, the random regression test-day model improved prediction reliability for most traits by using repeated records across lactation. Mean reliability increased from 0.417 under the animal model to 0.570 under the test-day model, with clear improvements for fat percentage, protein percentage, total solids, milk urea nitrogen and somatic cell score. These results indicate that genomic prediction is feasible for dairy goat breeding populations and that random regression test-day models can further improve genomic evaluation for traits with dynamic lactation patterns. This study provides a practical framework for early selection and genetic improvement of high-yielding dairy goats.

Keywords: Dairy goat, genomic selection, GBLUP, Bayesian model, test-day model

RESEARCH ON RAPID DETECTION METHOD FOR MASTITIS IN DAIRY GOATS BASED ON VIS-NIR SPECTROSCOPY

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Abstract

Mastitis is a common disease in dairy goat farming, causing significant economic losses and severely restricting the high-quality development of the dairy goat industry. Early detection of mastitis in dairy goats during production is crucial for effective intervention. However, the existing detection methods for mastitis in dairy goats have drawbacks such as cumbersome operation and long-term consumption, which make it difficult to meet the needs of rapid on-site screening. Therefore, this study proposes a non-destructive and in situ detection method for mastitis in dairy goats based on Vis-NIR spectroscopy, based on Vis-NIR spectroscopy, focusing on changes in breast tissue structure and composition caused by mastitis, that lead to changes in absorption spectra. The results showed that mastitis tissue exhibited histopathological characteristics such as epithelial cell shedding, bleeding, and inflammatory cell infiltration; The positive proportion and expression levels of TNF- α , IL-1 β , and IL-6 pro-inflammatory cytokines were significantly upregulated; The protein electrophoresis bands showed increased brightness, band displacement, uneven depth, or an increase in the number of bands. It was found that diseased mammary gland tissue had significant absorption of wavelengths such as 210 nm, 420 nm, 1176 nm, 1470 nm, and 1960 nm in the UV-Vis and NIR spectral ranges, but no significant absorption in the MIR spectrum. Principal component analysis and continuous projection algorithms were used to screen for characteristic wavelengths related to mastitis, and it was found that wavelengths at 208 nm, 231 nm, 415 nm, 1426 nm, 1720 nm, 1936 nm, and 2308 nm were characteristic absorption wavelengths of inflammatory tissues. The prediction results showed that the prediction coefficient of the model established using UV-Vis characteristic spectra was 0.9291, and a root mean square error of 0.1255; whereas the model established using NIR characteristic spectra had a coefficient of determination of 0.9778 and a root mean square error of 0.0702. The Vis-NIR spectroscopy-based method for detecting mastitis in dairy goats established in this study can provide a new technical solution for rapid on-site screening

Keywords: *Dairy goat, mastitis, spectroscopy, non-destructive detection, smart farming*

EFFECTS OF MICROPLASTICS OF DIFFERENT PARTICLE SIZES ON GOAT TESTICLES

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Abstract

Microplastics (MPs), a new class of environmental pollutants, are widely distributed in the environment. When animals consume feed containing MPs, the particles enter the body via the gastrointestinal tract and accumulate, causing damage to the animals. Previous studies have shown that MP ingestion can lead to testicular tissue damage and reduced sperm quality in monogastric animals (such as mice), however, their impact on the reproductive health of polygastric animals (such as goats) remains unclear. The present study demonstrated that dietary supplementation with polyethylene microplastics (PE-MPs) significantly reduced feed intake in goats. Compared with the control group, the small-sized PE-MPs group (S group: particle size 5-10 μm) exhibited significantly decreased testicular index and sperm motility, along with severe testicular histological damage, whereas the large-sized PE-MPs group (L group: particle size 50-100 μm) showed only mild injury. Further analysis revealed that the levels of PE-MPs containing particles in the blood of goats in the S and L groups were significantly higher than those in the control group ($P < 0.05$), and particles with a diameter $< 5 \mu\text{m}$ accounted for 57.48% of the total in the S group. Testicular transcriptomic and metabolomic analyses indicated that small-sized MPs (5–10 μm) may primarily induce oxidative stress in testicular tissue by affecting key genes such as PRDM16, as well as antioxidant-related metabolites like glutathione and taurine, thereby leading to metabolic dysfunction; In contrast, large-sized MPs (50–100 μm) likely primarily interfere with lipid metabolism and inflammation-related metabolic processes in the testes by regulating the expression of genes such as IGSF6 and ROM1. This study provides important scientific evidence for the healthy rearing of goats, suggesting that microplastic contamination in feed must be strictly controlled in practical farming operations, with particular vigilance regarding the potential reproductive risks of small-particle-size PE-MPs. It also provides key data support for the formulation of environmental safety standards and microplastic exposure thresholds in goat farming.

Keywords: *Microplastics, goat, testicular damage, transcriptomics, metabolomics*

CONJUGATED LINOLEIC ACID DECREASES MILK FAT GLOBULE SIZE BY REGULATING LIPID DROPLET PROTEINS AND DIAMETER IN DAIRY GOAT MAMMARY GLANDS

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Abstract

The size of fat globules in ruminant milk, to some extent, affects the nutritional quality of dairy products and may play a role in infant and adult health. Lipid droplets (LD) in mammary epithelial cells are the precursors of milk fat globules (MFG). However, it is unclear what happens to proteins during the transformation process from LD to MFG, and little is known about the regulation of LD diameter in vivo. In this study, 12 mid-lactation Saanen dairy goats were randomly divided into two groups: a control group fed a basal diet and an experimental group fed a basal diet supplemented with CLA at 90 g/d. Goat milk was collected for analysis of composition and MFG size. Mammary gland tissue was collected for analysis of LD diameter and proteins. MFG size was found to depend on LD diameter in the mammary glands of dairy goats. The regression equations for MFG size (Y) and LD diameter (x) were $YD[3,2] = 1.8776x - 1.1984$ ($R^2=0.7765$) and $YD[4,3] = 2.4898x - 0.4453$ ($R^2=0.7693$), respectively. Proteomic analysis revealed increased expression of proteins associated with lipid droplet autophagy and lipolysis (such as ATG5, ATG7, LDHA, MGL), while expression decreased for proteins involved in lipid synthesis (such as PLIN1, FASN, LPL, SCD, APOH). These LD proteins regulate LD diameter through glucose and lipid pathways metabolism, thereby affecting MFG size. Overall, these findings provide the first evidence that LD diameter determines MFG size and highlight the regulatory functions of LD protein in milk fat production.

Keywords: Dairy goats, milk fat globule size, lipid droplet diameter, proteomics

GENETIC PARAMETERS ESTIMATION AND GENOME-WIDE ASSOCIATION ANALYSIS REVEAL THE GENETIC ARCHITECTURE OF MILK COMPOSITION TRAITS IN DAIRY GOATS

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Abstract

Goat milk has attracted increasing attention due to its distinctive flavor characteristics, fat globule structure, and relatively low allergenicity. In this study, we systematically evaluated the genetic architecture of key economic traits using phenotypic data on milk production and body measurements from 3,232 dairy goats in the Guanzhong region of Shaanxi Province. Low-coverage whole-genome sequencing combined with a multi-population reference panel was employed for genotype imputation, generating a high-quality genomic dataset. Genetic parameters were estimated and breeding values were predicted using the genomic best linear unbiased prediction (GBLUP) model. Heritability estimates for milk yield, body conformation, and udder traits ranged from 0.34 to 0.65, indicating moderate to high genetic potential for improvement. Five-fold cross-validation further demonstrated the robustness and predictive accuracy of the model. Genome-wide association studies (GWAS) identified significant genomic regions on chromosome 6 associated with both milk protein percentage and milk fat percentage. Candidate genes for milk protein traits included CSN1S1, CSN3, SULT1E1, and LTBP1, among others. For milk fat percentage, 53 candidate genes were identified, with partial overlap observed between the two traits. Functional enrichment analysis revealed that these candidate genes were mainly involved in lipid metabolism, energy homeostasis, and hormone-related signaling pathways, including the Hippo, AMPK, JAK–STAT, and PI3K–Akt pathways. Overall, this study elucidates the genetic basis of milk composition traits in dairy goats from both quantitative genetics and molecular perspectives, providing a theoretical foundation for genomic selection and genetic improvement of milk quality.

Keywords: *Dairy goat, genomic selection, GWAS (Genome-wide association study), milk composition traits, heritability*

MICRORNOMICS REGULATION IN MAMMARY GLAND OF DAIRY GOATS

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Abstract

The mammary gland is a unique functional organ of dairy goats, and its development and lactation process directly affect milk production performance and milk quality. Research on the mechanisms of mammary gland development and lactation in dairy goats not only provides a theoretical basis for optimizing feeding management and improving milk production performance but also offers an ideal large animal model for addressing human lactation disorders, breast diseases, and stem cell differentiation through the analysis of regulatory networks involving hormones, growth factors, and cell signaling pathways. Furthermore, this research facilitates the screening of genetic markers associated with high lactation efficiency, promotes precision breeding and the development of functional goat milk products, and holds significant application value for ensuring the economic benefits of the dairy industry and improving the nutritional health of infants, young children, and special populations. In the present study, the microRNAomics and mRNAomics data derived from the mammary gland of dairy goats in the early lactation stage, peak lactation stage and late lactation stage were obtained and analysed. For the miRNAomics, a total of 18031615, 19044002 and 7385833 clean reads were obtained in different stages respectively. After blastn searches and further sequences analysis, 9093530, 15687114 and 6134001 sequences (representing 44928, 46610 and 35221 unique sRNAs, respectively) in early, peak and late lactations had perfect matches to known animal miRNAs deposited in miRBase 18.0, a total of 934 known miRNAs were co-expressed, 126 miRNAs were early lactation-specific, 104 miRNAs were peak lactation-specific, and 75 were late lactation-specific. Compared with miRNA expression in late lactation, 362 miRNAs in late lactation were significantly up-regulated, while 272 miRNAs were significantly down-regulated, as well as 106 miRNAs had a higher abundance, and 19 miRNAs were specifically expressed in early lactation. For the GO enrichment and Kegg pathway, most of the target genes were annotated with the molecular functions in binding and activity, and most genes were involved in cellular or metabolic processes. Most of these genes were involved in cellular metabolism, diseases and signal transduction. For the mRNAomics, from three libraries, 36,336,892, 36,469,596, and 35,759,380, pure sequences were obtained, with 25,292, 23,665 and 27,220 expressed genes, respectively, resulting in a total of 14,892 nonredundant differentially expressed genes. The Gene Ontology (GO) and Kyoto Encyclopedia of Genes and Genomes (KEGG) pathway analyses showed that these genes were annotated to biological regulation, cellular processes, metabolic processes, cells, organelles, binding, catalytic activity and transcriptional activity, and so on. The genes were mainly involved in cellular processes, environmental information processes, genetic information processes, human diseases, metabolism, and organ systems. Finally, a crosstalk between miRNAs and mRNAs were constructed, to generate a gene regulatory network. miR-135 and PRLR were selected for analysis of their targeting regulation.

Keywords: Dairy goat, mammary gland, miRNA, mRNA, regulation, network

IMMUNE CELL DYNAMICS ACROSS THE TRANSITION PERIOD: COMPARATIVE INSIGHTS FROM PERIPARTURIENT EWES AND COWS

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Abstract

The transition period (TP) is characterized by marked immune and metabolic adjustments in ruminants. While immune dysregulation around parturition has been extensively documented in dairy cows, comparable data in ewes remain limited. A comprehensive understanding of species-specific immune cell dynamics is essential for improving periparturient health management, particularly in light of the differing disease susceptibilities observed between bovine and ovine species. The primary objective of this study was to compare immune cell dynamics during the TP in cows and ewes. Nine clinically healthy German Blackhead ewes, in their second or third lactation, were monitored from late gestation (30 days antepartum, a.p.) through early lactation (30 days postpartum, p.p.). Blood samples were collected at: day (d) 30 a.p., d 14 a.p., d 1 p.p., d 14 p.p., and d 30 p.p. Samples were analyzed for total leukocyte counts (TLC), neutrophils, and monocyte subsets—classical (cM), intermediate (intM), and non-classical (ncM)—using CD14/CD16-based flow cytometry. Functional assays included *in vitro* neutrophil phagocytic activity and T-lymphocyte proliferative capacity. Data were analyzed using a two-way ANOVA (GraphPad Prism 8, San Diego, CA, USA). The ewes findings were compared with previously published data from periparturient German Holstein cows. At day 1 postpartum, ewes exhibited a significant leucocytosis and neutrophilia ($P = 0.0001$), consistent with bovine responses. In contrast to cows where monocyte subsets peak at parturition, total monocytes and all subsets (cM, intM, ncM) reached their highest values at day 30 postpartum ($P \leq 0.05$). Blood lymphocyte numbers showed no significant changes during TP, *in vitro* T-lymphocyte proliferative capacity remained stable throughout the TP in ewes, unlike cows, which typically showed a reduction during the postpartum period. The proportion of phagocytosis-positive neutrophils remained relatively unchanged; however, mean phagocytic capacity per cell increased markedly by day 14 postpartum ($P = 0.001$), a pattern comparable to what reported in cows. Ewes and cows share several periparturient immune features, including a prominent leukocyte and neutrophil surge at parturition. However, important species-specific differences were identified, particularly the delayed peak in monocyte and its subsets numbers and the maintenance of lymphocyte proliferative capacity in ewes. These findings highlight distinct immune adaptation strategies during the TP and provide the first detailed characterization of ovine monocyte subset dynamics under periparturient conditions. Further research is needed to interpret the metabolic and endocrine mechanisms underlying these interspecies differences.

Keywords: *Ewes, cows, transition period, immune cell, phagocytosis*

TARGETED DELIVERY OF BUTYRIC ACID: IMMUNOMODULATORY AND SEROLOGICAL RESPONSES IN BROILERS FED PROTECTED BUTYRATE

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Abstract

Protected butyrate formulations can overcome the rapid absorption and volatility of free butyric acid, thereby enhancing gut health and systemic immunity. We evaluated three protected forms in broilers by measuring antibody titers and key blood markers of immune function. A total of 600 one-day-old Hubbard broilers (43.76 ± 0.11 g) were randomly assigned to four dietary treatments (10 pens per treatment) for 35 days: a negative control without acidified products, organic acids, or probiotics (NC); NC + 70% sodium butyrate protected by medium-chain fatty acid salts (SB); NC + 60% di-/triglycerides of butyrate (TB); and NC + 54% sodium butyrate protected by buffer salts (BB). All additives provided an equivalent active butyric acid level of 54%. Diets were pelleted and formulated according to FEDNA (2021) guidelines for starter (0–14 d), grower (15–27 d), and finisher (28–35 d) phases. Blood was collected on days 21 and 33 and analyzed for antibody titers and the concentrations of IgG, IgM, IgA, TNF- α , IL-6, and IL-10. Data were tested for normality (Shapiro–Wilk, Kolmogorov–Smirnov) and homogeneity of variance. Based on these results, log-transformed ND titers were analyzed using the Kruskal–Wallis test, and log-transformed IBD markers were analyzed by one-way ANOVA with Tukey’s post hoc test. Bootstrapping (20,000 iterations) was applied to estimate confidence intervals. Results showed highest IgG in SB (465.3 ng/mL), followed by TB (443.0), BB (428.2), and NC (328.5), indicating enhanced humoral immunity, especially with SB. IgA followed a similar pattern, highest in TB (617.7), then SB (581.0), NC (473.7), and BB (459.8), suggesting improved mucosal and systemic responses in SB- and TB-fed birds. IgM remained relatively stable (284.7–305.2), with NC at 291.8. The cytokine profile supported the immunomodulatory role of the additives. TNF- α declined in all treated groups vs. NC (503.2), with lowest values in SB (358.2), BB (359.5), and TB (388.3), indicating reduced inflammation. Similarly, IL-10 increased across treatments, highest in SB (525.0), followed by TB (493.5), BB (467.2), and NC (438.8), reflecting improved immune regulation. IL-6 showed no notable change (range: 448.8–483.0). IBD antibody titers (ELISA) showed the highest GMT in SB (9041), followed by BB (8581), TB (8271), and NC (8123), reinforcing SB’s effect on humoral immunity. Finally, protected butyrate—especially SB—enhanced humoral responses and modulated inflammatory markers, underscoring the importance of delivery form in maximizing systemic immune benefits.

Keywords: *Broilers, butyric acid, immunity, antibody titers, cytokines*

OPTIMIZING CRYOPRESERVED PERANAKAN ETAWAH BUCK SEMEN: DOSE-DEPENDENT EFFECTS OF COENZYME Q10 ON POST-THAW VIABILITY AND APOPTOSIS

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Abstract

Goat spermatozoa are highly susceptible to cryoinjury because their plasma membrane contains abundant polyunsaturated fatty acids (PUFAs), which are prone to lipid peroxidation during freezing–thawing. Usually, oxidative damage of this kind affects the structural integrity of mitochondrial membranes ($\Delta\Psi_m$)¹, thereby causing intrinsic apoptosis related to early membrane-associated apoptotic signalling events. Coenzyme Q10 (CoQ10), a lipophilic mitochondrial antioxidant and electron carrier, may protect mitochondria², and thereby stabilize membrane polarization after thawing³. This study evaluated whether CoQ10 supplementation improves post-thaw quality of cryopreserved Peranakan Etawah (PE) goat spermatozoa, with emphasis on viability, early apoptosis, and DNA fragmentation. Semen was collected from a 4-year-old PE buck and cryopreserved using a two-step extender protocol. The samples were divided into groups of five with reference to the CoQ10 dosage in Extender A: C0 (0 mg/dL), C1 (5 mg/dL), C2 (10 mg/dL), C3 (20 mg/dL), and C4 (40 mg/dL). Straws were thawed for 30 s at 37 °C. The live percentage after freezing and thawing was determined by the eosin nigrosine staining method. The apoptosis was detected using Annexin V, PI, and DAPI staining, by which early apoptosis cells were counted. DNA integrity was assessed using an apoptosis DNA ladder detection approach. A positive fragmentation result was defined by periodic ladder bands (~180–200 bp), whereas negative results appeared as diffuse smear without periodic banding. Research ethics: No. 34-KEP-FKHUB-2025. The highest post-thaw viability was observed in C4 (40 mg/dL) with 68%. Early apoptosis was highest in C0 and lowest in C3 (20 mg/dL), indicating that CoQ10 at an intermediate dose most effectively reduced early intrinsic apoptotic changes. No DNA fragmentation (ladder pattern) was detected in any group; all samples were negative. CoQ10 supplementation improved post-thaw sperm quality in PE goats, showing dose-related benefits: 40 mg/dL yielded the highest viability, while 20 mg/dL most strongly minimized early apoptosis. The fact that there were not any DNA bands visible for all the treatments is an indication that the DNA was kept intact under this cryopreservation protocol.

Keywords: Coenzyme Q10, goat semen, cryopreservation, apoptosis, viability, DNA fragments

EFFECTS OF PRODUCTION SYSTEMS, MUSCLE TYPES, AND POSTMORTEM AGEING ON THE MUSCLE FATTY ACID PROFILE IN SWAMP BUFFALOES (*Bubalus bubalis*)

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Abstract

Ruminant meat is often perceived as less favorable due to high saturated fatty acids (SFAs) content, which is associated with cardiovascular risks. However, swamp buffalo (*Bubalus bubalis*) meat may offer a leaner and unique lipid profile. This study evaluated the effects of two production systems: Herd Health Program (HHP) versus Non-Proper Herd Health Program (NHHP), three muscle types: *Longissimus dorsi* (LD), *Supraspinatus* (SS), and *Semitendinosus* (ST) and three postmortem ageing periods: 1, 7, and 14 days on the fatty acid (FA) composition of swamp buffalo. A total of ten male swamp buffaloes at the ages of 18 -24 months old were used. Total lipids were extracted using the Folch method, fatty acid methyl ester (FAME) and gas-liquid chromatography. Results indicated that the NHHP group, characterized by greater grazing activity with limited feed supplementation consistently produced meat with significantly higher polyunsaturated fatty acids (PUFA) and omega-3 (n-3) levels compared to the HHP group, which showed higher SFA and monounsaturated fatty acids (MUFA) due to concentrate supplementation. For muscle type; the ST muscle was the most nutritionally favorable cut, demonstrating the highest PUFA/SFA ratios and the lowest n-6/n-3 ratios within the WHO's healthy recommendation of 5:1. While meat ageing led to a general reduction in PUFA in some muscles, the ST muscle in the NHHP group at 14 days of ageing exhibited the most favorable health indices. In conclusion, muscle type and production system are more significant determinants of FA profile than ageing. Swamp buffaloes raised under extensive grazing systems (NHHP) provide high-quality meat rich in essential PUFAs, particularly when utilizing locomotion muscles like the ST.

Keywords: Swamp buffalo, fatty acid profile, muscle type, postmortem ageing, herd health, PUFA.

EMBRYO TRANSFER TECHNOLOGY IN CATTLE BREEDING IN MALAYSIA: A WAY FORWARD

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Abstract

In Malaysia, boosting self-sufficiency in livestock production for human consumption is a top priority. While natural mating in cattle breeding can achieve success rates of over 80% in calf production, assisted reproductive technologies such as embryo transfer (ET) offer greater potential to increase production capacity. Embryo transfer is a technique that involves transferring embryos from genetically superior donor cows into recipient dams, thereby improving reproductive efficiency and accelerating genetic progress. However, the adoption of ET technology in Malaysia remains limited due to high costs, shortage of technical expertise, and the need for specialized facilities. To address this, a study was conducted to evaluate how embryo transfer technology could enhance cattle production and support the growth of Malaysia's livestock industry. All recipient dams (n=9) each with at least one previous calving (parity) and an average body condition score of 4 (on a scale of 1 to 5) were synchronized and randomly assigned to two ET programs; P1 (n=4) and P2 (n=5). A total of 16 frozen embryos at the morula, compact morula or blastocyst stage obtained through the MOET technique, were used in the ET program. The number and location of corpus lutea were monitored as indicators for successful embryo transfer. Pregnancy was diagnosed by rectal palpation at 90-, 150- and 270-days post-embryo transfer. At 90 days post-embryo transfer, pregnancy rates were 50% (2 out of 4) in group P1 and 60% (3 out of 5) in group P2. By day 150, the number of confirmed pregnancies had declined in both groups compared to day 90, except for one recipient dam in P2 that maintained pregnancy through to Day-270. At day 285, a healthy female calf was successfully born. Upon reaching maturity, this calf was naturally bred and subsequently produced a male calf. Thus, the study indicates that a frozen embryo transfer (ET) program in cows can achieve a pregnancy rate of approximately 56%, resulting in the birth of a viable female calf. These findings demonstrate that the embryo transfer method has been successfully developed and can play a significant role in improving reproductive efficiency and genetic quality in cattle production systems.

Keywords: *Embryo transfer, frozen embryo, cattle breeding*

THE LONG-TERM EFFECTS OF FEEDING AND ENVIRONMENTAL ENRICHMENT ON ORAL STEREOTYPIC BEHAVIOUR, FEED INTAKE, BODY WEIGHT, AND STRESS BIOMARKER OF DAIRY CALVES PRE-, POST-WEANING AND HEIFER STAGE

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Abstract

Early-life feeding and environmental enrichment may reduce non-nutritive oral behaviours and improve welfare in dairy calves; however, evidence for sustained behavioural and physiological effects remains limited. This study evaluated the short- and long-term effects of feeding enrichment (Braden bottle) and environmental enrichment devices (EED; brush, tug rope, hay net) on oral stereotypic behaviour (OSB), feed intake, body weight gain (BWG), and hair cortisol concentration (HCC). Twenty-four Friesian × Jersey calves were assigned to three treatments: bucket only (BC), Braden bottle only (BB), and mixed (bucket + Braden bottle)(BC-BB). Behaviour (feeding, drinking, standing, lying, tongue-rolling, bar-biting, cross-sucking, non-nutritive oral manipulation) and performance (feed intake, BWG) were recorded during pre- and post-weaning phases. Hair samples were analysed for cortisol. Post-weaning, calves received EED, while no enrichment was provided during the heifer stage. Braden bottle feeding reduced cross-sucking compared with bucket feeding, suggesting improved satisfaction of suckling motivation. Calves showed greater interaction with brush-type devices than other EED. However, feed intake, BWG, and HCC did not differ significantly among treatments. During the heifer stage, OSB occurrence was low across groups, limiting detection of long-term treatment effects. These findings indicate that teat-based feeders can mitigate specific early-life oral stereotypes, whereas environmental devices elicit variable behavioural responses. The absence of physiological differences suggests that behavioural improvements may not necessarily correspond to measurable reductions in chronic stress under the present conditions. Larger sample sizes, extended follow-up, and repeated physiological assessments are recommended better to determine the persistence and welfare significance of enrichment strategies.

Keywords: *Braden bottle, environmental enrichment, dairy calves, hair cortisol, oral stereotypic behaviours.*

DETERMINATION OF TOTAL SAPONIN, FLAVONOID, AND PHENOLIC CONTENT IN THREE DIFFERENT PARTS OF FIVE INDONESIAN PLANTS AS CANDIDATES FOR RUMINANT IMMUNOMODULATORS

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Abstract

This study aimed to identify saponins, flavonoids, and phenolic compounds in five Indonesian plant species: *Clidemia hirta*, *Ficus septica*, *Carica pubescens* L., *Morus macroura* Miq., and *Ceiba pentandra*, across three plant parts (leaves, stems, and fruits) as potential immunomodulators for ruminants. The plants were collected from the IPB Bogor campus area, Wonosobo Regency (Dieng area) in Central Java, as well as Agam and Tanah Datar Regencies in West Sumatera. Plant parts were ground and extracted using the *Ultrasound-Assisted Extraction* (UAE) method. The powder was subjected to qualitative phytochemical screening, and the extract yields were calculated. Furthermore, they were quantitatively analyzed for total saponin, flavonoid, and phenolic content using UV-Vis spectrophotometry. Data were analyzed using ANOVA and the Duncan's Multiple Range Test at a 5% significance level using IBM SPSS Statistics version 29. The screening results showed that, overall, the leaves, stems, and fruits of *C. hirta*, *F. septica*, *C. pubescens*, *M. macroura* Miq. and *C. pentandra* contain saponins, flavonoids, and phenolics. The highest total saponin content was found in the *C. pentandra* stem (13129.17 ± 148.49 mg SE/g crude extract), and the lowest in the *C. pubescens* fruit (1258.75 ± 101.87 mg SE/g crude extract). The highest total flavonoid content was obtained from the stem of *M. macroura* Miq. (362.20 ± 26.76 mg QE/g crude extract), and the lowest from the stem of *C. hirta* (12.45 ± 0.23 mg QE/g crude extract). The highest total phenolic content was obtained from the *C. pentandra* stem (273.65 ± 19.83 mg GAE/g crude extract), and the lowest from the *F. septica* leaf (14.27 ± 0.80 mg GAE/g crude extract). It can be concluded that the leaves, stems, and fruits of *Ceiba pentandra* are sources of saponins. Meanwhile, the stems of *Morus macroura* Miq. and the leaves of *Ceiba pentandra* are sources of flavonoids. Furthermore, the leaves and stems of *Clidemia hirta* and *Ceiba pentandra* are the best sources of phenolic compounds, according to this analysis. These five plant species, based on analysis of three different parts, have potential as immunomodulators in ruminants

Keywords: *Saponins, flavonoids, phenolics, immunomodulators, ruminants*

EVALUATION OF MICROBIAL DIVERSITY OF TOTAL MIXED RATION SILAGE AS RUMINANT FEED

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Abstract

Fresh Total Mixed Ration (TMR) is highly susceptible to aerobic deterioration, characterized by rapid microbial proliferation, nutrient depletion, and heat generation upon exposure to oxygen, which limits its storage stability and practical application. Ensiling represents an effective preservation strategy; however, its success depends on the establishment of efficient lactic acid bacteria (LAB) driven fermentation. Soy curd residue (SCR), a protein-rich agro-industrial by-product, may enhance TMR silage quality by supplying fermentable substrates that support LAB growth and activity. This study evaluated the effects of varying SCR inclusion levels, such as T0 (0%), T15 (15%), T25 (25%), and T35 (35%), on the microbial dynamics of TMR silage. Fresh TMR was formulated to contain 14% crude protein (CP) and 11 MJ/kg dry matter (DM) of metabolizable energy (ME) and was subsequently ensiled for 45 days. Microbial analysis included enumeration of LAB, yeast, mold, and coliform populations, as well as 16S rDNA-based metagenomic profiling. Data were analyzed using ANOVA ($p < 0.05$), with linear and quadratic contrasts to assess the effects of increasing SCR inclusion. Results demonstrated a significant linear increase ($p < 0.05$) in LAB populations with higher SCR levels, with *Limosilactobacillus* dominating (55%) in T35, indicating enhanced fermentative activity. However, T35 also exhibited significantly elevated yeast, mold, and coliform counts that exceed acceptable thresholds, thereby compromising aerobic stability. T25 showed a moderate increase in yeast counts, whereas T15 maintained microbial populations within acceptable limits (e.g., yeast = 9.0×10^4 CFU/g $< 1 \times 10^5$ CFU/g), indicating better preservation quality. In addition, mycotoxin analysis was negative across all treatments, suggesting that anaerobic conditions and rapid acidification effectively inhibited toxigenic fungi. Hence, T15 demonstrated the best overall performance as it met all microbial safety standards. The SCR can be a promising, sustainable agro-industrial by-product that enhances the fermentation quality of TMR silage by promoting beneficial LAB.

Keywords: *Total mixed ration silage, soy curd residue, microbial diversity, mycotoxin, aerobic stability*

THE PHYSICOCHEMICAL AND MICROBIAL STATUS OF LAMB MEAT FED BY DIFFERENT RATION

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Abstract

This study aimed to evaluate the effects of feed type and storage duration on the dynamics of physicochemical quality, nutrient composition, and microbiological characteristics of lamb meat using a repeated-measure design. A total of 15 lambs aged 6–8 months old were reared under three ration treatments: 100% forage, 50 forage: 50 concentrates, and a concentrate-dominant diet, with five lambs for each treatment. Hind leg meat samples at storage times of 0, 2, 4, 6, and 8 hours after slaughtering at room temperature were analysed. The parameters observed include the pH, colour, drip loss (DL), cooking loss (CL), water holding capacity (WHC), nutrient composition (moisture, ash, protein, and fat), and total bacteria (log CFU/g). Data were calculated by Randomized Completely Design by repeated measurement and continued with Duncan Multiple Range Test. The results showed that storage duration had a highly significant effect ($p < 0.05$) on all major parameters, except ash content. Feed type had a significant effect ($p < 0.05$) on pH, colour, DL, WHC, moisture content, fat content, and total bacteria, indicating that the quality of feed could affect meat quality. Feed type determines the initial meat quality, while the dynamics of quality deterioration are more strongly influenced by storage duration. These findings are important for the development of nutritional strategies and postharvest management practices to maintain lamb meat quality at room temperature or in traditional markets.

Keywords: *Feed type, storage duration, repeated measures, meat quality*

EFFECTS OF MULTIMODAL TREATMENT ON LAMENESS RECOVERY, ACUTE PHASE PROTEINS, SUBSTANCE P, AND NOCICEPTION IN DAIRY COWS WITH CLAW HORN LESIONS

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Abstract

Claw horn lesions (CHLs) are important causes of lameness in dairy cows and are commonly associated with poor animal welfare. This study investigates the effects of multimodal treatments for CHL on lameness status, nociception and dynamics in acute-phase proteins (APPs) and substance P (SP) in early-lactating cows. A single-centre randomised clinical trial (RCT) was conducted, involving 93 lame cows allocated to four groups: TNHB (n = 25) received the standard multimodal treatment (therapeutic trim + NSAID + hoof block + bandaging), TNH (n = 22) was treated as the first group but without bandaging, while a bimodal treatment was applied in TH (therapeutic trim + hoof block) (n = 24) and TN (therapeutic trim + NSAID) (n = 22). Locomotion scoring, lesion progression and hoof pain tests were recorded at baseline (day 0) and weekly until day 30 post-treatment. Blood samples were collected before treatment (T1) and between days 14 and 18 (T2), and days 26 to 30 (T3) for APPs and SP measurement. TNH recorded the highest proportion of non-lame cows at week 3 (77%), and week 4 (82%), and this proportion was significantly higher than those of TNHB (60.0%), TH (63.6%) and TN (25.0%). TNH also spent significantly less time recovering than TNHB, TH, and TN. SAA concentrations were reduced significantly in TNH, the normal range at T3 ($5.62 \pm 1.97 \mu\text{g/mL}$) relative to TN ($14.53 \pm 1.31 \mu\text{g/mL}$) which remained markedly elevated. At T2 and T3, Hp concentrations were significantly lower in TNHB, TNH and TH than in TN. Treatments had no significant effect on SP concentrations over time. At T4, a significantly lower proportion of cows was positive for hoof pain in the TNH (27.3%) compared to TNHB (60.0%), TN (83.3%) and TH (59.0%). Multimodal therapy comprising hoof trimming, hoof block, and NSAID (without bandaging) was effective in reducing inflammation, pain responses, and improving locomotion in cows with CHL. SAA and Hp are better predictive biomarkers of recovery from painful CHLs in dairy cows compared to SP. Tailored treatment strategies are crucial for optimal pain management and addressing the welfare implications of CHLs in dairy cattle.

Keywords: *Claw horn lesions, dairy cows, lameness, animal welfare, acute phase protein*

FARM HEALTH AND MANAGEMENT ASSESSMENT OF RUMINANT FARMS UNDER LADANG ANGKAT PROGRAM IN SELANGOR, MALAYSIA: A DESCRIPTIVE STUDY USING THE FARM AND ANIMAL MANAGEMENT (FAHAM) CHECKLIST

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Abstract

The Farm and Animal Health Management (FAHAM) checklist is a multidomain on-farm assessment tool designed to evaluate ruminant farm performance across four domains: farm infrastructure, animal health management, nutrition and feeding, and biosecurity. This study aimed to characterize the health and management status of ruminant farms under Ladang Angkat Program Malaysia and to reports the descriptive findings from farm assessments conducted by veterinary students at Universiti Putra Malaysia (UPM). Thirteen ruminant farms across Selangor, with various species including caprine, ovine, and bovine were assessed using the 77-item binary FAHAM checklist. Scores were expressed as a percentage of compliant items relative to the total number of assessed criteria, and interdomain correlations were used as of holistic farm management. Descriptive statistics and Spearman rank correlations were computed using R statistical software. Results show that overall farm performance ranged from 29.9% to 88.3% (mean $\pm$ SD: 52.3 $\pm$ 18.2%), with the majority of farms categorized as "Needs improvement" (n=5) and "Fair" (n=4). Only two farms achieved an "Excellent" status. Among the four FAHAM domains, animal health management recorded the highest mean compliance (56.3%), followed by farm infrastructure (51.9%), biosecurity (47.3%), and nutrition and feeding (44.6%). Item-level analysis shows that feed container availability and daily sick animal examination are universally practiced, whereas visitor footbath and vehicle disinfection are absent across all assessed farms. Other critically low-compliance items include weight gain recording, treated drinking water, and emergency response planning. Spearman correlation analysis revealed significant positive associations, with interdomain correlations between farm infrastructure and both biosecurity ($\rho = 0.649$, $p = 0.016$) and animal health management ($\rho = 0.578$, $p = 0.039$), indicating that farm management quality is holistic and interconnected. These findings highlight substantial systemic gaps in biosecurity and nutrition management practices among assessed Malaysian ruminant farms. The study also highlights the importance of FAHAM integration into veterinary rotations for on-farm assessment and the collection of meaningful baseline data on management standards. Evidence-based, targeted interventions that address biosecurity protocols, nutritional management, and farm infrastructure are recommended to improve overall performance of ruminant farms in Malaysia.

Keywords: FAHAM, ruminant farms, farm assessment, biosecurity, animal health management

MILK YIELD AND REPRODUCTIVE PERFORMANCE OF HOLSTEIN COWS ACROSS SUCCESSIVE LACTATIONS IN A TROPICAL DAIRY SYSTEM

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Abstract

Lactation order exerts a major influence on milk production and reproductive efficiency in dairy cattle, yet evidence from tropical environments remains limited. This is the first study that evaluated the lactation performance of 100 Holstein cows managed under tropical conditions (intensive farming with milking herds more than 60-70%) using Holstein dairy longitudinal herd performance records from the first through fifth lactations. The dataset comprised 100, 94, 82, 80, and 46 lactation records analysis using IBM SPSS Statistics. One-way Analysis of Variance (ANOVA) used because more than two independent lactation groups were compared, respectively. Significant differences ($P < 0.05$) were detected among lactations for milk yield traits. Average daily milk yield increased from 19.25 ± 1.86 kg in the first lactation to a peak of 22.16 ± 1.84 kg in the third, then declined sharply to 5.48 ± 3.48 kg by the fifth. Monthly and total yields followed a similar trend, with maximum production in the third lactation (655.11 ± 52.88 kg/month; $6,932.84 \pm 771.87$ kg total). Mean days in milk were consistent across the first four lactations (310 - 313 days) but shorter in the fifth (274.85 ± 50.24 days). Calving interval was longest in the first lactation (360.50 ± 57.58 days) and progressively reduced thereafter (336.46 ± 65.49 days in the fourth). These results confirm that milk yield potential under tropical management peaks in the second and third lactations, followed by progressive decline. The reduced performance and shorter lactation in later parities indicate accelerated physiological wear and limited productive longevity, possibly exacerbated by heat stress, dietary requirements, and disease pressures common in tropical production systems. Incorporating the farm data on culling and survival, disease incidence, body condition score dynamics, and environmental indices (e.g., temperature-humidity index) would improve the interpretation of age-related yield decline. Such information is essential for refining breeding and management strategies to enhance the resilience and longevity of Holsteins in tropical dairying systems. As well as determining the suitability of this breed for Malaysia as a tropical dairy system to be more sustainable.

Keywords: *Dairy industry, tropical production, Holsteins, milk yield, Malaysia*

WHITE ROT FUNGI-MEDIATED BIOCONVERSION OF RICE STRAW SILAGE: EFFECTS ON PHYSICOCHEMICAL CHARACTERISTICS AND NUTRITIONAL QUALITY

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Abstract

Rice straw is an abundant by-product of paddy cultivation which is known as one of the most widespread lignocellulosic agricultural waste materials. The high lignin and silica content make the rice straw unfit to be used in ruminant feed due to its poor digestibility. The use of white-rot fungi for biological pretreatment is an environmentally friendly method to increase the nutritional content of rice straw. This study examined the nutritional composition of rice straw silage treated with enzyme extracts from *Schizophyllum commune* and *Ganoderma lucidum*. The experiment was conducted to assess the nutritional quality and physical properties of silage produced by mixing rice straw with fungal enzyme extracts under specific conditions. The results demonstrated that silage quality improved after fungal enzyme pretreatment, resulting in desirable pH levels, acceptable physical attributes (color, odor, and texture), the absence of mold, and reduced structural fibre content. The silage treatment resulted in higher crude protein levels, while fibre fractions became more degradable, indicating better access to cellulose and hemicellulose. The combined action of ligninolytic and hydrolytic enzymes resulted in partial delignification, altering the structure of the lignocellulosic material of the rice straw. The study demonstrates that white-rot fungal enzyme extracts improve the physical and nutritional attributes of rice straw silage, making it a more appropriate feed option for ruminants. The method promotes sustainable livestock farming by enabling effective management of agricultural waste and reducing environmental pollution from the open burning of rice straw.

Keywords: Rice straw, white rot fungi, enzyme, nutritional quality

INHIBITION OF BACTERIAL ISOLATES FROM SHEEP SEMEN USING ROSELLE, MULBERRY, AND LENGKUAS EXTRACTS

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Abstract

The use of antibiotics in semen extenders is essential to prevent bacterial contamination during small ruminant semen cryopreservation. However, growing concerns about antimicrobial resistance (AMR) have spurred the search for natural antimicrobial alternatives. This study aimed to evaluate the antimicrobial efficacy of ethanolic extract of Roselle (*Hibiscus sabdariffa*), Mulberry (*Morus alba*), and Lengkuas (*Alpinia galanga*) against bacterial isolates obtained from cryopreserved Barbados Blackbelly sheep semen. Semen samples from six rams (n=6) were evaluated for bacterial contamination, and isolates (*Bacillus cereus* and *Priestia aryabhattai*) were identified by agar diffusion, and subjected to minimum. Post-thaw progressive motility was lower in semen extenders without antibiotics than in antibiotic-supplemented extenders ($39.3 \pm 1.65\%$ vs $45.5 \pm 2.11\%$); however, the difference was not statistically significant ($p > 0.05$). Among the plant extracts evaluated, Lengkuas (*Alpinia galanga*) exhibited the strongest antimicrobial activity, with a minimum inhibitory concentration (MIC) of 10 mg/mL against both *Bacillus cereus* and *Priestia aryabhattai*. Roselle (*Hibiscus sabdariffa*) inhibited *B. cereus* at 10 mg/mL and *P. aryabhattai* at 50 mg/mL. In contrast, Mulberry showed comparatively weaker activity, with an MIC of 50 mg/mL against both bacterial isolates. At 10 mg/mL, Lengkuas produced inhibition zones of 6 ± 1.3 mm and 8 ± 1.3 mm against *B. cereus* and *P. aryabhattai*, respectively. In contrast, Roselle and Mulberry produced inhibition zones of 5 ± 2.5 mm against *B. cereus*. These findings suggest that Lengkuas extracts show potential for use as a natural antimicrobial and may serve as natural alternatives to antibiotics in semen extenders to reduce bacterial contamination during semen cryopreservation.

Keywords: Semen cryopreservation, plant extract, antimicrobial activity, semen extender, bacteria contamination.

COUNTRY-SPECIFIC EMISSION FACTOR FOR LOCAL DAIRY CATTLE OF MALAYSIA

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Abstract

This study developed state-specific enteric methane emission factors (EFs) for Malaysian dairy cattle using the IPCC Tier 2 methodology. Emission factors varied considerably among states and animal categories, reflecting differences in body weight, production stage, and feed quality. Milking cows consistently recorded the highest emissions, with EF values generally ranging from 88 to 118 kg CH₄ animal⁻¹ year⁻¹ across most states, while calves exhibited the lowest values (4.65–22.22 kg CH₄ animal⁻¹ year⁻¹). An exceptionally high estimate observed in Penang was associated with substantial inter-farm variability and should be interpreted with caution. To improve inventory accuracy, adjusted annual emission factors (EF2) were calculated by accounting for the actual number of days animals remained within each production category. The adjustment had the greatest impact on calves, reducing annual emissions by approximately 75% due to their shorter production cycle. In contrast, EF2 values for milking cows remained largely unchanged because they were present in production systems throughout the year. The results demonstrate significant inter-state variation in enteric methane emissions from Malaysian dairy cattle and highlight the importance of incorporating animal population structure and production duration into greenhouse gas inventories. These findings represent the first state-disaggregated, country-specific enteric methane emission factors for Malaysian dairy cattle developed using the IPCC Tier 2 approach. The study underscores the value of region-specific parameterization for improving the accuracy of national greenhouse gas inventories and supporting evidence-based climate mitigation strategies in the livestock sector.

Keywords: *Enteric methane, emission factor, dairy cattle, Malaysia, greenhouse gas*

DIAGNOSIS AND MANAGEMENT OF PITUITARY-DEPENDENT HYPERADRENOCORTICISM IN A SIBERIAN HUSKY

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Abstract

Pituitary-dependent hyperadrenocorticism (Cushing Disease) is an endocrine disorder commonly diagnosed in middle-age to older dogs. In this case report, the patient is a 10 year old Siberian Husky presented with polyphagia, polyuria, polydipsia, and a distended abdomen. Other clinical signs, including chronic skin disease and neurological abnormalities were not present in this case, but may also occur in affected patients. Accurate diagnosis requires ruling out other diseases with similar clinical presentations. Diagnostic work ups in this case report included a complete blood count, serum biochemistry, serum bile acid tests, abdominal radiography, abdominal ultrasonography, a low-dose dexamethasone suppression test, bile bacterial culture and liver biopsy. Vacuolar hepatopathy, a common sequela of prolonged cortisol exposure, was observed in this patient. Cholecystectomy may be indicated depending on the presence of a gallbladder mucocele; in this case, a gallbladder mucocele type 1 was identified from ultrasonography. Trilostane therapy was initiated to control cortisol levels and successfully managed the clinical signs of hypercortisolism. In conclusion, a combination of diagnostic tests is essential for a definitive diagnosis of pituitary-dependent hyperadrenocorticism. Long-term management with trilostane, along with cholecystectomy when indicated, can be effective in controlling the disease progression.

Keywords: *Hyperadrenocorticism, gall bladder mucocele, vacuolar hepatopathy, trilostane*

CARDIAC INTERVENTION FOR COMPANION ANIMALS IN MALAYSIA: PROSPECTS, CHALLENGES, AND EARLY CLINICAL EXPERIENCE

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Abstract

Interventional cardiology is redefining the management of companion animal cardiac disease in Malaysia, offering minimally invasive, catheter-based and hybrid alternatives to conventional medical therapy. While well established in advanced centres globally, its adoption locally remains nascent but is steadily gaining momentum. This presentation reviews the current experience with cardiac interventions in our clinic and highlights early clinical outcomes. Procedures performed include transcatheter edge-to-edge repair for canine myxomatous mitral valve disease, trans-jugular and arterial patent ductus arteriosus (PDA) closure in dogs, pulmonary artery banding in cats with ventricular septal defect, as well as heartworm extraction and left atrial decompression in dogs. These cases demonstrate the feasibility of performing advanced cardiac and hybrid interventions in companion animals within a resource-limited setting, with encouraging procedural success and favourable medium- to long-term outcomes. Despite these advances, several barriers remain. These include high setup costs, limited access to specialised equipment and technical expertise, financial constraints and risk tolerance among pet owners, as well as the lack of locally generated long-term outcome data. In addition, limited awareness among referring veterinarians continues to influence case selection and clinical decision-making. Nevertheless, the outlook remains promising. Increasing awareness among veterinarians and pet owners, together with targeted training initiatives and regional collaboration, is expected to further drive the growth and accessibility of interventional and hybrid cardiology in Malaysia.

Keywords: *Companion animal cardiology, minimally invasive therapy, Malaysia*

PLEURAL EFFUSION WITH MARKED MESOTHELIAL PROLIFERATION IN A YOUNG CAT: REACTIVE PROCESS OR UNDERLYING NEOPLASIA? A DIAGNOSTIC CHALLENGE IN A FELV POSITIVE CASE

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Abstract

Pleural effusion in cats presents a diagnostic challenge, particularly when cytologic findings suggest mesothelial proliferation that may mimic neoplasia. Differentiating reactive mesothelial hyperplasia from malignant mesothelioma or lymphoma is often difficult without histopathology. Feline Leukemia Virus (FeLV) infection further complicates interpretation due to its association with both inflammatory and neoplastic conditions. A 3-year-old domestic short-haired cat presented with dyspnea and was diagnosed with pleural effusion on thoracic radiography. Thoracocentesis yielded a non-exudative effusion, and a negative result for Feline Infectious Peritonitis (FIP) via a routine Rivalta test. Cytologic evaluation of the effusion revealed marked mesothelial cell proliferation, characterized by cellular clustering, anisocytosis, and prominent nucleoli, suggesting mesothelioma rather than reactive hyperplasia. FeLV infection was confirmed via a rapid test kit. The cat was treated with the RetroMAD antiviral protocol and supportive therapy. Despite treatment, the cat showed progressive clinical deterioration over a one-month period and ultimately died. This case highlights the limitations of cytology in distinguishing reactive mesothelial proliferation from malignant processes in cats with pleural effusion. In young cats, FeLV-associated disease, including lymphoma or inflammatory effusion, should remain a key differential diagnosis. A negative Rivalta test may help reduce suspicion of FIP, but does not exclude other serious conditions. This case emphasizes the importance of advanced diagnostics, including imaging and histopathology, and cautious interpretation of cytologic findings in guiding prognosis and treatment.

Keywords: *Feline, pleural effusion, mesothelial proliferation, Feline Leukemia Virus (FeLV), cytology*

EVALUATION OF MICROBIAL HYDROLYSED PROTEIN PALATABILITY IN FELINE DIETARY TRIALS

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Abstract

Cutaneous adverse food reaction (CAFR) is a common cause of non-seasonal pruritus in cats, diagnosed by diet elimination trial (gold standard), often requiring elimination diets based on novel or hydrolysed proteins. However, hydrolysed protein diets may present palatability challenges, limiting compliance. This study established a feeding trial protocol aimed at evaluating the palatability of a treatment diet containing microbial hydrolysed protein (MHP) compared to a control diet without MHP. A total of 27 clinically healthy cats (1–5 years old) were randomly selected from animal shelters in Selangor, Malaysia. The cats first underwent a pre-trial screening (obvious choice and side bias) to determine their suitability for subsequent adaptation and palatability testing. An adaptation period was conducted to minimise novelty-related responses (preference or aversion) and standardising the feeding routine. This also served to acclimate the cats to the investigator's presence ensuring that behavioural stress did not interfere with subsequent palatability data. Palatability was assessed using a two-bowl test, where cats were simultaneously offered both diets during a single 15-minute feeding session per day over two consecutive days. Feeding behaviour was video recorded, and intake ratios were calculated based on total consumption. This study successfully implemented a structured, multi-phase feeding protocol that accounted for individual cat bias and environmental stressors through specialized screening and adaptation periods.

Keywords: *Cutaneous adverse food reaction (CAFR), microbial hydrolysed protein (MHP), feeding trial protocol, cat*

PREPUTIAL PERINEAL URETHROSTOMY AS ALTERNATIVE SURGICAL TREATMENT IN A CAT

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Abstract

A 4-year-old castrated male Persian cat was presented to the University Veterinary Hospital (UVH), Universiti Putra Malaysia (UPM), with a primary complaint of chronic recurrent urinary incontinence. The cat had a history of urinary incontinence since March 2025 and was previously managed at a private clinic, experiencing five episodes between April and December 2025. From September to December 2025, five unsuccessful catheterization attempts were performed, likely due to suspected urethral narrowing, and the cat was referred to UVH for further diagnostic workup. Blood test results were unremarkable, while a positive contrast study revealed narrowing at the distal urethra. The cat underwent a preputial perineal urethrostomy in early January 2026 as an alternative to the traditional perineal urethrostomy technique. This method involves suturing the urethral mucosa to the preputial mucosa rather than to the skin, which may improve postoperative outcomes by opposing similar tissue layers. Postoperatively, the cat developed haematuria during hospitalization but improved clinically prior to discharge. The owner reported resolution of urinary incontinence, with no haematuria or other complications observed from Day 8 to Day 6 post-surgery. However, on Day 8 post-surgery, the cat presented with haematuria suggestive of feline idiopathic cystitis, despite having healthy perineal skin and no evidence of urethral stenosis on examination.

Keywords: *Urinary incontinence, perineal urethrostomy, preputial perineal urethrostomy, haematuria, Feline Idiopathic Cystitis*

CAUDAL SEGMENTAL MANDIBULECTOMY AS AN EFFECTIVE TREATMENT FOR UNILATERAL TEMPOROMANDIBULAR JOINT ANKYLOSIS IN A CAT

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Abstract

A 4-month-old domestic short hair cat was presented to the University Veterinary Hospital (UVH), University Putra Malaysia (UPM) with a history of inability to open its mouth. Upon physical examination, the cat had a maximum mouth opening (MMO) of 6mm with the tongue sticking out and the presence of halitosis. Although emaciated, appetite was good and the cat was able to lick and swallow slurry food. No other systemic signs were noticed. Complete blood count (CBC) and serum biochemistry (SBC) were conducted and only showed hypoalbuminaemia due to undernutrition and hyperglobulinaemia due to immune response. A CT-scan was performed on the cat which provided the findings of thickened, smooth new bone formation of the zygomatic process of left temporal bone, which extends around and fuses with the rostral aspect of the left temporomandibular joint (TMJ) causing reduced to absent joint space. Hence, a tentative diagnosis of a left TMJ ankylosis was made. A left mandibular deviation was also observed from the CT-scan. A left caudal segmental mandibulectomy with temporary tracheostomy was performed as the treatment. Immediately post-op, the cat is able to open its mouth with a MMO of 23mm. However, the mandible is moderately deviated to the left and malocclusion of the mouth was present. On Day 3 post-op, the cat is able to eat and masticate on kibbles. No pain present upon palpation of the lower mandible. On Day 13 post-op, the cat is still able to grab onto kibbles and masticate well. On Day 66 post-op, the cat is able to open its mouth smoothly without pain and the MMO remains at 23mm.

Keywords: *Temporomandibular joint, ankylosis, segmental mandibulectomy, maximum mouth opening*

ARTICULAR FIXATION CAUSING BIOMECHANICAL DYSFUNCTION AS A PRIMARY ETIOLOGY FOR REFRACTORY NON-WEIGHT BEARING LAMENESS: A CANINE CHIROPRACTIC CASE STUDY

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Abstract

Non-weight bearing lameness (NWBL) in canine patients is frequently attributed to acute orthopedic trauma or neurological deficits. However, when clinical imaging and neurological examinations yield non-significant findings (NSF), the role of global body malalignment and joint fixation should be considered as a probable mechanical cause. This case study evaluates a 12-year-old spayed female Pomeranian with a complex history of orthopedic intervention in February 2021 encompassing a left sacroiliac luxation repair, right comminuted pelvic fracture repair and a right femoral head ostectomy (FHO). The initial surgical outcome was successful. The patient was represented in October 2024 with NWBL of the right hind (RH) limb. Consultations with the previous orthopedic surgeon, a neuro specialist as well as conventional pharmacological management (Meloxicam, Gabapentin, Galliprant and Mecobalamin) failed to restore function. The dog soon started to develop significant RH muscle atrophy. Dog was presented in November 2024 for chiropractic assessment which revealed significant multi-segmental fixations such as C1-C2 and C4-5 subluxations, outward rotation of the right front elbow, reverse S-shaped thoracolumbar scoliosis as well as incorrect angulation of the RH joints. These findings suggest a state of "functional lockdown" where fixated joint angles and compensatory scoliosis inhibited the neural drive and mechanical ability to weight-bear. A protocol of manual chiropractic adjustments was implemented over five weeks. By the end of the third weekly session, the patient initiated independent standing. Following the fifth session, the patient achieved full functional mobility and independent four-legged gait. This case suggests that chronic NWBL could possibly be primarily mechanical in origin, stemming from global skeletal malalignment. This highlights the necessity of biomechanical assessment in refractory lameness cases where conventional diagnostics are inconclusive.

Keywords: *Chiropractic, non-weight bearing lameness, body malalignment, canine biomechanics, functional recovery*

EVALUATION OF THE ANTIPARASITIC ACTIVITY OF NONI FRUIT (*Morinda citrifolia*) EXTRACT AGAINST *Toxoplasma Gondii*: AN IN VIVO STUDY

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Abstract

Toxoplasmosis, induced by *Toxoplasma gondii*, is a zoonotic infection exemplifying the One Health paradigm that connects human, animal, and environmental health. *Morinda citrifolia* (noni) fruit is extensively utilized in traditional medicine and has bioactive substances with antioxidant, immunomodulatory, and anti-inflammatory attributes that may aid in managing parasite infections. This study sought to assess the efficacy of *M. citrifolia* fruit extract as an alternative treatment for *T. gondii* infection in vivo and to identify the best dosage. A genuine experimental investigation utilizing a post-test control group design was conducted. Male white rats were randomly allocated into multiple groups, and infection was induced through the intraperitoneal administration of RH-strain tachyzoites. The extract was administered at multiple dosage levels. The observed parameters included clinical scores, body weight changes, hematological parameters, and microscopic findings. Data were analyzed using One-Way Analysis of Variance (ANOVA), followed by Tukey's post hoc test to determine differences between groups. The results demonstrated that *M. citrifolia* fruit extract exerted a protective effect against *T. gondii* infection, with the 200 mg/kg body weight dose identified as the most optimal in improving clinical conditions, hematological parameters, and microscopic features. These findings support noni extract as a safe adjunctive antiparasitic candidate for managing toxoplasmosis through immunomodulatory mechanisms.

Keywords: Antiparasitic activity, *Morinda citrifolia*, *Toxoplasma gondii*, hematology, clinical score

THREE FACES OF FELINE ANEMIA: CLINICAL INTERPRETATION OF IMMATURE RETICULOCYTE FRACTION IN MARROW DYNAMICS

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Abstract

The Immature Reticulocyte Fraction (IRF), which is the proportion of the most RNA-rich reticulocytes quantified by fluorescence flow cytometry, is currently recognised as a sensitive and early marker of marrow kinetics that complements the reticulocyte percentage. IRF offers veterinarians a practical means of understanding the rate of erythropoietic acceleration for effective red blood cell production. It reflects rapid erythropoietic activation following stimuli such as anemia, hypoxia or hemolysis, which rises before mature reticulocytes appear in circulation. The IRF benchmarks help to differentiate erythropoietic responses. The IRF in regenerative anemia generally has markedly elevation of IRF (mean of 69.9%). Meanwhile, inflammatory non-regenerative anemia has moderately increased IRF (mean of 42.5%), and bone marrow failure, presumably impaired erythropoiesis, has low IRF levels (mean of 25.9%). To illustrate this concept, three feline anaemia cases of different pathophysiological states were analysed on the Mindray BC-60R Vet. In the first case, a 15-year-old cat with severe macrocytic hypochromic anaemia (PCV of 10%) and marked thrombocytopenia, presumed secondary to mycoplasmosis or immune-mediated destruction, demonstrated an IRF of 78.5%, indicating maximal erythropoietic drive and profound marrow hyperplasia. In the second case, a 12-year-old cat with chronic severe inflammation and moderate microcytic non-regenerative anemia (PCV 22%) showed a reticulocyte percentage within the normal range. However, the IRF (35.4%) is consistent with accelerated, but inadequate erythropoietic activity due to chronic inflammation. The third case illustrates an adult feral cat showing lethargy and dehydration, presenting with a low normal PCV (25%) and a low IRF (14.4%), indicating a non-responsive anemia attributed to bone marrow failure. Together, these cases showcase the advantages of IRF and reticulocyte indices in refining the distinction between bone marrow failure, anemia of inflammatory diseases and regenerative anemia, enabling veterinarians to make earlier, more rational diagnostic and therapeutic decisions.

Keywords: *Immature reticulocyte fraction, feline anemia, erythropoiesis, bone marrow failure, anemia of inflammatory disease*

REVOLUTIONIZING VETERINARY DIAGNOSTICS: PRECISE ESTROGEN AND PROGESTERONE RECEPTOR DETECTION IN SMALL ANIMAL MAMMARY GLAND TUMOURS USING IN SILICO DNA-APTAMER TECHNOLOGY

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Abstract

Mammary gland tumours are among the most common neoplasms in small animals with more than 50% cases in dogs and up to 90% of cases in cats which are malignant. Prognosis and treatment decisions currently rely on clinical staging and histological grading. Hormone receptor biomarkers, particularly estrogen receptor (ER) and progesterone receptor (PR), have emerged as promising prognostic indicators, with reduced expression associated with higher tumour grade and worse prognosis. Despite their potential, routine assessment of ER and PR relies on immunohistochemistry (IHC), a method constrained by high cost, batch-to-batch variation, and variable sensitivity and specificity. This pilot study aims to develop a novel in silico-based DNA-Aptamer assay targeting the ER and PR in canine and feline mammary gland tumours using biocomputational technology and to evaluate its diagnostic and prognostic potential in mammary gland tumours. Numerous DNA-Aptamer candidates were designed consisting of several stem-hairpin loops structures. Quantitative analysis from mfold and Molecular Dynamic (MD) simulations identified 4 optimal candidates ranging from 27 to 50 mers, exhibiting high structural stability (ΔG -5.0 to -17.0 kcal/mol). These DNA-Aptamers demonstrated high-affinity binding toward ER and PR (-11.0 to -22.0 kcal/mol) mediated primarily through hydrogen bonding interaction. Cross-reactivity analysis further confirmed the non-specific binding was negligible, indicating that the DNA-Aptamers were selectively bound to the target ER and PR. *In vitro* tissue validation via Aptahistochemistry (AHC) in mammary gland tumour samples showed specific nuclear expression of DNA-Aptamers targeting ER in different histological grades. These preliminary findings showed the promising potential of DNA-Aptamers as cost-effective, high-precision diagnostic and prognostic tools for mammary gland tumour detection in feline and canine.

Keywords: *Mammary gland tumour, ER, PR, in silico aptamer, aptahistochemistry*

COX-2 EXPRESSION AS A MOLECULAR SIGNATURE OF MALIGNANT PROGRESSION IN CANINE MAMMARY TUMORS

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Abstract

Cyclooxygenase-2 (COX-2) contributes to carcinogenesis through prostaglandin-mediated effects on cell proliferation, apoptosis resistance, angiogenesis, and tumor-associated inflammation. In canine mammary tumors (CMTs), its clinicopathologic relevance remains incompletely defined in routine diagnostic practice. This study aims to evaluate the association between COX-2 immunoexpression and histological grade in canine mammary tumors and to examine its value as a candidate biomarker of malignant progression. A retrospective study was performed using 24 formalin-fixed, paraffin-embedded canine mammary tumor samples archived between 2021 and 2024. Histological grading was conducted according to Zappulli et al. (2019). COX-2 expression was assessed by immunohistochemistry and scored using an immunohistochemical score (IHS; range 0-12) based on the proportion of positive cells and staining intensity. The relationship between IHS and tumor grade was evaluated using Spearman rank correlation. COX-2 positivity was observed in 18/24 cases (75.0%). Positive staining was detected in 3/5 grade I tumors (60.0%), 10/13 grade II tumors (76.9%), and 5/6 grade III tumors (83.3%). The overall median IHS was 1 (mean 1.54; range 0-6). COX-2 expression increased across grades, and a significant positive correlation was identified between IHS and tumor grade ($\rho = 0.407$, $p = 0.048$). In conclusion, COX-2 expression is associated with increasing histological grade in canine mammary tumors and may serve as an adjunct biomarker of malignant progression. Given the modest effect size and limited sample number, COX-2 should be interpreted in conjunction with conventional histopathology and additional molecular markers.

Keywords: *Canine mammary tumor, COX-2, immunohistochemistry, biomarker, histological grade*

FISH OIL AS A DUAL MODULATOR OF AMYLOID AND TAU PATHOLOGY IN HYPERGLYCAEMIC RATS

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Abstract

Chronic hyperglycaemia has been strongly associated with an increased risk of Alzheimer's disease (AD), primarily through mechanisms involving brain insulin resistance and persistent neuroinflammation. The present study investigated whether fish oil supplementation could attenuate amyloid- β ($A\beta$ 1–42) deposition and tau phosphorylation via anti-inflammatory mechanisms in streptozotocin–lipopolysaccharide (STZ-LPS)-induced rats, a combined diabetic–Alzheimer's disease-like model. Diabetes was induced using streptozotocin, followed by lipopolysaccharide administration to promote neuroinflammatory responses and AD-like pathology. Fish oil, rich in omega-3 polyunsaturated fatty acids (EPA and DHA), was administered orally at therapeutic doses for six weeks. STZ-LPS induction resulted in persistent hyperglycaemia, elevated pro-inflammatory cytokines (TNF- α and IL-6), increased total amyloid precursor protein (APP), enhanced $A\beta$ 1–42 deposition in the cerebral cortex and hippocampus, and significant tau hyperphosphorylation at Ser202. These pathological alterations were accompanied by impaired cognitive performance in the Y-maze test. Fish oil supplementation significantly reduced TNF- α and IL-6 levels, indicating suppression of neuroinflammation. Importantly, fish oil-treated groups exhibited decreased APP expression, reduced $A\beta$ 1–42 accumulation, and lower levels of phosphorylated tau (Ser202) compared to untreated STZ-LPS rats. Improvements in amyloid and tau pathology were paralleled by enhanced cognitive performance. Mechanistically, the findings suggest that fish oil mitigates AD-like neuropathology primarily through modulation of inflammatory pathways and restoration of brain insulin signaling, thereby limiting amyloidogenic processing and abnormal tau phosphorylation. These results highlight the therapeutic potential of omega-3 fatty acids as a dietary intervention targeting inflammation-driven amyloid and tau pathology in diabetes-associated Alzheimer's disease. Fish oil supplementation may represent a promising adjunct strategy to reduce neurodegenerative progression under hyperglycaemic conditions.

Keywords: *Fish oil, Amyloid- β 1–42, Tau phosphorylation (Ser202), neuroinflammation, diabetic alzheimer's model*

MODULATION OF PROINFLAMMATORY AND PROFIBROTIC GENE EXPRESSION BY ENALAPRIL, CHLOROGENIC ACID, AND MORUS ALBA LEAF EXTRACT IN EXPERIMENTAL RENAL FIBROSIS

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Abstract

Renal fibrosis is the pathological hallmark of chronic kidney disease and is characterised by persistent inflammation, activation of profibrotic signaling pathways, and excessive extracellular matrix deposition. Targeting molecular mediators involved in inflammation and fibrogenesis remains a key therapeutic strategy. This study aimed to evaluate the modulation of proinflammatory and profibrotic gene expression by enalapril, chlorogenic acid (CGA), and *Morus alba* Linn. leaf extract (MLE) in an experimental model of renal fibrosis. Twenty-five male BALB/c mice were subjected to unilateral ureteral obstruction (UUO) to induce renal fibrosis and divided into five groups: sham-operated control, untreated UUO, UUO treated with enalapril (15 mg/kg), UUO treated with MLE (125 mg/kg), and UUO treated with CGA (25 mg/kg). Total RNA was extracted from kidney tissue, reverse-transcribed into cDNA, and gene expression was quantified using real-time quantitative polymerase chain reaction (RT-qPCR). The expression levels of proinflammatory genes (TLR4, MCP-1, ICAM-1) and profibrotic markers (TGF- β 1, α -SMA, and Collagen-1) were analyzed. UUO induction significantly upregulated the expression of TLR4, MCP-1, and ICAM-1, indicating enhanced inflammatory responses. Concurrently, profibrotic genes including TGF- β 1, α -SMA, and Collagen-1 were markedly elevated, reflecting activation of the TGF- β /Smad pathway and myofibroblast differentiation. Enalapril treatment significantly downregulated TGF- β 1 and inflammatory mediators, confirming its renoprotective and antifibrotic properties. Similarly, MLE and CGA treatments significantly reduced the expression of TLR4, MCP-1, and ICAM-1, suggesting suppression of inflammatory signaling. Both treatments also attenuated TGF- β 1, α -SMA, and Collagen-1 gene expression, indicating inhibition of extracellular matrix accumulation and fibrogenesis. Overall, these findings demonstrate that MLE and CGA exert molecular protective effects comparable to enalapril by modulating key proinflammatory and profibrotic genes in UUO-induced renal fibrosis. The suppression of TGF- β 1-mediated signaling and downstream fibrotic markers suggests their potential as alternative or adjunct therapeutic agents for preventing the progression of renal fibrosis.

Keywords: Renal fibrosis, UUO model, TGF- β 1, TLR4, α -SMA, Collagen-1, Chlorogenic acid, *Morus alba*.

CANCER STEM CELLS IN CANINE MAMMARY ADENOCARCINOMA: GENE UPREGULATION AND A REVIEW OF NUCLEAR RECEPTORS

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Abstract

Canine mammary adenocarcinoma is the most common tumour in the female dog, and has been proposed severally to be a model for human breast cancer. Cancer stem cell (CSC) is defined as a cell within a tumour that possesses the capacity to self-renew and to cause the heterogeneous lineages of cancer cells that comprise the tumour. The CSCs are able to achieve the said characteristics due to their ability to self-renew, live for a long time, inherently resist chemotherapy drugs, resist apoptosis, undergo a dormant state and differentiate into tumour cells. Cancer stem cells, despite making up to just 0.1 – 4% of the total cancer cells, can initiate tumours, cause metastasis and recurrence even after a supposed successful treatment. It is therefore imperative to identify genes and proteins in the CSC that can be therapeutically targeted. The aim of this study is to isolate CSC from a canine mammary gland adenocarcinoma (CMA) cell line, and determine the dysregulated genes in the CSCs compared with the original cell line. Putative CSC were isolated using flow cytometry (CD44⁺ and 24^{-/low}) and confirmed using QPCR for ALDH expression. Custom-designed microarray was used to identify dysregulated genes between the CSCs and the original cell line. The isolated CSC were CD44⁺ and CD24^{-/low}, with a 9-fold increase in ALDH (CSC marker) expression in the CSC. The CSCs made up 2.8% of the total tumour cells. Genes upregulated in the CSCs include Nuclear Receptor subfamily 4, group A, members 1 and 2 (NR4A1 and NR4A2). These genes are upregulated in the CSC by about 7-folds compared to the original cell line. Cancer stem cells form a small percentage of total tumour cells, but are significant in development and progression of cancer. Nuclear receptors have been reported to play significant roles in normal hematopoietic stem cells and in CSC of some human cancers. Their upregulation in cancer has been associated with tumorigenesis, invasion, metastasis and even drug resistance in a few cancer types in human oncology. Additionally, these receptors have been suggested as targets of immunotherapy in breast cancer. Their upregulation in these CMA CSC highlights their possible influence on maintenance of CSC phenotype and makes them worthy targets of further studies especially in veterinary oncology to determine their mechanism of effect on CMA for possible therapeutic targeting not just in the general cancer cells, but also in CSC.

Keywords: *Cancer stem cells, mammary gland tumour, nuclear receptors, canine*

A STUDY ON THE IN VITRO VIRUCIDAL ACTIVITY OF PARAFORMIC ACID AND FORMIC ACID AGAINST AVIAN INFLUENZA VIRUS H9N2

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Abstract

Avian influenza virus H9N2 is a low-pathogenic but widely prevalent subtype that continues to threaten poultry production due to its high infectivity, frequent co-infection with other pathogens, zoonotic potential, and role as an internal gene donor for other avian influenza viruses. Effective biosecurity measures are therefore essential to reduce virus transmission within poultry systems. Formic acid is widely used in feed hygiene and farm sanitation due to its broad antimicrobial activity, however, its practical application is constrained by its pungent odor, irritant effects, and corrosive properties. Paraformic acid, an innovative derivative of formic acid, has been developed to improve handling safety and material compatibility while maintaining strong antimicrobial activity. The present study evaluated the in vitro virucidal activity of paraformic acid against avian influenza virus H9N2 in comparison to formic acid. The H9N2 virus was propagated under standard laboratory conditions in an ICLAS Laboratory Animal Quality Network-qualified facility. The initial viral titre before treatment was 1.0×10^6 PFU/mL, as determined by plaque assay. Paraformic acid was diluted in phosphate-buffered saline at 1:400, 1:300, and 1:200, corresponding to 2.5, 3.3, and 5.0 mL/L, respectively. Virus suspensions were exposed to each treatment for 10 min, with phosphate-buffered saline as the untreated control. Formic acid (85%) at 1:200 (4.25 mL/L) was included as the reference treatment. Residual viral infectivity after exposure was assessed by plaque assay. Paraformic acid showed a clear concentration-dependent virucidal response against H9N2. Complete viral inactivation was achieved at 1:300 and 1:200, with no detectable infectivity after treatment. At these concentrations, paraformic acid produced a mean viral reduction of 2.5 log₁₀, corresponding to a killing rate of 99.68%. In contrast, activity declined at 1:400, where viral reduction decreased to 1.0 log₁₀, indicating reduced efficacy at the lower concentration. In comparison to formic acid reference, paraformic acid achieved a comparable antiviral endpoint while remaining effective at a lower formic acid-equivalent concentration. In conclusion, paraformic acid exhibited strong in vitro antiviral activity against H9N2 and may serve as a practical acid-based biosecurity intervention for poultry production, warranting further validation under in vivo and commercial conditions.

Keywords: *Paraformic acid, formic acid, H9N2, avian influenza virus, virucidal activity*

EVALUATING *L. VANNAMEI* CHITOSAN EFFECTIVENESS AGAINST FUNGAL INFECTIONS IN RAT SKIN

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Abstract

This study evaluates the potential of shrimp-derived chitosan (*Litopenaeus vannamei*) as an alternative antifungal therapy against *Curvularia* sp. infections, which frequently affect the skin of companion animals. Using a rat model (*Rattus rattus*), the research focused on analyzing histopathological changes and cytokeratin expression to determine the efficacy of chitosan in restoring epidermal integrity. The subjects were divided into six groups, including a miconazole-treated positive control and four chitosan treatment groups with concentrations ranging from 1.25% to 10%. The qualitative histopathological evaluation revealed that while all groups exhibited signs of infection—such as exocytosis, spongiosis, and cellular necrosis—the severity varied significantly across treatments. Quantitative analysis of cytokeratin expression via One-Way ANOVA further demonstrated the physiological recovery of the skin. The results indicated that 5% chitosan outperformed other concentrations, showing the most significant improvement in skin tissue structure and the highest increase in cytokeratin expression levels. In conclusion, 5% chitosan represents the optimal therapeutic dose for treating *Curvularia* sp. infections. It effectively promotes tissue repair and strengthens the epidermal barrier, proving to be a potent and sustainable alternative to conventional antifungal agents. This concentration provides a balanced approach to healing, ensuring significant histopathological recovery and enhanced protein expression for skin regeneration.

Keywords : *Curvularia* sp., cytokeratin, Chitosan, histopathology

ANTIFERTILITY EFFECT OF CONTRACEPTIVES ON OVARIAN AND UTERINE STRUCTURES IN SPRAGUE-DAWLEY RATS

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Abstract

Depredation by pests remains a major constraint to agricultural productivity and a source of zoonotic disease transmission, necessitating environmentally sustainable control strategies. Fertility control has emerged as a promising alternative to conventional rodenticides. This study evaluated the antifertility effects of two contraceptive baits, Contraceptol (botanical-based) and ROCO2, on the female reproductive system of Sprague-Dawley rats. Female rats were administered low and high doses of each bait for 15 days, followed by macroscopic, histopathological, and histomorphometry assessment of ovarian and uterine tissues. Contraceptol treatment resulted in increased ovarian and uterine weights, accompanied by mild to moderate follicular atresia, partial depletion of follicular populations, and moderate uterine alterations. In contrast, ROCO2 induced a marked, dose-dependent reduction in reproductive organ weights and severe histopathological damage, including extensive follicular depletion, granulosa cell degeneration, increased atretic follicles, and suppression of corpus luteum formation. Uterine changes in ROCO2-treated groups were pronounced, characterised by significant endometrial thinning, glandular regression, epithelial degeneration, stromal oedema, vascular congestion, and inflammation. Collectively, both agents disrupted female reproductive function; however, ROCO2 exerted a significantly greater antifertility effect by profoundly impairing folliculogenesis, oocyte viability, and uterine integrity. These findings highlight the potential of fertility control, particularly ROCO2, as an effective and sustainable strategy for rodent population management.

Keywords: *Contraceptol, Fertility control, ROCO2, Sprague-Dawley rats*

ADVANCING AVIAN IMMUNOLOGY THROUGH CELLULAR IMMORTALIZATION: MULTI-PARAMETRIC CHARACTERIZATION OF A NOVEL CHICKEN BONE MARROW-DERIVED DENDRITIC CELL LINE WITH PRESERVED IDENTITY AND VIRAL PERMISSIVENESS

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Abstract

Dendritic cells (DCs) are highly specialized antigen-presenting cells that play a central role in linking innate and adaptive immune responses and are critical for host defense against viral infections. This study aimed to establish and characterize an immortalized chicken bone marrow-derived dendritic cell line (Immort-chBMDC) using Simian Virus 40 Large T antigen (SV40-LT) and to evaluate its suitability as an *in vitro* model for avian viral infection studies. Primary ch-BMDCs were generated from specific pathogen-free chickens and immortalized using SV40-LT-mediated transformation. Phenotypic characterization was performed using flow cytometry to assess the expression of dendritic cell markers, including major histocompatibility complex class II (MHC-II) and CD11c. Functional competence was evaluated following stimulation with lipopolysaccharide (LPS) and infection with very virulent infectious bursal disease virus (vvIBDV). The immortalized cell line exhibited continuous proliferation while maintaining characteristic dendritic cell morphology, including stellate appearance, dendritic projections, cellular clustering, and complex surface structures. Flow cytometric analysis confirmed sustained expression of MHC-II and CD11c, thereby preserving dendritic cell identity. Following exposure to LPS and vvIBDV, Immort-chBMDCs showed significant upregulation of dendritic cell activation markers, indicating retained immunological responsiveness. NDV infection studies demonstrated that both primary and immortalized cells were permissive to infection. However, immortalized ch-BMDCs supported prolonged viral replication, whereas primary ch-BMDCs displayed stronger antiviral responses associated with viral clearance. In conclusion, this study successfully established the first immortalized chicken bone marrow-derived dendritic cell line that retains key phenotypic and functional characteristics of primary dendritic cells. This cell line provides a robust, reproducible, and ethically sustainable platform for avian immunology research, viral pathogenesis studies, vaccine evaluation, and high-throughput screening, thereby enhancing investigations of host-virus interactions in poultry.

Keywords: *Chicken bone marrow-derived dendritic cells (ch-BMDCs), SV40 Large T antigen, immortalization, Infectious bursal disease virus, Newcastle disease virus*

AFRICAN HORSE SICKNESS - EPIDEMIOLOGICAL OVERVIEW WITH FOCUS ON MALAYSIA AND SOUTHEAST ASIA

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Abstract

African Horse Sickness (AHS) is a highly lethal, vector-borne disease caused by an *Orbivirus* that poses a catastrophic threat to naive equine populations globally. In 2020, Southeast Asia suffered a major epidemiological shift when an outbreak of African Horse Sickness Virus (AHSV) Serotype 1 struck Thailand, followed by a secondary, highly localised incursion of AHSV Serotype 9 in Mukim Manir, Terengganu, Malaysia, which was introduced via unmonitored overland horse movement across the porous Thai-Malaysian border. To investigate this cross-border dynamic, a systematic review and meta-analysis were executed following PRISMA 2020 guidelines across PubMed, Scopus, and Web of Science databases. Out of 120 initial records, 35 high-quality studies published between 1977 and 2025 were analysed using a random-effects model to calculate the pooled global Case Fatality Rate (CFR), while a Weighted Least Squares meta-regression assessed temporal virulence attenuation. Methodological quality and publication bias were validated using a five-dimension Risk of Bias matrix and funnel plot asymmetry analysis, integrated with localised socio-demographic field data from the Malaysian surveillance campaign. The meta-analysis established a pooled global CFR estimate approaching 85% to 100% in naive equine populations, matching the 100% mortality observed in the Terengganu index cluster. The meta-regression confirmed that this high virulence is temporally stable and has not naturally attenuated over time. Entomological data supported the "Bridge Vector Hypothesis," proving that indigenous Southeast Asian midges, specifically *Culicoides orientalis*, possess the ecological competence to sustain transmission. Local holding profiles revealed extreme vulnerability, with 78.4% categorised as small-scale backyard operations and 86.5% utilising open-air, unscreened stabling. In conclusion, the 2020 Terengganu incursion demonstrates that local spatial containment cannot compensate for porous international perimeters, as unmonitored overland trade transit from Thailand resulted in a three-year WOAHS status suspension for Malaysia. Mitigating future transboundary incursions requires shifting from a reactive domestic containment model to an aggressive border-management strategy. Critical policy recommendations include enforcing mandatory molecular screening at border corridors, vector-proofing rural backyard stabling, and establishing a synchronised ASEAN Equine Health Zone, while future research must prioritise cross-border vector competence mapping and the development of recombinant, DIVA-compliant subunit vaccines to safeguard the regional equine industry.

Keywords: *African Horse Sickness, Arboviral epidemiology, Culicoides vectors, Southeast Asia outbreak*

DETECTION AND RISK FACTORS OF *ISOSPORA* SPP. IN CATS FROM BADUNG AND DENPASAR REGENCY

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Abstract

Gastrointestinal protozoan infections such as *Isospora* spp. remain an important concern in cats living in tropical regions, including Bali, due to their strong association with environmental sanitation and improper husbandry practices. The presence of *Isospora* spp. oocysts in feline faeces can contaminate the environment and cause gastrointestinal disorders, particularly in young or immunocompromised cats. This study aimed to detect the presence of *Isospora* spp. and analyze the risk factors associated with infection in cats from Badung Regency and Denpasar City. A cross-sectional descriptive design was applied. A total of 100 faecal samples were collected using a purposive sampling method and examined microscopically through Sheather's sugar flotation technique. Risk factor data were obtained from questionnaires administered to cat owners and analyzed using Chi-square and logistic regression tests at a significance level of $p < 0.05$. The results showed a prevalence of *Isospora* spp. infection of 21% (95% CI: 13.5–30.3). Four risk factors were significantly associated with infection: cat origin (rescue) (OR 3.4; 95% CI: 1.1–12.2; $p = 0.037$), age over one year (OR 1.6; 95% CI: 1.1–6.0; $p = 0.030$), non-caged management (OR 3.1; 95% CI: 1.0–9.8; $p = 0.046$), and mixed feeding (OR 2.8; 95% CI: 1.0–8.3; $p = 0.048$). This study concludes that *Isospora* spp. infection is endemic among the cat population in Bali and closely related to environmental and husbandry factors. The four significant risk factors identified should be prioritized in control strategies based on the One Health approach. It is recommended to improve environmental hygiene, provide commercial feed, and monitor rescue and free-roaming cats to reduce infection risks.

Keywords: *Bali, cats, Isospora spp., risk factors*

HISTOPATHOLOGICAL, IMMUNOHISTOCHEMICAL, AND MOLECULAR DETECTION OF CLASSICAL SWINE FEVER VIRUS IN ARCHIVED FORMALIN-FIXED PARAFFIN-EMBEDDED PIG TISSUES

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Abstract

Classical swine fever virus (CSFV) remains an economically important transboundary disease of pigs, with sporadic outbreaks reported in several regions despite ongoing vaccination programs. This study investigated the presence and characteristics of CSFV in archived formalin-fixed paraffin-embedded (FFPE) porcine tissues from Malaysia using an integrated histopathological, immunohistochemical, and molecular approach. A retrospective cohort design was employed, utilizing 375 FFPE tissue blocks representing 100 pigs collected between 2018 and 2024 from the Histopathology Laboratory, Faculty of Veterinary Medicine, Universiti Putra Malaysia. Based on tissue preservation, clinical history, and histopathological features suggestive of CSFV infection, 64 FFPE blocks from 13 pigs were selected for detailed evaluation. Histopathological examination revealed consistent lymphoid and vascular lesions, including lymphoid depletion, necrosis, congestion, and haemorrhage, predominantly affecting the spleen and lymph nodes, with additional multisystemic involvement of the gastrointestinal tract, lungs, and kidneys. Immunohistochemical analysis demonstrated CSFV antigen localization in five cases, primarily within macrophages, epithelial cells, and endothelial cells of lymphoid and non-lymphoid tissues. Molecular detection using two-step PCR targeting the 5' untranslated region of the CSFV genome confirmed viral RNA in one immunohistochemically positive case. Phylogenetic analysis placed the Malaysian isolate within genotype 1, showing close genetic relatedness to classical strains while remaining distinct from the vaccine strain. The findings demonstrate that archived FFPE tissues retain sufficient diagnostic value for retrospective CSFV surveillance and support the combined use of pathology, immunohistochemistry, and molecular tools in disease monitoring, particularly where fresh samples are unavailable.

Keywords: *Classical Swine Fever virus, FFPE tissues, histopathology, immunohistochemistry, phylogenetic analysis*

EPIDEMIOLOGICAL AND MOLECULAR DETECTION OF *Salmonella* spp. IN CHICKEN MEAT FROM WET MARKETS AND HYPERMARKETS IN NORTH KELANTAN

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Abstract

Salmonellosis, caused by *Salmonella* spp., is one of the most significant foodborne zoonotic diseases globally, posing major public health and economic burdens. In Malaysia, the poultry industry has expanded rapidly, contributing significantly to national food security and economy, with increasing production to meet domestic and export demand. However, this growth is accompanied by heightened risks of foodborne contamination. Kelantan, a northeastern agricultural state, provided an important setting to investigate the persistence and transmission of *Salmonella* in poultry supply chains. This study aimed to identify *Salmonella* spp. in raw chicken meat and environmental samples, determine associated risk factors from wet markets and hypermarkets across five districts in North Kelantan (Kota Bharu, Bachok, Tumpat, Tanah Merah and Pasir Mas). A total of 210 samples, including chicken meat and environmental samples (knives, cutting boards, boots and rinse water) were collected. Samples were enriched in Buffered Peptone Water followed by Rappaport-Vassiliadis enrichment broth and cultured on XLD and Brilliant Green Agar. Suspected isolates were confirmed using biochemical tests including Triple Sugar Iron, Citrate and SIM tests. In addition, 30 structured questionnaires covering source, traceability, storage conditions, hygiene practices, equipment handling and antibiotic use were administered. Out of 210 samples, 159 (75.7%) were positive for *Salmonella*. The high prevalence indicated widespread contamination across retail environments. Questionnaire data indicated gaps in hygiene practices, temperature control and biosecurity measures, potentially contributing to contamination and cross-transmission. The findings highlighted a significant public health risk associated with *Salmonella* in poultry products in Kelantan. Strengthening biosecurity, improving food handling practices and monitoring antimicrobial resistance are essential to reduce foodborne transmission and safeguard public health.

Keywords: *Salmonella, poultry, antimicrobial resistance, chicken meat, public health*

THE CIRCULAR JOURNEY TOWARDS ONE HEALTH: TRANSFORMING WASTE INTO WEALTH FOR FOOD, SECURITY, ANIMAL HEALTH, HUMAN WELL-BEING, ENVIRONMENTAL SUSTAINABILITY AND CLIMATE RESILIENCE

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Abstract

The increasing challenges of food insecurity, livestock waste accumulation, soil degradation, environmental pollution, and climate change require integrated solutions that recognize the interconnectedness of human, animal, plant, and environmental health. The One Health framework provides a holistic approach to addressing these challenges through sustainable resource management and cross-sector collaboration. The CropX Circular Agriculture Model was developed by Tan Lan Agri Venture Sdn. Bhd. as a practical pathway towards achieving One Health through soil rehabilitation, circular economy principles, greenhouse gas mitigation, and waste-to-wealth transformation. The model is founded on the principle that healthy soil serves as the foundation for healthy plants, healthy animals, healthy food systems, healthy communities, and a healthy environment. A key feature of the model is the recirculation of agricultural, livestock, food, and biomass wastes into productive agricultural ecosystems. Through the application of CropX Bio+ biotechnology, organic waste streams are biologically transformed into valuable agricultural inputs, enabling a regenerative and zero-waste approach that converts environmental liabilities into economic assets. This process improves soil fertility, enhances nutrient cycling, promotes biodiversity, reduces environmental pollution, and supports sustainable food production. The model further contributes to climate resilience by reducing greenhouse gas emissions associated with organic waste decomposition, particularly methane and nitrous oxide, while enhancing soil carbon sequestration and nutrient-use efficiency. By transforming waste into resources and returning nutrients to the soil, the system creates a circular pathway in which waste becomes wealth, healthy soil supports productive crops, crops support animal and human nutrition, and organic residues are reintegrated into the agricultural cycle. The CropX Circular Agriculture Model has been implemented across more than 2,000 hectares of paddy cultivation areas in Malaysia and further evaluated in rubber, oil palm, aquaculture, and livestock-related applications. Field observations indicate improvements in soil condition, crop productivity, climate resilience, water quality, and resource-use efficiency. This model proposes that soil health and circular resource management should be recognized as fundamental pillars of the One Health agenda. The findings demonstrate that transforming waste into wealth through circular agriculture offers a scalable pathway towards resilient food systems, environmental sustainability, climate resilience, and long-term One Health outcomes.

Keywords: *CropX Circular Agriculture, One Health, livestock, food security, Malaysia*

OPTIMIZING DOUBLE-SPIN CENTRIFUGATION FOR STANDARDIZED GOAT ALLOGENEIC PLATELET-RICH PLASMA: A TRADE-OFF BETWEEN PLATELET ENRICHMENT AND LEUKOCYTE CARRYOVER

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Abstract

Platelet-rich plasma (PRP) is increasingly used in veterinary regenerative medicine, but its biological performance depends heavily on the preparation protocol, especially centrifugation settings that affect platelet concentration and residual blood-cell contamination. This study examined the effects of five double-spin centrifugation protocols on platelet levels and red and white blood cell carryover in goat allogeneic PRP. Whole blood from eight donor goats was used to establish baseline hematological values, and PRP was prepared using five protocols: C1 (800 g/15 min; 1200 g/10 min), C2 (1000 g/15 min; 1300 g/5 min), C3 (1000 g/20 min; 1400 g/10 min), C4 (1000 g/10 min; 1500 g/10 min), and C5 (1000 g/30 min; 1500 g/15 min). Platelet, white blood cell, and red blood cell counts were compared using one-way ANOVA. Baseline whole-blood values were $573.9 \times 10^9/L$ for platelets, $9.87 \times 10^9/L$ for white blood cells, and $10.71 \times 10^{12}/L$ for red blood cells. Centrifugation settings significantly affected PRP composition. Among all protocols, C5 produced the highest platelet concentration ($3586 \pm 41.48 \times 10^9/L$), approximately 6.25 times higher than baseline. Conversely, C1-C3 produced platelet levels below baseline, while C4 showed only minimal enrichment. Red blood cells contamination was low in all groups, with reductions of about 94.6% to 99.7% compared to whole blood. White blood cells retention varied greatly, from $0.24 \pm 0.04 \times 10^9/L$ in C3 to $5.88 \pm 0.07 \times 10^9/L$ in C5. These results demonstrate that double-spin centrifugation plays a key role in determining the final characteristics of goat allogeneic PRP. The C5 protocol achieved the highest platelet enrichment but retained more leukocytes, whereas C2-C3 produced leukocyte-reduced products with poorer platelet recovery. Overall, protocol selection should be tailored to the specific clinical application and desired PRP profile.

Keywords: *Platelet-rich plasma, double-spin centrifugation, goat, allogeneic PRP, leukocyte carryover*

LYCOPENE-MEDIATED REGULATION OF NK CELLS AND ICAM IN MITIGATING SPIRAL ARTERY REMODELING DYSFUNCTION DUE TO LEAD EXPOSURE: A REVIEW

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Abstract

Lead (Pb) exposure during pregnancy constitutes a significant environmental hazard, inducing systemic oxidative stress and chronic inflammation. This toxic environment greatly hinders the remodeling of spiral arteries, which is an important physiological process that is needed for successful placentation and fetal development. Recent research shows that the dysregulation of uterine Natural Killer (uNK) cells and the pathological overexpression of Intercellular Adhesion Molecule (ICAM) are the main immune system factors that cause Pb-induced vascular dysfunction. Lycopene, a powerful antioxidant carotenoid, has become a promising immunomodulatory agent that can help lessen these negative effects. This review of the literature looks at how lycopene protects against lead toxicity by controlling NK cell activity and ICAM expression to stop damage to the spiral artery. PubMed, Scopus, Google Scholar, and other electronic databases were all thoroughly searched. The review compiled research on uNK cell immunophysiology, ICAM signaling, lead-induced reproductive damage, and lycopene's beneficial qualities. According to analysis, exposure to lead produces a pro-inflammatory milieu that increases ICAM-1, which results in aberrant adhesion and a change in NK cell profiles toward cytotoxic ones. This interference with the NK-ICAM-1 axis prevents trophoblast invasion and the ensuing remodeling of the blood vessels. By neutralizing reactive oxygen species (ROS) that cause ICAM-1 activation, restoring the homeostatic functional profile of uNK cells, and maintaining the structural integrity of the uteroplacental vasculature, lycopene provides protection through three main processes. In conclusion, lycopene shows great promise as a dietary intervention to prevent vascular damage caused by lead. Lycopene promotes healthy spiral artery remodeling by modifying the NK-ICAM-1 axis, providing a workable plan for enhancing pregnancy outcomes in populations exposed to heavy metal pollution.

Keywords: *Lycopene, lead toxicity, NK Cells, ICAM, spiral artery remodeling*

PATHOGENICITY OF THE NOVEL MALAYSIAN CHICKEN ASTROVIRUS (CASTV) ISOLATE IN SPECIFIC-PATHOGEN-FREE (SPF) CHICKEN

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Abstract

Chicken astrovirus (CAstV) is one of the several avian enteric RNA viruses reported to cause several illnesses other than enteritis in commercial broiler chickens shortly after its discovery in 2004. This study determined the pathogenicity and horizontal transmission capability of the Malaysian CAstV isolate UPM1019/2018 (group B) in specific-pathogen-free (SPF) chickens. Day-old SPF chickens were divided into three groups: infected (challenged with $10^{5.5}$ EID₅₀/mL via oral route), exposed sentinels (introduced 24 hours post-inoculation), and controls (PBS-treated). Clinical signs, viral shedding, antibody response, and tissue lesions were monitored over 15 days. Clinical signs, including diarrhoea, drowsiness, depression and growth retardation (20%), were observed on days 3 and 9, respectively. Macroscopic lesions comprised cachexia, enlarged kidneys with urate deposits, visceral gout, and distended intestines. Microscopic examination revealed lymphocytic infiltrates in the duodenum, tubular degeneration, interstitial nephritis, and cystic formations in crypts. Peak viral load ($\log_{10}13.23$) occurred on day 3 in infected birds and day 6 in sentinels ($\log_{10}9.04$). Specific antibodies in infected birds and sentinels were detected with peak titres on days 12 and 15, respectively. Critically, all 15 exposed sentinel birds became horizontally infected via faecal-oral transmission, with CAstV detected in tissues and cloacal swabs throughout the study. In conclusion, the Malaysian CAstV isolate is moderately pathogenic in SPF chickens, causing characteristic gastrointestinal and renal lesions and demonstrating efficient horizontal transmission. The virus demonstrates persistent cloacal shedding and a gradual decline in viral load. Although classified as group B, the Malaysian isolate forms a distinct new subgroup (Bv) based on molecular characterisation, differentiating it from previously described CAstV strains. These findings provide important epidemiological information regarding Malaysian CAstV pathogenesis and transmission dynamics.

Keywords: *Chicken astrovirus, pathogenicity, horizontal transmission, specific-pathogen-free chickens, viral shedding*

FROM SUPERFOOD TO SUPER-HEALER: ASSESSING THE REGENERATIVE EFFICACY OF *PERSEA AMERICANA* OIL IN DERMAL WOUND REPAIR

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Abstract

Dermal wound healing is a highly orchestrated physiological sequence involving inflammatory, proliferative, and maturation phases. While these stages are continuous, their efficiency often hinges on the availability of specific fatty acids to modulate the extracellular matrix. This study investigates the therapeutic potential of avocado oil (*Persea americana*), which is rich in linoleic and oleic acids, to accelerate tissue regeneration through topical application. A murine model comprising 24 female mice (aged 8 weeks) was utilized. Excision wounds were established using a 4 mm biopsy punch on the dorsal skin. The subjects were categorized into four cohorts receiving varying concentrations of avocado oil cream: Group K (0%), P1 (5%), P2 (10%), and P3 (15%). Healing progress was monitored macroscopically via digital calipers on days 3, 6, and 9. Histopathological analysis, specifically Hematoxylin-eosin and Masson's Trichrome staining was conducted on 48 tissue samples to quantify inflammatory cell infiltration and collagen density, respectively. The data demonstrates that avocado oil significantly enhances the wound-healing trajectory in a dose-dependent manner. The 15% formulation (P3) exhibited superior macroscopic wound closure and the highest collagen density by day 9. Furthermore, the 10% formulation (P2) proved most effective in dampening the acute inflammatory response between days 3 and 6. Topical pharmaceutical formulations of avocado oil effectively modulate the inflammatory microenvironment and promote structural tissue integrity via enhanced collagen deposition. These findings position avocado oil as a potent, viable candidate for advanced wound repair treatments.

Keywords: *Collagen synthesis, dermal regeneration, inflammation modulation, Persea americana*

WHEN THE CONSULTATION ROOM HOLDS GRIEF: INTRODUCING THE VETERINARY CARES FRAMEWORK™ FOR COMPANION ANIMAL END-OF-LIFE COMMUNICATION

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Abstract

When a companion animal reaches the end of life, the consulting room quietly becomes a space of grief. For many owners, this loss is deeply felt but rarely validated by those around them, a phenomenon bereavement literature identifies as disenfranchised grief. Veterinarians must hold this grief alongside their own emotional responses, clinical responsibilities, and ethical obligations, yet most do so without formal preparation or structured support. Communication frameworks currently applied in companion animal practice, including SPIKES and the Calgary-Cambridge Guide, were developed for human clinical medicine and do not adequately address the triadic veterinarian-client-patient relationship, the unique emotional weight of companion animal loss, the clinician's own moral distress, or the cultural diversity of grieving families, particularly within Asian practice contexts. This presentation introduces the Veterinary CARES Framework™ (Clarify – Acknowledge – Respect – Explore – Sustain), a veterinary-native, practice-oriented framework developed at IMU University, Malaysia, purpose-built for end-of-life and euthanasia consultations in companion animal practice. Unlike existing models, CARES was conceived from within veterinary medicine itself and holds space for both the client and the clinician. Clarify guides honest, compassionate delivery of clinical information; Acknowledge invites recognition of the emotional weight carried by owner and veterinarian alike; Respect incorporates cultural, spiritual, and family values that shape end-of-life decisions; Explore facilitates collaborative ethical decision-making that centres animal welfare; and Sustain affirms the clinician's own wellbeing and team support as an integral part of professional practice. The framework is currently being developed into a practitioner handbook and this presentation serves as its first formal introduction to the veterinary community. Practitioners are invited to engage with the framework, share their clinical experiences of end-of-life consultations, and contribute feedback that will directly inform the final handbook. It is hoped that the Veterinary CARES Framework™ will offer companion animal clinicians a shared language and a steady structure for the grief that enters the consulting room and that they deserve support in navigating.

Keywords: *Veterinary CARES Framework, companion animal, end-of-life communication, disenfranchised grief, euthanasia*

PROTECTING THE VETERINARIAN: TEACHING GRIEF AND EMOTIONAL COMPETENCE EXPLICITLY TO SAFEGUARD WELLBEING IN THE VETERINARY PROFESSION

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Abstract

Veterinarians experience disproportionately high rates of burnout, compassion fatigue, and psychological distress compared with other healthcare professionals. A significant contributor is repeated, unmediated exposure to client grief, euthanasia, and end-of-life decision-making experiences rarely addressed explicitly in undergraduate curricula. When emotional coping is learned implicitly, students may internalise suppression or detachment as professional norms, compounding long-term risk of moral distress and occupational attrition. This study aimed to explore whether intentional grief education, delivered through immersive simulation and structured reflective writing, could foster emotional awareness, moral distress recognition, and early professional identity formation in undergraduate veterinary students. A qualitative educational study was conducted with undergraduate bioveterinary science students enrolled in a professional skills module. An immersive simulation depicted companion animal end-of-life care and client bereavement, facilitated by trained actors in a psychologically realistic environment emphasising emotional presence and communication. A structured debrief followed, after which students completed reflective reports as formative assessment. Approximately 25 anonymised reflections were analysed using thematic analysis. Five interrelated themes emerged: (1) emotional detachment as a protective mechanism; (2) tension between empathy and professionalism; (3) recognition of the human–animal bond; (4) emerging awareness of moral distress and emotional labour; and (5) shifts in professional identity toward relational and communicative competence. Students described meaningful transitions from emotional avoidance toward acceptance of grief as integral to sustainable veterinary practice. These findings suggest that immersive simulation paired with guided reflection can meaningfully support emotional self-awareness and early professional identity formation. Explicitly embedding grief care education in undergraduate veterinary curricula normalises emotional competence as a core professional skill and represents a meaningful early intervention in safeguarding long-term veterinary wellbeing.

Keywords: *Veterinary wellbeing, grief education, simulation-based learning, professional identity formation, emotional competence*

DEVELOPING A PRACTICAL EMERGENCY MANAGEMENT SYSTEM FOR VETERINARY GENERAL PRACTICE CLINICS

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Abstract

Emergency presentations in veterinary general practice (GP) clinics are commonly associated with delayed response, inconsistent workflow, communication problems and inefficient patient prioritization. Many GP clinics operate with limited manpower, mixed outpatient consultations and variable emergency preparedness, creating challenges in maintaining patient safety, staff welfare and operational efficiency. This study presents the development of a practical emergency management system specifically designed for veterinary GP clinics using a practical workflow-based framework. The framework integrates a structured triage and escalation pathway involving reception staff, veterinary assistants or nurses, and attending veterinarians to improve early emergency recognition and streamline patient management. A color-based triage categorization system and organ-system assessment guide were developed to assist frontline staff in identifying critical patients requiring immediate intervention. The framework additionally incorporates structured owner communication regarding prognosis discussion and cardiopulmonary resuscitation (CPR) authorization for critically ill patients to support efficient and ethically guided decision-making during acute deterioration. Structured emergency delegation may reduce treatment delays, staff confusion and emotional burnout while improving clinic workflow efficiency and client confidence. This model is intended to be practical, low-cost and adaptable for small animal veterinary clinics with varying staffing capacities.

Keywords: *Emergency triage, veterinary workflow, general practice clinic, CPR consent, staff welfare*

THE CAGE-FREE JOURNEY IN MALAYSIA: PROGRESS, CHALLENGES AND OPPORTUNITIES

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Abstract

Globally, the movement toward cage-free egg production has gained significant momentum as governments, corporations, and civil society organisations collaborate to improve animal welfare standards in the poultry industry. This presentation provides an overview of the progress made in advancing cage-free egg production in Malaysia. Key developments include the establishment of cage-free and free-range farms, corporate engagement initiatives, and industry training programmes aimed at building technical capacity and awareness. The presentation also examines the challenges encountered during the transition process, including infrastructure investment requirements, technical knowledge gaps, and the need to strengthen consumer demand. In addition, lessons learned from countries that have successfully expanded cage-free production will be highlighted to provide relevant insights for Malaysia's context. These experiences demonstrate the importance of coordinated efforts, industry alignment, and sustained advocacy in driving meaningful change. Malaysia has significant potential to expand cage-free egg production through collaborative efforts among industry stakeholders, government agencies, veterinarians, and international partners. Continued engagement, knowledge sharing, and capacity building will be essential to support a sustainable and scalable transition toward higher welfare production systems.

Keywords: *Cage-free eggs, animal welfare, poultry industry, Malaysia, sustainable production*

DIVERSITY OF NUISANCE FLY POPULATIONS AND THEIR IMPACT ON THE DEFENSIVE BEHAVIORS OF DAIRY CATTLE IN SMALLHOLDER FARMING SYSTEMS, BATU CITY, INDONESIA

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Abstract

Nuisance fly infestations in dairy cattle represent a critical welfare concern, acting as potent stressors that trigger physiological distress and significantly reduce productivity through impaired feeding behavior. This study investigated the correlation between fly population dynamics and specific behavioral defense mechanisms in dairy cattle within the Batu City region. A quantitative-analytical study was conducted on 51 dairy cows across nine smallholder farms, utilizing systematic observation and entomological collection. The results revealed that the defensive behaviors in dairy cattle were most significantly characterized by tail flicks and skin twitches, reaching a frequency of 13.86 events per 5 minutes. In contrast, leg stomps and head shakes were observed as less frequent responses. A significant positive correlation ($r = 0.357$; $p < 0.001$) suggests that behavioral intensity is driven by fly-related irritation. Entomological analysis identified five key species: *Musca domestica* (41.31%), *Stomoxys sitiens* (22.07%), *Musca autumnalis* (21.36%), *Simulium sigiti* (9.86%), and *Stomoxys calcitrans* (5.40%). Notably, the identified fly population is dominated by the Muscidae family, which serves as critical vectors for pathogen transmission. With a Shannon–Wiener diversity index of $H' = 1.41$, the high prevalence of these hematophagous and nuisance flies underscores the direct link between fly diversity and the intensity of defensive behaviors. These findings highlight that specific Muscidae species act as primary stressors, where their presence directly dictates the frequency of cattle's defensive responses and increases the risk of vector-borne disease transmission.

Keywords: Behavioral defense, dairy cattle, fly diversity, *Stomoxys*, animal welfare.

"TURNING WASTE TO WORTH" GREENER DAIRY FARM USING RECYCLED POLYPIPE

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Abstract

The dairy sector is increasingly moving toward sustainable, cost-efficient, and welfare-oriented farming systems. One critical challenge faced in traditional dairy shed construction is the reliance on metal infrastructure. Non galvanised iron which is prone to rust, structural weakening, sharp edges, and high maintenance demands. These issues negatively affect animal welfare, increase veterinary interventions, and elevate long-term operational costs. In response to rising material prices and the need for greener solutions, the innovative use of recycled poly pipes (RPP) has emerged as a practical and impactful alternative for building modern dairy farm structures. Recycled poly pipes, made from durable High-Density Polyethylene (HDPE) thermoplastic polymers, offer significant advantages including corrosion resistance, chemical stability, smooth surfaces, and long service life under wet and manure-rich environments. Their properties provide safer housing conditions for dairy cattle, reduce injury risks, and enhance overall herd wellbeing. By repurposing waste poly materials into structural components such as perimeter barriers, electric fence posts, feed pad partitions, water systems, tool stands, and signage supports the project demonstrates a highly efficient, low-cost, and environmentally responsible construction approach. This innovation delivers multiple layers of impact: economic savings through reduced construction and maintenance costs, environmental benefits by diverting plastic waste from landfills, and improvements in labour efficiency due to the lightweight and easy-to-install nature of RPP. The approach transforms readily available waste materials into functional, long-lasting infrastructure, creating a climate-resilient and animal-safe farm environment. Beyond infrastructure, this initiative strengthens sustainability practices and aligns with national goals for greener agricultural development. The project highlights how simple, accessible, and replicable innovations can reshape dairy farm management systems. By turning waste into structural resources, the use of recycled poly pipes exemplifies practical green technology that enhances farm productivity, animal welfare, and long-term operational sustainability.

Keywords: *Recycle polypipe, cheaper, greener solution, animal welfare, sustainability*

COLIC SURGERY: ENTEROLITH REMOVAL FROM THE SMALL COLON IN A THOROUGHBRED GELDING

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Abstract

Entry into the abdomen (ventral midline laparotomy) the peritoneal cavity revealed the presence of frank blood. Systematic examination of the small intestines followed by the extrusion of the large colon revealed no abnormalities. However, only very slight peristaltic movement was noted in the large intestine. Further exploration of the small colon revealed a mass in a portion that was fortunately able to be extruded. Closer examination revealed that this mass was solid, irregularly shaped, and had recently lodged in that part of the small colon. An enterotomy into the small colon was performed to remove the mass, later revealed to be an enterolith. The colon was then sutured (two-layer closure). The peritoneal cavity was lavaged and the intestines were replaced into the abdominal cavity. However, the source of the bleeding could not be ascertained. Tranexamic acid infusion was given to help control the bleeding. The abdomen was closed as per routine (three-layer closure). A stent bandage was placed to protect the suture line. Profuse bleeding was noted from the incision site, ascertained to be coming from within the abdomen. Once stable upon recovery, a belly bandage was placed. Post-operative care was provided with fluid therapy, antibiotics, painkillers, bandage changes, gastric ulcer medication, probiotic administration and laminitis monitoring. The horse developed diarrhoea 10 days post-surgery and was treated with fluid therapy, montmorillonite clay, Lomotil (Diphenoxylate and Atropine), charcoal tablets and probiotics via Naso-gastric intubation. The horse had lost a significant amount of weight from hypoproteinaemia due to protein-losing enteropathy (PLE) as a result of the post-operative colitis. This horse was subsequently supplemented with probiotics, Anazolic (Gamma-Oryzanol) and Equine Growth Hormone (EGH) injections to promote gut health and steadily improve his body condition.

Keywords: *Colic, enterolith, surgical exploration, small colon, colitis*

LATERAL CONDYLAR FRACTURE REPAIR IN AN ENDURANCE GELDING

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Abstract

This 9-year-old Arab gelding pulled up lame midway through a 120km endurance ride. Lameness was graded 4 (of 5). Subsequent radiographs showed a non-displaced, complete lateral condylar fracture on the right fore fetlock. Pre-operative measurements were made to ascertain screw length, glide hole length and position of the screws. A padded PVC half shell cast was placed to support the limb during the time of induction of anesthesia. The horse was guided by personnel to ensure a smooth descent to the padded ground. The horse was placed on dorsal recumbency to facilitate screw placement and arthroscopic visualization. A 4.5mm cortical screw was placed after the creation of a glide hole and thread hole. The second screw was placed in a similar manner, 2cm proximal and slightly palmar to the first screw. An arthroscope was placed into the metacarpo-phalangeal joint to ascertain smooth union of the bone and cartilage and facilitate flushing of the joint. A half limb Robert-Jones bandage was placed and fortified with a half shell PVC cast to provide support to the limb during recovery from anesthesia. Post-operatively, the horse received phenylbutazone to control pain. The gelding was confined to box rest for the first five days and was subsequently allowed short bouts of hand walking. No signs of bone or implant failure were observed in subsequent x-rays. No signs of bone or implant failure were observed in subsequent X-rays. Skin sutures were removed on day 10 post-op, and a light support bandage was placed. The horse was discharged at day 14 post op with no signs of lameness and minimal effusion in the fetlock joint.

Keywords: *Lateral condylar fracture, lag screw fixation, equine anesthesia, arthroscopy*

ANALYSIS OF BEHAVIOURAL CHANGES IN NEW ZEALAND RABBIT EXPOSES TO 5G RADIO FREQUENCY ELECTROMAGNETIC FIELD (RF-EMF)

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Abstract

The The growing adoption of fifth-generation (5G) wireless technology and its associated radiofrequency electromagnetic fields (RF-EMF) have raised concerns about their potential biological effects on animal health. Despite growing exposure to 5G, few studies have examined how 5G RF-EMF affects behavioural responses in animals. Using the New Zealand rabbit, this study evaluates acute and subacute behavioural changes following exposure to different 5G RF-EMF frequencies. A total of 20 rabbits were randomly assigned (n=5 per group) to four conditions: control (no exposure), 700 MHz, 3.5 GHz, and 26-28 GHz RF-EMF for 22 hours/day over 28 days. The RF-EMF was generated from a vector signal generator and emitted by horn antennas. Signal levels were monitored weekly using a broadband RF meter to ensure consistent exposure. Rabbits were housed individually in steel cages with *ad libitum* resources, and their behaviour was continuously recorded via CCTV and analysed weekly based on frequency. Instantaneous scan sampling was conducted in the first week to identify peak activity periods, followed by focal continuous scan sampling during selected morning, evening, and night periods (3-minute segments). 12 behaviours were observed and classified under four categories: exploratory & locomotor, nutritional, stress-related and rest postures. The number of times the behaviour occurred within the observation was recorded in an ethogram, and the data were analysed using the Generalised Estimating Equation. The results demonstrated significant acute alteration in maintenance and exploratory behaviours, with additional progressive subacute changes recorded across multiple behavioural categories. These changes were most frequently observed in exploratory, nutritional and rest postures ($p < 0.05$). These findings suggest that RF-EMF exposure may act as a physiological stressor or excitatory stimulus in rabbits. This highlights the need to evaluate long-term exposure risk by incorporating physiological parameters to better understand causal effects and to clarify the long-term impact of RF-EMF exposure.

Keywords: *Animal behaviour, biological effects, electromagnetic fields, New Zealand rabbit, 5G*

CURRENT TRENDS, CHALLENGES, AND OPPORTUNITIES IN THE SWIFTLET (EDIBLE BIRD'S NEST) INDUSTRY IN SELANGOR, MALAYSIA

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Abstract

The swiftlet (*Aerodramus* spp.) industry, centred on edible bird's nest (EBN) production, has become one of Malaysia's fastest-growing agro-based sectors with Selangor serving as a strategic hub due to its coastal geography, infrastructure, and logistics connectivity. Malaysia currently produces about 375 metric tonnes of EBN annually, valued at RM 1.5 billion, positioning the country as the world's second-largest producer after Indonesia. This study, undertaken from the perspective of the Department of Veterinary Services (DVS) Selangor, assesses the state's role in the industry through literature review, analysis of national data and market trends (2008–2025), case studies of licensed farms in Kuala Langat, Klang and Kuala Selangor, and review of regulatory frameworks. Results highlight Selangor's significant contribution to national output, yet high farm failure rates persist, largely due to poor site selection, inadequate designs, and weak management practices. While some farms have adopted advanced technologies, automated environmental controls, and RFID traceability, many shop-lot operations remain inefficient and face regulatory and community challenges. Nevertheless, the industry holds strong potential for sustainable growth. Increasing global demand for high-quality, contaminant-free nests, the emergence of value-added products (ready-to-drink beverages, powdered formulations), and eco-tourism initiatives present opportunities for diversification and resilience. Ensuring the long-term sustainability of the sector will require enhanced farm design standards, stricter regulatory enforcement, ecological management, and closer integration of veterinary oversight with community and market expectations.

Keywords: *Edible bird's nest, swiftlet farming, Selangor, sustainability*

A CASE STUDY OF AN ANIMAL WELFARE FRAMEWORK APPLICATION IN A MALAYSIAN SHRIMP FARM

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Abstract

As aquaculture intensifies, there is a growing need to transition from survival-based metrics to more comprehensive welfare assessments. This study applies the Five Domains model (nutrition, environment, health, behaviour, and mental state) to evaluate the welfare of Pacific white shrimp (*Litopenaeus vannamei*) in a semi-intensive commercial farm in Banting, Selangor. A mixed-methods approach was employed, combining semi-structured interviews with farm management and a longitudinal analysis of water quality parameters over a 56-day culture cycle. The interviews were conducted with shrimp farmers to explore farm practices, particularly water quality management procedures. The findings indicate that the "Environment" domain is the primary driver of overall shrimp welfare. While pond preparation practices, including the use of lime and Effective Microorganisms (EM), reflect proactive management within the nutrition and health domains, physiological stressors remain evident. Water quality data showed relatively stable temperatures (29.57°C to 31.07°C), but also revealed significant welfare concerns. Notably, a chronic ammonia spike was observed on Day 14 (5.09 ± 0.32 mg/L), alongside periodic declines in dissolved oxygen (DO). DO levels fluctuated near the critical threshold (4.38 to 6.11 mg/L), suggesting that the system was operating close to its maximum carrying capacity. To mitigate these stressors, the farm employs "pukat naga" for periodic ("time-by-time") harvesting. This selective harvesting method functions as a critical management strategy by reducing biomass density and alleviating oxygen demand as shrimp grow, thereby preventing respiratory stress. Overall, the application of the Five Domains framework highlights chronic water quality fluctuations as the main constraint on shrimp welfare at the study site. Although selective harvesting and rigorous pond preparation contribute positively to welfare, the elevated ammonia levels during the early culture stage indicate a need for improved biological filtration and water management strategies.

Keywords: Shrimp farming, animal welfare, aquaculture sustainability, semi-intensive ponds, water parameter

EFFECTS OF PALM-BASED LIPIDS ON THE NUTRITIONAL QUALITY AND FATTY ACID PROFILE OF TILAPIA DIETS

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Abstract

Fish oil (FO) is a primary lipid source in aquafeed due to its high energy content and source of essential long-chain polyunsaturated fatty acids (LC-PUFA), particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). However, its high cost and limited availability require the exploration of sustainable alternative feedstuffs. Palm-based lipids, including crude palm oil (CPO) and palm fatty acid distillate (PFAD), are promising substitutes due to their wide availability and cost-effectiveness. Therefore, this study was conducted to formulate and evaluate tilapia diets incorporating PFAD and CPO as partial or complete replacements for FO. Five diets were prepared, including a control diet (4% FO), T (2% FO + 2% CPO), T2 (4% CPO), T3 (2% FO + 2% PFAD) and T4 (4% PFAD). Diets were formulated using New Century™ software (FORMAT International, USA) to be isonitrogenous (approximately 30% crude protein), isocaloric (approximately 4200 cal g⁻¹ of gross energy), with crude fat content of 8%. Proximate analysis showed that all diets met the nutritional requirements of tilapia, with similar levels of moisture, crude protein, crude fat, total ash and gross energy. Fatty acid profiles corresponded to the level of FO replacement, with higher inclusion of CPO and PFAD increasing saturated fatty acids (SFA), particularly palmitic acid, while EPA, DHA, total polyunsaturated fatty acids (PUFA), and the n-3:n-6 ratio decreased, with the lowest values in T4. Partial FO replacement with PFAD in T3 maintained moderate SFA levels and relatively high levels of EPA and DHA compared with full replacement, thereby retaining a balanced fatty acid profile. Despite these changes, the DHA/EPA ratio remained stable across diets, suggesting retention of essential fatty acid balance. Overall, palm-based lipids can replace FO in tilapia diets without compromising nutritional quality. Partial replacement with PFAD maintained a favourable fatty acid profile and provided a sustainable alternative to fish oil in aquafeed.

Keywords: *Tilapia feed, palm fatty acid distillate, crude palm oil, fish oil, fatty acid profile*

**POTENTIAL OF HORMONE FEMINISATION IN FRESHWATER
CRAYFISH *C. quadricarinatus* FOR AQUACULTURE AND BIOCONTROL**
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Abstract

Cherax quadricarinatus or locally known as the red claw crayfish, is a new commodity in the aquaculture industry that rakes high price. However, since the past 10 years, its production remains unstable whilst being classified as among the top 10 invasive aquatic species in Malaysia. The production of neo-females via hormone sex reversal has been proposed as a two-pronged strategy to solve both aquaculture and ecological problems. Hence, this study evaluates the effects of 17β -estradiol oral administration on the sex ratio, growth and survival rate of juvenile *C. quadricarinatus*. The experiment consists of two controls (normal feed and ethanol carrier) and 17β -estradiol treatments at three different doses (25, 50, and 100 mg/kg of feed). The juveniles were fed once daily at 1% body weight for 60 days. At the end of the treatment period, the highest feminization rate (65.07% female population) was observed in the 100 mg/kg treatment while the lowest female population (42.92%) was observed in the ethanol control group. Chi-square analysis showed a significant difference in the male:female ratio of *C. quadricarinatus* treated with 17β -estradiol at 100mg/kg diet. Growth performance did not differ significantly among treatments ($p>0.05$). In contrast, the survival rates varied significantly ($p>0.05$) with the highest survival performance were observed in the ethanol control group (49.33%) and the lowest in the normal control (20%). These findings suggest that 17β -estradiol has the potential to feminize *C. quadricarinatus* but more studies especially on hormone administration doses optimization needs to be done to ensure a higher feminization rate.

Keywords: *Crustacea, sex reversal, 17β -estradiol, estrogen, invasive species*

ENHANCED GROWTH PERFORMANCE AND FEED UTILIZATION EFFICIENCY OF TILAPIA UNDER ELEVATED TEMPERATURE REGIMES WITH BLACK SOLDIER FLY (BSF)-BASED HIGH-LIPID DIETS

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Abstract

Elevated water temperatures driven by climate change impose metabolic stress on cultured fish, increasing energetic demands and potentially compromising production efficiency. Nutritional strategies that enhance dietary energy density may mitigate these effects, particularly through sustainable ingredients such as insect-derived meals. This study evaluated the interactive effects of dietary lipid level and rearing temperature on growth performance and feed utilization of FRIGL strain Nile tilapia (*Oreochromis niloticus*) fed diets formulated with protein from Black Soldier Fly. Fish (initial weight 7.03 ± 0.35 g) were cultured for 2 days in a 2×2 factorial design comprising two lipid levels (4% and 8%) and two temperatures (28°C and 32°C), with each treatment conducted in triplicate. A significant interaction between dietary lipid and temperature was detected ($P < 0.05$). At 32°C, fish fed with the 8% lipid diet exhibited superior growth performance (specific growth rate, SGR: $.99 \pm 0.02\%$ day⁻¹) and improved feed conversion ratio (FCR: 2.27 ± 0.02) relative to other treatments. In contrast, at 28°C, the same high-lipid diet resulted in reduced growth (SGR: $.74 \pm 0.04\%$ day⁻¹), indicating diminished efficiency under non-stress conditions. These results suggest that elevated dietary lipids enhance energy availability to support increased metabolic demand under thermal stress, but may lead to inefficient nutrient utilization when temperature is optimal. The findings highlight the importance of aligning feed formulation with environmental conditions and demonstrate that the performance benefits of high-lipid, insect-based diets are temperature-dependent. While Black Soldier Fly offers a sustainable alternative to conventional feed ingredients, further investigation into nutrient partitioning, physiological responses, and cost-effectiveness is required to support its broader adoption in climate-resilient aquaculture systems.

Keywords : *Fish nutrition, fish feed, BSF, aquaculture, climate change*

FIELD TRIAL OF AN ORAL FEED-BASED *VIBRIO* VACCINE REVEALS ENHANCED GUT-ASSOCIATED LYMPHOID TISSUE ACTIVATION IN HYBRID GROUPEL (*Epinephelus* sp.)

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Abstract

This study examined the immunostimulatory effects of a scaled-up, inactivated feed-based *Vibrio* vaccine on the mucosal immunity of hybrid grouper over 10 weeks, with sampling at weeks 0, 2, 6, 8, and 10. Fish were orally vaccinated and assessed for gut-associated lymphoid tissue (GALT) responses, including GALT count, area, density, and lymphoid cell infiltration in the anterior, mid, and posterior intestinal segments. Vaccinated fish showed significant increases in all GALT parameters compared to controls ($p < 0.05$), indicating enhanced mucosal immune activation. Rapid responses were associated with increased lymphoid cell accumulation and GALT in the anterior and mid-intestine, indicating early antigen recognition. The posterior intestine exhibited a slower but sustained increase in GALT density and size, implying prolonged immune surveillance. The consistent GALT expansion and activation across intestinal regions demonstrate the vaccine's capacity to induce localized immune defences. Overall, these results show that oral administration of an inactivated *Vibrio* vaccine effectively stimulates mucosal immunity by specifically activating the GALT. . This method offers a practical, scalable strategy to boost disease resistance and promote sustainable aquaculture.

Keywords: Oral vaccine, GALT, mucosal immunity, grouper, aquaculture

COMPARATIVE EVALUATION OF LIVE FEEDS FOR OPTIMIZING FIRST FEEDING AND LARVAL SURVIVAL IN *Betta imbellis*

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Abstract

Early larval mortality remains a major constraint in the culture of *Betta imbellis*, with survival often falling below 10% within the first two weeks post-hatch when fed conventional *Artemia* nauplii. This study evaluated the suitability of selected live feeds as first food for *B. imbellis* larvae to improve early-stage survival. Four feeding regimes were tested: *Paramecium* sp., *Panagrellus redivivus* (microworm), *Turbatrix aceti* (vinegar eel), and *Artemia* nauplii as a control. The experiment was conducted over 14 days using larvae at four days post-hatch, corresponding to the onset of exogenous feeding. Each treatment was performed in triplicate using 500 mL glass beakers containing 300 mL of water, with a stocking density of 10 larvae per unit. Larvae were fed ad libitum, with daily partial water exchange. Survival was recorded daily, and final survival (%) was determined at day 14. Larval mouth opening size and the size range of each live feed were also measured microscopically using a 10× objective. Survival differed significantly among treatments ($P < 0.05$). Fish fed with *P. redivivus* consistently produced the highest larval survival, achieving a mean survival of $53.3 \pm 15.3\%$ at day 14. *Paramecium* sp. treatment resulted in moderate survival ($16.7 \pm 5.8\%$), while fish fed with *T. aceti* and *Artemia* showed low survival of $6.7 \pm 5.8\%$ and $5.8 \pm 5.2\%$, respectively. Although *Paramecium* supported successful feeding during the first week, a marked decline thereafter indicated its limitation as a sole food source beyond early stages. Across all treatments, elevated mortality occurred between days 10 and 14, suggesting a critical shift in feeding requirements. The superior performance of *P. redivivus* highlights the importance of prey size compatibility with larval mouth gape, enabling efficient first feeding. In contrast, *Artemia* nauplii appear too large for effective ingestion at this stage. These findings demonstrate that microworm (*P. redivivus*) is a suitable, low-cost first feed for *B. imbellis*, offering a practical approach to improving early larval survival and supporting culture and conservation efforts of this native species.

Keywords: *Betta imbellis*, larval nutrition, early survival, live feed, aquaculture

MOLECULAR DETECTION OF *Megalocytivirus* IN MALAYSIAN AQUACULTURE SPECIES

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Abstract

Malaysia's aquaculture industry includes freshwater, brackish, marine and ornamental fish culture. Viral diseases caused by megalocytiviruses have been associated globally with severe systemic disease and economic losses in food and ornamental fish. Megalocytivirus infection in Malaysia has been detected in several fish species including hybrid grouper, seabass, freshwater ornamental fish, oysters, mussels and trevally. A brief introduction to the occurrence of Megalocytivirus infection in food fish and previous studies conducted in the ornamental fish industry will be elaborated. The intensity of Megalocytivirus infection in *Pterophyllum scalare* in Malaysia is unknown. Thus, the objectives of this study include detecting the presence of Megalocytivirus, determining genotypes and identifying the major risk factors that contribute to the precipitation of disease outbreaks in *P. scalare* and lastly, evaluating non-invasive sampling (swabbing method) in *P. scalare* broodstock. A total of six pairs of freshwater angelfish broodstock were used. The water samples such as inlet river, inlet well, broodstock ponds, breeding pails, growth out ponds, outlet water, and other samples such as mucus swabs, gill swabs, freshwater angelfish eggs, fries, juvenile, snail, snail eggs, live feed (tubifex worms and moina), sediment samples (from river, broodstock ponds, growth out ponds, outlet) and wild fish were collected from the farm from day 0 until day 60. These samples were extracted and processed using nested polymerase chain reaction (PCR) analysis according to Whittington et al. (2009). A total of 159 samples included both inlet river and well, broodstock ponds, breeding pails, growth-out ponds, outlet water samples, mucus and gill swabs, the egg fries and juveniles of *P. scalare*, snail and snail eggs, tubifex worm, moina and all sediment samples showed positive results for *Megalocytivirus*. In conclusion, the results showed the existence of multiple possible routes for Megalocytivirus distribution on the farm.

Keywords: *Megalocytivirus, ornamental fish, PCR, sequencing analysis, epidemiology*

FISH RECIRCULATING ANESTHETIC DELIVERY SYSTEM: DEVELOPMENT OF PROTOCOLS, METHODS, APPROACH AND APPLICATION BY USING MS222 AND CLOVE OIL

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Abstract

The need for a proper anesthetic procedure is crucial to determine the success of various procedures such as blood sampling, biopsy and surgery in fish. Given current sentiment on animal ethics and welfare, this area of technical knowledge is becoming more important. Development of fish recirculating anesthetic delivery systems in Veterinary Aquatic Animal Health Unit (VAAHU), Faculty of Veterinary Medicine, UPM is a gradual and continuous process which includes drug selection and dosage, anesthetic delivery method, fish species tolerance and safety. Selection of MS222 (Tricaine methanesulfonate) as a drug of choice is due to the fact it is regarded as a standard drug in aquatic anesthesia whereas the use of clove oil is due to wide availability and safety. In principles, an oxygenated anesthetic solution is delivered by a mechanical water pump into the fish respiratory via flexible tubing in an appropriate tank equipped with a perforated working platform on the top, thus creating a recirculating effect. A study of safety and tolerance was conducted in various fish species such as Koi & Common Carp (*Cyprinus carpio*), Goldfish (*Carrasius sp.*), Tilapia (*Oreochromis sp.*), Jade perch (*Scortum barcoo*), Kelah/Empurau (*Tor tambroides*), Patin (*Pangasius sp.*), Snakehead (*Channa sp.*) and Walking Catfish (*Clarias gariepinus*). Physical assessment of morbidity & mortality and histopathological analysis of gills, liver and kidney were carried out and showed no significant adverse effect to the fish. This method creates simple, effective and relatively inexpensive ways in fish restraining applicable for various clinical procedures.

Keywords: *Fish Recirculating Anesthetic Delivery System, MS222, clove oil.*

MULTIVARIATE ANALYSES CONFIRM SPECIMEN MISIDENTIFICATION OF KELAH, AS NON-NATIVE LOWER-VALUED TENGAS: IMPLICATIONS FOR CONSERVATION AND AQUACULTURE

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Abstract

Kelah (*Tor* spp.) is a native Malaysian fish highly valued in recreational sport fishing, ornamental fish and regarded as an exotic delicacy. In contrast, Tengas (*Neolissochilus* spp.), which have lower aesthetic value, are often misidentified because of their morphological similarity to Kelah. To support government initiatives to increase, Kelah is proposed as a new aquaculture species to drive economic growth. A critical aspect of this program is ensuring a reliable supply of high-quality seed, making species verification essential. In response to a request for confirmation of the supplied specimens labelled as 'Renggam', a study was conducted using morphometric evaluations followed by multivariate analyses. The specimens were compared with both Kelah and Tengas specimens at the Fisheries Research Institute Glami Lemi (FRIGL), together with additional published reports from Indonesia. The morphometric features include eye diameter, length of dorsal ray, post-orbital length, and dorsal preorbital length. The analysis revealed that Kelah and Tengas populations from FRIGL are distinctly different morphometrically. The Renggam samples, alongside the Indonesian populations, fall between the two species but are closer to Kelah, as supported by Principal Component Analysis (PCA). Consequently, this analysis revealed that 'Renggam' specimens are neither the native Kelah (*Tor tambra*) nor the Tengas (*Neolissochilus soroides*) species found in Malaysia.

Keywords: *Aquaculture, conservation, farmed fish, Mahseer, Principal Component Analysis (PCA)*

ISOLATION AND IDENTIFICATION OF TILAPIA LAKE VIRUS ISOLATES FROM PENINSULAR MALAYSIA

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Abstract

Tilapia is an important group of farmed fish that serves as a significant protein source worldwide. Tilapia lake virus (TiLV) is an emerging virus that is rapidly spreading globally and poses a serious threat to the tilapia industry. The increasing frequency of outbreaks calls for detailed investigation of TiLV. This study aimed to isolate and identify TiLV from tilapia farms across different regions of Peninsular Malaysia. Diseased tilapia from farms in the Northern, Southern, Central, and Eastern regions of Peninsular Malaysia were sampled for TiLV isolation. Brain tissues were used for virus isolation in E-11 cell culture. Cell cultures exhibiting cytopathic effects (CPE) were subjected to RT-PCR confirmation of TiLV and transmission electron microscopy (TEM). Amplified RT-PCR products were subjected to Sanger sequencing, and phylogenetic analysis identified a single major clade among the isolates. A total of seven TiLV isolates were successfully obtained, comprising three from the Northern region and four from the Central region of Peninsular Malaysia. Cytopathic effects observed in E-11 cells included cell aggregation, shrinkage, and syncytial formation. TEM examination revealed marked cytopathic changes in infected cells affecting the nucleus, mitochondria, and multivesicular bodies, along with viral particles. Sequence analysis showed 96% nucleotide homology to the published TiLV sequence from India (MG515169). These findings suggest that the local TiLV isolate is closely related to the strain from India compared to other continents.

Keywords: *Tilapia Lake virus, red hybrid tilapia, transmission electron microscopy*

STUDY OF ANTIBACTERIAL RESISTANCE IN THE GUT AND WATER ENVIRONMENT OF WILD CAUGHT AND CULTURED *Cherax quadricarinatus*

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Abstract

This study investigated the presence of antibiotic-resistant bacteria (ARB) in the gut microbiome and surrounding water environment of wild-caught and cultured *Cherax quadricarinatus*. The objective was to assess the occurrence of ARB and evaluate the potential role of *C. quadricarinatus* in the environmental dissemination of antimicrobial resistance. Wild-caught crayfish were collected from freshwater drainage systems in Felda Bukit Batu, Kulai, Johor, Malaysia, while cultured crayfish and culture water samples were obtained from an aquaculture farm in Sungai Petani, Kedah. Bacterial isolates were obtained by selective culture on Tryptic Agar supplemented with ampicillin, tetracycline, and streptomycin. Bacterial load was determined through colony-forming unit (CFU) counts, followed by morphological and biochemical characterisation. Antibiotic susceptibility was assessed by the disc diffusion method, while resistance levels were further confirmed by determining minimum inhibitory concentrations (MIC) determination using the broth microdilution method. The results revealed diverse bacterial populations in both gut and water samples capable of surviving under antibiotic selective pressure, with water samples generally exhibiting higher CFU values and resistance levels than gut samples, indicating that the aquatic environment may act as a significant reservoir for ARB. Disc diffusion results showed widespread ampicillin resistance among isolates, with variable tetracycline susceptibility. MIC analysis further confirmed high resistance, particularly to ampicillin and streptomycin, with several isolates exhibiting MIC values exceeding the maximum tested concentrations. Dominant resistant bacterial groups included *Aeromonas*, *Enterobacterales*, and *Acinetobacter*. These findings demonstrate that wild-caught and cultured *C. quadricarinatus*, along with their surrounding water environments, harbour antibiotic-resistant bacteria and may serve as environmental reservoirs of antimicrobial resistance.

Keywords: *Cherax quadricarinatus*, antibiotic-resistant bacteria, antimicrobial resistance, aquaculture, freshwater ecosystems

THE PERCEPTION OF SIX HUNDRED MEMBERS OF THE SRI LANKAN GENERAL PUBLIC ON THE REASONS FOR THE PREVALENCE OF THE HUMAN- ELEPHANT CONFLICT, AND THE LIMITATIONS IN PROPOSED SOLUTIONS

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Abstract

The Sri Lankan elephant (*Elephas maximus maximus*) is native to Sri Lanka and is currently classified as an endangered species. Despite being a protected species, their survival is threatened by human elephant conflict. This primarily Likert-scale-based online survey was sent to Sri Lankans with diverse cultural and educational backgrounds, aiming to explore gaps among existing laws, conservation practices, and their implementation and public understanding. The survey sample of 600 respondents was dominated by females (54.8%), Sinhalese (95.5%), and Buddhists (93.2%), distributed across 23 Districts and 9 provinces. The majority (53.8%) of the respondents were aged between 20 and 30, and undergraduates/ graduates represented 48.7% of the sample. The percentage of respondents from areas affected by the human-elephant conflict was 21.7%. The majority (77%) of the respondents agree that the human-elephant conflict has worsened over the past decade, with 74.5% acknowledging an "Increase in elephant population density driven by scarcity of habitable lands" as a reason. The acknowledgement of other reasons, such as the obstruction of elephant corridors, being tempted by food waste, cattle grazing in conserved areas, and reciprocal aggression, was limited and significantly influenced by age and educational status. Furthermore, they identified food and water scarcity within the natural habitats, and over-familiarisation with commercial crops were frequently mentioned in responses. Dissatisfaction with government intervention was predominant, with 40% of the sample expressing dissatisfaction and 21.8% extreme dissatisfaction; higher levels of dissatisfaction were associated with the younger and more educated respondents. The respondents acknowledged the absence of a dedicated team or institution, funding constraints, human resource scarcity, lack of expertise among decision-makers, and ignoring the experiences of affected communities as shortcomings in the existing mechanism. The Department of Wildlife Conservation's anthropocentric perspective on the crisis was criticised in the comments. The perceived success of proposed solutions favoured sustainable and humane options, including expanding forest cover (45.5%- Extremely successful, 31.1%- Successful) and restoring elephant corridors (43.5% - Extremely successful, 8.1% successful), while culling was perceived as unfruitful (56%- very unsuccessful and 16.5% unsuccessful) by the majority. The electric fence was favoured over the live fence and the placement of bee colonies.

Keywords: *Elephas maximus maximus, Sri Lanka, wildlife conservation, ecocentrism, public perception*

WE-O-2

BEHAVIORAL PATTERNS, VOMERONASAL ORGAN MORPHOLOGY AND HISTOLOGY OF THE MALAYAN PORCUPINE (*Hystrix brachyura*)

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Abstract

The Malayan porcupine (*Hystrix brachyura*) is a nocturnal rodent widely distributed across Southeast Asia. Despite its wide distribution, the Malayan porcupine remains poorly studied, particularly regarding its behavioral ecology and chemosensory system. Sex-related variation strongly influences mammalian behavior, reproductive signaling, and sensory processing. Chemical communication is a fundamental mechanism regulating social interactions, reproductive behavior, territoriality, and mate recognition in many mammalian species. In nocturnal mammals, where visual cues are often reduced, chemical signals become particularly important for facilitating communication between individuals and coordinating reproductive activities. The detection and interpretation of these chemical signals are mediated by specialized sensory systems that influence a wide range of behavioral and physiological responses. This study aims to investigate behavioral patterns, characterize the morphology and histology of the vomeronasal organ (VNO) of *H. brachyura*. Behavioral observations were being conducted using camera trapping to document reproductive and dyadic interactions. Morphological features of the VNO were examined through macroscopic observation and morphometric measurements. Histological analyses were performed using hematoxylin and eosin staining, supported by CT imaging of transverse anatomical sections. It is expected that distinct behavioral patterns will be associated with VNO-related sensory function. Differences in VNO morphology are anticipated to reflect sexual dimorphism and functional specialization. Histological results are expected to describe the structural organization of the vomeronasal system. Overall, this multidisciplinary study provides foundational knowledge on the behavioral ecology and chemosensory biology of *Hystrix brachyura*, supporting future conservation strategies and captive breeding management in Malaysia

Keywords: *Hystrix brachyura*, vomeronasal organ (VNO), behavioral ecology, chemosensory, histology

PRELIMINARY STUDY OF INTRANASAL OXYTOCIN ADMINISTRATION IN MALAYAN TIGERS (*Panthera tigris jacksoni*)

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Abstract

Stereotypic behavior in captive animals is a recognized indicator of compromised welfare and is often associated with environmental restriction, insufficient stimulation, and chronic stress. This study aimed to evaluate the effects of intranasal oxytocin on behavioral patterns in captive Malayan tigers (*Panthera tigris jacksoni*), with particular emphasis on active, resting, and stereotypic behaviors. Five captive Malayan tigers (males; n=3, females; n=2) were selected at the National Wildlife Rescue Center and were exposed to two conditions: a control condition without treatment and an experimental condition following intranasal oxytocin administration. Both conditions were observed for five days, and the tigers' behavior was recorded for 10 minutes every day. All data were converted into an ethogram comprising two main categories: (1) normal behavior (e.g., resting, active) and (2) abnormal behavior (e.g., stereotypic pacing, circling). During the experiment, meat was used to lure the tigers nearly to the fence, and immediately, 1.5 mL oxytocin was administered using a syringe directly into the nostrils. Results showed that the behavioral study reveals no statistical significance of oxytocin administration on the normal behaviors, which are active and resting behaviors. However, intranasal oxytocin administration showed a statistically significant decrease in abnormal stereotypic behavior. The results support the view that oxytocin may function as a behavioral modulator in captive large carnivores and could complement enrichment-based welfare strategies. Although the study was limited by a small sample size and short observation period, it provides preliminary evidence that intranasal oxytocin may have practical value for improving behavioral welfare in captive Malayan tigers and merits further investigation in larger and more controlled studies.

Keywords: *Captive, intranasal, oxytocin, stereotypic behavior, Panthera tigris jacksoni*

FROM DIET TO BLOOD: EVALUATING NUTRITIONAL STATUS IN BORNEAN ORANGUTANS THROUGH SERUM BIOCHEMISTRY AT SEPILOK ORANGUTAN REHABILITATION CENTER (SORC)

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Abstract

Great ape diets are known to include a wide range of plants, but their complex dietary ecology is still not fully understood. Therefore, understanding their nutritional needs in conservation centers setting is important, particularly by examining the association between dietary intake and serum biochemical profiles. Firstly, a retrospective comparative study was performed involving 153 health records between 2020 and 2024. Habitat status and serum biochemical profiles data were divided into semi-wild and captive orangutans in Sepilok Orangutan Rehabilitation Center (SORC). Significant differences ($p < 0.05$) were found in serum biochemistry (SBC) parameters between these two groups, in which the captive subjects showed significantly higher serum total cholesterol ($p < 0.001$), LDL ($p < 0.001$), non-HDL ($p < 0.001$), potassium ($p = 0.016$) and significantly lower uric acid ($p = 0.037$) than the semi-wild subjects. These findings suggested potential influences of environmental or dietary factors on the metabolic profiles of captive orangutans compared to semi-wilds. Building on this, a follow-up study was conducted to investigate the role of nutrition in shaping the blood profiles of orangutans at SORC. In this phase, the dietary intake of 18 captive orangutans was recorded over a two-week period. The data were analyzed to determine each subject's average daily proximate dietary composition, including crude fiber, crude fat, crude protein, and metabolizable energy. Spearman's partial correlation analysis was performed between SBC parameters and proximate dietary composition of the captive orangutans' diet with adjustments for age and weight. Results revealed the average crude fiber intake showed a large negative correlation with total cholesterol ($r = -0.567$, $p < 0.05$) and a large positive correlation with glucose ($r = 0.579$, $p < 0.05$) and creatinine ($r = 0.514$, $p < 0.05$). Additionally, average metabolizable energy was found to be negatively correlated with serum α -amylase ($r = -0.570$, $p < 0.05$). Overall, the results from this study suggested that habitat factor may influence dietary intake, and that certain SBC parameters may reflect distinct dietary patterns independent of age and body weight. These results supported the use of targeted dietary interventions, informed by routine health monitoring and SBC profiles, to improve orangutan conservation efforts.

Keywords: *Orangutan nutrition, serum biochemistry, lipid profile*

EMERGENCY STABILIZATION OF A LACTATING MEERKAT (*SURICATA SURICATTA*) WITH RECURRENT SEIZURES SUSPECTED TO BE SECONDARY TO ECLAMPSIA: A CASE REPORT

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Abstract

Emergency stabilization in exotic animal practice is often challenging due to limited species-specific protocols, medications, and diagnostic resources. This case report describes the successful emergency management of a lactating female meerkat (*Suricata suricatta*) presented with recurrent seizures suspected to be secondary to lactational hypocalcemia (eclampsia). The patient was presented with acute seizure activity accompanied by tachypnea, hyperactivity, and intermittent neurologic abnormalities. Initial treatment focused on stabilization of airway, breathing, circulation, body temperature, and seizure control. As diazepam was unavailable during the emergency presentation, isoflurane anesthesia was utilized to control seizure activity and minimize handling stress. Supportive care such as oxygen supplementation, thermal support, and continuous monitoring was provided throughout the hospitalization. The patient initially responded to treatment and was discharged with supportive care instructions. However, recurrent seizures developed following continued nursing of offspring, prompting further diagnostic investigation. Complete blood count and serum biochemistry findings supported hypocalcemia consistent with lactational eclampsia. Calcium supplementation and nursing restriction were subsequently implemented, resulting in progressive clinical improvement and complete resolution of neurologic signs. This case highlighted the importance of a stabilization-first approach in exotic animal emergencies, particularly in resource-limited settings, and demonstrated the value of flexible clinical decision-making when standard anticonvulsant therapy is unavailable. Lactational hypocalcemia should be considered as an important differential diagnosis in lactating exotic mammals presenting with seizures or acute neurologic abnormalities.

Keywords: *Meerkat, eclampsia, hypocalcemia, seizure, emergency stabilization*

OCCURRENCE OF ANTIMICROBIAL-RESISTANT BACTERIA IN LIVESTOCK PRODUCTION ENVIRONMENTS IN PENINSULAR MALAYSIA

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Abstract

Antimicrobial drugs play a critical role in the livestock farming industry, particularly in controlling infectious diseases. However, the extensive and unregulated usage of antimicrobial drugs has contributed to the emergence of antimicrobial resistance (AMR) in bacteria. The emergence of antimicrobial resistance in bacteria within farm environments represents a significant concern, particularly as infections in livestock can result in substantial and often unavoidable economic losses. This study aimed to examine the prevalence of environmental AMR bacteria and their resistance genes across various states in Peninsular Malaysia, as well as to identify the high-kinetic "hotspots" within farm ecosystems. By analyzing documented case studies of bacterial surveillance data in livestock environments within Peninsular Malaysia, this study compared the prevalence of AMR bacteria across different states, identified potential environmental sources of AMR within farm settings, and examined the distribution of antimicrobial resistance genes. In broiler farms of the east coast states, the prevalence of *Escherichia coli* was recorded at around 48.3% to 58.0%, whereas the prevalence of *Salmonella* spp. was lower, ranging from 5.8% to 7.0%. Notably, Kelantan broiler farms showed high distribution of ESBL-producing *E. coli*, with 84.5% of isolates carrying at least one ESBL gene. Surveillance in Perak and Selangor revealed 98% of enterococcal isolates were multidrug-resistant, including ciprofloxacin. The wastewater systems in the northern states were identified as significant conduits for MDR *E. faecium* and *E. faecalis*, with *E. faecium* exhibiting higher Multiple Antibiotic Resistance index values than *E. faecalis*. The β -lactamase gene family is the most dominant resistant gene determinant. The prevalence of *Pseudomonas aeruginosa* varies by water sources, where 17.5% were isolated from wells and 8.9% in tap water. Livestock manure is a significant environmental hotspot for selective pressure and horizontal gene transfer due to the presence of active antibiotic residues. These findings proved the importance of integrated One Health surveillance that prioritizes the regulation of antibiotic distribution, treatment of livestock waste, implementation of systemic vaccination programs, and strengthened biosecurity measures in farm environments to mitigate the spread of environmental AMR.

Keywords: Antimicrobial resistance, prevalence, environment, livestock farms, Peninsular Malaysia.

PREVALENCE OF *Blastocystis sp.* INFECTION IN RUMINANTS IN SELECTED DISTRICTS OF KELANTAN

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Abstract

Blastocystis sp. is an intestinal protozoan parasite with zoonotic potential, commonly found in humans and a wide range of animals, including ruminants. Despite its global distribution, limited data are available on its occurrence in livestock in Kelantan, Malaysia, a state known for extensive livestock farming. This study aimed to determine the prevalence of *Blastocystis sp.* in ruminants across selected districts of Kelantan namely Bachok and Kota Bharu. Faecal samples were obtained from cattle (n = 101), goats (n = 87), sheep (n = 85), and buffaloes (n = 8), then cultured in Jones' medium supplemented with 10% heat-inactivated horse serum and incubated at 37 °C for 24 hours. Subsequently, faecal smears were prepared from all samples, and Giemsa staining was employed to examine the microscopic morphology of *Blastocystis sp.* in the cultured samples. The overall prevalence of *Blastocystis sp.* among ruminant species was 71.9% (202/281), with the highest prevalence observed in buffaloes (100%), followed by cattle (83.2%), sheep (69.4%), and goats (58.6%). The vacuolar form was the most predominant morphology which is characterized by a large, spherical cell containing a central body that resembles a vacuole. Other morphological variants were identified, including the cyst, granular, and amoeboid forms. The high prevalence of *Blastocystis sp.* in ruminants in Kelantan is likely influenced by traditional farming practices, close animal contact, and the tropical environment. This widespread occurrence among livestock suggested that they may serve as important reservoirs of the parasite, potentially infecting the farmers. Further molecular analysis is essential to confirm the species and subtypes of *Blastocystis sp.*, which will provide greater insight into its genetic diversity, host specificity, and zoonotic potential.

Keywords: *Blastocystis sp.*, protozoan parasite, prevalence, livestock, ruminants

SUPERBUG IN THE SEABASS: TRACKING ANTIBIOTIC RESISTANCE AND VIRULENCE IN *Vibrio cholera* FROM MALAYSIA'S EAST COAST

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Abstract

Aquaculture systems along Malaysia's East Coast face notable biological challenges from opportunistic bacterial pathogens. This study investigated the distribution, phenotypic antibiotic resistance, and virulence characteristics of 38 *Vibrio cholera* isolates recovered from the liver and kidney of Asian seabass across Kelantan (Laguna Semerak and Laguna Tumpat) and Pahang (Kuala Pahang). Phenotypic profiling revealed widespread antibiotic resistance among the isolates, most notably against vancomycin (71%), rifampicin (60%), and compound 129 (58%). Conversely, high susceptibility was maintained against chloramphenicol (95%), oxytetracycline (95%), and nalidixic acid (82%). Multiple Antibiotic Resistance (MAR) indexing demonstrated severe multidrug resistance profiles, with MAR values reaching 0.77 in Laguna Tumpat isolates, indicating exposure to high-risk contamination sources. Haemolytic activity assays further confirmed their pathogenic potential, with isolates exhibiting distinct α or β -haemolytic activity. Genotypic screening for virulence factors showed that *colA* was the most prevalent, detected in 22 isolates, followed by *hlyA* (20 isolates), *toxRVC* (19 isolates), and *luxR* (17 isolates). The chitinase gene (*chiA*) was identified in 5 isolates, primarily clustered within the Kelantan region, while other clinical virulence markers, such as *tdh*, *trh*, and *vhA*, were entirely absent. Notably, isolates from Kuala Pahang displayed highly uniform virulence profiles characterised by the co-occurrence of *toxRVC*, *hlyA*, *luxR*, and *colA*. These findings highlighted a critical intersection of high multidrug resistance and strong expression of virulence factors in *V. cholera* populations inhabiting commercial aquaculture sites. The presence of these potential "superbugs" in fish organs underscores an urgent public health and economic concern, necessitating robust surveillance and stricter management of antimicrobial usage in regional aquaculture practices.

Keywords: *Vibrio cholera*, Asian seabass, antibiotic resistance, virulence genes, MAR index

PREVALENCE OF *BARTONELLA* FROM FLEAS COLLECTED AMONG STRAY CATS IN KOTA BHARU, KELANTAN

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Abstract

Bartonella species are considered neglected vector-borne and zoonotic bacterial pathogens that frequently remain underrecognized, particularly in tropical regions. In Kelantan, Malaysia, cultural norms encourage the presence of free-roaming stray cats, leading to frequent human–cat interactions in public spaces and increased potential for flea exposure. Despite these conditions, Kelantan remains underrepresented in national surveillance for cat-associated zoonoses. This study investigated the prevalence of *Bartonella* spp. in fleas collected from 75 stray cats across six localities in Kota Bharu, representing both high-population-density and village/coastal areas. Fleas were collected using fine-toothed combs and identified morphologically. Molecular screening for *Bartonella* DNA was conducted on 60 randomly selected fleas (one per cat) using PCR targeting the citrate synthase (*gltA*) gene, followed by Sanger sequencing and phylogenetic analysis. An overall flea infestation was observed in 80% of the sampled cats, and all 382 collected fleas were identified as *Ctenocephalides felis*. *Bartonella* DNA was detected in 83.3% (50/60) of the tested flea samples, representing one of the highest prevalence rates reported globally. Species-level identification confirmed the presence of *B. claridgeiae* (48%), *B. henselae* (36%), and eight sequences corresponding to unclassified *Bartonella* spp. While flea infestation rates were slightly higher in village/coastal areas, *Bartonella* detection was equally distributed across all localities. The high detection rate of *Bartonella* DNA indicated a well-established enzootic transmission cycle within stray cat populations and their flea vectors in Kota Bharu. The presence of both *B. henselae* and *B. claridgeiae* highlighted a significant public health risk for flea-borne bartonellosis. These findings emphasized the necessity for strengthened One Health–based zoonotic surveillance and targeted vector management strategies in the region.

Keywords: *Bartonella* spp., *Ctenocephalides felis*, stray cats, kelantan, zoonotic

ELUCIDATION OF ANTIMICROBIAL AND ANTIBIOFILM POTENTIAL OF *ADANSONIA DIGITATA* (BAOBAB) PULP AND SEED EXTRACTS AGAINST SELECTED ESKAPE PATHOGENS

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Abstract

The increasing risk of antimicrobial resistance among ESKAPE bacteria has strengthened the search for alternative natural therapies. *Adansonia digitata* (baobab), a plant with extensive traditional medicinal use, is a promising candidate due to its reported bioactive compounds. This study evaluated the antibacterial and antibiofilm potential of baobab pulp and seed extracts against selected ESKAPE pathogens, namely *Staphylococcus aureus* and *Klebsiella pneumoniae*, using time–kill assays. Baobab extracts were tested at concentrations of 25, 12.5, 6.25, and 3.125 mg/mL over 24 hours. The pulp extract demonstrated pronounced, concentration-dependent antibacterial activity against *Staphylococcus aureus*, achieving complete bactericidal effect at 25 mg/mL within 24 hours. Lower concentrations exhibited partial or delayed inhibition, while 3.125 mg/mL showed negligible effect compared to the control. In contrast, the pulp extract displayed minimal activity against *Klebsiella pneumoniae*, with bacterial growth remaining comparable to untreated controls across all concentrations. The seed extract showed no observable antimicrobial activity against both tested organisms at any concentration, indicating limited antibacterial efficacy of this plant component. For the anti-biofilm, the pulp extract showed strong, concentration-dependent inhibition of *Staphylococcus aureus* biofilm formation (38.3%, 66.1%, and 69.2% at 6.25, 12.5, and 25 mg/mL), while the seed extract showed little to no effect. On other hands, both extracts exhibited weak and inconsistent antibiofilm activity, with slight or no meaningful inhibition observed against *Klebsiella pneumoniae*. These findings suggested that *Adansonia digitata* pulp extract possesses significant antibacterial and antibiofilm activities, particularly against Gram-positive bacteria such as *Staphylococcus aureus*, while its effectiveness against Gram-negative bacteria remains limited. The lack of activity in seed extracts highlighted potential differences in phytochemical composition between plant parts. Overall, this study supports the potential of baobab pulp as a natural antimicrobial agent and provides a foundation for further investigation into its antibiofilm properties and active compounds.

Keywords: *Adansonia digitata*, antimicrobial activity, ESKAPE pathogens, *Staphylococcus aureus*, *Klebsiella pneumoniae*

EFFECTS OF ENCAPSULATED PROBIOTIC AND NANO-PREBIOTIC SUPPLEMENTATION ON LIPID AND HEMATOLOGICAL PROFILES IN BROILER CHICKENS

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Abstract

The integration of synbiotics, the combination of probiotics and prebiotics into poultry nutrition is a promising strategy to modulate metabolic health and immune status. Utilizing encapsulation and nanotechnology may further enhance the delivery and efficacy of these functional ingredients. This study aimed to investigate the effects of supplementing broiler chicken diets with varying concentrations (0.5, 1.0, and 1.5 g/kg) of an encapsulated probiotic and nano prebiotic bio-ingredient on their lipid profiles and hematological parameters. Broilers were assigned to four dietary treatments: a control group and three experimental groups receiving 0.5, 1.0, or 1.5 g/kg of the bio-ingredient. At the end of the trial, blood samples were collected to analyze serum lipid profiles including total cholesterol, triglycerides, high-density lipoprotein (HDL) and low-density lipoprotein (LDL) and hematological indicators, including red blood cell (RBC) counts, hemoglobin levels and white blood cell (WBC) differentials. Supplementation significantly improved the serum lipid profile. Triglyceride levels were significantly lower in all treated groups ($P < 0.05$) with the lowest concentration observed at 1.0 g/kg. Similarly, LDL cholesterol was significantly lowered ($P < 0.05$), specifically in the 1.0 g/kg group (0.90 ± 0.05 mmol/L). Hematological analysis revealed a dose-dependent increase in RBC counts and hemoglobin concentrations, peaking at the 1.5 g/kg group. Regarding the immune response markers, supplementation significantly altered WBC components by decreasing segmented heterophils ($P < 0.05$) and increasing lymphocytes ($P < 0.05$), suggesting a shift towards enhanced immune state and reduced physiological stress. Monocyte, eosinophil, and basophil levels remained statistically unaffected. In conclusion, the inclusion of encapsulated probiotic and nano prebiotic bio-ingredient effectively modulates lipid metabolism by reducing undesirable fats and enhances the hematological and immune status of broiler chickens. A dosage of 1.0 to 1.5 g/kg appears to be most effective in promoting these health benefits, making it a viable feed additive for sustainable poultry production.

Keywords: *Broiler, encapsulation, probiotics, growth performance, carcass yield.*

EFFECTS OF DEFATTED BLACK SOLDIER FLY LARVAE (DBSFL) ON THE BLOOD PARAMETERS, CARCASS QUALITY AND COST ANALYSIS OF CROSSBREED VILLAGE CHICKEN

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Abstract

This study investigated the potential of Defatted Black Soldier Fly Larvae (DBSFL) as a sustainable feed ingredient for crossbreed village chickens over a nine-week feeding trial. Three dietary treatments were evaluated: T1 (100% commercial feed), T2 (95% commercial feed + 5% DBSFL), and T3 (90% commercial feed + 10% DBSFL). Results showed that the inclusion of DBSFL did not negatively affect haematological or biochemical parameters, indicating that DBSFL is safe for poultry consumption at the tested levels. Most carcass characteristics were also unaffected, except for wing weight, which was significantly lower in T3. Although body weight gain remained comparable among treatments, feed intake and feed conversion ratio differed significantly. Economically, T2 demonstrated the best performance, recording the highest gross profit (RM18.61) and net profit (RM6.64). Overall, the findings suggest that incorporating 5% DBSFL in the diet can improve profitability without compromising the health or growth performance of crossbreed village chickens, highlighting its potential as an alternative and sustainable protein source in poultry production.

Keywords: *Black soldier fly, blood, carcass, crossbred village chicken, cost analysis*

ASSESSMENT OF DRINKING WATER QUALITY IN LIVESTOCK FARMS

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Abstract

The quality of livestock drinking water is closely related to animal health, productivity, and farm profitability. The aim of this study was to evaluate the mineral content such as ammonia, chloride, chlorine, copper, iron, nitrate, sulphate, zinc as well as pH in animal drinking water from various farm. All water samples were received and tested in Biochemistry Section, Veterinary Research Institute (VRI) using the Hach DR 2800 Spectrophotometer and Metler Toledo FiveEasy pH meter. A total of 476 water samples were analysed, with most of the samples were tap water (79.9%) from poultry farms (86.4%). Results showed that iron had the highest exceedance rate (56.84%) of samples tested, with values up to 23.00 mg/L, followed by ammonia (14.66%) reaching 107.50 mg/L. High percentage of iron was mainly detected in tap and groundwater water while high ammonia was only from tap water with both were from poultry farms. Approximately 12.68% of the samples have exceeded limits of chlorine, while nitrate and chloride were under acceptable limit (1.10% and 3.30%, respectively). However, for copper, zinc, and sulphate, no exceedance limit was detected. pH analysis discovered that 14.53% of samples was outside the normal range (6.5–8.5), with extremes of 4.07 and 9.76, possibly affecting water palatability, corrosion rates, and mineral solubility. Overall, the data indicate that substandard drinking water quality in livestock production poses potential health risks and economic impacts. Regular monitoring and corrective actions, including improved farm water management and treatment, are recommended to ensure safe and optimal water for animal consumption, safeguard productivity, and support compliance with WHO and national guidelines.

Keywords: *Water quality, animals drinking water, mineral content, pH*

MONITORING OF ORGANOCHLORINE PESTICIDE RESIDUES IN MALAYSIAN CHICKEN MEAT OVER A FIVE-YEAR PERIOD (2021–2025)

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Abstract

Organochlorine pesticides (OCPs) are persistent organic pollutants historically used in agriculture and pest control but are currently banned or severely restricted due to their environmental persistence, bioaccumulation potential, and associated health risks. Continuous surveillance of these residues in food of animal origin remains essential to ensure food safety and regulatory compliance. This study reports the findings of a five-year monitoring programme (2021–2025) assessing the presence of OCP residues in chicken meat from poultry processing plants across Malaysia. A total of 1,100 chicken meat samples were analysed. Homogenised samples were extracted using the QuEChERS method and analysed using gas chromatography coupled with tandem mass spectrometry (GC–MS/MS). Calibration curves for the 29 targeted organochlorine pesticide compounds demonstrated excellent linearity, with coefficients of determination (r^2) of up to 0.9998 within the calibration range of 5–100 ng/g. Method recoveries ranged from 115% to 134%. The analysis targeted 29 OCP compounds using the AE-10 AccuStandard multi-residue pesticide standard mixture, with internal standards spiked into samples to ensure analytical accuracy and stability. All analysed samples showed non-detectable levels of the targeted organochlorine pesticide residues throughout the monitoring period, with concentrations below the limit of detection (LOD). These findings demonstrate full compliance with existing regulatory standards and indicate that chicken meat produced in Malaysia remains safe with respect to organochlorine pesticide contamination. The results further support the effectiveness of current regulatory controls and national food safety monitoring programmes.

Keywords: *Organochlorine pesticides, chicken meat, food safety, residue monitoring, GC–MS/MS*

EFFECTS OF ENCAPSULATED PROBIOTIC BIO-INGREDIENT SUPPLEMENTATION ON GROWTH PERFORMANCE AND INTERNAL ORGAN DEVELOPMENT IN BROILER CHICKENS

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Abstract

The search for effective feed additives in the poultry industry has intensified with the shift toward antibiotic-free production. Probiotics are known to enhance gut health, but encapsulation is often required to ensure their viability and efficacy within the gastrointestinal tract. This study evaluated the effects of varying levels of encapsulated probiotic bio-ingredient (0.5, 1.0, and 1.5 g/kg) on growth performance, carcass characteristics, and internal organ development in broiler chickens compared to a non-supplemented control group. A total of four treatment groups were established. Growth parameters, including final body weight, Feed Intake[A1] (FI), and Feed Conversion Ratio (FCR), were monitored. After the chickens were slaughtered, carcass weight, breast and thigh muscle yields, abdominal fat, and internal organ weights (liver, spleen, gizzard, and heart) were measured. Dietary supplementation significantly affected growth performance ($P < 0.01$), with broilers supplemented with 1.5 g/kg encapsulated probiotic bio-ingredient achieving the highest final body weight (2460.14 ± 32.33 g). [A2] Overall feed intake (FI) and feed conversion ratio (FCR) over the 42-day feeding period differed significantly among treatments ($P < 0.01$). Broilers supplemented with 0.5 and 1.0 g/kg exhibited significantly higher overall FCR than the control, whereas the 1.5 g/kg group maintained an FCR comparable to that of the control.[A3] Regarding carcass quality, broilers supplemented with 1.5 g/kg encapsulated probiotic bio-ingredient exhibited significantly greater carcass weight ($P = 0.026$), breast muscle yield ($P = 0.038$), and thigh muscle yield ($P = 0.005$)[A4]. Probiotic supplementation significantly affected abdominal fat deposition ($P = 0.006$), with the lowest mean abdominal fat observed in broilers supplemented with 1.0 g/kg encapsulated probiotic bio-ingredient. Broilers supplemented with encapsulated probiotic bio-ingredient exhibited significantly greater liver ($P = 0.036$), gizzard ($P = 0.017$), and heart ($P = 0.034$) weights than the control group, whereas spleen weight did not differ significantly among treatments ($P = 0.056$).[A5] Overall, supplementation with 1.5 g/kg encapsulated probiotic bio-ingredient increased final body weight, enhanced carcass yield and muscle development, and reduced abdominal fat deposition, demonstrating its potential as an effective antibiotic-free feed additive for improving broiler productivity and carcass quality.

Keywords: Broiler, encapsulation, probiotics, growth performance, carcass yield

DEVELOPMENT AND OPTIMIZATION OF METHIONINE-LOADED MODIFIED CHITOSAN NANOPARTICLES FOR POULTRY NUTRITION APPLICATIONS

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Abstract

Methionine is an essential amino acid widely supplemented in poultry diets to support growth performance, protein synthesis, and feed efficiency. However, conventional methionine supplementation may experience rapid degradation and reduced utilization efficiency during gastrointestinal transit. Therefore, this preliminary study aimed to develop and optimize methionine-loaded modified chitosan nanoparticles (Met-MCNPs) as a potential nano-delivery system for poultry nutrition applications. Met-MCNPs were synthesized using an ionic gelation method based on chitosan and sodium alginate polyelectrolyte complexation. Different chitosan-to-alginate ratios and methionine concentrations were evaluated to optimize nanoparticle characteristics. The synthesized nanoparticles were characterized for particle size, polydispersity index (PDI), zeta potential, encapsulation efficiency (EE), and morphology. Optimization was performed using response surface methodology (RSM). The optimized Met-MCNPs demonstrated an average particle size of 245.6 ± 8.3 nm with a PDI of 0.312 ± 0.02 , indicating relatively uniform particle distribution. The zeta potential was $+31.4 \pm 1.7$ mV, suggesting good colloidal stability. Encapsulation efficiency reached $78.5 \pm 3.1\%$, indicating effective methionine entrapment within the nanoparticle matrix. Morphological observation revealed predominantly spherical nanoparticles with smooth surface characteristics. Preliminary in vitro release evaluation showed a slower methionine release profile under simulated acidic conditions compared to neutral pH conditions, suggesting pH-responsive release behavior. In conclusion, the developed Met-MCNPs exhibited promising physicochemical properties and encapsulation performance, highlighting their potential application as a controlled nutrient delivery system in poultry nutrition.

Keywords: *Methionine, chitosan nanoparticles, nanoencapsulation, poultry nutrition, controlled release*

HEAVY METAL LOADING IN PIG FARMING WASTEWATER ACROSS TREATMENT STAGES

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Abstract

Pig farming activities can cause environmental pollution if the waste is not properly treated. Department of Environment (DOE) report shows that pig farming is a significant contributor of pollution load in Malaysian rivers in terms of Biochemical Oxygen Demand (BOD), Suspended Solids (SS) and Ammoniacal Nitrogen (AN). The current pig population in Malaysia is estimated at approximately 1.15 millions with Selangor having the second highest pig population. In addition to its high organic content, pig wastewater also contains heavy metals which may originate from the feed additives used in pig farming. The heavy metal loading of wastewater from four pig farms in Kuala Langat, Selangor was analysed in this study. Wastewater samples from the stall, pond and drain were collected, and the concentration of heavy metals was determined by Inductively Coupled Plasma-Mass Spectrometry (ICP-MS). The allowable limit for heavy metals stipulated under Standard B of the Environmental Quality (Industrial Effluent) Regulations 2009 were used as the reference standard. Nine out of sixteen heavy metals analysed were detected in the samples, which are aluminium (Al), barium (Ba), copper (Cu), iron (Fe), manganese (Mn), rubidium (Rb), strontium (Sr), titanium (Ti), and zinc (Zn). All farms recorded concentrations of heavy metals below the standard limit except for Fe and Mn. The observed decrease in heavy metal concentrations from stall to pond samples, supported by a significant Fisher's Exact test result ($p < 0.05$), demonstrates the ability of waste stabilisation ponds in reducing the loading of metal pollutants. However, elevated concentrations in the drain samples may indicate subsequent recontamination downstream of the ponds or possible contamination from nearby industrial activities. Kruskal-Wallis test showed significant differences ($p < 0.05$) in heavy metals concentration among farms. This may reflect the difference in feed composition and management practices among the farms. The findings from this study highlight the important role of waste stabilisation ponds in mitigating heavy metal pollution from pig farming wastewater. Wastewater treatment is crucial to ensure the livestock wastewater meets the discharge limit and avoids environmental pollution.

Keywords: *Heavy metals, pig farming, wastewater treatment, sustainable livestock production*

DESIGN OF CURCUMIN-LOADED NANOLIPOSOMES FOR POTENTIAL ENHANCEMENT OF BROILER IMMUNITY

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Abstract

Curcumin, a polyphenolic compound derived from turmeric (*Curcuma longa*), is renowned for its antioxidant, anti-inflammatory, and immune-supporting activities. Nanoliposomes are useful carriers for transporting bioactives as they can improve solubility, protect sensitive compounds from degradation, enhance absorption and support controlled release. In broiler production, chickens are highly vulnerable to infectious diseases and pathogen challenges, while the routine use of antibiotics raises concerns about antimicrobial resistance and potential risks to consumers. Therefore, supplementing broilers with curcumin may provide a natural strategy to support health and immunity and potentially reduce reliance on antibiotics. This study aims to design a nanoliposomal formulation of curcumin for the potential application as a natural supplement for broilers to support immunity and reduce reliance on antibiotics. A standard calibration curve was generated to assess curcumin content in the extract, and concentrations of 0.25–15 mg/mL were selected for formulation development. Two nanoliposomal formulations with lipid ratios, DPPC:DSPE and DPPC:DSPE:Cholesterol, were characterized before and after chitosan coating. Curcumin powder size was optimised by sequential centrifugation and sonication to reduce particle size before encapsulation. The optimised curcumin powder was then loaded into the selected nanoliposomal formulation, and encapsulation efficiency was determined using UV-Vis analysis with triplicate measurements. Among the nanoliposomal formulations, DPPC:DSPE:Cholesterol showed better stability and was selected for subsequent encapsulation studies. The optimised curcumin powder size achieved a mean particle size of 75.5 ± 13.6 nm with a PDI of 0.25 ± 0.04 . Using this optimised powder size, successful nanoliposomal encapsulation was obtained, where the final formulation coated with 0.1% w/v chitosan demonstrated an encapsulation efficiency of $93.8 \pm 2.4\%$. The curcumin-loaded nanoliposomal formulation was optimised and achieved high encapsulation efficiency with favorable particle characteristics, supporting its potential for stable and controlled delivery and future supplementation in broiler chickens as a natural approach to enhance immunity and reduce antibiotic dependence.

Keywords: *Curcumin, Curcuma longa, nanoliposome, chitosan*

THE DESIGN OF METHOXYFLAVONE-RICH EXTRACT-LOADED NANOLIPOSOMES FOR POTENTIAL ENHANCEMENT OF BROILER IMMUNITY

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Abstract

Black ginger, *Kaempferia parviflora* is a medicinal plant rich in methoxyflavones, its main bioactive flavonoid compounds, which have been associated with antioxidant, anti-inflammatory and immune-supporting activities. Nanoliposomes are useful carriers for transporting bioactives because they can improve solubility, protect sensitive compounds from degradation, enhance absorption and support controlled release. This makes nanoliposomal delivery particularly promising for poultry applications, where improved stability and uptake of bioactives are needed. In broiler production, chickens are potentially vulnerable to infectious diseases and pathogen challenges, while the routine use of antibiotics raises concerns about antimicrobial resistance and potential risks to consumers. Therefore, supplementing broilers with methoxyflavone-rich black ginger extract may provide a natural strategy to support health and immunity and potentially reduce reliance on antibiotic use in broilers. A standard calibration curve was generated to assess methoxyflavone content in black ginger extract, and concentrations of 2–5 mg/mL were selected for formulation development. Two nanoliposomal formulations, which consist of lipidic ratios of Full (DPPC): Full (DSPE) and DPPC:DSPE:Cholesterol, were characterized before and after chitosan coating. The black ginger extract powder was optimised by sequential centrifugation and sonication to reduce its particle size before encapsulation. The optimised extract powder was then loaded into the selected nanoliposomal formulation, and encapsulation efficiency was determined using UV-Vis analysis with triplicate measurements. The nanoliposomal formulation of DPPC:DSPE:Cholesterol exhibited better stability and was selected for subsequent encapsulation studies. The optimised black ginger extract achieved a mean particle size of 91.2 ± 18.78 nm and a Full (PDI) of 0.33 ± 0.03 . Using this optimised extract powder, successful nanoliposomal encapsulation was obtained, and the final formulation coated with 0.1% w/v chitosan demonstrated an encapsulation efficiency of $86.83 \pm 3.11\%$. The methoxyflavone-rich extract-loaded nanoliposomal formulation was optimised and achieved high encapsulation efficiency with favourable particle characteristics, supporting its potential for stable and controlled delivery and future supplementation in broiler chickens as a natural approach to enhance immunity and reduce antibiotic dependence.

Keywords: *Kaempferia parviflora*, nanoliposome, chitosan

FIRST REPORT ON AGE-DEPENDENT BREEDING SOUNDNESS ASSESSMENT OF KEDAH-KELANTAN BULLS WITH IMPLICATIONS FOR HERD FERTILITY IN TROPICAL MALAYSIA

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Abstract

Breeding Soundness Evaluation (BSE) is a practical tool used to determine the reproductive capability of breeding bulls and to support efficient herd fertility management. This study aimed to assess the influence of age on key reproductive parameters in Kedah-Kelantan bulls and to highlight its potential value as a guideline for cost-effective bull selection at the farm level. A total of 24 bulls aged between 11 months and 12 years were evaluated, representing pre-pubertal, sexually mature and aged bulls. Parameters recorded included body weight, body condition score, scrotal circumference, progressive motility, total motility and sperm concentration. Semen samples were collected using an electro ejaculator and analysed using iSperm, a portable semen analysis device, to provide rapid and accurate measurements of sperm quality directly at farm. Correlation analysis was conducted to examine the relationship between age and reproductive traits. The results demonstrated a strong positive correlation between age and body weight ($r = 0.87$) and a moderate positive correlation with scrotal circumference ($r = 0.64$), indicating progressive reproductive development with maturity. Younger bulls (≤ 16 months) showed smaller scrotal circumference and variable semen quality, reflecting incomplete sexual maturity during the pubertal transition. Bulls within the prime breeding age (2 - 4 years) exhibited stable BSE parameters, including higher progressive motility and adequate scrotal circumference. Conversely, aged bulls (> 10 years) demonstrated reduced semen quality, particularly lower progressive motility and sperm concentration. Progressive motility showed strong correlation with total motility ($r = 0.88$) confirming its importance in assessing semen fertility. These findings highlight that both pubertal development and advanced age significantly influence BSE outcomes. Incorporating age-based evaluation into routine BSE provides farmers with practical, cost-effective decisions for selecting bulls, optimizing reproductive efficiency and enhancing productivity in local cattle breeding programs.

Keywords: *Breeding Soundness Evaluation (BSE), Kedah-Kelantan breed, bulls, semen quality, sexual maturity*

EVALUATION OF DIFFERENT CONCENTRATIONS OF POMEGRANATE (*Punica granatum*) JUICE IN TRIS- EGG YOLK-BASED EXTENDER ON THE QUALITY OF FRESH AND CHILLED ARABIAN STALLION SEMEN AT DIFFERENT STORAGE TIME

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Abstract

Artificial insemination (AI) is widely used in the equine industry for genetic improvement, with fresh and chilled semen preferred due to higher fertility than frozen semen. However, semen quality declines during chilled storage, as sperm motility, viability, and morphology deteriorate within 48 hours, mainly due to oxidative stress. Therefore, natural antioxidants such as pomegranate (*Punica granatum*) juice are being explored as potential additives to improve semen preservation. This study aimed to evaluate the effects of different concentrations of pomegranate juice (0%, 5%, and 10% v/v) supplemented in a Tris–egg yolk-based extender on the quality of Arabian stallion semen during chilled storage at 0, 24, and 48 hours. Semen samples ($n = 3$ ejaculates) collected from a fertile four-year-old Arabian stallion were divided into three treatment groups and assessed for progressive motility, viability, and normal morphology at each storage interval. Statistical analysis was performed using one-way and two-way ANOVA followed by Duncan's Multiple Range Test and Bonferroni post-hoc test, with statistical significance set at $p < 0.05$. The results showed that all sperm quality parameters declined significantly with increasing storage duration ($p < 0.05$). Progressive motility decreased from $(41.85 \pm 8.66^a) \%$ at 0 hours to $(14.29 \pm 4.04^a) \%$ at 48 hours, while normal morphology declined from $(84.81 \pm 3.27^a) \%$ to $(68.74 \pm 4.44^a) \%$. Sperm viability also decreased sharply within the first 24 hours, followed by a stabilization phase. Despite this decline, supplementation with pomegranate juice was associated with improved semen quality compared to the control group. The 10% pomegranate juice treatment consistently recorded the highest average values for progressive motility $(38.83 \pm 9.14^a) \%$, viability $(73.33 \pm 5.15^a) \%$, and normal morphology $(85.93 \pm 2.66^a) \%$ across all storage periods, suggesting a concentration-dependent protective effect. The improved preservation observed in pomegranate-supplemented groups may be attributed to the presence of antioxidant compounds such as polyphenols, which help reduce oxidative stress and maintain sperm cell integrity. Although chilled storage leads to an inevitable decline in semen quality, the inclusion of 10% pomegranate juice in a Tris–egg yolk extender effectively enhances the preservation of stallion semen by maintaining higher sperm quality compared to untreated samples. However, these findings should be interpreted with caution due to the limited sample size and the use of semen from a single stallion. Further studies involving a larger sample size and multiple stallions are required to confirm these findings.

Keywords: Semen extender, pomegranate juice, stallion semen, sperm preservation, chilled storage

SMART AGRICULTURE ADOPTION IN MALAYSIAN DAIRY GOAT FARMING: EVIDENCE FROM A FUZZY LOGIC ANALYSIS

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Abstract

The dairy goat industry in Malaysia is still at an early stage of development, characterized by small scale operations and limited technological integration despite increasing demand for goat milk. This study aims to assess the level of smart agriculture technology adoption among dairy goat farmers in Malaysia. A total of 80 farmers were surveyed using structured questionnaires. The level of technology adoption was measured using a Fuzzy Logic Index across seven farm management components namely breeding, health, housing, feeding, milk management, waste management, and farm record systems. The findings indicate that technology adoption is predominantly at a moderate level, with 61% of farmers classified as moderately low and 39% as moderately high while none achieved a high level of adoption. The medium Fuzzy Index score of 0.446 reflects reliance on basic mechanization such as mixer feeders and portable milking machines rather than advanced technologies such as IoT and automation. In addition, 61% of farmers lacked knowledge of smart agriculture technologies, highlighting a significant knowledge gap, while only 14% reported using such technologies. The study also found that adoption is higher in routine farm operations such as feeding and milk management, while other areas remain largely dependent on manual practices. Key barriers to adoption include high investment costs, limited access to technology, and lack of technical expertise. Although 68% of farmers expressed interest in adopting smart technologies in the future. Overall, the findings suggest that the Malaysia dairy goat sector remains at a transitional stage of technology adoption, requiring targeted interventions to enhance awareness, accessibility, and capacity building to support the adoption of smart agriculture technologies.

Keywords: *Smart agriculture, dairy goat, technology adoption, fuzzy logic, Malaysia*

THE MONITORING OF BOD₅ AND COD LEVELS IN DAIRY CATTLE FARMS

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Abstract

Dairy cattle farms play a crucial role in food production, yet it also poses a significant environmental threat due to the release of wastewater effluent. Effluent from cattle farm facilities contains a mixture of organic matter, nutrients, and pathogens, which pose risks to water quality and the health of aquatic ecosystems. Five-day Biochemical Oxygen Demand (BOD₅) and Chemical oxygen demand (COD) serve as the critical indicators for assessing the level of organic pollution in wastewater and their potential adverse effects on nearby water bodies. Understanding fluctuations in BOD₅ and COD levels is essential for crafting effective management strategies to safeguard water resources and minimize environmental harm. This research aims to evaluate the BOD₅ and COD parameters in dairy cattle farm wastewater from different states of Malaysia and assess their compliance with the Environment Quality Act, 1974. The evaluation of wastewater quality was carried out by collecting wastewater samples and monitoring the dairy cattle farming activities. A total of 21 dairy cattle farm wastewater samples from different states of Malaysia were collected and transferred into one-litre polyethylene (PE) bottles at the outflow point of each final pond between 9.00 am and 1.00 pm. The collected samples were preserved and transported inside an icebox for laboratory analysis. Biochemical oxygen demand (BOD₅) and chemical oxygen demand (COD) were determined according to the American Public Health Association (APHA) 2005 21st Edition, APHA 5210B and APHA 5220D respectively. The findings of this study revealed that the average biological oxygen demand (BOD₅) level for the dairy cattle farm is 222.5 mg/L. The average COD level for the cattle farm is 1278.43 mg/L. The effluent produced from the dairy cattle farm has exceeded the standard limits of 50 mg/L for BOD₅ and 200 mg/L for COD, as stipulated by the Department of Environment, Malaysia. This indicates a widespread issue of organic pollution, highlighting the urgent need for targeted interventions and stricter enforcement of environmental regulations to mitigate adverse impacts on water quality and ecosystem health.

Keywords: *Effluent, cattle, Biochemical Oxygen Demand (BOD), Chemical oxygen demand (COD), environment*

LIVESTOCK MANAGEMENT SYSTEM IN OIL PALM PLANTATIONS TOWARDS DIGITAL TRANSFORMATION

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Abstract

Integrated cattle in plantation systems offer a strategic approach to improving land productivity and agricultural sustainability. Therefore, implementing effective monitoring practices is essential for achieving optimal results. Traditional livestock management in oil palm plantations relies on fragmented manual records, thereby hindering traceability and performance assessment for coordinated decision-making. This study presents a Livestock Management System developed for livestock operations within oil palm plantation environments. The platform centralizes farm registration, plantation block mapping, livestock profiling, health records, paddock rotation scheduling, and operational monitoring within a unified data architecture. Currently, there are 14 recorded farms, which include 235 plantation blocks covering a total land area of 14,832.69 hectares. Additionally, 4,223 livestock records have been digitized and are managed through the system. The web application was developed using Laravel and a MySQL database, featuring a secure API integration layer that enables interoperability with the national MyFeed system to synchronize daily feed ration data. This integration enables cross-analysis of daily feeding inputs, paddock rotation patterns, and livestock performance indicators to support evidence-based farm management. Furthermore, the system is designed with a scalable and extensible architecture, allowing for seamless integration with future digital agriculture platforms, smart cattle weighing systems, IoT-based monitoring tools, analytics engines, and national-level decision support systems. The introduction of this digital platform supports national agricultural priorities aimed at increasing livestock units within oil palm plantations to enhance domestic beef supply and improve self-sufficiency levels. By providing a future-ready and interoperable digital infrastructure, the system also supports operational stakeholders and policymakers in advancing sustainable, data-driven livestock development within integrated plantation ecosystems.

Keywords: *Digital livestock system, oil palm integration, precision livestock management*

EFFECTS OF DIFFERENT REARING SYSTEMS ON THE GROWTH PERFORMANCE OF KATJANG–BOER CROSSBRED GOATS UNDER TROPICAL CONDITIONS

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Abstract

Goat production is a crucial component of tropical agricultural systems, contributing to food security and rural livelihoods. Production systems, intensive and semi-intensive, differ in terms of cost management and operational intensity. This study aimed to compare the growth performance of 8-month-old Katjang-Boer crossbred bucklings managed under intensive (pen-housed and provided with cut-and-carry forage diet supplemented with concentrate) and semi-intensive systems, where animals were allowed to graze guinea grass (*Panicum maximum*) for 4 hours daily and received similar supplementation at MARDI Kluang, Malaysia. A total of 32 (6-25 Kg) goats were randomly assigned to two treatments (n = 6 per group) and fed a commercial grower pellet with *ad libitum* access to mineral blocks for 20 days. Growth in Body weight (BW), body length (BL), height at withers (WH), heart girth (HG), and chest depth (CD) were monitored biweekly. Data were analyzed using a two-way repeated measures ANOVA, with production system (intensive vs. semi-intensive) as the between-subject factor and time as the within-subject factor. Differences were considered significant at $P < 0.05$. After 20 days, goats under the semi-intensive system showed significantly higher ($P < 0.05$) body weight growth (20.59 ± 2.08 kg) compared to those under the intensive system ($7.24 \pm .88$ kg). Similarly, semi-intensive goats exhibited greater gain in body length (60.26 ± 5.56 vs. 53.70 ± 5.00 cm), heart girth (7.0 ± 3.40 vs. 63.90 ± 3.6 cm), chest depth ($4.95 \pm .04$ vs. 0.80 ± 0.64 cm), and height at withers ($0.69 \pm .44$ vs. 8.08 ± 0.60 cm) than those in the intensive system. No mortality or clinical health problems were observed in either group. These findings indicate that the semi-intensive system enhances the growth performance of Katjang-Boer crossbred bucklings and supports better body development under tropical conditions, making it a more efficient production strategy when grazing resources are available.

Keywords: *Katjang-Boer crossbred, production system, growth performance, goat farming, tropical livestock*

FIELD-BASED EVALUATION OF LoRa COMMUNICATION FOR SMART VETERINARY LIVESTOCK TRACKING IN CATTLE INTEGRATED FARMING SYSTEMS

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Abstract

Long Range Communication (LoRa) is a key Internet of Things (IoT) technology in Low Power Wide Area Networks (LPWAN), enabling energy-efficient communication, wide coverage, low data rates, and prolonged battery life. These features render it suitable for large-scale agricultural and livestock monitoring applications. Under theoretical and ideal line-of-sight conditions, LoRa communication can achieve transmission ranges of up to approximately 4.8 km in urban environments and up to 6 km or more in rural open fields. However, data from real-world applications involving live animals remains limited. This study presents a field evaluation of LoRa communication performance for livestock tracking within an integrated cattle farming system located in an oil palm plantation. The experimental setup includes a statically positioned LoRa Border Gateway, a relay gateway deployed at the farthest communication point from the border gateway, and LoRa-based collar devices. These collars, originally designed for cattle tracking, were used in this study as instruments to measure LoRa signal performance. The trackers were randomly distributed at varying distances and placed beneath the oil palm canopy to simulate realistic free-roaming cattle movements in an integrated oil palm-livestock system. Key communication parameters, such as distance, Received Signal Strength Indicator (RSSI), Signal-to-Noise Ratio (SNR), and Spreading Factor (SF), were systematically measured and analyzed across multiple field locations. The experimental design replicates real-world operating conditions in a free-range integrated cattle farming environment, facilitating a realistic assessment of LoRa communication reliability and propagation behavior under canopy obstructions, terrain variations, and spatial node dispersion. This finding offers practical insights into the feasibility and performance limitations of integrated cattle tracking in oil palm plantations based on LoRa.

Keywords: *Long Range Communication (LoRa), collar tracker, Received Signal Strength Indicator (RSSI), Signal-to-Noise Ratio (SNR), Spreading Factor (SF)*

IMPACT OF INTENSIVE ACTIVITY ON PASTURE AND FODDER AREAS: IMPLICATIONS FOR SOIL FERTILITY

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Abstract

The intensification of land use in pasture and fodder management areas, driven by increasing demands for livestock production, has raised significant concerns regarding the sustainability of grass in pasture and fodder areas. Pastures are land covered with cultivated grass suitable for grazing by domesticated animals especially cattle or sheep meanwhile, fodder refers to grass grown cut and carried for feeding livestock. Intensive practices such as overgrazing and mechanised farming are known to accelerate soil degradation, reduce soil fertility and grass quality. This study aims to evaluate the impact of intensive activity on pasture and fodder areas. A total of five (5) pastures and four (4) fodder plots were randomly selected, soil samples were taken using auger and assessed through lab tests for soil nutrient analysis. Key parameters analysed were soil pH and electrical conductivity as indicators of soil fertility in pasture and fodder areas. The results showed that fodder areas exhibited moderately in acidic conditions, with a mean pH of 4.7 compared to pasture areas with mean pH of 6.0. There were no significant differences between pasture and fodder areas regarding the pH values. In addition, for soil electrical conductivity was lower in fodder areas with mean 35.3 $\mu\text{S}/\text{cm}$ compared to pasture areas with mean 57.2 $\mu\text{S}/\text{cm}$ and this figure shows a significant difference between pasture and fodder areas. It shows that pasture areas were highly present in organic matter compared to fodder areas. Low presence of organic matters in fodder areas indicates that intensive daily use of mechanised farming such as tractors and harvester or prolonged use of fodder management can reduce soil fertility which can result in a decline of organic matters that can affect soil fertility. Overall, this study concludes that intensive uses in fodder areas increase the risk of soil degradation and then also affect quality and yield productions compared to pasture areas. Thus, in order to improve organic matter and soil fertility management, further research in regenerative farming were recommended for instance rotational grazing for pasture, bio-organic fertilizer usage and legume cover cropping for fodder to ensure long term sustainability of soil as well as improve the quality and yield production of pasture and fodder.

Keywords: *Pasture, fodder, electrical conductivity, intensive activity, soil degradation*

UNCOVERING THE GENOMIC LANDSCAPE OF KEDAH-KELANTAN CATTLE USING A 770K HIGH-THROUGHPUT SNP PLATFORM

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Abstract

The Kedah-Kelantan (KK) cattle represent a cornerstone of Malaysia's genetic heritage, specifically adapted to tropical environmental stressors and essential for national food security goals. However, high-resolution genomic characterization of this breed has historically lagged behind, often relying on lower-density marker sets that lack the resolution to identify fine-scale selection signatures or precise ancestral admixture. This study establishes a comprehensive genomic audit of the KK population using the Illumina BovineHD 770K BeadChip to develop a high-density molecular baseline for diversity, population structure, and environmental adaptation. DNA was extracted from representative nucleus populations maintained at MARDI's strategic stations in Kemaman and Muadzam Shah and genotyped using the 770K high-throughput platform. Post-genotyping, rigorous quality control filters were applied, followed by Principal Component Analysis (PCA) and Admixture profiling to evaluate breed purity, alongside Runs of Homozygosity (ROH) to assess historical effective population size (N_e) and levels of autozygosity. Preliminary genomic characterization revealed a highly distinct genetic architecture within the KK breed compared to standard *Bos indicus* and *Bos taurus* reference populations. Initial scans identified high-frequency SNP windows and candidate regions associated with key tropical adaptation traits, including thermotolerance and parasitic resistance, providing the molecular basis for stabilizing composite lines. These findings provide detailed genomic roadmap for Kedah-Kelantan cattle to date, facilitating Genomic-Assisted Selection (GAS) in precision breeding programs to ensure the long-term productivity of Malaysia's indigenous livestock assets under the RMK13 framework.

Keywords: *Kedah-Kelantan Cattle, SNP Panel, population structure, Runs of Homozygosity (ROH), genetic diversity.*

ASSESSMENT OF BEEF CATTLE POPULATION UNDER PALM OIL INTEGRATION SYSTEM FOR NATIONAL GREEN HOUSE GAS ESTIMATION

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Abstract

Malaysia's beef cattle industry, valued at over RM17.4 billion, currently faces a significant supply-demand gap with a self-sufficiency level (SSL) of 14.7% as of 2024. As efforts to increase local production intensify, quantifying the environmental impact, specifically enteric greenhouse gas (GHG) emissions from ruminants, has become a critical priority. However, accurate national GHG estimation is currently hindered by a lack of detailed baseline data on breed profiles, animal weights, and age-specific emission factors. To address this gap, this study assesses population dynamics and evaluates enteric methane emissions across 18 commercial farms integrated within palm oil estates. Utilizing IPCC Tier 2 methodology, a population of over 10,000 head was categorized into five cohorts: calves (0 to 1 year), young males/females (< 2 years), and adult males/dams (> 2 years). A historical overview since 1990 was constructed by incorporating animal proportion data derived from the census and average annual slaughter statistics over the last 7 years. Results indicate that enteric fermentation emission factors (EF) range from 32.9 to 93.9 kg CH₄/head/year, with the highest emissions observed in adult bulls. These findings, based on Brahman and Kedah-Kelantan (KK) crosses under rotational grazing, provide the essential statistical framework required for robust national GHG inventories and sustainable livestock management strategies.

Keywords: *Enteric fermentation, IPCC Tier 2, methane emissions, palm oil integration, population dynamics*

AGE-RELATED DYNAMICS IN MILK YIELD, COMPOSITION, AND FTIR SPECTRAL FINGERPRINTS OF SAANEN DAIRY GOATS

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Abstract

The dairy goat industry in Malaysia is a developing sector currently working toward meeting rising consumer demand. Optimizing production requires a deep understanding of how physiological factors, such as age, influence both the quantity and quality of milk. This study evaluated the effect of age on milk yield, composition, and chemical characterization in Saanen dairy goats at Ladang Pasir Akar, Universiti Sultan Zainal Abidin (UniSZA). Ten healthy dams ($n=10$) were divided into two groups: young dams (under 2 years old) and old dams (2 years and above). Milk yield was monitored over a six-week period, while milk composition—including fat, protein, lactose, and solids-not-fat (SNF)—was analyzed using a Milkotester at days 14, 60, and 120 of lactation. Chemical characterization was further conducted using Fourier Transform Infrared (FTIR) spectroscopy. Results indicated that old dams achieved a higher initial milk yield, peaking at 1433.6 g in Week 2, whereas young dams showed a more gradual increase, peaking at 1018.4 g in Week 4 and maintaining higher production levels in later weeks. Compositional analysis revealed that young dams produced milk with higher fat content (e.g., 6.19% at Day 60) compared to old dams (4.43%), though these differences were not statistically significant ($p>0.05$). FTIR spectra complemented these findings, showing higher absorbance in fat and protein regions for older dams toward late lactation (Day 120), suggesting more concentrated milk solids. In conclusion, while age did not significantly alter the basic chemical parameters, it notably influenced the timing of peak production and early-lactation fat concentration. These insights can assist producers in making informed breeding and culling decisions to optimize herd performance.

Keywords: *Age, milk yield, composition, FTIR, Saanen, goat*

ARTIFICIAL INSEMINATION IN SELANGOR CATTLE FARMS: IMPLEMENTATION AND KEY CONSTRAINTS

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Abstract

Artificial insemination (AI) is a valuable reproductive technology with significant potential to enhance livestock productivity and food security, a critical pillar of Malaysia's strategic development plan. This study assessed the level of AI adoption and identified factors limiting its implementation among cattle farms in Selangor. Specifically, it determined the proportion of farms practicing AI and examined the key factors influencing its uptake. A cross-sectional survey was conducted involving 42 cattle farmers using a structured 52-question questionnaire. Data were collected via Google Forms (n = 39) and on-site farm visits (n = 3), yielding a 56% response rate. Descriptive statistics summarized adoption patterns, while independent *t*-tests, Mann-Whitney U tests, and Pearson's Chi-square tests were used to identify factors associated with AI adoption. The results indicated that only 2.4% (n = 1) of farms relied exclusively on artificial insemination (AI), while 42.9% (n = 18) adopted both AI and natural mating, and 54.8% (n = 23) depended solely on natural mating. Seven factors were significantly associated with higher AI adoption: preferred breeding program ($p < 0.001$), reproductive readiness ($p < 0.001$), availability of AI technicians ($p = 0.024$), perceived AI outcomes ($p = 0.003$), awareness of AI ($p = 0.031$), farmers' education level ($p = 0.025$), and exposure to reproductive training ($p = 0.011$). Overall, natural mating remains the predominant breeding method among cattle farms in Selangor, with limited adoption of AI as the sole reproductive strategy. Improving technical support, increasing farmer awareness, and providing reproductive training may enhance AI adoption. Further studies are recommended to identify additional barriers and develop targeted strategies to promote effective AI implementation within the cattle industry.

Keywords: *Artificial insemination, breeding program, cattle farm, limiting factors*

EFFECT OF POLYPHENOL-RICH OIL PALM EMPTY FRUIT BUNCH EXTRACT ON PLASMA FATTY ACID OF SAANEN GOATS

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Abstract

Agricultural by-products are increasingly used as functional feed additives in sustainable ruminant production. Oil palm empty fruit bunch (OPEFB) extract is rich in polyphenol that modulates rumen fermentation and microbial ecosystems. Specifically, these phytochemicals can inhibit rumen biohydrogenation by suppressing key bacteria, allowing more unsaturated fatty acids to escape the rumen and alter blood lipid profiles. Understanding this systemic link between OPEFB supplementation and blood lipid composition is crucial for improving livestock meat and milk quality. Therefore, this study aimed to determine the changes in blood fatty acid profiles of goats supplemented with 5% OPEFB extract. Four female Saanen goats (mean weight 54.3 ± 9 kg) crossbred dairy goats were randomly assigned to treatment sequences in a crossover study. Starting 14 days post-partum, each trial consisted of a 10-day adaptation, a 7-day experimental phase and a 12-days washout period to prevent carry-over effects. Blood samples were taken at day 17, 2 hours post feeding via jugular vein puncture for a plasma fatty acid analysis. The result indicated that the 5% OPEFB diet showed no significant differences ($P > 0.05$) on lauric, myristic, palmitic, margaric, stearic and total unsaturated fatty acid (UFA) content of the blood plasma. Meanwhile, capric, oleic, linoleic, total saturated fatty acid (SFA), unsaturated to saturated fatty acid (UFA: SFA) ratio and poly-unsaturated fatty acid (PUFA: SFA) ratio was affected significantly ($P < 0.05$) by the 5% OPEFB diet. The 5% OPEFB diet significantly increased ($P < 0.05$) the content of capric, oleic and total SFA, at the same time, significantly decreased ($P < 0.05$) the content of linoleic, UFA: SFA ratio and PUFA: SFA ratio compared to the control diet. In conclusion, the 5% OPEFB extract diet successfully modulates goat blood lipid profile by increasing capric and oleic acids, though the concurrent decrease in linoleic acid and UFA:SFA ratios suggests further optimization is required to maximize its benefits for livestock product quality.

Keywords: *Oil palm empty fruit bunch, extract, plasma fatty acid, dairy goat*

ENHANCING THE PERFORMANCE OF IMPORTED BRAHMAN CATTLE IN CATTLE–PALM OIL INTEGRATION SYSTEMS THROUGH TARGETED MANAGEMENT INTERVENTIONS

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Abstract

Cattle–oil palm integrated farming is a low-input livestock system in which cattle graze weeds and other plants within a palm oil plantation without additional feed. An oil palm plantation in Pahang has been practicing cattle–palm oil integration on its 1,680.33-hectare area since the early 2000s, which was initiated with Kedah–Kelantan (KK) cattle. However, in 2025, the plantation revamped its livestock integration system to establish a more systematic approach and improve overall profitability. As part of this initiative, 1,413 Brahman cattle were imported from Australia. However, within seven months of their arrival in Malaysia, a mortality rate of 9.6% was recorded, highlighting the need for immediate intervention. Although the plantation had already appointed a veterinary doctor as an expert consultant, a successful livestock integration farmer was also engaged as an expert advisor due to the critical condition of the herd. Livestock with body condition scores (BCS) below 2 were transferred to a feedlot for close monitoring and weight recovery. Weaker animals with lower competitiveness were housed separately in a low-density feedlot area to ensure better access to feed. The grazing herd was subsequently reorganized from a single large herd of 800 animals into four smaller groups consisting of 200–250 animals each. During the acclimatization period, the existing diet consisting of Napier grass, hay, molasses, and mineral blocks was enhanced with additional supplements, including Palm Kernel Cake (PKC) as a source of protein and energy, Dolomix for minerals and vitamins, and corn and soybean hulls for additional energy. During the first month of grazing, cattle received 1 kg of supplementary feed per day, which was reduced to 0.5 kg per day in the second month. In addition to the emergency intervention measures, the plantation developed a competency framework for field workers through livestock management and handling training courses. Following the implementation of these interventions, livestock conditions improved steadily, and the mortality rate decreased by 53%. In conclusion, imported livestock require close monitoring and specialized management approaches compared to locally adapted KK cattle to facilitate environmental adaptation, minimize stress, and reduce the risk of morbidity and mortality.

Keywords: *Cattle-Oil palm integration, livestock management, intervention, imported Brahman*

SYNERGIZING BEEF PRODUCTION: PERFORMANCE ANALYSIS OF A COMMERCIAL INTEGRATED CATTLE-OIL PALM FARM IN PAHANG

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Abstract

Malaysia is among the largest palm oil producers; however, approximately 10% of the plantation area is currently used for integrated livestock farming systems. To support the national goal of achieving a 50% beef self-sufficiency ratio (SSR) by 2030, a case study was conducted to evaluate the performance of an integrated beef cattle–oil palm production system on a commercial farm in Pahang, Malaysia. The assessment included key aspects such as livestock management, breeding, animal health, feeding practices, and farm infrastructure. Data were collected in February 2026 through structured questionnaires, along with a 45-minute interview with the farm manager. The farm spans 520 hectares and maintains a herd of 146 cattle. Grazing was only allowed in oil palm plots with trees at least 8 years old to prevent crop damage. Kedah–Kelantan crossbred cattle were the preferred breed (62.2%), followed by Brahman (36.5%). The remaining Nelore cattle (1.2%) were gradually phased out due to management challenges and aggressive behavior that often led to injuries among animals. No livestock losses were reported in the past 3 years. The bull-to-cow ratio was maintained at an optimal level of 1:16, with all breeding bulls being younger than 6 years of age to minimize the risk of inbreeding. Pregnancy tests were performed twice a year, with pregnancy and calving rates average at 80%, indicating good reproductive performance. The herd's average mortality rate was 0.6%, due to attacks by stray dogs. Although the grazing area was limited to 0.35 hectares per cow, the farm implemented a rotational grazing system with intervals of 1.5–2.5 days, totaling 6 grazing cycles annually, supported by batteries and solar-powered electric fencing. The cattle relied entirely on natural pasture, supplemented with mineral blocks. Regular herd health programs included deworming and vaccinations against foot-and-mouth disease (FMD), lumpy skin disease (LSD), and brucellosis. This integrated system resulted in a 20–25% annual reduction in weed control costs. Overall, the farm achieved an average profit margin of 22.5%, amounting to RM14,000–15,000 annually from cattle sales.

Keywords: *Integrated system, oil palm, beef cattle, commercial farm*

TRAJECTORY ANALYSIS OF GROWTH AND SUSTAINABILITY PERFORMANCE (SDG) IN THE MALAYSIAN LIVESTOCK INDUSTRY

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Abstract

The livestock industry is a critical component of national protein security, yet it faces challenges of growth imbalance and high dependency on imported inputs. This study was conducted to analyse the growth trajectories and performance of Sustainable Development Goals (SDG) in the Malaysian livestock industry from 2012 to 2023. The data were obtained from the Department of Veterinary Services (DVS), Department of Statistics Malaysia (DOSM) and FAOSTAT databases. As for the analysis, the Compound Annual Growth Rate (CAGR) was used to measure the growth trajectories, while data regarding SDG performance (SDG 2, and 8) was evaluated through self-sufficiency ratio (SSR), Consumer Price Index (CPI) for food, average retail prices, and labour productivity analysis. Findings indicated a significant disparity in growth, where the poultry subsector recorded marginal growth with a CAGR of +1.37% for broilers and +1.50% for eggs, compared to a critical downward trajectory for the beef cattle subsector at a CAGR of -2.19%. While the physical availability of major protein sources remains relatively stable with the 2023 SSR for eggs and broiler at 110.5% and 96.5% respectively. The ruminant sector revealed severe vulnerability as beef SSR significantly declined from 28.26% to 15.9%. Moreover, food security is increasingly challenged by economic affordability. The trend analysis indicated that since 2020, the retail price growth of broilers has surged sharply, reaching RM 9.80/kg in 2023, which significantly outpaced the overall food inflation rate (CPI) and potentially hinders accessibility for low-income households. Ultimately, this study contributed to the broader SDG literature by providing empirical evidence on food affordability, while simultaneously serving as a data-driven alert for policymakers to formulate more balanced and sustainable interventions for the National Agrofood Policy 2.0 (DAN 2.0).

Keywords: *Trajectory analysis, livestock industry, SDG 2, SDG 8, food security*

ANALYTICAL PROFILING OF HAWTHORN FRUIT EXTRACTS USING GAS CHROMATOGRAPHY-MASS SPECTROMETRY (GC-MS)

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Abstract

In this study, the Hawthorn fruit was extracted using both methanol and hexane solvents, followed by gas chromatography-mass spectrometry (GC-MS) to identify the chemical constituents of the hawthorn fruit. According to the GC-MS chromatogram of the methanol crude extract of hawthorn fruit, five of the highest compounds were identified. Hexadecanoic acid and octadecyl ester (38.46%) showed the highest percentages, followed by the n-Decanoic acid (20.05%), 5-Hydroxymethylfurfural (14.81%), beta-D-Glucopyranose, 1,6-anhydro (2.27%), and lastly 9-Octadecenoic acid (Z)-, tetradecyl ester (2.19%). However, five different compounds were identified in the hexane crude extract from the same fruit. Tetracontane was found in the highest concentration (50.59%), followed by 7-Tetradecenal (11.65%), octacosyl trifluoroacetate (8.74%), n-Hexadecanoic acid (4.66%), and octacosane (3.21%). These results provided valuable insights for future research on isolation and application of these compounds for use in veterinary medicine as food additives or pharmaceutical preservatives.

Keywords: *Hawthorn fruit, methanol extract, hexane extract, phytochemical compounds*

EFFECTS OF OIL PALM-BASED CONCENTRATE ON LACTATION PERFORMANCE AND MILK FATTY ACID COMPOSITION OF DAIRY COWS

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Abstract

Oil palm industry by-products, particularly palm kernel expeller (PKE) and palm stearin (PS), represent promising and cost-effective alternative feed ingredients for the partial replacement of conventional components in commercial (COM) dairy cow rations. However, the optimal inclusion levels of PKE and PS and their effects on milk production and composition are not well established. Therefore, this study aimed to evaluate the effects of incorporating PKE and PS in feed formulation on milk production and composition traits in lactating dairy cows. A comparative study was conducted on dairy cows fed with COM concentrate and MPOB-formulated concentrate (containing optimal PKE and PS). A total of eight multiparous mid-lactation Jersey-Friesian crossbred dairy cows were randomly assigned to a 2 x 2 Latin square experimental design (four cows/treatment) across two 21-day experimental periods. Each period consisted of 14 days of adaptation followed by 7 days of sampling. Dairy cows received the treatment diet in mash form at a milk yield-to-concentrate ratio of 2:1, and Napier grass was offered *ad libitum*. Milk samples were collected twice daily (0700 and 1700 h), and individual milk yields were recorded. Mean milk yield (kg/day) was calculated from the last seven days of each experimental period. Sub-samples were collected on days 15, 18, and 21 for compositional analysis. The results indicated that the milk production of dairy cows fed with COM and MPOB concentrates was 10.34 and 10.13 kg/day/cow, respectively, with no significant differences observed between treatments ($p > 0.05$). Similarly, the chemical composition of milk, including total solids, solid-non-fat, ash, protein, fat, and lactose in the COM and MPOB treatments showed no significant differences ($P > 0.05$). The milk fatty acid composition from dairy cows fed with MPOB concentrate showed a significantly higher ($P < 0.05$) content of saturated fatty acid (SFA), whereas the contents of monounsaturated fatty acid (MUFA) and polyunsaturated fatty acid (PUFA) were not significantly different ($p > 0.05$) compared with those of cows fed the COM concentrate. This study demonstrated that the MPOB-formulated concentrate is a viable, cost-effective alternative to the COM concentrate, supporting comparable milk production without adversely affecting milk quality traits.

Keywords: *Palm kernel expeller, palm stearin, dairy cow, milk yield, milk composition*

APPLICATION OF MULTISPECTRAL IMAGING FOR FODDER REGROWTH MONITORING AND ASSESSMENT

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Abstract

High quality fodders are essential to provide the nutrients needed for sustainable livestock production. Limitations in feeding have become the main factors inhibiting livestock from reaching their optimal production potential, primarily due to the unavailability of feed and fodder (50.2%), followed by issues related to breeding and reproduction (21.1%), diseases (17.9%), and management (10.5%). The emergence of Unmanned Aircraft System (UAS) technology and its applications in the agriculture sector has transformed the sector towards a digital driven industry where increasing efficiency and productivity can be achieved. UAS spectral band of electromagnetic signature in the fodder crops can be identified to analyze the crop condition based on the reflectance value. This study aimed to produce a fodder regrowth map at day 35, 45 and 60 after cutting based on the normalized difference red-edge index (NDRE) value and validate the fodder regrowth map using the soil plant analysis development (SPAD) data. The image data were collected using multispectral and RGB cameras using DJI Mavic 3 multispectral (M3M) drone equipped with one 4/3 CMOS 20 MP RGB camera with max field of view 84° and four multispectral camera sensor of 1/2.8-inch CMOS 5 MP which capture images in five imaging bands at the altitude of 60 m, and a calibrated reflectance panel was used to calibrate the image. NDRE was used to measure the changes in nitrogen absorption in fodder crops. NDRE map showed the distribution of NDRE value across the study plot, which includes the healthy and less healthy vegetative area. A strong significant positive association was found ($r=0.76$) between SPAD value and the aerial imagery of NDRE value. The NDRE map allows farmers to monitor their fodder regrowth status and effectively improve their fodder management including fertilizer and water supplementation. In the future, advanced classification methods based on the reflectance of weed, water, and soil can be prioritized and separated into different classes, whereby the NDRE map can be plotted for fodder crop monitoring.

Keywords: *UAS, multispectral imaging vegetation index, fodder, NDRE*

PREVALENCE OF LAMENESS AND MASTITIS AND THEIR ASSOCIATED RISK FACTORS IN DAIRY COWS UNDER THE UPM LADANG ANGKAT PUTRA PROGRAMME

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Abstract

This study investigated the prevalence of lameness and mastitis and their associated risk factors in dairy cows at Ladang Angkat PUTRA farms. Both conditions represent major health and welfare concerns in dairy herds, contributing to production losses, economic burdens, and compromise animal well-being. However, data on their prevalence and associated risk factors in Malaysian dairy farms remains limited. A cross-sectional study was conducted on 44 lactating dairy cows from four farms under the UPM Ladang Angkat PUTRA programme. Lameness was assessed using a five-point locomotion scoring system, while mastitis was diagnosed through udder palpation, milk appearance assessment, and the California Mastitis Test (CMT). Information on breed, parity, stage of lactation, and the management system was collected via direct observation and structured interviews with farm personnel. Associations were analysed using Chi-square and Fisher's exact tests, followed by binary logistic regression to estimate the odds ratios (ORs) with 95% confidence intervals (CIs). The prevalence of lameness was 18.2% (8/44), while mastitis was detected at 54.5% (24/44). Logistic regression revealed a significant association between stage of lactation and lameness ($p < 0.05$). Cows in early lactation were 15.4 times more likely to develop lameness than those in late lactation (OR = 15.4, 95% CI: 1.61–142.9, $p = 0.018$). In conclusion, both lameness and mastitis were prevalent in the studied herds, with stage of lactation identified as the principal risk factor for lameness. Targeted management interventions during early lactation are recommended to reduce lameness and enhance overall cow welfare and productivity.

Keywords: *Dairy cows, lameness, mastitis, stage of lactation, risk factors*

GENOTYPIC CHARACTERISATION OF VAGINAL MICROBIOTA AND ITS CORRELATION TO REPRODUCTIVE HORMONES THROUGHOUT GESTATION IN DORPER EWES

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Abstract

This study investigated the longitudinal shifts in vaginal microbiota composition and its correlation to reproductive hormones (progesterone and estrogen) in pregnant Dorper ewes across three trimesters of gestation. Twenty clinically ewes (approx. 2 years old, 40–45 kg) with body condition score (BCS > 3) were monitored throughout gestation, and the vaginal swabs and blood samples were collected at pre-breeding (days 0), trimester 1 (60 days), trimester 2 (90 days), and trimester 3 (130 days). Microbial identification and phylogenetic analyses were performed using NCBI BLAST and MEGA 11, respectively. Enzyme-Linked Immunosorbent Assay (ELISA) determined hormone concentrations. Differences across trimesters were analysed using repeated-measures ANOVA, while R software was used to visualize temporal shifts in vaginal microbiota. Results showed that the vaginal microbiota of the ewes revealed a distinct successional pattern throughout gestation. In trimester 1, *Actinobacillus*, *Histophilus*, and unclassified *Leptotrichiaceae* had higher relative abundance (mean richness 140 ± 12 OTUs). As gestation progressed, taxonomic consolidation occurred, transitioning toward a *Firmicutes*-dominated landscape by the trimester 2 and 3. Microbial diversity reached its lowest point (85 ± 9 OTUs), with high sequence identity for genera such as *Lysinibacillus*, *Psychrobacillus*, and *Planococcus*. Concurrently, progesterone levels rose significantly from basal non-pregnant levels (0.36–0.59 ng/mL) to 3.17–3.63 ng/mL in trimester 1, peaking and stabilizing between 9.00 and 10.33 ng/mL during trimesters 2 and 3. Estrogen concentrations displayed a gradual upward trend during pregnancy. This finding suggests that the endocrine system modulates the vaginal microbiome to support the distinct physiological demands of pregnancy, providing a vital baseline for evaluating reproductive health and dysbiosis in sheep.

Keywords: *Dorper ewes, vaginal microbiota, progesterone, estrogen, 16S rRNA sequencing*

MILKING THE POTENTIAL: STRATEGIES FOR A 100% SELF-SUFFICIENT MALAYSIA

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Abstract

Malaysia's persistent reliance on imported fresh milk has positioned dairy self-sufficiency as a strategic food security priority. This study evaluated the performance of the National Dairy Production Enhancement Project under the Twelfth Malaysia Plan (RMK-12, 2021–2025) and examined the strategies underpinning its successor, the National Dairy Production Strengthening Project under the Thirteenth Malaysia Plan (RMK-13, 2026–2030), which targeted a 100% fresh milk Self-Sufficiency Ratio (SSR). Programme records, reimbursement data, and national production statistics from the Department of Veterinary Services were analysed to assess intervention impact across two delivery channels: the Large-Scale Entrepreneur Transformation and the Small Farmer Transformation. Under RMK-12, the project facilitated the entry of 7,051 head of breeding dairy stock (6,296 large-scale; 755 smallholders). National fresh milk production rose from 38.7 million litres in 2021 to a provisional 66.0 million litres in 2025, lifting the SSR from 56.7% to a provisional 81.8%. Notably, these production gains were achieved even as the active dairy farmer base contracted from 827 in 2021 to a provisional 622 in 2025, underscoring smallholder-retention pressures. Persistent constraints were identified, including land limitation, limited barn infrastructure, rising operating and feed costs, farm labour shortages, high start-up capital, and disease threats. Building on these findings, RMK-13 adopts a refined four-scope strategy that maintains the incentive reimbursement, now channelled through Agrobank, alongside local breed improvement (MAFRIWAL) and structured outreach (Jerayawara); the equipment package continues the cooling-tank provision of RMK-12 while newly introducing grass-chopper machines. The evidence indicated that targeted, reimbursement-based interventions can substantially accelerate domestic milk output and SSR gains; however, sustaining momentum toward full self-sufficiency requires parallel investment in infrastructure, feed-resource development, biosecurity, and smallholder retention. The Malaysian model offers transferable lessons for tropical developing economies pursuing dairy self-reliance.

Keywords: *Dairy self-sufficiency, fresh milk, livestock reimbursement, Malaysia food security*

ECONOMIC COSTS OF LUMPY SKIN DISEASE (LSD) ON RUMINANTS IN PENINSULAR MALAYSIA

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Abstract

Lumpy Skin Disease (LSD), first detected in Peninsular Malaysia in May 2021, rapidly spread across all 11 states, prompting nationwide control measures led by the Department of Veterinary Services (DVS). This study assessed the economic costs of the 2021–2022 outbreak and evaluated the cost-effectiveness of control strategies using the Global Burden of Animal Diseases (GBADs) framework. Focus Group Interviews with stakeholders were analysed thematically, and partial budget analysis was conducted to evaluate nine intervention scenarios at the national level. Total revenue losses due to LSD were estimated at MYR 48,109,823, with 46% attributed to direct losses and 54% to indirect costs. Vaccination alone emerged as the most cost-effective intervention, generating a net benefit of MYR 4,025,704 with a marginal rate of return (MRR) of 2.62. Combined strategies (vaccination with movement control or culling) produced positive but lower net benefits, with MRR values below 1. In contrast, cattle import bans resulted in substantial net losses ranging from MYR 1,356,277.56 to MYR 97,674,953.79, indicating adverse economic consequences. Overall, LSD imposed significant economic costs on Malaysia's ruminant industry, and vaccination alone or in combination offers the most economically efficient control strategy, supporting evidence-based policy decisions for improved outbreak preparedness and response.

Keywords: *Cost benefit analysis, economic, lumpy skin disease, ruminant industry*

ENHANCING BREEDLOT PROFITABILITY IN MALAYSIA: INTEGRATING COST OPTIMIZATION, VALUE ADDITION, AND CROSS-DOMAIN INNOVATIONS

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Abstract

Malaysia's beef industry faces a wide supply-demand gap, producing 16.8% of domestic consumption in 2024 while the consumption per capita increased at 1.8% from 2023. Despite this favorable macroeconomic environment and a substantial price premium for local fresh beef, many domestic breedlot operators struggle to achieve sustainable profitability. This study presents a comprehensive strategic blueprint to transform marginal commodity breedlots into highly profitable enterprises through a Three-Pillar Approach: cost reduction, revenue enhancement, and operational efficiency. Analysis of operational cost structures reveals that feed represents 58.6% of variable costs, making feed efficiency optimization the highest-leverage intervention. A 10% improvement in feed efficiency increases profitability by 43%. Precision nutrition management and integration of local agricultural byproducts such as Palm Kernel Cake (PKC) is recommended. For Malaysia's tropical climate, Brahman cross offers the optimal balance of heat tolerance, disease resistance, and market value. Bypassing middlemen through direct-to-consumer sales or selling contracts captures significant retail margins, while cross-domain innovations—such as integrating anaerobic digesters for biogas production or combining cattle with oil palm plantations—transform waste streams into profit centres. To justify investments in precision livestock farming technologies and achieve profitability after 3 years of investment, operations must achieve a minimum viable scale of 100 head. Implementing this blueprint, phased from foundational cost control to advanced vertical integration, can increase gross margins by 40% to 70%, establishing resilient and competitive domestic beef production systems.

Keywords: *Breedlot economics, feed efficiency, value addition, Brahman cross, precision livestock farming*

MALAYSIA EGGS: ARE WE REALLY SECURED?

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Abstract

Malaysia's table egg industry is one of the country's most important in industrialized food sectors. Eggs are a major source of affordable protein for Malaysian households, and the industry plays an important role in national food security. Malaysia's self-sufficiency ratio (SSR) for eggs was reported at 107%. Malaysia has a highly commercialized layer farming sector dominated by large integrated poultry companies. According to Unit Unggas, DVS Putrajaya, in 2025, there were five layer breeder companies operating in Peninsular Malaysia, with capacities ranging from 220,000 to 278,200 birds. The total female parent stock population was 850,232 birds. There is no Grand Parent Stock layer farm in Malaysia. The breeds available in the market are Hisex Brown which accounts for about 43.3 % of the total parent stock, Lohmann Brown (42.2%), Hyaline (10.5%), and Dekalb (4.1%). The layer parent stocks were imported from Brazil, Spain and Australia. The day-old pullet production in 2025 was 44.5 million birds. The estimated projection production for 2026 is 53.2 million birds. The traded ex-farm price day-old pullet averaged at RM3.83. Egg production was 33.17 million per day in 2025. The estimated projection production for 2026 was 39.67 million eggs per day. Currently there are 147 layer farms in Peninsular Malaysia with each farm capacities more than 10,000 concentrated mainly in Melaka (19,655,770), Johor (14,656,000) and Perak (11,308,500).

Keywords: *Poultry, layer, table eggs, Hisex*

VETERINARY EXTENSION AS A PILLAR OF LIVESTOCK INDUSTRY DEVELOPMENT: MEASURING THE ROLE OF DVS VETEC ON FARM SERVICE DELIVERY ACROSS PENINSULAR MALAYSIA (2021–2025)

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Abstract

Veterinary extension services form a critical link between national agricultural policy and farm-level productivity. This study evaluates the performance of the Department of Veterinary Services (DVS) Veterinary Extension Centres (VetEC) across Peninsular Malaysia over a five-years (2021-2025), using consolidated operational records covering staffing, extension programmes, registered farmers, farm visits, and ten categories of technical activity. In this study, descriptive trend analysis, compound annual growth rates (CAGR), and productivity ratios were computed. The findings reveal a pronounced decoupling of workforce size from service output. While the officer headcount remained essentially static (95 to 96 officers, +1.05%), the intensity of service delivery rose substantially from 3.71 to 5.99 interventions per farm visit, indicating that each visit became markedly more productive. Vaccination service grew by 34.9% to 107,581 doses in 2025, clinical treatments rose by 113.5%, and regulatory audits expanded by 639.6%. The number of livestock physically handled for treatment and breeding increased by 102.8% and 47.6% respectively. The registered farmer base is concentrated in beef cattle (42.8%), meat goat (24.9%) and sheep (14.6%) enterprises, with growth led by exactly those segments — consistent with national ruminant self-sufficiency priorities. These findings prove that VetEC's contribution to national ruminant self-sufficiency is sustained and strengthened, functioning as a vital pillar of livestock industry development and national food security.

Keywords: *Veterinary extension, livestock productivity, service density, workforce efficiency, food security*

A COMPARATIVE MARKET OBSERVATION OF THE EGG INDUSTRY: THE UNITED STATES VS. MALAYSIA

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Abstract

The egg industry serves as a critical pillar of global food security and daily nutrition, yet market structures differ significantly across geographical regions. Therefore, this market observation was carried out to explore the commercial landscapes of the egg industry between the United States and Malaysia through a cross-country comparative analysis. Utilizing a qualitative approach, this study employed content analysis to systematically evaluate digital commercial platforms. The results identified three core themes: farming ethics and welfare, nutritional enhancement, and safety and trust certifications. Under the farming ethics and welfare dimension, the US market landscape is predominantly ethically driven, characterized by a high occurrence of animal welfare claims alongside production transparency certifications such as pasture-raised, cage-free, and organic. Meanwhile, the Malaysian market is value- and functionally driven, heavily emphasizing direct consumer health benefits and nutritional enhancements such as Omega-3, selenium, lutein, and probiotics. Regarding safety and trust certifications, the US relies heavily on independent production transparency verifications, whereas Malaysia depends strictly on state and religious authority endorsements, specifically JAKIM Halal, MeSTi, and MyGAP certifications. This study is highly significant as it addresses a critical knowledge gap in cross-border market dynamics by demonstrating how geographical and cultural differences shape consumer demand. Understanding these distinct premiumization frameworks equips agro-business marketers with insights to craft localized branding strategies, while providing layer producers with actionable benchmarks to diversify from low-margin commodities into high-margin, value-added segments. As a conclusion, this market observation reveals that the definition of product value in the egg industry is highly dependent on regional consumer priorities. The US market is predominantly shaped by ethically driven forces that prioritize animal welfare and production transparency, whereas the Malaysian market is guided by value- and utility-driven forces that focus on price and direct consumer health benefits. Furthermore, trust-building mechanisms differ fundamentally, shifting from non-governmental, method-of-production certifications in the US to centralized state and religious authority endorsements in Malaysia. Ultimately, these findings underscore how geographical context transforms a basic staple food from an ethical statement in the West into a functional health asset in Southeast Asia.

Keywords: *Market observation, content analysis, egg industry, market dynamics, consumer drivers*

CLIMATE RESILIENCE IN MALAYSIA'S LIVESTOCK SECTOR: CURRENT IMPACTS, VULNERABILITIES, AND THE DEPARTMENT OF VETERINARY SERVICES' STRATEGIC RESPONSE

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Abstract

Malaysia's livestock sector is increasingly exposed to climate-related risks that may affect animal health, productivity, feed availability and national food security. This paper reviews the sector's principal biophysical and socio-economic vulnerabilities and outlines the strategic response of the Department of Veterinary Services Malaysia (DVS). Rising temperatures and more frequent extreme-weather events can reduce feed intake, growth, reproductive performance, and meat, milk and egg production, while increasing disease and mortality risks. These pressures are compounded by Malaysia's dependence on imported feed ingredients, rising feed costs and the relatively low self-sufficiency level for beef and buffalo meat. In response, DVS has strengthened disaster coordination, issued heat-stress management advisories, enhanced disease surveillance and farm biosecurity, and provided technical guidance through its nationwide extension network. The paper concludes that improving the resilience of Malaysia's livestock sector will require an integrated approach combining climate-smart farming practices, stronger early-warning and surveillance systems, more secure feed supplies, and sustained collaboration among government agencies, industry stakeholders and livestock producers.

Keywords: *Department of Veterinary Services, climate resilience, livestock, heat stress, food security*

ANATOMICAL DISTRIBUTION AND CLINICAL OUTCOMES OF TRAUMATIC INJURIES IN DOMESTIC CATS: A RETROSPECTIVE STUDY IN KELANTAN DARUL NAIM, MALAYSIA

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Abstract

Traumatic injury is a common condition that adversely affects the welfare and well-being of domestic cats. Although numerous studies worldwide have investigated the prevalence and patterns of feline trauma, limited information exists on the anatomical distribution and clinical outcomes of traumatic injuries in cats in Kelantan Darul Naim, Malaysia. Therefore, this retrospective study aimed to evaluate the anatomical distribution, etiologies, types of injuries sustained, and clinical outcomes of traumatic injuries in domestic cats presented within the district of Kota Bharu, Kelantan. Clinical records from January 1 to April 31, 2025, were reviewed and analyzed. The prevalence of traumatic injuries among feline cases presented during the study period was estimated at 5.56% (95% CI: 4.39–6.73%). Road traffic accidents were identified as the most common cause of trauma, accounting for 34.15% (28 cases), followed by animal altercations at 30.49% (25 cases). Anatomically, injuries most frequently involved the integumentary and musculoskeletal regions, with lacerations representing the most common injury type (28.05%, 23 cases). The majority of affected cats survived following clinical management, with an overall survival rate of 84.15% (69 cases). Statistical analysis demonstrated that stray cats were significantly associated with higher mortality compared with owned cats ($\chi^2(1) = 9.19$, $p = 0.002$). Additionally, cases involving road traffic accidents were significantly more likely to result in mortality ($\chi^2(1) = 17.49$, $p < 0.001$) among cats presenting with traumatic injuries. In conclusion, traumatic injuries in domestic cats within Kota Bharu are primarily associated with road traffic accidents and inter-animal aggression, with injuries predominantly affecting the integumentary and musculoskeletal systems. These findings highlight the importance of preventive strategies, improved traffic awareness, and targeted interventions for stray cat populations to reduce trauma-related morbidity and mortality in the region.

Keywords: *Anatomical distribution, clinical outcome, domestic cats, retrospective study, traumatic injury*

FIRST PROKARYOTIC EXPRESSION & STRUCTURAL ASSEMBLY OF MALAYSIAN DOMESTIC CAT HEPADNAVIRUS CORE PROTEIN

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Abstract

Domestic cat hepatitis B virus (DCHBV) was first reported in 2018 in a domestic cat with lymphoma in Australia. This newly identified member of the family *Hepadnaviridae* has since been associated with elevated liver enzymes, chronic hepatitis and hepatocellular carcinoma in domestic cats. Since its discovery, DCHBV DNA has been reported in different geographical regions, suggesting its global circulation. The DCHBV core protein (DCHBVc) is an important viral component because of its role in viral assembly, replication, and antigenicity, while its ability to form virus-like particles (VLPs) may provide a basis for future diagnostic and immunological studies. However, information on the structural and molecular properties of its core protein remains limited. Therefore, the objective of this study is to clone, express, purify and characterise the DCHBVc of a Malaysian isolate. An *Escherichia coli* expression system was used for recombinant DCHBVc expression, and the expressed protein was purified using size-exclusion chromatography. Transmission electron microscopy (TEM) was performed to examine the purified DCHBVc VLPs. Sanger DNA sequencing confirmed that the cloned DCHBVc sequence was 100% identical to the local UPM strain. The expressed DCHBVc encoded 218 amino acids. TEM showed that the recombinant DCHBVc self-assembled into a homologous population of spherical VLPs. Sequence analysis further indicated that the deduced protein retained typical hepadnavirus core protein features, including an N-terminal assembly domain and an arginine-rich C-terminal region. Phylogenetic analysis showed that the Malaysian DCHBVc clustered closely with reported Asian DCHBV strains, without forming a distinct Malaysian lineage. Overall, these findings provide preliminary molecular and structural evidence that the Malaysian DCHBVc can be expressed in a bacterial system while retaining capsid-like assembly properties. This study contributes to the current understanding of DCHBV core protein biology and provides a basis for further investigation of capsid structure and serological assay development.

Keywords: *Domestic cat hepatitis B virus, E. coli expression system, phylogenetic analysis, size exclusion chromatography, transmission electron microscopy*

NON-SURGICAL PET CONTRACEPTION: A STUDY OF OWNER AWARENESS AND PRACTICES

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Abstract

Non-surgical contraception for pets represents an alternative to the conventional surgical neutering method, yet it remains largely unrecognized among many pet owners. The exploration of this approach, including its theoretical groundwork, practical implementation, and application in real-world settings, has not been extensively researched. Consequently, non-surgical methods face significant unpopularity within clinical environments, which can deter their adoption and application by veterinarians and pet owners alike. This study examines Malaysian pet owners' knowledge, attitudes, and practices (KAP) related to non-surgical contraceptives for controlling pet and stray populations. A cross-sectional study involved distributing bilingual online and hardcopy questionnaires to 310 clients at a veterinary teaching hospital. Analysis using descriptive statistics, logistic regression, and Spearman correlation revealed that 44.9% of respondents had poor knowledge of non-surgical contraceptives, while 52.4% demonstrated positive attitudes towards fertility control methods, and 54.8% showed supportive practices in managing their pets' reproductive health. Respondents with unneutered local or mixed-breed dogs demonstrated a significant knowledge about pet contraceptives, indicated by an odds ratio (OR) of 4.16 (95% confidence interval [CI] 1.39-12.46). In contrast, individuals not caring for stray cats showed favourable attitudes towards fertility control, reflected in an OR of 5.56 (95% CI 1.35-22.93). The study highlights that Malays (OR = 0.42; 95% CI 0.18-0.97) and Indians (OR = 0.21; 95% CI 0.07-0.59) are less likely to engage in beneficial pet fertility control practices. Furthermore, a weak positive correlation ($r = 0.37$) was found between attitudes and practices regarding fertility control, indicating the need for increased public awareness on this issue. These results emphasise the importance of raising public awareness to enable pet owners to make educated decisions and to aid authorities in developing effective future stray animal population control strategies.

Keywords: *Pet contraception, non-surgical methods, KAP survey, animal welfare*

A DROP OF BLOOD TELLS THE STORY: MASTOCYTAEMIA LEADING TO DIAGNOSIS SYSTEMIC MAST CELL TUMOR IN A CAT

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Abstract

Mast cell tumor (MCT) is one of the common cutaneous tumors in cats, while visceral MCTs most frequently affect the spleen. Mastocytosis is an uncommon but important diagnostic finding and is strongly suggestive of MCT in cats, most often associated with visceral forms. In this context, the following case illustrates mastocytosis as a diagnostic indicator of an underlying visceral MCT. An eight-year-old male mixed breed cat presented with a five-month history of intermittent vomiting with transient improvement with antiemetic treatment and a gastrointestinal diet. The patient subsequently developed inappetence and a firm mass was palpated in the cranial abdomen on physical examination. Radiographic examination revealed splenomegaly. Blood was withdrawn and lipaemic serum was observed. Hemogram and serum biochemistry evaluation showed responsive moderate anaemia, marked generalized leukopenia with severe degenerative left shift and marked thrombocytopenia. Mild hyperglycaemia was observed suggestive of stress, while liver enzymes and albumin were at low normal suggestive of liver insufficiency. However, these biochemical values may be affected by lipaemic interference. Peripheral blood smear evaluation revealed presence of well differentiated mast cells that lead to the tentative diagnosis of visceral mast cell tumor. Over time, the patient's condition deteriorated, with progressive inappetence and weight loss. Hence, euthanasia was performed one month later. At necropsy, gross pathology revealed diffused hepatic lipidosis and splenomegaly due to congestion. Cytology was done during necropsy using fine-needle aspiration of a small raised non-ulcerated skin lesion on the lateral aspect of the right hindlimb, and squash smear of the cut surface of liver and spleen. Cytological examination of the skin and spleen revealed abundance of pleomorphic mast cells of various stages of differentiation characterized by variable cytoplasmic metachromatic granularity. A few binucleated mast cells were observed in addition to anisocytosis and anisokaryosis. Besides infiltration of numerous mast cells, the hepatocytes were distended by large clear cytoplasmic vacuoles consistent with lipid accumulation of hepatic lipidosis, supporting lipaemia and gross pathology findings. This case demonstrates that routine blood smear examination can provide critical diagnostic clues, with mastocytosis serving as an early indicator of systemic mast cell disease in cats.

Keywords: *Mastocytosis, feline, blood smear examination, cytology, systemic mast cell tumor*

ANTI-METASTASIS EFFECTS OF LUTEIN AND β -SITOSTEROL IN BREAST CANCER MOUSE MODEL

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Abstract

Carotenoids, lutein, and phytosterol, β -sitosterol, have been identified as the major bioactive components of many anticancer medicinal plants such as *Strobilanthes crispus* (a Malaysian herb locally known as "*Pecah kaca*" or "*Jin batu*"). These bioactive compounds have demonstrated anti-cancer activities in different cancer models, including breast cancer. In this study, the anti-metastasis and anti-tumor immune response of lutein and β -sitosterol were investigated using a 4T1-induced mouse mammary carcinoma model. At a 2-millimeter tumor size, five each ($n = 5$) from tumor-bearing mice (TM) were administered lutein (TM-L group) and β -sitosterol (TM- β group) by oral (each group 50 mg/kg/day) gavage daily for 30 days. The response to treatment was assessed based on the expression of tumor markers of metastasis and immune modulation. The results showed that lutein and β -sitosterol upregulated E-cadherin, while N-cadherin, vimentin, MMP9, VEGF, Twist, and MUC1 tumor metastasis markers were downregulated in both TM-L and TM- β groups compared to the TM group. Similarly, the anti-metastatic effect was linked to the T cell-mediated tumor destruction. This was demonstrated by a significant increase in biomarkers of immune activation (CD4, CD8, CD45RO, CIITA, IL2, MHCI, and MHCII) in the treatment groups in comparison with the TM group, which showed significant upregulation of CD68. In conclusion, this study demonstrates that lutein and β -sitosterol significantly inhibited breast cancer progression and metastasis in a mouse carcinoma model. Thus, supporting their potential contribution to the anticancer properties of various medicinal plants in breast cancer.

Keywords: *Lutein, β -sitosterol, breast cancer, metastasis, mouse model*

FATAL INTRAORAL FIRECRACKER EXPLOSION IN A DOG: A POST MORTEM CASE REPORT

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Abstract

The killing of animals, especially by firecracker explosion is a serious animal welfare issue. An explosive wound in the oral cavity is considered a severe, high-energy trauma caused by an explosion occurring inside the oral cavity. The injuries were often catastrophic resulting in extensive damage to soft tissues, teeth, sphenoid bones, lips, cheeks and mandible. A carcass of male Mongrel dog was presented at VRI Pathology Section for a forensic necropsy. The objective of the necropsy was to observe any abnormalities of the carcass grossly related to firecracker explosion in the oral cavity. The right lower lip was torn together with canine and premolar teeth. Blood stains were detected around the lip and inside the buccal cavity. A piece of remaining firecracker was found inside the oral cavity. There was a presence of three ulcers around 3mm diameter at the right side of the tongue. The palatine bone was completely destroyed together with pterygoid. Basisphenoid and presphenoid bones were also destroyed and the temporal lobe of the brain was exposed. Some brain pieces were found together with a small hole at the basephenoid about 1cm diameter. Ecchymotic hemorrhages were observed at the right lateral of the latissimus dorsi muscle and tight lateral of brachiocephalic muscle. In conclusion, the post mortem revealed that the dog was dead due to brain trauma at the temporal lobe due to an intraoral firecracker explosion. These findings can become valuable information for enforcement teams to be considered in the case investigation.

Keywords: *Animal welfare, firecracker, oral cavity, brain trauma, hemorrhages*

OUTBREAK OF HAEMORRHAGIC SEPTICAEMIA (HS) IN MALAYSIA FROM 2005-2025

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Abstract

Haemorrhagic septicaemia (HS) is a severe and often fatal infection caused by *Pasteurella multocida* serotypes B:2 and E:2, affecting mostly cattle and buffaloes in Asia and Africa. It is classified as a reportable disease by the World Organisation for Animal Health (WOAH) and the Department of Veterinary Services (DVS) in Malaysia. Outbreaks of the HS in Malaysia have been recorded since 1880 and Malaysia is categorized as a HS endemic country by WOAH. The current work aims to study outbreaks of HS in Malaysia in 2005 to 2025. Twenty years cumulative data from WAHIS (World Animal Health Information System Disease control) WOAH showed a total of 68 outbreaks in different states which include Perak, Sabah, Kedah, Pahang, Kelantan, Negeri Sembilan, Selangor, Terengganu and Penang from 2005 to 2025. The highest number of HS outbreaks recorded was in the year of 2007 with a total of 18 outbreaks. There were no reported cases in 2009, 2012, 2013, 2014, 2015, 2016, 2019, 2022, 2023 and 2024. The highest number of HS outbreaks was in Terengganu and the lowest HS outbreak was in Penang and Selangor which only has one outbreak for the past twenty years. The disease pattern showed a declining trend from 2005 to 2025. Vaccination is still an effective strategy for the disease prevention practices in Malaysia. Since 1957, the Veterinary Research Institute (VRI) has been committed to the production of HS Alum Precipitated (HSAP) and HS Double Adjuvant (HSDA) vaccines using the Malaysian strain.

Keywords: *Haemorrhagic septicaemia, vaccine, Pasteurella multocida*

FATAL GASTRIC DILATATION-VOLVULUS (GDV) IN A BELGIAN SHEPHERD DOG: A CASE REPORT

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Abstract

Gastric dilatation volvulus (GDV) is a rapidly progressive and life-threatening condition in dogs, characterized by acute accumulation of gas within the stomach, often accompanied by gastric rotation. This resulted in impaired venous return, reduced cardiac output, and subsequent cardiovascular collapse. GDV is most commonly reported in large, deep-chested breeds, particularly working dogs, and is associated with a high mortality rate without immediate intervention. Early recognition and prompt treatment are essential to improve survival outcomes. This report describes a case of GDV in an 11-year-old male Belgian Shepherd dog presented as an emergency with acute abdominal distension and severe respiratory distress. The dog was reportedly normal prior to feeding on the evening before presentation. On admission, the patient was recumbent, weak, and exhibited severe dyspnea, cyanotic mucous membranes, and poor pulse quality, indicative of circulatory shock. Physical examination revealed marked abdominal distension consistent with gastric gas accumulation. Despite immediate and aggressive resuscitative efforts, the dog succumbed shortly after presentation. Necropsy findings revealed severe gastric distension with displacement of abdominal organs, including the spleen and liver. Pulmonary examination showed congestion and inflammatory changes with evidence of vascular compromise. Cardiac examination revealed inflammation of the aorta. The liver displayed inflammatory changes with an irregular surface, while the spleen showed marked congestion. The right kidney demonstrated renomegaly with loss of corticomedullary distinction, whereas the left kidney appeared unremarkable. Histopathological examination revealed thickening of interalveolar septa, interstitial pneumonia, moderate hemorrhage, tubular necrosis in both kidneys, severe hepatic necrosis, and splenic congestion with haemorrhage. Bacteriological analysis showed mild growth of opportunistic organisms, including *Escherichia coli*, *Klebsiella pneumoniae* spp. *ozaenae*, and *Proteus* spp., *Salmonella* spp. not isolated, while PCR for blood protozoa was negative. These findings indicate that death was due to circulatory failure, hypoxia, multi-organ necrosis, and systemic shock, highlighting the fulminant nature of GDV and the critical need for early intervention.

Keywords: *Gastric dilatation-volvulus, dog, canine emergency, circulatory shock, multi-organ necrosis*

ACUTE INTESTINAL OBSTRUCTION DUE TO TORSION AND FEED IMPACTION IN A DAMARA RAM: A CASE REPORT

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Abstract

Red gut syndrome is a fatal form of acute intestinal volvulus characterised by torsion of the small intestine and mesentery, resulting in severe vascular compromise and intestinal ischemia. This case report describes a diagnostic case in a 3-year-old Damara ram (*Ovis aries*), weighing 45kg, which presented with acute gastrointestinal obstruction culminating in sudden death. The animal had been separated from its flocks two weeks prior for semen collection and subsequently exhibited signs of stress and reduced feed intake. On 21 November 2025, the ram was found in lateral recumbency with marked abdominal distention. Clinical assessment was consistent with ruminal tympany and gastrointestinal stasis. Emergency intervention, including trocarisation at the left paralumbar fossa, resulted in immediate evacuation of ruminal gas and partial abdominal decompression. This was followed by oral stomach tube placement for further decompression, administration of anti-bloat agent, mineral oil, and supportive fluid therapy. An initial clinical response was favourable, evidenced by reduced abdominal distension and passage of small, clumped faeces, indicating a partial restoration of gastrointestinal motility. However, the animal's condition progressively deteriorated, and it subsequently died. Post-mortem examination revealed lesions consistent with intestinal volvulus. Microbiological analysis identified *Escherichia coli* in all sampled organs, while *Proteus mirabilis* was isolated from the heart, liver, and lungs, indicating systemic bacterial dissemination secondary to intestinal compromise. Given the poor prognosis associated with this condition and the limited information available in sheep, this case report aims to describe the clinical management undertaken and the clinical and laboratory findings of this disease.

Keywords: *Volvulus, sheep, abdominal distention, gastrointestinal disorder, red gut syndrome*

CASE REPORT OF CANINE PARVOVIRUS (CPV) OUTBREAK WITH SECONDARY BACTERIAL INFECTION IN A HIGH-DENSITY CANINE POPULATION

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Abstract

Canine parvovirus (CPV), predominantly caused by Canine Parvovirus type-2 (CPV-2), remains a highly contagious and life-threatening viral disease of dogs, particularly within high-density housing facilities. Transmission occurs rapidly via the fecal–oral route and contaminated environmental routes. The virus exhibits a marked tropism for rapidly dividing cells, especially intestinal crypt epithelial cells. This report describes a 4-year-old female vaccinated mongrel from Kampung Tersusun Sungai Buloh, Perak, that presented with acute vomiting, dehydration, lethargy, and neurological manifestations prior to death. Over a two-month period, 26 out of 56 co-housed dogs died, representing a cumulative mortality rate of 46.4%, with affected animals exhibiting similar clinical signs. Antimicrobial therapy was administered without documented dosage or adherence to a standardised therapeutic protocol. Following the clinical course, necropsy examination revealed diffuse pulmonary congestion, marked thoracic wall and tracheal mucosal hyperemia. Histopathological examination revealed pulmonary atelectasis, severe alveolar and interstitial congestion and prominent perivascular lymphocytic cuffing. Conventional polymerase chain reaction (PCR) was performed on intestinal tissue samples collected during post-mortem examination. The results were positive for canine parvovirus. Bacterial culture isolated *Escherichia coli* and *Klebsiella* spp., supporting secondary opportunistic infection. In conclusion, high mortality, consistent clinical signs, characteristic pathology, and positive PCR confirm CPV as the primary cause, complicated by secondary bacterial infection. This highlights the need for strict vaccination, standardised treatment, early isolation, and robust outbreak control to prevent widespread illness.

Keywords: *Canine parvovirus (CPV), mortality, post-mortem, histopathology, PCR*

HISTOPATHOLOGICAL OBSERVATION OF THE DISTRIBUTION OF NON-CLASSICAL LESIONS ASSOCIATED WITH MALIGNANT CATARRHAL FEVER (MCF) IN A BUFFALO

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Abstract

Malignant Catarrhal Fever (MCF) is a fatal viral disease affecting several ruminant species, including buffalo, and is commonly associated with infection by Ovine herpesvirus 2 (OvHV-2). This study describes the histopathological observations of non-classical lesions related to MCF in a buffalo. A comprehensive panel of specimens, encompassing the pulmonary, renal, splenic, hepatic, and cardiac tissues were meticulously retrieved by the attending field veterinarian. These specimens were subsequently submitted to Makmal Veterinar Zon Tengah for definitive histopathological examination via the established Modified Harris' Hematoxylin and Eosin staining protocol. Microscopic evaluation demonstrated perivascular fibrosis in the hepatic tissue, a marked lymphocytic infiltration characteristic of bronchopneumonia, and severe generalized lymphoid follicular hyperplasia. The collective histopathological profile, including lymphocytic infiltration in the lung and a reactive spleen, was subsequently corroborated by molecular testing, which detected the MCF virus DNA in the lung tissue via Polymerase Chain Reaction (PCR). Overall, the findings suggest a non-classical lesion distribution that slightly deviates from the features of classical lesion distribution commonly observed in cattle infected with MCF. The absence of perivascular cuffing and vasculitis, which are pathognomonic lesions of MCF, is most likely attributable to sampling bias (i.e., the specific portion of the specimen collected) or the need to broaden specimen collection to include other lymphoid and non-lymphoid organs, such as the brain. From a technical perspective, employing a variety of tissue trimming, cutting and sectioning planes is necessary and pivotal for accurate histopathological diagnosis.

Keywords: *Malignant Catarrhal Fever, buffalo, histopathology, non-classical lesion distribution*

A LABORATORY STUDY ON ORGAN-SPECIFIC BACTERIAL DISTRIBUTION IN POULTRY DIAGNOSTIC CASES (2025)

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Abstract

Monitoring the pattern of bacterial isolates from poultry diagnostic cases in the laboratory, along with antimicrobial susceptibility profiling, provides key insights for infection control and public health stewardship. This study assessed the microbial profile of 107 samples from 14 poultry cases with various background clinical history in Selangor and Melaka, which were submitted to the Makmal Veterinar Zon Tengah in 2025. Samples included various organs (heart, liver, lung, kidney, intestine, spleen), cloacal swabs, bursal, tracheal tissues, and others. Identification was performed using biochemical tests and VITEK 2 Compact System. Results yielded 208 bacterial and 12 fungal isolates from the overall samples. The top five bacterial isolates discovered were *E. coli* (n=77), *Staphylococcus aureus* (n=19), *Proteus sp.* (n=18), *Sphingomonas paucimobilis* (n=7), and *Bacillus sp.* (n=6). Two *Salmonella* isolates were discovered. Interestingly, the tested isolate demonstrated complete susceptibility to all 11 antimicrobial agents, which suggests the possible responsible use of antimicrobials within poultry farmers. In terms of distribution pattern, the isolation of *E. coli* and *Proteus sp.* was mostly observed in multiple organs, highlighting their role as common opportunistic pathogens. However, further characterization at the strain level is required to better determine their clinical significance.

Keywords: *Organ-specific bacterial distribution, Salmonella, poultry, diagnostic case, antimicrobial susceptibility.*

MORPHOLOGICAL CHARACTERISATION OF THE CAECUM IN THE COMMERCIALLY FARMED MALAYAN PORCUPINE (*Hystrix brachyura*): INSIGHTS INTO HINDGUT FERMENTATION ANATOMY

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Abstract

The Malayan porcupine (*Hystrix brachyura*) is increasingly farmed in Malaysia for commercial and conservation purposes; however, scientific data on the gastrointestinal (GI) tract morphology remains scarce. Comprehensive anatomical knowledge is crucial for improving captive management, nutrition, and welfare, particularly by understanding hindgut fermentation and optimizing dietary strategies. The cecum plays an important role in hindgut fermentation, yet its structural adaptations in the Malayan porcupine are poorly documented. Therefore, this study aims to characterize the gross anatomical and histomorphological features of the cecum in adult Malayan porcupines raised for commercial purposes. Convenient sampling was performed by collecting 19 caecal samples (sourced from PERHILITAN-registered farms) post-slaughter. Caecal morphology and length were assessed grossly. Histological evaluation was performed to assess general tissue architecture and mucin content using Periodic Acid–Schiff (PAS) and Alcian Blue (AB) staining. The results revealed a well-developed caecum, indicating that it is a prominent component of the large intestine and is well adapted to frugivorous and herbivorous diets. Grossly, the caecal wall showed distinct haustra and semilunar folds, which continued into the colon, reflecting structural adaptation for increased surface area, prolonged retention time, and efficient hindgut fermentation. The mean caecal length was 36.46 ± 0.64 cm. Histologically, the caecum was lined by simple columnar epithelium, and its wall comprised mucosa, submucosa, tunica muscularis, and serosa. Histochemical analysis demonstrated the presence of mucins of both neutral and acidic types, particularly in the basal region of the epithelium. Numerous goblet cells containing large mucin vacuoles were observed, suggesting an important role in mucosal protection, lubrication, and maintenance of an optimal environment for microbial fermentation. In conclusion, the caecum of the Malayan porcupine is structurally well-developed, with distinct gross and histological features that support its role in hindgut fermentation and digestive function.

Keywords: *Malayan porcupine, caecum, gross anatomy, histology, hindgut fermenter*

CHALLENGES IN DEVELOPMENT OF IMMUNOHISTOCHEMISTRY METHOD FOR DETECTION FOR BOVINE SPONGIFORM ENCEPHALOPATHY IN MALAYSIA

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Abstract

Bovine spongiform encephalopathy (BSE) is a fatal neurodegenerative prion disease characterized by the accumulation of misfolded prion proteins (PrP) within the central nervous system. Immunohistochemistry (IHC) is a widely applied diagnostic tool for detecting disease-associated prion protein in formalin-fixed paraffin-embedded (FFPE) brain tissues. Accurate detection requires careful optimization of technical and analytical parameters to ensure specificity, sensitivity, and reproducibility. The IHC factors included tissue selection, antigen, epitope, blocking, primary and secondary antibodies, signal detection, counterstaining and analysis. Pre-analytical variables such as fixation time, cold ischemia duration, section thickness, and storage conditions were evaluated for their impact on antigen preservation and staining quality. Inadequate fixation or improper handling compromised epitope integrity and tissue morphology. Proper slide preparation using positively charged glass slides improved tissue adherence and reduced section loss. Antigen retrieval methods were optimized using heat-induced or enzymatic techniques, with buffer pH and retrieval intensity adjusted according to epitope characteristics. Blocking step is crucial in IHC primarily to minimize non-specific background staining and provide accurate result. Optimized blocking steps minimized background staining, enhancing antigen localization. Antibody selection involved validated clones or well-characterized polyclonal antibodies with documented tissue reactivity. Titration ranges, dilution factors, and incubation conditions were established to achieve optimal signal-to-noise ratios. Appropriate antibody titration and compatible secondary antibody selection were critical for achieving specific and reproducible staining. Signal detection systems, including horseradish peroxidase–diaminobenzidine (HRP-DAB) or alkaline phosphatase (AP), were applied for permanent brightfield visualization. Staining quality was highly dependent on fixation parameters, antigen retrieval conditions, and antibody optimization. However, limited availability of positive control FFPE tissues for BSE presented a significant challenge for assay validation. Successful implementation of IHC for BSE detection requires meticulous optimization of pre-analytical and analytical variables. Standardization of antigen retrieval, antibody selection, and detection systems is essential to ensure diagnostic reliability. Further validation, particularly addressing the scarcity of appropriate positive control tissues, is necessary to establish a robust and reproducible IHC protocol for routine BSE diagnosis.

Keywords: *Challenges, IHC, BSE, prion, Malaysia*

COMPARATIVE HISTOMORPHOMETRY AND COLLAGEN DISTRIBUTION OF SKELETAL MUSCLES IN NEW ZEALAND WHITE AND HYCOLE RABBITS

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Abstract

The growing demand for sustainable animal protein has intensified the need to optimize non-ruminant production systems, including hybrid rabbit production, within the One Health framework. Skeletal muscle characteristics, including muscle fiber morphology and collagen organization, play a critical role in muscle function and growth efficiency. However, limited information is available regarding how hybridization influences skeletal muscle microstructure compared to conventional breeds in rabbits. This study aimed (1) to characterize the histomorphological and histomorphometric properties of skeletal muscles in New Zealand White (NZW) and Hycole rabbits, and (2) to evaluate collagen distribution within their muscle tissues. A total of 10 animals per breed were sampled post-slaughter from healthy rabbits at a commercial farm, with skeletal muscles including the psoas major (loin region), biceps femoris, semimembranosus, semitendinosus (hindlimb), and triceps brachii (forelimb) collected for analysis. Histological assessment using routine staining was performed to evaluate muscle fiber architecture and fascicular organization, while histomorphometric analysis measured muscle fiber diameter and cross-sectional area. Collagen distribution was assessed using Picrosirius Red staining under polarised light to differentiate type I and type III collagen. Preliminary findings demonstrated variations in muscle fiber morphology and fascicular organization across selected muscles. Quantitative analysis revealed that Hycole rabbits exhibited significantly larger muscle fibre diameter and cross-sectional area compared to NZW rabbits ($p < 0.05$) in all muscle types. Additionally, collagen distribution analysis demonstrated a predominance of type I collagen relative to type III collagen, with type I collagen being most abundant in the semimembranosus muscle, while type III collagen was more prominent in the semitendinosus muscle, and a higher overall collagen deposition was observed in NZW rabbits compared to Hycole rabbits. These structural differences may influence muscle function, where larger myofibers are associated with enhanced force generation, while variations in collagen deposition may affect tissue mechanical properties. Overall, the findings highlight breed-related differences in skeletal muscle microstructure, with potential implications for muscle function and meat quality. This study provides a baseline for understanding anatomical variation in rabbits.

Keywords: *Skeletal muscle, collagen Type I, collagen Type III, Hycole rabbit, New Zealand White rabbit*

MOLECULAR DIFFERENTIATION OF LUMPY SKIN DISEASE VIRUS: A REAL-TIME PCR APPROACH FOR ENHANCED DISEASE MANAGEMENT

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Abstract

Lumpy skin disease (LSD) is recognized as an emerging transboundary viral disease listed by the World Organisation for Animal Health (WOAH) as a notifiable disease and the recent outbreak in Malaysia has resulted in substantial economic losses and elevated industry concerns. The etiological agent called lumpy skin disease virus (LSDV); could infect cattle and water buffalo by causing high fever, swollen lymph nodes, cutaneous nodules of 2 to 5 cm in diameter on the head, neck, limbs, udder, genitalia and perineum; lachrymation, reduction in milk production, and sometimes death. Implementation of the vaccination program at the end of 2021 has led to the endemicity of LSD since 2022. However, there is recurrence of this eradicated disease in Pahang and Perak, Malaysia which has been newly reported in the year 2025. As a result, distinguishing between naturally infected and vaccinated animals; an approach known as DIVA (Differentiating Infected from Vaccinated Animals) is essential for effective disease management. Thus, this study aims to molecularly differentiate and confirm the source of infection among LSD-positive cases in Pahang by using a real-time polymerase chain reaction (qPCR) assay as DIVA strategy. Following this, clinical samples from suspected LSD cases of 2025 were processed and tested for the presence of LSDV. The confirmed positive samples were then subjected to DIVA qPCR testing to identify the viral strain. Our findings revealed that all positive cases were due to wild-type LSDV, indicating ongoing circulation of the virus in Pahang. We have successfully differentiated and confirmed the origin of the infection via molecular-based method for DIVA LSD through real-time PCR approach which assists in rapid response mechanisms and supports targeted control interventions. Hence, it is an urge for continuous efforts of LSD awareness, strengthening early detection and laboratory preparedness as well as enhancing stakeholder engagement for sustainable management of LSD.

Keywords: *Lumpy skin disease, Lumpy skin disease virus, differentiating infected from vaccinated animals (DIVA), Real-time PCR, disease management*

PULMONARY ASPERGILLOSIS AS A PREDISPOSING FACTOR FOR TRAUMATIC INJURY AND FATAL SEPTICAEMIA IN A WREATHED HORNBILL (*RHYTICEROS UNDULATUS*)

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Abstract

The Wreathed Hornbill (*Rhyticeros undulatus*) is a vulnerable species in Malaysia, depending largely on successful wildlife rescue and rehabilitation efforts. This case report outlines the management of an adult female Wreathed Hornbill discovered on the ground at a local fruit farm in Semenyih, Selangor. The hornbill sustained a traumatic, open compound fracture of the distal left ulna and radius, accompanied by cutaneous myiasis. The hornbill was presented to EL'S Veterinary Centre for, where a surgical amputation of the left wing was performed. Despite successful surgical intervention and initial post-operative stabilisation, the bird experienced an acute decline and succumbed nine days later. Necropsy examination revealed extensive chronic lesions characterized by multifocal to coalescing granulomatous pneumonia impacting 70% of the lung tissue. Histopathologically, the presence of well-formed granulomas with macrophage and lymphocyte infiltration surrounding fungal hyphae indicates that the aspergillosis was a primary, chronic condition. Examination of the heart and liver revealed systemic failure characterized by marked vascular congestion and widespread hepatocyte shrinkage. Microbiological cultures isolated *Aspergillus fumigatus* from the lungs, while *Klebsiella pneumoniae* and *Enterococcus faecalis* were isolated from both lung and liver tissues, suggesting a terminal polymicrobial septicemia. In summary, this case demonstrates that primary, subclinical aspergillosis can result in significant physical impairment and subsequent injury in wild avian species. Aspergillosis weakened the bird, predisposing it to a subsequent traumatic fall. Notably, aspergillosis involving the air sacs is documented to cause unilateral wing drooping, which directly compromises flight capacity. The identification of subclinical aspergillosis is challenging due to its subtle clinical manifestations and the limitations of conventional diagnostic methods. The results from fungal cultures may not be available in a timely manner to impact clinical decision-making, and while PCR offers greater sensitivity, it can still be compromised by the quality of the sample and the occurrence of false negatives. This study underscores the importance of implementing risk-based screening and consideration of prophylactic antifungal therapy as a cost-effective standard of care for grounded wild hornbills, even in cases where the primary complaint is a traumatic injury.

Keywords: *Wreathed hornbill, pulmonary aspergillosis, avian aspergillosis, avian trauma, septicemia*

UNVEILING THE SEROPREVALENCE OF AFRICAN SWINE FEVER VIRUS IN SELANGOR, MALAYSIA: SURVEILLANCE INSIGHTS FROM THE CENTRAL ZONE VETERINARY LABORATORY (2024–2025)

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Abstract

African Swine Fever (ASF) is a highly contagious viral disease of swine caused by the African swine fever virus (ASFV), posing a serious trade and economic threat to the global swine industry. Serological surveillance is pivotal for monitoring disease exposure and assessing the epidemiological status of pig populations. This study aimed to determine the seroprevalence of ASFV in pig populations in Selangor, based on samples analysed at the Central Zone Veterinary Laboratory as part of the national surveillance program. Serum samples were collected from pigs in Selangor between 2024 and 2025 through two primary collection streams: the national animal disease surveillance program (targeting 5% of premises and 1% of the total population) and diagnostic submission activities from clinically suspected animals. All collected samples were subsequently processed and tested by the laboratory to quantify antibodies against ASFV using a commercial Enzyme-Linked Immunosorbent Assay (ELISA) kit. This assay was performed to assess the serological status and determine potential exposure trends, levels, and transmission dynamics within the population. All 299 pig serum samples collected and tested in 2024 were derived solely from the national animal disease surveillance program and yielded negative ASFV antibody readings, providing no serological evidence of exposure during that year. In contrast, a total of 530 pig serum samples were tested in 2025, a cohort that included 244 samples from clinically suspected pigs. Within this total, a seropositive prevalence of 24.7% was recorded, while the remaining samples, including all serum from suspected pigs, were seronegative. The detection of ASFV antibodies underscores the importance of continuous surveillance, early laboratory diagnosis, and strengthened farm biosecurity measures to prevent further spread of the disease. Furthermore, these results demonstrate the crucial role of veterinary diagnostic laboratories in supporting the national disease surveillance program and contributing to a deeper understanding of ASF epidemiology in Malaysia. These insights are essential for informing future surveillance strategies and targeted interventions to mitigate the disease burden and safeguard swine health.

Keyword: *African Swine Fever, ASF, swine, seroprevalence, ELISA*

GEOGRAPHICAL MAPPING OF FOOT-AND-MOUTH DISEASE HOTSPOTS IN LIVESTOCK: A STUDY IN THE NORTHERN REGION OF PENINSULAR MALAYSIA (2023–2025)

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Abstract

Foot-and-Mouth Disease (FMD) continues to pose a significant challenge to the livestock industry in the Northern Region of Peninsular Malaysia, particularly in Penang, Kedah, and Perlis. Despite ongoing control efforts such as vaccination programmes and movement restrictions, positive cases are still being detected, highlighting the need for reliable, laboratory-based disease surveillance. This study aimed to examine the temporal patterns and spatial distribution of FMD-positive cases based on laboratory-confirmed data from 2023 to 2025. All samples were tested using non-structural proteins (NSPs) enzyme-linked immunosorbent assay (ELISA) at the Northern Zone Veterinary Laboratory in Penang. A total of 4,050 samples were analysed in 2023, decreasing to 3,135 in 2024 and 3,016 in 2025. The seroprevalence remained relatively stable between 2023 (44.64%) and 2024 (44.21%), before showing a noticeable decline to 38.56% in 2025. The analysed data comprised information on year of testing, state, district location, livestock species, and FMD status. Descriptive statistical analysis and choropleth map visualisation were applied to assess spatial distribution and identify areas with higher concentrations of FMD-positive samples. Overall, the findings showed year-to-year variation in FMD-positive samples, without a clear or consistent temporal trend. Spatial analysis revealed distinct clustering of FMD in several districts, indicating areas of higher case concentration and suggesting potential localized hotspots. In addition, the distribution of FMD-positive samples varied across livestock species, with no single species consistently dominating detections over time. In conclusion, this study demonstrates the dynamic and spatially heterogeneous nature of FMD occurrence in the Northern Region of Peninsular Malaysia. These findings provide a useful baseline for improving disease monitoring and supporting more targeted, location-specific control strategies.

Keywords: *Foot-and-Mouth Disease (FMD), temporal patterns, spatial mapping, laboratory surveillance*

A DOSE-RESPONSE ANALYSIS OF THE EFFECT OF IONIZING RADIATION ON ELECTROLYTE PARAMETERS AND SERUM AMYLOID A IN RABBIT MODELS

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Abstract

Radiation exposure can disrupt electrolyte balance, leading to disturbances in cellular and organ function, while the liver produces Serum Amyloid A as a biomarker for monitoring inflammatory and immune responses in the body. Therefore, this experimental study investigated the effects caused by different doses of radiation on the electrolyte and Serum amyloid A (SAA) levels in a rabbit model. A total of 36 New Zealand white rabbits weighing between 2 and 2.5 kg were divided into six groups at equal proportions. Total body radiation doses of 0 Gy (Control group), 0.053 Gy, 0.11 Gy, 0.21 Gy, 0.42 Gy, and 0.84 Gy were given to the rabbits on different days 1, day 2, day 3, week 1, 2, 3, and 4, and compared statistically using Generalized Linear Mixed Models (GLMM). There was a substantial rise in the serum amyloid A (SAA) level and a dose-dependent modification in electrolyte concentration. Sodium, Potassium, Chloride, and SAA all showed a statistically significant time effect on the different radiation doses. Based on the group effect of radiation, Sodium, potassium, and chloride, except for SAA, showed a statistically significant finding.

Keywords: *Electrolyte, serum amyloid A, radiation, rabbit model*

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DETECTION OF ECTOPARASITES AND HEMOPARASITES AND THEIR ASSOCIATED RISK FACTORS IN BACKYARD CHICKENS IN KOTA BHARU, KELANTAN

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Abstract

Parasite infections are an important health concern in poultry production, particularly in backyard systems where free-range management and low biosecurity increase exposure to vectors and environmental parasites. However, recent data on ectoparasite and hemoparasite infections in backyard chickens in Kelantan, Malaysia, remain limited. Therefore, this study aimed to detect the presence of ectoparasites and hemoparasites and to identify associated risk factors in backyard chickens in Kota Bharu, Kelantan. To detect ectoparasites, chickens were physically examined, and parasites were collected with fine forceps and analyzed under a stereomicroscope for morphological identification. To detect hemoparasites, blood samples were collected and examined using Giemsa-stained thin blood smears. The results showed that 75% (30/40) of chickens were infested with lice, including *Menopon gallinae* (67.5%) and *Lipeurus caponis* (7.5%). Hemoparasites were detected in 27.5% (11/40) of samples, and morphological identification confirmed *Leucocytozoon* spp. Age and rearing systems were significantly associated with lice infestation ($p < 0.05$), whereas no significant association was found between hemoparasite infection and age and rearing systems ($p > 0.05$). These findings highlight the presence of parasitic infections in backyard chickens and provide baseline data for future control and management strategies.

Keywords: *Backyard chickens, ectoparasites, hemoparasites, risk factors*

ATYPICAL INTERSTITIAL PNEUMONIA IN 4-YEAR-OLD FRIESIAN CATTLE IN MALAYSIA: A CASE REPORT

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Abstract

Atypical Interstitial Pneumonia (AIP), commonly referred to as "fog fever," is a severe respiratory condition that affects dairy cows, often associated with sudden dietary changes when introduced to a new farm. A 4-year-old Friesian dairy cow recently introduced to a farm in Negeri Sembilan, exhibited behavioural changes such as aggression and tendency to seek attention. Additionally, the cow displayed a reduced feed intake, which the owner had noted a week earlier prior to reporting to the veterinary clinic. Symptomatic treatment was initiated with a combination of 10% Ironix and Vitamin B12. However, a few days later, the cow developed acute respiratory distress syndrome, characterized by rapid breathing, coughing, and discharge from the oro-nasal cavity. Clinical examination revealed harsh lung sounds upon auscultation, and the cow appeared lethargic. In response, Flunixin Meglumine (5 mg/ml dose 2ml/45kg BW), Marbofloxacin (20mg/ml dose 1ml/10 kg BW), and Atropine Sulphate (Acipin) (1 mg/ml, 5ml) were administered via intramuscular injections. Despite all the supportive treatments, the cow ultimately succumbed to respiratory failure. PCR analysis for suspected herpesvirus infection returned negative results, and gross and histopathological examinations revealed lung consolidation with homogeneous dark discoloration in the lung lobes, interstitial oedema, emphysema, and alveolar thickening. This case emphasizes the importance of gradual dietary transitions and monitoring of pasture conditions to prevent AIP in dairy herds. Early recognition and intervention are critical; however, prognosis remains guarded due to the disease's rapid progression. This report highlights the importance of educating the farmers about the risk associated with sudden dietary changes and implementing preventive strategies to mitigate the risk of AIP in dairy cattle.

Keywords: *Atypical interstitial pneumonia, dairy cow, Fog fever, respiratory distress, post-mortem*

LOCALISED HAEMORRHAGIC DERMATITIS FOLLOWING TRANSDERMAL TRAMADOL ADMINISTRATION IN BROILER CHICKEN

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Abstract

Transdermal drug delivery has gained increasing attention in avian medicine as a practical alternative to repeated handling associated with oral and parenteral administration. Tramadol hydrochloride is a widely used analgesic with demonstrated antinociceptive effects in several species, including birds. However, information regarding local cutaneous adverse effects following transdermal administration in avian species remains limited. This report describes the development of a localised skin reaction following experimental transdermal administration of tramadol hydrochloride in broiler chickens. During a study evaluating the pharmacokinetics and thermal antinociceptive effects of transdermal tramadol, cutaneous lesions were observed at the application site in multiple birds receiving transdermal treatment. Grossly, petechial to purpura cutaneous haemorrhages were observed at the transdermal cream application sites 24 hours following administration. Skin samples were collected for histopathological evaluation. Histopathological examination revealed inflammatory cell infiltration within the cutaneous tissue, consistent with dermatitis, accompanied by dermal extravasation of erythrocytes indicative of haemorrhagic dermatitis. No evidence of systemic toxicity was observed during the study period. The development of haemorrhagic dermatitis exhibited marked individual variability and did not strictly correlate with the administered dose. While the most severe gross and histopathological lesions were observed in the high-dose (10 mg/kg) group, severe paradoxical reactions were also noted in the low-dose (5 mg/kg) group. Conversely, some subjects in the high-dose group remained asymptomatic. The lack of a consistent dose-dependent severity suggests an idiosyncratic or immune-mediated aetiology, rather than direct, predictable chemical toxicity. Alternatively, individual variations in stratum corneum integrity, or local reactions to the transdermal penetration enhancers, may account for the varying degrees of cutaneous haemorrhage and necrosis observed across both dose groups. This is the first report describing histopathologically confirmed cutaneous adverse effects associated with transdermal tramadol administration in chickens. Although transdermal tramadol demonstrates potential as a stress-reducing analgesic delivery method in avian species, clinicians and researchers should be aware of the possibility of local skin irritation or tissue injury. Further investigations are warranted to determine the incidence, severity, and underlying mechanisms of these reactions and to optimise formulation safety for avian use.

Keywords: *Avian, haemorrhagic dermatitis, tramadol, transdermal*

SEROPREVALENCE AND ASSOCIATED RISK FACTORS OF EQUINE PIROPLASMOSIS IN MALAYSIA

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Abstract

Equine piroplasmosis, a tick-borne disease caused by *Theileria equi* and *Babesia caballi*, poses a significant threat to the growing Malaysian equine industry, yet local epidemiological data remain limited. This cross-sectional study aimed to determine the seroprevalence and associated risk factors of equine piroplasmosis across Malaysia. Blood samples from 440 horses were analyzed using a commercial competitive ELISA in accordance with OIE guidelines, while concurrent epidemiological data were gathered via structured surveys, observational farm evaluations, and standardized clinical examinations demonstrating excellent inter-rater reliability (Cohen's kappa = 0.8). Following multicollinearity diagnostics and logistic regression analysis in SPSS, the overall seroprevalence was determined to be 30.7% (135/440), driven exclusively by widespread *T. equi* infection, whereas *B. caballi* was completely absent. While univariable analysis initially identified five potential variables meeting the $p < 0.20$ threshold, multivariate regression revealed that only stable location and horse type were significant independent predictors of infection ($p < 0.05$). Geographically, horses in the Northeast zone (Sabah) were approximately 61 times more likely to be infected, and those in the Southern zone had nearly twice the odds compared to the East Coast reference group. Additionally, ponies were 1.9 times more likely to be seropositive than other breeds ($p = 0.032$). This higher risk in ponies likely reflects cumulative historical exposure driven by extensive management systems and prolonged outdoor grazing, rather than inherent genetic susceptibility. Similarly, the exceptionally high infection risk in Sabah is plausibly driven by its tropical rainforest ecology and extensive grazing practices that favor tick vectors (e.g., *Rhipicephalus microplus*), contrasting with the lower prevalence in Central and Southern Peninsular Malaysia where urbanized environments and intensive stabling offer protective effects. Ultimately, the complete dominance and nationwide endemicity of *T. equi* emphasize the critical need for region-specific biosecurity interventions, targeted tick control, and tailored management practices to safeguard the Malaysian equine industry.

Keywords: *Equine, Piroplasmosis, Malaysia, Theileria equi, Babesia caballi*

PHYLOGENETIC ANALYSIS REVEALS FOWL ADENOVIRUS CIRCULATION IN BROILER FARMS IN MALACCA, MALAYSIA

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Abstract

Inclusion body hepatitis (IBH) is an economically important viral disease of broiler chickens caused by fowl adenovirus (FAdV). Malacca is one of the major broiler-producing regions in Malaysia and outbreaks in this area may threaten biosecurity and national poultry supply. In 2025, several farms reported similar cases suspected of FAdV infection, raising concern over whether a single circulating serotype was responsible or a new serotype had emerged. This study aimed to determine the serotype and evaluate the phylogenetic relationship of FAdV detected in broiler farms in Malacca using hexon gene sequence analysis. Three clinical samples were subjected to DNA extraction followed by polymerase chain reaction (PCR) for FAdV detection. Positive samples were subsequently processed for sequencing of the hexon gene region. Sequences were aligned with reference strains retrieved from public databases and analyzed phylogenetically to determine FAdV species and serotype and to assess genetic relatedness with available reference sequences. All three samples tested positive for FAdV by PCR. Phylogenetic analysis demonstrated that the isolates were genetically identical, belonged to FAdV species E, and clustered within serotype 8b. The isolates did not group with a previously reported Malaysian strain but showed close genetic association with FAdV-8b strains from Thailand. These findings confirm the circulation of FAdV species E serotype 8b in broiler farms in Malacca and indicate regional lineage association. Continuous molecular surveillance is essential to support effective biosecurity and vaccination strategies in the Malaysian poultry industry.

Keywords: *Fowl adenovirus, hexon gene, phylogenetic analysis, broiler farms, Malaysia*

EBH-P-1

DEVELOPMENT, VALIDATION AND IMPLEMENTATION OF AN INTERVENTION MODULE FOR ENHANCING EMERGENCY PREPAREDNESS AND TRIAGE PRACTICES AMONG VETERINARY PERSONNEL IN MALAYSIA

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Abstract

Veterinary emergencies require rapid clinical decision-making, effective triage, and coordinated preparedness to optimise patient outcomes. However, structured emergency preparedness and standardised triage practices remain inconsistently implemented in veterinary settings. In Malaysia, limited published evidence exists regarding veterinary emergency preparedness, creating a critical gap in workforce readiness and emergency response capability. This study aimed to develop, validate and implement the module to enhance emergency preparedness and triage practices among veterinary personnel in Malaysia. A single-arm quasi-experimental study was conducted among veterinary personnel working in clinics and hospitals across the Klang Valley, Malaysia. The module was validated among 10 veterinarians regarding its content, presentation, clarity, usability and formative assessment. Using purposive sampling, 100 veterinary personnel, comprising veterinarians, veterinary assistants, veterinary nurses, and veterinary technicians, were recruited. Emergency preparedness, triage practices, and self-reported confidence were assessed using a structured questionnaire. Emergency preparedness was quantified using a weighted objective preparedness scoring system and categorised using Bloom's cut-off points. Most respondents were veterinarians (76%) working predominantly in small-animal practice (79%). Strong foundational preparedness was observed, including the availability of emergency crash kits (94%), emergency power backup systems (95%), and emergency supplies (91%). However, substantial gaps were identified, including the absence of written emergency protocols (57%), limited capnography availability (7%), and infrequent emergency drills (81%). The mean preparedness score was 34.71 ± 4.73 (range: 21–47/50), indicating an overall moderate preparedness level, with 79% of clinics categorised as moderately prepared. Veterinary emergency preparedness among veterinary personnel in Klang Valley was predominantly moderate, with critical deficiencies in structured emergency protocols, advanced monitoring capability, and simulation training. These findings highlight the need for targeted interventions to strengthen veterinary emergency preparedness and triage systems, ultimately improving emergency response efficiency and patient outcomes in Malaysia.

Keywords: *Veterinary emergency, triage, emergency preparedness, veterinary personnel, Malaysia*

NOT JUST WORMS: UNCOVERING ANTHELMINTIC RESISTANCE IN EQUINE STRONGYLES ACROSS PENINSULAR MALAYSIA

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Abstract

Equine strongyles represent a primary gastrointestinal threat to horse welfare globally, yet the Malaysian equine industry has long operated without definitive data regarding their molecular identity or resistance status. This multi-state survey establishes the first comprehensive baseline to address this gap, documenting a concerning emergence of drug resistance across Peninsular Malaysia. A total of 377 horses across nine states were examined using the Modified McMaster technique for faecal egg count determination. To characterise infections beyond egg counts, ITS-2 rDNA PCR amplification using universal primers NC5/NC2 and Sanger sequencing were performed for species identification, while anthelmintic efficacy was evaluated in a subset of 76 horses via the Faecal Egg Count Reduction Test (FECRT), with resistance defined as FECR less than 95% and a lower confidence interval below 90%. Analysis revealed an overall strongyle prevalence of 31.6% with a mean faecal egg count of 195 EPG. Significant regional variation was observed, with infection hotspots in Terengganu (58.2%), Selangor (49.1%), and Pahang (48.3%). Risk factor analysis identified the treatment interval as the primary driver of infection intensity: horses on six-month dosing schedules exhibited 15.59 times higher odds of strongyle positivity compared to those treated every three months. Molecular identification confirmed *Cylicocycylus nassatus*, *Cyathostomum catinatum*, and *Cylicostephanus longibursatus* as the dominant cyathostomin species, with phylogenetic analysis clustering Malaysian sequences within globally distributed lineages. Notably, large strongyles were absent from all samples. FECRT confirmed resistance to ivermectin at one Centre region farm (FECR 83.3%), ivermectin-praziquantel combination at one East Coast farm (FECR 71.2%), and abamectin-morantel at one North West farm (FECR 84.4%). Oxibendazole remained fully efficacious across all farms. These findings establish the first evidence of multi-drug anthelmintic resistance in Malaysian equine strongyles and underscore the urgent need to transition from calendar-based deworming to surveillance-driven Targeted Selective Treatment (TST) to preserve the future efficacy of available anthelmintics.

Keywords: *Cyathostomins, equine, parasitology, anthelmintic resistance, phylogenetic*

EVALUATION OF DIFFERENT CONCENTRATIONS OF ALOE VERA (*Aloe barbadensis*) GEL SUPPLEMENTED IN SOYBEAN LECITHIN-BASED EXTENDER ON STALLION SEMEN QUALITY FOR DIFFERENT CHILLING DURATION

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Abstract

The expanding equestrian sector in Malaysia requires high-quality breeds that have driven the use of Assisted Reproductive Technologies (ART) to maximize the genetic resources while minimizing disease risk. Thus, optimizing the stallion semen preservation is vital. So, the substitution from commercial semen extenders to soybean lecithin-based semen extenders will be more cost-effective. However, soybean lecithin-based semen extenders are not very heat-resistant towards tropical climates. So, Aloe vera (*Aloe barbadensis*) has been incorporated into semen extenders due to its bioactive compounds, which can help prevent the formation of reactive oxygen species (ROS) which cause degradation of semen and sperm quality. However, there is insufficient data on the effects of using Aloe vera gel-supplemented (AVG) soybean lecithin-based semen extenders in equine species. So, the objective of this study is to evaluate and assess the effects of (AVG) soybean lecithin-based extenders at different concentrations against different chilling durations on chilled stallion semen quality. . The experiment was done using semen from a single donor that ejaculates three times ($n = 3$) independently for biological replicates. Later, the semen was equally divided into five aliquots for five different AVG soybean lecithin-based extender concentrations. Each replicate will be distributed into three chilling duration groups and run simultaneously. At 0 and 24 hours, the results showed no significant differences ($p > 0.05$) between groups for total motility, progressive motility, viability, and normal morphology. AVG supplemented groups showed non-inferiority towards the control groups. At 0 hours, the total motility rates for the .5% group were $75.00 \pm 4.62a$ % and 2% group ($75.33 \pm 2.9a$ %) compared to the control group ($72.00 \pm 2.3a$ %). At 24 hours, it can be highlighted that the .5% group had a better result compared to the control group in terms of total motility and progressive motility with the percentiles of ($62.33 \pm 6.06a$ %) vs ($60.00 \pm 3.46a$ %) and ($37.30 \pm 3.46a$ %) vs ($36.00 \pm 2.4a$ %), respectively. In conclusion, it can be confirmed that AVG is a practical natural alternative for equine semen preservation, specifically the .5% concentration AVG supplemented group.

Keywords: *Aloe vera, semen extender, stallion, chilled semen, soybean lecithin*

DEVELOPING A MULTIDIMENSIONAL SCALE MODEL FOR INVASIVE ALIEN FISH MANAGEMENT IN URBAN FRESHWATER SYSTEMS

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Abstract

The proliferation of invasive alien fish species (IAS) in urban freshwater ecosystems, particularly in Kuala Lumpur, poses substantial ecological and socio-environmental challenges. These species exhibit high adaptability, rapid reproduction, and frequently outcompete native species, resulting in threats to aquatic biodiversity. In urban settings, certain IAS also contribute to physical environmental degradation, such as riverbank destabilisation. Their introduction is primarily linked to anthropogenic activities, including ornamental fish releases and cultural practices, as well as limited public awareness of ecological impacts. This research aims to develop a multidimensional framework for IAS management by integrating ecological, social, economic, institutional, and technological dimensions. The study has three objectives: (i) to identify key multidimensional elements relevant to IAS management; (ii) to construct a multidimensional scale model for assessing IAS governance; and (iii) to propose strategic management interventions based on multidimensional scaling (MDS) outputs. A quantitative research design was employed using purposive sampling of stakeholders directly associated with urban IAS issues in Kuala Lumpur, including local communities, relevant NGOs, and ornamental fish industry representatives ($n = 153$). MDS was applied to evaluate stakeholder perceptions of sustainability across ecological, social, economic, institutional, and technological dimensions. The proposed sample size was considered adequate for MDS, given its emphasis on generating stable ordination patterns and identifying critical leverage dimensions within complex social-ecological systems. Data collection was conducted through structured questionnaires administered both online and in person. Data analysis employed descriptive statistics and MDS techniques to generate a composite sustainability index and visualise dimensional interactions using RStudio software. The findings revealed a moderate level of sustainability across all dimensions, with index values ranging from 61.41% to 85.92%. Ecology (85.92%) dimension recorded the highest score, followed by social (71.87%), technology (71.78%), whereas economy (68.44%) and institutional (61.41%) dimensions exhibited comparatively lower performance, indicating priority areas for future interventions and policy enhancement. The study is expected to provide a structured, evidence-informed framework for translating MDS outputs into strategic management interventions, thereby supporting integrated IAS governance, informing policy development, and enhancing stakeholder engagement towards sustaining Malaysia's aquatic biodiversity.

Keywords: *Invasive Alien Species Management, multidimensional scale model, urban ecosystem resilience, stakeholder-based governance*

***Paramecium* sp. AS A STARTER LIVE FEED TO ENHANCE *Pangasius nasutus* LARVAL SURVIVAL**

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Abstract

The availability of suitable live feed during early larval stages is critical for improving fish survival and growth in aquaculture. This study aimed to isolate and mass culture *Paramecium* sp. and evaluate its effectiveness as a starter live feed for *Pangasius nasutus* (Patin Buah) larvae. *Paramecium* sp. was isolated from green water obtained from tilapia culture and maintained under batch culture conditions to determine its production performance. Morphological characterization showed that *Paramecium* sp. had an average length of $127.12 \pm 8.91 \mu\text{m}$ and width of $40.33 \pm 3.93 \mu\text{m}$. Upscaling to a 5 L culture system achieved a peak cell density of $1800 \pm 200 \text{ cells mL}^{-1}$ on day 7, indicating efficient mass production potential. Feeding trials were conducted using 3-day post-hatch larvae at a stocking density of 5 larvae L^{-1} , with three treatments: (G1) *Paramecium* sp., (G2) green water (*Scenedesmus* sp.) only, and (G3) a combination of *Paramecium* sp. and green water (*Scenedesmus* sp.). The experiment was performed in triplicate. Results demonstrated that *P. nasutus* larvae fed exclusively on *Paramecium* sp. exhibited the highest survival rate (73.7%) compared to other treatments. In conclusion, *Paramecium* sp. cultured is a viable and effective starter live feed, significantly enhancing the survival of *Pangasius* larvae. This approach offers a practical and scalable strategy for improving early larval rearing success in aquaculture.

Keywords: Aquaculture, livefeed, *Pangasius* sp., fish larvae, fish survival

EFFECTS OF SIREHMAX SUPPLEMENTATION ON GROWTH PERFORMANCE AND SURVIVAL OF *Macrobrachium rosenbergii* CULTURED AT HIGH STOCKING DENSITY

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Abstract

Macrobrachium rosenbergii, commonly known as the giant freshwater prawn, is a commercially important aquaculture species with high market demand. To enhance production, farmers increasingly adopt high-density culture systems, however, these systems often face challenges such as slow growth and reduced survival rates. SirehMAX, a herbal supplement developed by the Fisheries Research Institute (FRI), was initially formulated to improve the health and resilience of aquatic species, and subsequent studies have indicated its potential to promote growth. This study evaluated the effects of SirehMAX on the growth performance of *M. rosenbergii* cultured under high-density conditions. The experiment was conducted at the Fisheries Research Institute Glami Lemi, Malaysia, using earthen ponds stocked at a density of 25 individuals/m². The culture period continued until the prawns reached the target weight of 25 g per individual. Prawns were fed either commercial feed coated with SirehMAX (treatment) or uncoated feed (control), with each treatment conducted in duplicate. The results showed that prawns in the SirehMAX-treated group reached the target market size of 25 g by the fourth month, whereas the control group only achieved a similar size by the sixth month. At the end of the culture period, the SirehMAX group recorded a survival rate of 77.4%, compared to 56.2% in the control group. These findings suggest that SirehMAX enhances both growth and survival under intensive aquaculture conditions. Its application may shorten the time required to reach marketable size, offering a natural and sustainable strategy to improve productivity in freshwater prawn farming.

Keywords: *Macrobrachium rosenbergii*, SirehMAX, growth, survival

CONTROL OF ECTOPARASITE, *Trichodina* sp. INFECTION IN CULTURED RED HYBRID TILAPIA (*Oreochromis* spp.) BY APPLICATION OF WHITE AND CERAMIC CLAY

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Abstract

Trichodinids are complex protozoa found on the skin, gills and fins of most fish, in low numbers, but occasionally become extremely high in numbers and cause disease in the fish population. Infected fish exhibit clinical signs such as sluggish behaviour, loss of appetite, black colouration, necrosis and ulcers on parts of the body and excessive mucus production in gill pouches and on the body surface. An experiment using clay as a submerged medium was conducted on red hybrid tilapia infected with the ectoparasite *Trichodina* sp.. Prior to the experiment, fish were checked for infection and maintained for five days in 50-litre aquaria, allowing the parasite to bloom. Five fish (5.72 ± 2.7 g) were then distributed for each treatment of TL (white clay), TL2 (ceramic clay) and control without the clay. About 30 g of clay was weighed and placed in the aquarium before the fish were introduced. Experimental tanks were prepared in triplicate. Fish were fed with pellet feed *ad libitum* twice daily for ten days without water exchange. Study results showed that after 0 days, the mean parasite intensity for the white clay treatment was 4.4 per fish and 2.89 per fish for the ceramic clay treatment, compared to the control, which was 5.0 parasites per fish. This promising result showed the potential of using clay as a medium in freshwater fish culture for controlling ectoparasite infections, thus minimising the risk of secondary infection by pathogenic bacteria due to the damaged epithelium barrier.

Keywords: *Trichodina, clay, red hybrid tilapia, ectoparasite, mean intensity*

EVALUATION OF FISHERIES RESTOCKING PROGRAM: MONITORING OF BAUNG, *Hemibagrus capitulum* GROWTH PERFORMANCE IN A COMMUNITY-MANAGED FISHERY FACILITY (FISH ESTATE), SUNGAI JERNIH, GEMENCHEH, NEGERI SEMBILAN

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Abstract

This study was conducted to evaluate the growth rate of catfish, *Hemibagrus capitulum* fingerlings released in a community-managed fish estate at Sungai Jernih, Gemencheh, Negeri Sembilan using the Visible Implant Elastomer (VIE) tagging method. A total of 200 fingerlings with a mean total length of approximately 5 inches (3.53 ± 0.93 cm) were tagged and released in January and February 2025. Sampling was carried out in July and November 2025 using hook and line, fishing rods and traps. Fish total length (TL) and bodyweight were recorded to assess Specific Growth Rate (SGR). Only seven tagged fish were successfully recaptured from the 200 released individuals (3.5%). The initial mean weight was 8.0 ± 3.4 g. In July, the mean TL and weight had increased to 8.06 ± 2.72 cm and 5.3 ± 27.3 g respectively with an SGR of 0.7%/day, while in November the mean TL and weight were 6.79 ± 2.23 cm and 36.6 ± 9.0 g respectively with an SGR of 0.28%/day. The findings indicate that the released fingerlings were able to adapt and grow in the reservoir environment, although the low recapture rate may have been influenced by limited sampling access, fish dispersal and reduced tag visibility as fish grew. This study provides baseline data for the assessment and improvement of inland fish stocking programmes in Malaysia.

Keywords: *Visible Implant Elastomer, tag, community-based fisheries management (CBFM), fish estate, recapture*

EFFECT OF DIFFERENT NURSING STRATEGIES ON THE GROWTH PERFORMANCE OF *Oreochromis* spp. FRY

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Abstract

The nursery phase is a critical bottleneck in tilapia seed production, particularly in tank-based systems where natural food availability is limited. This study evaluated the effects of integrating biofloc technology with live zooplankton (*Moina* sp.) as a supplemental feeding strategy for red tilapia (*Oreochromis* spp.) fry reared in polyethylene tanks without water exchange. Approximately 0.02 g red tilapia were stocked at 1,000 fish m⁻³ and assigned to three treatments in triplicate for 28 days: (1) biofloc-linked tank with a physical filter drum containing *Moina* sp. (BMF), (2) biofloc-linked tank with a physical filter compartment (BF), and (3) a control tank without filtration or biofloc integration. All groups were fed a powdered diet (40% crude protein) once daily. At the end of the trial, fry in the BMF treatment exhibited the highest mean final weight (1.535 ± 0.468 g), followed by BF (1.419 ± 0.198 g) and control (0.968 ± 0.597 g), although the differences among treatments were not statistically significant ($p > 0.05$). However, the survival rates were generally low across treatments, with the highest recorded in BMF (34 ± 16%), followed by control (30 ± 10%) and BF (6 ± 1%). Water quality parameters remained within acceptable ranges throughout the study, although un-ionized ammonia was highest in the control tanks (0.05 ± 0.00 mg L⁻¹). The integration of biofloc and *Moina* sp. demonstrated a positive trend toward improved growth performance and survival, suggesting their potential role as supplemental nutrient sources in tank-based nursery systems. Meanwhile, low survival rates observed highlight the need for further optimization of feeding regimes and culture conditions. In summary, this approach is promising for enhancing the productivity of tilapia nurseries in tank systems, however, further investigation under improved management practices is required.

Keywords: *Oreochromis* spp, nursery, biofloc, filter, tank

IDENTIFICATION OF ECTOPARASITES IN BUDGERIGARS (*Melopsittacus undulatus*) AND THEIR ASSOCIATED RISK FACTORS IN SELECTED ZOOS IN MALAYSIA

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Abstract

Ectoparasitic infestation represents a significant cause of morbidity and mortality within captive bird populations, yet scientific research concerning the ectoparasites affecting budgerigars (*Melopsittacus undulatus*) in Malaysia remains limited. This cross-sectional study was conducted to determine the occurrence of ectoparasite infestations, identify the presence of specific genera, and assess the potential associated risk factors among captive budgerigars housed in three selected zoos across Malaysia. A total of 50 budgerigars were randomly selected for this research. Ectoparasite samples were collected utilizing both feather plucking and acetate tape strip methodologies. Subsequently, the collected specimens were examined under a compound light microscope and tentatively identified based on reported morphological features and available taxonomic keys. The findings revealed a detection percentage of exactly 100%, which means all fifty sampled budgerigars tested positive for feather mite infestations. The microscopic examination identified a diverse array of feather mite genera, specifically including *Kramerella* spp., *Eustathia* spp., *Analgas* spp., *Proctophyllodes* spp., *Sokoloviana* spp., *Ptiloxenoides* spp., *Syringophilus* spp., *Pandionacarus* spp., *Ardeacarus* spp., *Pelargolichus* spp., and *Fainalgas* spp. This universal infestation is likely attributed to the unique biological traits of feather mites, including their remarkable ability to survive long-term on host birds, persist on fallen feathers, and spread extensively within enclosed zoo environments. Ultimately, this research underscores the pressing need for advanced molecular analysis and specialized taxonomic expertise to achieve accurate species-level identification. Further extensive screening with larger sample sizes is recommended to evaluate the associated risk factors and determine the zoonotic potential of these persistent avian ectoparasites.

Keywords: *Budgerigars, captive birds, ectoparasites, feather mites, zoos*

WE-P-2

**LABORATORY FINDINGS OF THEILERIOSIS IN A MALAYAN TAPIR
(*Tapirus indicus*): A CASE REPORT FROM THE CENTRAL ZONE
VETERINARY LABORATORY, MALAYSIA IN 2025**

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Abstract

Theileriosis, a tick-borne hemoprotozoan disease caused by *Theileria* spp., poses a significant threat to domestic and wild ungulates. Despite its importance, reports of this infection in endangered wildlife species are scarce. This case report documented the laboratory findings of suspected theileriosis in an adult Malayan tapir presented for diagnostic investigation. Clinical examination revealed multiple penetrating wounds as the primary finding. Concurrently, four ticks (*Dermacentor* spp.) were collected and identified as potential vectors of hemoparasitic pathogens. Hematological analysis indicated anemia (PCV = 25.7%), macrocytosis, hyperchromic red blood cells, and mild lymphocytopenia. Blood smear examination demonstrated intraerythrocytic piroplasm-like organisms suggestive of *Theileria* spp. Fecal examination revealed nematode eggs (300 EPG). The combination of hematological abnormalities, blood smear findings, and tick infestation suggested a possible hemoparasitic infection consistent with theileriosis. These findings emphasized the importance of considering theileriosis and gastrointestinal parasitism in the differential diagnosis of anemia in wildlife species. Early laboratory diagnosis is crucial for guiding clinical management and contributes valuable information to the understanding of emerging parasitic diseases in endangered wildlife populations, such as the Malayan tapir.

Keywords: *Theileriosis, Dermacentor, anemia, Malayan tapir, endangered wildlife*

DETECTION AND MOLECULAR IDENTIFICATION OF LOW PATHOGENIC H9N2 AVIAN INFLUENZA VIRUS IN IMPORTED FROZEN CHICKEN MEAT

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Abstract

Low pathogenic avian influenza (LPAI) subtype H9N2 is an important causative agent that poses increasing concern for both poultry and public health. In 2024, an LPAI H9N2 virus was detected in imported frozen chicken meat samples by real-time polymerase chain reaction (PCR). The virus was isolated via egg inoculation. Complete hemagglutinin (HA) and neuraminidase (NA) genes were sequenced, followed by phylogenetic analysis. The HA and NA sequences of the isolate showed more than 98% nucleotide identity with those of H9N2 viruses isolated from chickens in China in 2023. The amino acids in the HA cleavage site showed a typical monobasic motif of LPAI (PARSSR/GLF). Notably, the isolate had a leucine (L) at position 226 in the HA protein, enabling binding to mammalian α 2,6-linked sialic acid receptors and posing a potential risk for human transmission. Based on phylogenetic analysis, the isolate was classified under clade B4.7.2 viruses. Both the HA and NA genes were clustered with recent H9N2 viruses identified in poultry from China. In conclusion, these molecular features highlighted its potential for interspecies transmission and public health risk. However, properly cooked poultry poses minimal risk to consumers, as adequate thermal processing effectively inactivates the virus. These findings emphasized the necessity of continuous surveillance of imported poultry products to prevent potential impacts on poultry production and public health.

Keywords: *LPAI, H9N2, chicken meat*

ESTABLISHMENT OF A MOLECULAR METHOD FOR DETECTION OF PORCINE DNA CONTAMINATION IN VETERINARY VACCINE

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Abstract

Porcine-derived materials are utilized in certain veterinary vaccine formulations as stabilizers, cell culture preparation, or other starting material preparation. While porcine-free vaccines are prioritized, any use of formulations containing porcine-derived materials particularly in cases of urgency or where no alternatives exist, requires technical and religious consultation with JAKIM to ensure Syariah compliance. In Malaysia, halal compliance is a significant consideration as potential presence of porcine-derived contaminants in vaccines administered to livestock may raise concerns about downstream food-chain integrity and consumer confidence. Molecular methods have been widely used for species identification for animal-based food and forensic analysis. This study describes the establishment of a conventional polymerase chain reaction (PCR) assay for detection of porcine DNA in veterinary vaccine formulations. Two (2) sets of published porcine-specific primers, namely Porcine 1PF/Porcine 2PR and Porcine 3PF/Porcine 4PR, targeting conserved regions of porcine mitochondrial DNA, were employed to amplify fragments of 132 bp and 211 bp, respectively. Porcine DNA was extracted using a commercial DNA extraction kit in accordance with the manufacturer's instructions. Assay specificity was validated using non-targeted species including bovine and avian DNA, while commercial porcine DNA (*sus scrofa domesticus*) and in-house porcine DNA served as positive controls. Nuclease-free water was used as a non-template control. The assay was applied to screen veterinary vaccines with porcine-derived materials, which were used either indirectly during the preparation of the starting material or potentially present in the final vaccine formulation. The established PCR method was successfully validated, with clear amplification observed in positive controls and vaccine samples spiked with porcine DNA. As for vaccines where porcine-derived materials were used indirectly during upstream processing, no porcine DNA was detected. Overall, the established PCR method demonstrated high specificity and reliability, providing a practical molecular tool to support veterinary vaccine regulation. This approach enhances transparency and contributes to increasing consumer confidence in regulatory oversight in Malaysia.

Keywords: *Veterinary vaccine, PCR, porcine DNA, porcine-derivative component, species-identification*

SEROPREVALENCE OF JAPANESE ENCEPHALITIS AMONG MULTISPECIES ANIMALS IN PERAK

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Abstract

Japanese encephalitis (JE) is caused by the Japanese encephalitis virus (JEV), a flavivirus primarily transmitted by *Culex tritaeniorhynchus* mosquitoes, which commonly breed in rice fields and pig-rearing environments. JE is endemic throughout Southeast Asia, including Malaysia, and remains a leading cause of viral encephalitis in the region. Its transmission cycle involves multiple animal species. Pigs are recognised as key amplifying hosts because they sustain high viraemia and efficiently infect the mosquito vectors. This study aimed to determine the seroprevalence of JEV antibodies among multiple animal species in Perak, Malaysia. A total of 264 serum samples were collected from cattle, goats, pigs, horses, deer, dogs, ostriches, chickens, and ducks in Perak using simple random sampling. The study targeted approximately 30 animals per species, except ostriches (n = 24). All samples were screened for JEV-specific IgG antibodies using validated species-specific ELISA kits (sensitivity: 92.3%–98.3%; specificity: 97.2%–99.2%). The overall weighted prevalence was 96.15%. Species-specific point prevalence ranged from 0% to 100%, and weighted prevalence ranged from 0% to 81.92%. Chickens contributed the highest proportion to the weighted prevalence, suggesting a potentially important role as reservoir hosts. The high weighted prevalence observed in poultry indicated extensive virus circulation in Perak and highlighted potential implications for animal health and the risk of zoonotic spillover to humans.

Keywords: *Weighted prevalence, Japanese encephalitis virus, IgG antibodies, reservoir host*

A PRELIMINARY STUDY ON ISOLATION OF *Burkholderia pseudomallei* FROM SOIL SAMPLES IN SELECTED LIVESTOCK FARMS IN PAHANG, MALAYSIA

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Abstract

Melioidosis is an infectious disease caused by *Burkholderia pseudomallei*, a gram-negative bacterium that is commonly found in soil and water in tropical and subtropical regions worldwide. This bacterium can affect both humans and animals through inhalation, ingestion or direct contact with contaminated environmental sources. This study aimed to investigate the environmental distribution of *Burkholderia pseudomallei* in high-risk livestock areas (small and large ruminant farms) in Pahang, Malaysia, identified based on seroprevalence data from Makmal Veterinar Zon Timur (MVZT) Pahang. Between 2019 and 2022, a total of 622 samples were tested, of which 30 were seropositive across four areas. Based on these findings, environmental sampling was conducted in two selected high-risk livestock farms, involving 30 soil samples and 11 water samples. Isolation and identification of *Burkholderia pseudomallei* were performed using standard bacteriological culture methods and using selective media (Francis Media). The results showed that 1 out of 30 soil samples (3.3%) tested positive for *Burkholderia pseudomallei*, while all water samples were negative. These findings confirmed the presence of *Burkholderia pseudomallei* in the farm environment and highlighted the potential risk of melioidosis transmission in livestock areas. Therefore, appropriate preventive and biosecurity measures are recommended to reduce exposure risk. This preliminary study provides baseline data and serves as an early warning for both veterinary and public health sectors, particularly in livestock farms in Pahang.

Keywords: *Burkholderia pseudomallei*, melioidosis, bacteria, livestock soil, ruminant

FATAL MELIOIDOSIS IN GOATS: A CASE SERIES

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Abstract

Burkholderia pseudomallei, the etiological agent of melioidosis, is an endemic soil- and waterborne pathogen in Malaysia, where the risk of infection in humans and livestock increases substantially following heavy or prolonged rainfall. This report described four sudden-death incidents in intensively managed Boer breeder goats. The first two cases occurred one week apart after sustained rainfall, while the third and fourth cases were recorded a month later within the same herd. The herd was managed under a cut-and-carry feeding system, and no premonitory clinical signs were observed. Post-mortem examination of the initial two cases revealed severe pulmonary congestion and edema, mild hepatomegaly, mild splenomegaly, and diffuse intestinal congestion, without pathognomonic lesions. In contrast, the third and fourth cases demonstrated marked haemorrhage of the apical lobes of the lungs, accompanied by multifocal whitish pustules and purulent exudate, suggestive of suppurative bronchopneumonia. Bacteriological culture consistently yielded *Burkholderia* spp., and polymerase chain reaction (PCR) confirmed *B. pseudomallei* in all four cases. Serological screening of the remaining herd using the Complement Fixation Test (CFT) was negative following the first two deaths, supporting an acute course of infection. Although environmental sampling of soil and water was negative, concurrent grass replanting and structural repairs likely disturbed deeper soil layers, increasing the risk of exposure during periods of continuous rainfall. This case series confirms fatal melioidosis in goats under intensive management and underscores Malaysia's high environmental risk for sapronotic transmission, highlighting the need for heightened vigilance during soil-disturbing activities and reinforcing the diagnostic value of laboratory testing in cases where gross lesions may be nonspecific or variable.

Keywords: *Melioidosis, sapronotic transmission, Boer goat, Burkholderia pseudomallei*

PREVALENCE OF ANTIMICROBIAL RESISTANCE IN BACTERIAL ISOLATES FROM BOVINE MASTITIS CASES AT UPM FOSTER FARMS

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Abstract

Bovine mastitis remains a significant health and economic concern in dairy production, frequently requiring antimicrobial intervention. This study aimed to determine the prevalence of antimicrobial resistance (AMR) in bacterial isolates recovered from mastitis cases in UPM Ladang Angkat PUTRA farms and to identify associated risk factors. A cross-sectional study using convenience sampling was conducted. Thirty-one milk samples from 25 California Mastitis Test (CMT) positive cows were cultured, and bacterial isolates were subjected to antimicrobial susceptibility testing. The findings revealed a high prevalence of AMR at both the cow (60%) and quarter (58.1%) levels. *Staphylococcus aureus* was the predominant isolate (42.9%), while less frequent isolates included *Actinomyces*, *Bacillus sp.*, *Chromobacterium*, *E. faecalis*, *E. faecium*, *Enterococcus group*, *Streptococcus viridans*, *Staphylococcus delphini*, *Streptococcus bovis*, and *Streptococcus bovis equinus* complex (3.6% each). Resistance to at least one of six antibiotics tested was highest in *Staphylococcus aureus* (39.3%), followed by *Klebsiella sp.* and *Staphylococcus intermedius* (7.1% each). Neomycin exhibited the greatest sensitivity (67.9%, 19/28), followed by Gentamicin (64.3%, 18/28) and Enrofloxacin (60.7%, 17/28). Breed and farm practices, including management, feed type, and antibiotic use, were not significantly associated with AMR ($p > 0.05$). These findings highlighted widespread antibiotic use in mastitis treatment and underscore the need for routine AMR surveillance and prudent antimicrobial stewardship in Malaysian dairy systems.

Keywords: *Bovine mastitis, antimicrobial resistance, risk factors, prevalence, dairy cattle*

BIOSECURITY GATEKEEPING IN ACTION: THE CENTRAL ZONE VETERINARY LABORATORY'S ROLE IN ANIMAL DISEASE DETECTION AND BIORISK MANAGEMENT

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Abstract

Amidst the escalating threats from transboundary animal diseases and the complexities of growing international trade, veterinary diagnostic laboratories are indispensable for prompt disease detection and the safe management of infectious agents. The Central Zone Veterinary Laboratory (MVZT) is instrumental in Malaysia's national biosecurity framework, supporting national animal health initiatives and facilitating international trade for the central zone of Peninsular Malaysia through comprehensive disease detection, confirmation, and integrated biorisk management services. This study retrospectively evaluated the contribution of MVZT to national biosecurity by analyzing laboratory activities and biorisk management practices over a three-year period (2023–2025). Laboratory records were reviewed and activities were systematically categorized as diagnostic testing, national disease surveillance, or entry point control for import and export screening. During the study period, MVZT processed a total of 8,251 cases (84,476 samples), encompassing 1,665 diagnostic cases (12,524 samples), 4,696 surveillance cases (63,330 samples), and 1,890 entry point control cases (8,622 samples). Of these, 1,803 cases (22,724 samples) were detected and confirmed positive for various animal diseases of veterinary and economic importance. All laboratory operations strictly adhered to established national and international biosafety and biosecurity frameworks, including the World Health Organization Laboratory Biosafety Manual, the World Organisation for Animal Health Manual of Diagnostic Tests, and the Malaysia Laboratory Biosafety and Biosecurity Guideline. Importantly, no laboratory-acquired infections or environmental release incidents were reported throughout the study. These findings underscore the laboratory's sustained and significant role in supporting routine diagnostics, strengthening surveillance systems, and enhancing biosecurity control at critical entry points. In conclusion, the integration of comprehensive diagnostic services with stringent biorisk management practices is crucial and it not only strengthens laboratory reliability and supports national disease control programs but also reinforces Malaysia's biosecurity preparedness while simultaneously facilitating safe trade.

Keywords: *Central zone veterinary laboratory, MVZT, biosecurity, animal disease detection, biorisk management.*

ANTIBIOTIC USE KNOWLEDGE, MISCONCEPTIONS AND CERTIFIED CHICKEN MEAT PURCHASING BEHAVIOUR AMONG MALAYSIAN CONSUMERS

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Abstract

Consumer knowledge of antibiotic use in poultry production and antimicrobial resistance (AMR) is an important component of One Health risk communication. However, whether knowledge and misconceptions influence certified chicken meat purchasing behaviour among consumers remains unclear. This cross-sectional questionnaire survey assessed antibiotic use knowledge, misconceptions, and certified chicken meat purchasing behaviour among 661 Malaysian adults aged ≥ 18 years. An Antibiotic Knowledge Score (AKS), derived from four questionnaire items, was categorised as adequate ($\geq 75\%$ correct) or inadequate ($< 75\%$). Associations between knowledge, misconceptions, demographic variables, and purchasing behaviour were analysed using Pearson's chi-square tests. Only 32.5% of respondents demonstrated adequate antibiotic use knowledge. Adequate knowledge was significantly associated with age ($\chi^2 = 8.84$, $p = .031$), education ($\chi^2 = 21.03$, $p < .001$), and household income ($\chi^2 = 37.71$, $p < .001$). Misconceptions were common: 61.4% believed antibiotic use in chicken feed is not harmful to humans, while 71.6% believed or were unsure that antibiotic use is widespread in organic chicken farming. Knowledge was significantly associated with these misconception indicators ($\chi^2 = 371.85$ and 226.91 , both $p < .001$). However, adequate knowledge was not significantly associated with prioritising organic or antibiotic-free chicken ($\chi^2 < 0.01$, $p = .979$) or purchasing VHM/GVHP-certified chicken products ($\chi^2 = 1.65$, $p = .199$). A significant association was observed between prioritising organic or antibiotic-free chicken and purchasing VHM/GVHP-certified chicken products ($\chi^2 = 15.22$, $p < .001$). These findings suggested a knowledge–perception–behaviour gap among Malaysian chicken meat consumers. Although antibiotic use knowledge was associated with misconceptions, it was not consistently reflected in certified chicken meat purchasing behaviour. Consumer education, transparent poultry production communication, and clearer certification labelling may help bridge the gap between knowledge and purchasing decisions.

Keywords: *Antibiotic use knowledge, chicken meat, certified purchasing behaviour, antimicrobial resistance, One Health*

AN ASSESSMENT OF SEROPREVALENCE AND ASSOCIATED RISK FACTORS FOR AKABANE, BLUETONGUE, EPIZOOTIC HAEMORRHAGIC DISEASE AND TOXOPLASMOSIS IN NATIVE GOATS OF KELANTAN

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Abstract

Infectious diseases significantly limit the productivity of small ruminants, especially goats, which are vital for food security and income in Malaysia. This cross-sectional investigation was conducted to assess the seroprevalence and associated risk factors for Bluetongue, Epizootic Haemorrhagic Disease (EHD), Akabane disease, and Toxoplasmosis in Kelantan. Blood samples were collected from 40 local goats from smallholder farms, and a questionnaire was used to collect information on the risk factors. A commercial ELISA kit was used for blood sample analysis. Data were analysed using chi-square tests and odds ratios for seroprevalence and risk factors. The seroprevalence results showed Bluetongue was highest at 82.5%, followed by Toxoplasmosis (12.5%), EHD (7.5%), and Akabane (5.0%). Bluetongue infection was significantly linked to animal source, farm type, and vector control ($p < 0.05$). For *Toxoplasma gondii*, significant risks included semi-intensive management and the use of untreated water. Associations were limited for EHD and non-existent for Akabane. The findings suggested Bluetongue is endemically circulating, likely due to animal movement and vector exposure, while Toxoplasmosis transmission relates to environmental contamination. The study offered baseline data on these notifiable diseases in Malaysian goats and stressed the importance of enhanced biosecurity, vector management, and subsequent longitudinal research for effective control.

Keywords: *Goats, seroprevalence, bluetongue, risk factors*

RUSMART: BRIDGING VETERINARY EDUCATION AND CLINICAL PRACTICE THROUGH A DIGITAL DRUG REFERENCE TOOL

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Abstract

RuSMART (Ruminant Smart Medicine and Reference Tool) was developed to provide veterinary students and clinicians with rapid, convenient access to reliable drug information for ruminants, addressing the challenge of searching across lecture notes, textbooks, and multiple online resources for essential medication references. The web-based application consolidates key drug information, including drug class, indications, recommended dosages, routes of administration, withdrawal periods, and treatment regimens, into a single, user-friendly platform. It also incorporates a rapid search function and an integrated dosage calculator to minimize calculation errors and improve users' confidence in determining appropriate drug dosages during both academic learning and clinical practice. The application was developed using the Loveable.dev low-code platform, enabling efficient, systematic development from veterinary textbooks, lecture materials, and reputable online references. To ensure accuracy, reliability, and clinical relevance, all content underwent expert review and validation by faculty members and specialists in ruminant medicine before integration into the final platform. The interface was intentionally designed to be simple, intuitive, and easy to navigate, allowing users to efficiently retrieve information during lectures, study sessions, clinical rotations, and case discussions while promoting responsible antimicrobial use in accordance with One Health principles. The application was evaluated by Year 3 to Year 5 veterinary students via a structured Google Form survey and received highly positive feedback, with an average satisfaction rating of approximately 4 out of 5 stars. Students described the platform as convenient, well-organized, and time-saving, highlighting the dosage calculator and rapid search function as its most valuable features for revision and clinical preparation. Participants also recommended expanding the drug database, incorporating revision-oriented learning tools, and providing more comprehensive guidance on drug administration. Overall, the findings demonstrate that RuSMART has strong potential to standardize ruminant drug referencing, improve dosing accuracy, support evidence-based clinical decision-making, and enhance students' confidence in managing clinical cases. As such RuSMART represents making it a valuable digital learning resource that support both for veterinary education and clinical practice.

Keywords: *Ruminant, pharmacology, platform, digitalization, education*

BRIDGE PROTOCOL: AN INTEGRATED REAL-WORLD LEARNING FRAMEWORK FOR LIVESTOCK ZONOSIS EDUCATION IN SOUTHEAST ASIA

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Abstract

Veterinary graduates across Southeast Asia frequently enter livestock field practice underprepared for the socially complex realities of managing zoonotic diseases. Clinical decisions in this context must simultaneously navigate pathological diagnosis, farmer compliance, mandatory reporting obligations, and socioeconomic pressure, yet existing curricula address these competencies in isolation and rarely incorporate direct field exposure. Evidence from Indonesia, Malaysia, Vietnam, and the Philippines documents recurring disruptors to outbreak control, including owner resistance to culling mandates, financial coercion against mandatory disease reporting, and herd-handling practices that accelerate transmission patterns consistent with regional One Health surveillance reports. No current veterinary learning framework systematically embeds these disruptors as structured cognitive variables and connects learners to live field conditions. The Bridge Protocol addresses this gap through a four-layer integrated real-world learning model delivered across a printed student workbook and a web-based digital module: (1) Theoretical Triage, applying textbook-level diagnostic knowledge; (2) Field Noise Decoding, embedding documented socioeconomic and cultural disruptors as decision variables within Script Concordance Test (SCT) tables; (3) Live Field Discovery, in which learners engage recorded and livestreamed field sessions conducted in partnership with regional livestock health units to observe real outbreak response, farmer negotiation, and reporting procedures as they occur; and (4) Cognitive Audit, structured reflection on the systemic One Health consequences of decisions made. The module addresses three high-priority zoonoses contextualized to Southeast Asian outbreak patterns: Brucellosis, Anthrax, and Highly Pathogenic Avian Influenza (HPAI/H5N1). Print deployability suits resource-limited settings; the digital and livestream components extend access across institutions with connectivity. Effectiveness will be evaluated using a pre-test/post-test quasi-experimental design that compares clinical reasoning gain scores between the experimental and control groups, benchmarked against the expert panel consensus. By linking classroom reasoning to real-world field realities, the framework aims to produce graduates better aligned with ASEAN regional disease-control priorities and global One Health workforce goals and is structured for systematic expansion into additional zoonoses and national regulatory contexts.

Keywords: *Zoonosis, One Health, livestock, Script Concordance Test, veterinary education*

GAMIFYING VETERINARY ANATOMY: A BOARD GAME APPROACH TO ENHANCE STUDENT ENGAGEMENT AND CONCEPT MASTERY

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Abstract

Veterinary anatomy is a challenging subject for animal science students, as it involves understanding complex structures, spatial relationships, and functional integration of multiple anatomical systems. Mastery of anatomical concepts is essential for interpreting physiological processes and clinical conditions in animals. This study explores the effectiveness of an innovative card-based gamified learning approach, *Veterinary Anatomy Quest*, in enhancing students' learning experience. The game is designed to promote active engagement through individual gameplay, in which students collect and assemble related anatomy cards to form complete, functional skeletal structures. A classroom-based intervention was conducted involving undergraduate students enrolled in an animal anatomy course. Students participated in structured gameplay sessions following conventional instruction. Each player was required to apply their knowledge of anatomical components, functions, and relationships to successfully complete skeletal systems using the card sets. Pre- and post-knowledge assessments were conducted to evaluate learning outcomes, and student reflections were collected to assess engagement and learning experiences. The findings indicate an improvement in students' understanding of anatomical concepts, as evidenced by pre- and post-test comparisons. Student reflections indicated that the activity was engaging and enjoyable and helped simplify complex anatomical relationships through structured visualization and logical sequencing. In conclusion, the card-based gamification approach offers an effective, low-cost teaching innovation that enhances active learning and conceptual understanding. The game demonstrates strong commercialization potential as an educational tool and offers a scalable solution to improve anatomy education in higher education institutions.

Keywords: *Anatomy, education, gamification, skeletal, veterinary*

NAPIERMIX TMR SILAGE: A SUSTAINABLE INNOVATION FOR HIGH-QUALITY RUMINANT FEED

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Abstract

Fresh Total Mixed Ration (TMR) is highly susceptible to aerobic deterioration, leading to significant nutrient loss, microbial spoilage, and reduced feed quality. To overcome these limitations, NapierMix TMR silage was formulated with soy curd residue (SCR). This inclusion serves as a strategic intervention to maximize fermentation efficiency and microbial safety while bolstering the nutritional contents of the ration. The optimized NapierMix formulation demonstrated a superior nutritional profile, with crude protein (CP) increasing from a 14% baseline to approximately 16–18% (DM basis), alongside an enhanced metabolizable energy (ME) of approximately 11 MJ/kg DM. Fermentation quality was significantly improved, characterized by stable acidic pH values (3.8–4.2) and controlled temperatures, indicating efficient anaerobic preservation. Microbial analysis revealed a robust dominance of beneficial lactic acid bacteria (LAB), with counts reaching 7.4×10^6 CFU/g. High-throughput metagenomic profiling confirmed the prevalence of *Limosilactobacillus* (up to 55% relative abundance) and *Lactobacillus* (up to 16.84% relative abundance), thereby facilitating rapid organic acid production and enhancing silage stability. Conversely, spoilage-associated taxa were significantly suppressed, with *Enterobacter* and *Klebsiella* reduced to 0.23% and 0.13%, respectively. Furthermore, yeast and mold populations remained within acceptable quality thresholds, and no mycotoxins were detected, confirming the feed's microbial safety and toxicological stability. Overall, NapierMix TMR silage provides a practical and sustainable solution for upcycling agro-industrial waste into high-quality ruminant feed, offering a promising strategy for enhancing the resilience of sustainable livestock production systems.

Keywords: *Aerobic stability, microbial analysis, soy curd residue, total mixed ration silage*

THE 1.5% RULE: A PRECISION-DOSING DISCOVERY IN FAT SUPPLEMENTATION THAT CUTS FEED COST WITHOUT SACRIFICING LAMB QUALITY

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Abstract

Ruminant fat supplementation is fundamentally constrained by ruminal biohydrogenation, which converts beneficial unsaturated fatty acids into saturated end-products prior to absorption, thereby limiting the potential nutritional enhancement of meat quality. This creates a critical knowledge gap in dose optimisation for commercial lamb production, particularly in the Dorper breed. This study investigated the respond of Dorper lambs to the graded levels of calcium salts of long-chain fatty acids (Ca-LCFA; 0%, 1.5%, 3.0% of dietary dry matter) over a 90-day feeding trial in 18 lambs. Growth performance, carcass quality, meat texture, and tissue fatty acid profiles were evaluated. The study revealed two distinct dose-response thresholds not previously characterised in sheep nutrition. At the lower threshold, 1.5% Ca-LCFA supplementation achieved near-maximal improvement in meat tenderness, reducing biceps femoris hardness by 80.9%, $P < 0.001$) and significantly improving dressing percentage (40.2% to 47.6%, $P < 0.001$). Increasing supplementation to 3.0% produced no further tenderness gain; instead, it induced a separate physiological response characterized by a 9-fold rise in muscle oleic acid, up to a 315% increase in monounsaturated fat, and a 51% increase in meat-plus-bone yield. The economic implications of these thresholds were also evaluated. The control diet incurred no additional supplementation cost but resulted in the lowest carcass performance (40.2% dressing percentage and 564.7 g BF hardness). Increasing Ca-LCFA supplementation to 1.5% incurred an estimated additional cost of RM12.10 per lamb (based on a trial dry matter intake of 115.2 kg and Ca-LCFA cost of approximately RM7/kg) while achieving an 80.9% reduction in meat toughness and a 7.4 percentage-point improvement in dressing percentage. Increasing supplementation further to 3.0% incurred an additional RM15.30 per lamb (RM27.40 total) but provided no additional tenderness benefit, indicating that this higher inclusion level primarily influences fatty acid composition rather than meat tenderness. For a 500-head finishing flock, the 1.5% inclusion level represents the most economically efficient strategy for producers targeting tenderness and carcass yield, with an estimated saving of RM7,640 per finishing cycle compared with routine supplementation at 3.0%. This study provides the first evidence that Ca-LCFA supplementation in meat sheep operates across two functionally distinct zones — one driving carcass yield and tenderness, the other driving fat-profile remodelling — rather than a single continuous dose-response curve. The discovery gives producers a precision-dosing rule: 1.5% for tenderness- and yield-focused production at lower cost, 3.0% only when marbling enhancement is the specific goal, with direct relevance to Dorper production across tropical and subtropical regions.

Keywords: *Dose-response threshold, rumen-protected fat, Dorper sheep, meat quality, precision nutrition*

SMARTVET RESPONSE: A SCALABLE DIGITAL HEALTH INNOVATION FOR VETERINARY EMERGENCY RESPONSE

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Abstract

Veterinary emergencies require rapid decision-making, accurate triage, and immediate access to critical information. Veterinary clinics, particularly in resource-limited settings, lack standardized protocols, leading to inconsistencies in emergency care. To address this challenge, we developed SmartVet Response, an innovative mobile application that enhances veterinary emergency preparedness through evidence-based triage guidance, emergency protocols, monitoring tools, drug calculators, and clinical checklists, all integrated into a user-friendly digital platform. A needs assessment was conducted among veterinary personnel working in private and public veterinary clinics. Baseline evaluations identified gaps in emergency preparedness, confidence, and access to structured emergency resources. The SmartVet Response application was subsequently deployed and evaluated using a pre- and post-intervention approach. Changes in preparedness, knowledge, confidence, and user acceptance were assessed using validated instruments and usability testing. Results indicate that SmartVet Response significantly improved emergency preparedness, with >90% of users reporting increased confidence. The platform achieved a System Usability Scale (SUS) score of 85.65, indicating high user satisfaction, ease of navigation, and strong acceptance among veterinary personnel. Participants highlighted the application's ability to support rapid clinical decision-making, reduce uncertainty during emergencies, and provide instant access to critical information at the point of care. SmartVet Response represents a practical, scalable, and cost-effective digital health solution with the potential to standardize veterinary emergency practices across Malaysia and beyond. By combining mobile technology, evidence-based protocols, and real-time decision support, the innovation strengthens veterinary service delivery, improves professional preparedness, and contributes to better animal health outcomes. This innovation demonstrates how digital transformation can bridge critical care gaps and strengthen the future of technology-enabled veterinary medicine.

Keywords: *Veterinary emergency, mobile health application, digital innovation, emergency preparedness, decision-support system*

THE MAKER-USER ASSESSMENT: DEEPENING VETERINARY CLINICAL SKILLS THROUGH SIMULATION DESIGN

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Abstract

Veterinary education often relies on passive learning or high-stress live-animal practice. This study evaluates the "Maker-User" approach, where clinical-phase veterinary students actively design and build Objective Structured Clinical Examination (OSCE) simulation models, assessing its impact on anatomical comprehension and procedural confidence. Veterinary students (N=8) participated in a model-building session. A mixed-methods survey utilized 19 Likert-scale items (1=Strongly Disagree, 5=Strongly Agree) and open-ended questions to evaluate domains like spatial awareness, haptic feedback, and anxiety reduction. Descriptive statistics and thematic analyses were applied. The Maker-User approach yielded highly positive educational outcomes. Strikingly, 100% of participants strongly agreed ($M = 5.00 \pm 0.00$) that building the model allowed them to discover anatomical details previously overlooked in textbooks or ready-made models. Students reported high confidence in their spatial awareness ($M = 4.62 \pm 0.52$) and a clearer understanding of procedural steps ($M = 4.75 \pm 0.46$). Furthermore, the simulation was highly effective in reducing student anxiety associated with live-animal procedures ($M = 4.88 \pm 0.35$). Actively building OSCE models forces deeper cognitive engagement with anatomical layers than utilizing pre-made models. While simulations cannot fully replicate dynamic live-animal complexities, the Maker-User assessment acts as a crucial, low-anxiety transitional bridge, solidifying clinical fundamentals prior to live patient interaction.

Keywords: *Simulation design, OSCE, veterinary education*

PREGNAMIX: NATURAL SOLUTION FOR PRECISION BREEDING IN RUMINANT

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Abstract

Estrus synchronisation is a vital component of structured breeding management, allowing for the simultaneous manipulation of the estrus cycle in livestock to improve production efficiency. In Malaysia, where the self-sufficiency level (SSL) for goats remains low at 10.5% and meat imports have reached approximately RM3 billion, achieving structured breeding is a national priority addressed by the Animal Breeding Policy 2013. While Controlled Internal Drug Release (CIDR) is the commercial standard for inducing estrus, its high cost and requirement for skilled labor present significant barriers for local small-scale farmers. This study evaluates the efficacy of Pregnamix, a cost-effective natural herb supplement, as an alternative to CIDR. Pregnamix consists of a modified herbal blend including *Cinnamomum verum*, *Zingiber officinale*, *Cananga odorata*, and *Piper nigrum* L. To test its efficacy, eight non-pregnant female goats were divided into two groups. Group A received a 14-day CIDR protocol, while Group B was fed Pregnamix orally for three days. The results demonstrated that estrus detection was higher in the herb-treated group (80.56%) compared to the CIDR group (77.78%). Both treatments achieved a 100% conception and pregnancy rate, as confirmed by ultrasound scanning during the second trimester. While the onset of estrus was slightly earlier in the CIDR group (22.15h vs. 24.4h) and the duration of estrus was marginally longer (57.5h vs. 56h), these differences did not significantly impact the overall reproductive success. The estrus response for CIDR and herbs were higher in the morning 100%, for both compared to evening (66.67% vs 83.3%, respectively). In conclusion, Pregnamix offers a comparable and effective alternative to expensive hormonal regimes, supporting the Quadruple Helix Model of innovation by providing a practical, safe, and accessible technology for the farming community. Its implementation facilitates a structured breeding plan, enabling farmers to anticipate farm productivity and improve local meat production.

Keywords: *Estrus Synchronisation, Pregnamix, herbs, CIDR, ruminant*

NOTES



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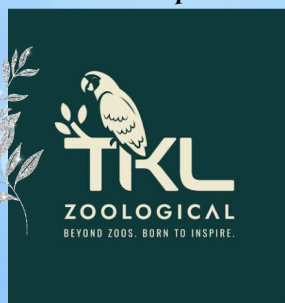
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