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"ONE HEALTH: BRIDGING VETERINARY AND ALLIED SCIENCES TOWARDS NATION'S WELL-BEING"

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CONTENTS

Poster Presentation

PREFACE

On behalf of the Scientific Committee, we would like to welcome all participants to the 29th Veterinary Association Malaysia Congress 2017, Shah Alam, Malaysia. With the theme "**ONE HEALTH: BRIDGING VETERINARY AND ALLIED SCIENCES TOWARDS NATION'S WELL-BEING"**, scientists from many institutions are here to share their experiences and findings in the field of veterinary and allied sciences.

This year, we received more than 100 scientific papers which will be presented either as keynote, plenary, oral or poster presentation. The scope of the paper varies from all kind of species from domestic to wildlife animals to many fields related to human and animals encompassing one-health concept.

To all participants, thank you very much for all the contributions and we sincerely hope that all of you will enjoy and have a fruitful congress.

The Editors

Disclaimer: The organising committee would like to thank all participants for the abstracts submitted. The Editors are not responsible for any errors in the published abstracts.

ONE HEALTH: BRIDGING VETERINARY AND ALLIED SCIENCES TOWARDS NATION'S WELL-BEING

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ONE HEALTH: BRIDGING VETERINARY AND ALLIED SCIENCES TOWARDS NATION'S WELL-BEING as a theme is a pertinent concept which all of us should embrace enthusiastically and implement it in our working environment as diseases emerge or re-emerge without warning and knows no boundaries.

This is important as seen from the fact that 60% of existing human infectious diseases are of zoonotic in nature, at least 75% of emerging infectious diseases of human (including Ebola, HIV and Influenza) have an animal origin, every five (5) new human diseases appear every year of which three (3) are of animal origin and 80 % of agents with potential bioterrorist use are zoonotic pathogens.

The One Health concept was introduced since year 2000. However, the idea had been known as early as 400 BC when Hippocrates produced a book titled "On Airs, Waters and Places" which relates diseases to the states of the environment.

The concept of One Health is that human health and animal health are interdependent and bound to the health of the ecosystems in which they co-exist. One Health is defined as a collaborative, multi-sectorial, and trans-disciplinary approach working locally, nationally and globally to attain optimal health for people, animals and the environment.

A healthy individual lives in relation to its flora and fauna. Human population is growing and ever expanding into new geographic areas. As a result, more people live in close contact with wild and domestic animals allowing better opportunities for disease spread between animals and people. Deforestation, intensive farming, climate change and urbanisation are also contributing factors. These changes have led to the emergence and re-emergence of many novel diseases. Furthermore, as the global trade increases and global travel accelerates, the consequences have led to the spreading of diseases quickly across the universe.
Hence our efforts to cause minimal impact to the environment and to be able to prevent, detect and control infectious diseases HAS TO BE COORDINATED WITH VETERINARIANS AND EXPERTS IN ALLIED SCIENCES to secure safe and adequate food and water supply as well as to avoid diseases of zoonosis. This is where the One Health concept and implementation is significant and important.

In Malaysia, the One Health approach has been extensively and successfully implemented by the Department of Veterinary Services (DVS). Such a multi-sectorial effort was indeed necessary, pertinent and need to be further nurtured and sustained especially when human lives are at stake. This was evident when the outbreak of Nipah virus in 1998 – 1999 was controlled from the efforts of the veterinarians and the people from the allied sciences. Further collaborative efforts were seen during the control of Highly Pathogenic Avian Influenza outbreak in 2004, 2006, 2007, and in 2017. Rabies control in 2015 and in 2017 also involved people from different backgrounds and organisations to work together to control disease of zoonotic importance.

DVS Malaysia continuously conduct awareness and networking programs such as regular meetings, discussions, seminars, conferences, simulation exercises involving multiple relevant agencies to stay current on One Health approach and also to bridge veterinary and allied sciences.

Initiatives such as the Malaysia One Health University Network (MyOHUN) were to collaborate on the one health concept by integrating universities and authorities to network and work together. The mission is to leverage the training, education and research capacities of the university network to build the skills, knowledge and attitude for One Health leaders.

Addressing health risks at the human-animal-ecosystems interfaces through one health approach must be reinforced. Coordinated efforts is required to minimize the burden on any one agency to control diseases. This approach will also avoid duplicating efforts by multiple agencies and the various skills can be harnessed in order to have an effective and optimum outcome.

Thus, it is imperative that we continuously engage various organisations and people from different sciences to coordinate our efforts in ensuring a safe and better world.

TRANSFORMING ONE HEALTH WORKFORCE FOR A WELL-BEING OF THE NATION

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One Health (OH) is a multi or trans-disciplinary collaborative approach to improving the health of humans, animals and the environment; a new global strategy of cooperation to provide solution on the global threats posed by infectious and zoonotic diseases. It encourages the collaborative efforts of multiple disciplines working locally, nationally, and globally to attain optimal health for people, animals and the environment. Rudolph Virchow (1821-1902) a founder of comparative medicine and veterinary pathology is a father of OH. Transforming of OH Workforce (OHW) through coordination and collaboration across all levels of the human and animal health sectors is essential to meet the Global Health Security Agenda (GHSA) vision, and a well-being of the nation; that integrates mental health (mind) and physical health (body). It requires a shift in our workforce culture and regulatory framework from the first responders on the front line such as veterinarian to the policy makers implementing change.

Recently, numerous disease outbreaks were reported worldwide, especially those of public health and zoonotic important. It continual threats to global health and produces suffering and death, and imposes enormous financial burdens on society. It is estimated economic losses of USD 25-30, 40-50, 20-24 and 0.4 billion a result of recent H5N1, SARS, BSE and Nipah outbreaks, respectively. About 60% of human pathogens are of animal origin and 75% of emerging animal diseases can be transmitted to human. The critical factors for disease outbreaks mainly due to an adverse interaction between the agent, host and environment such as climate and weather changes, changing ecosystems, demographics and populations, including issues of wildlife and exotic animals, economic development and land use, microbial adaptation and change, host susceptibility, international trade and travel, technology (synthetic biology) and industry. It also includes poverty and social inequity, insufficient farm and food-related security and surveillance, inefficient passive disease-reporting system, declining number of livestock veterinarian and diagnostic training, intensive breeding and farming system, as well as intent to harm (bioterrorism and agroterrorism), education and training system.

Highly crowded breeding and rearing conditions mean an outbreak of a contagious disease would be very difficult to contain, especially if it is airborne, and could require the destruction of all exposed livestock. Intensive farming practices may have stressed livestock and weakening their resistance to disease. This may result in an increased need for antibiotic use and may increase risk of the development of antibiotic resistance (AMR) strains of pathogens. AMR is a global health challenge and is an area of focus under the WHO-OiE-FAO Tripartite Agreement as well as the IHR-PVS-GHSA- JEE (Joint External Evaluation) standards and partnerships. Livestock farms seldom incorporate vigorous means to prevent unauthorized access, and food processing and packing plants tend to lack uniform security and safety preparedness measures, particularly the small- and medium-scale facilities that have proliferated in recent years. This could invite high risk of disease outbreaks and security risk of an intentional introduction of an animal-borne infectious disease or agroterrorism with the goal of spreading fear, producing economic losses, and/or threatening social stability, causing human illness or human casualties.

Malaysia has experienced the first outbreak of Nipah virus in 1998, SARS in 2003, localized outbreaks of H5N1 in 2004, H1N1 in 2009, MERS-CoV 2014 and Zika virus in 2016. One Health approach is implemented in the country through the establishment of a National Security Council and Inter-Ministerial Committee for Control of Zoonotic Diseases in 1998; lessons learned during Nipah virus outbreaks. In 2014, Malaysia One Health University Network (MyOHUN) is participated in

transformation of OHW in the country and dedicated in building the capacity of the global health workforce to prevent, detect and respond to emerging infectious diseases with the financial support from USAID and in collaboration with the University of Minnesota and Tuft University, USA. Currently, 17 universities (21 faculties), 2 government ministries and 5 government departments are members of MyOHUN. Education and training for the current and future OHW play an important role in transforming OHW in the country and globally. Issues and challenges such as on the shortage of collaborative student programmes, insufficient environmental training for OH professionals and a lack of institutional support and funding may impede progress and shall be addressed accordingly to train a new generation of OHW. Transforming OHW can be enhanced through assessing the current state of the OH approach, identifying and building upon successes and lessons learned, identifying opportunities and barriers to implementing OH and formulating strategies to address needs.

In conclusion, infectious and zoonotic diseases are a continuing threat to animal and human populations worldwide and they produce suffering, death and impose enormous financial burdens on society. Each new disease brings unique issues and challenges, forcing us to continually adapt to ever-shifting threats. The battle against infectious and zoonotic diseases is a continual process; winning does not mean stamping out every last disease, but rather getting out ahead of the next one. Transforming OHW hold promise of creating a world safe and secure from global health threats posed by infectious and zoonotic diseases, and a well-being of the nation.

CAN LIVESTOCK PRODUCTION FEED 3 BILLION NEW PEOPLE AND SAVE THE PLANET? A GLIMPSE INTO THE FUTURE

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World population is one trend that is going to dominate the lives and thinking of policy makers moving for world. The world's population at the beginning of the 20th century was about 2 billion people. At the beginning of the 21st century it was 6 billion people. On the middle of the century it is predicted there will be 9 billion people to feed the world (1).

Today there are nearly 1 billion hungry people around the globe (2). Yet by 2050 our growing population will require an estimated 100 percent more food than we produce today. The U.N. Food and Agricultural Organisational (FAO) reports that added farm land will help to produce 20 percent the additional food our plant will need by 2050 and 10 percent will come from increased cropping intensity. According the FAO concludes that 70 per cent of the world's additional needs can be produced only with new and existing agricultural technologies (1).

We all have to play in producing and deferring solutions we are seeking. This is a totally unique time for thinkers. A new paradigm is needed if we are going to feed the world population. The challenges of producing and feeding another 3 billion people is a major task because time is running out. The biggest challenge will be how to use land water and energy for production of food in a sustainable manner. The challenges that are being faced can be grouped into one-word GLIMPSE (3) which means:

G = Government
L = Losses of Land
I = Infrastructure
M = Markets
P = Politics / Policies
S = Science and Innovation
E = Environment

Agriculture and livestock production proven its ability to create economic growth and to provide stability for developed and emerging economies. The above posits glimpse into the future will be discussed in detail during the presentation with solutions to the problems faced.

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DRUG RESIDUE AND ANTIMICROBIAL RESISTANCE IN ANIMAL: CURRENT STATUS AND FUTURE DIRECTION

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The issues of drug residue and antimicrobial resistance in animal are highly discussed and debated among all parties including policy makers, government officers, industry players, private practitioners and publics. Therefore, its current status and future direction will be discussed and reviewed in the paper.

MAXIMIZING UTILIZATION OF LOCAL FEED RESOURCES FOR RUMINANT PRODUCTION IN MALAYSIA

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Feed generally comprises 60-70% of the total cost of livestock production. Over 87% of the ingredients used in compound feeds for non-ruminants are imported which justifies the need for substitution with local feedstuffs. In the ruminant sub-sector, the emphasis is towards maximizing use of local agro-industrial by-products from oil palm and rice industries, apart from extensive use of improved grasses, native grasses, and leguminous forages. Oil palm fronds (OPF), oil palm trunks (OPT), palm press fiber (PPF), empty fruit bunches (EFB), palm kernel cake (PKC) and palm oil mill effluent (POME) are the main by-products from oil palm industry; while rice bran, rice straw and rice husk are the main by-products from rice industries. PKC and OPF have been used extensively in the ration formulations for several ruminant species. The inappropriate use of PKC as one of the main feedstuff in beef cattle, dairy cattle and goat feedings is discussed in relation to the common practices by local farmers. OPT and POME can be combined with PKC and OPF to provide a cost-effective and complete total mix ration (TMR) for feeding ruminant livestock. Various treatment methods have been utilized to enhance the degradability and voluntary intake of fibrous by-products for ruminant feeding. *In-situ* utilization of available feedstuffs, including wet feeding should be extensively promoted to the industry players in order to maximize usage of agricultural by-products in Malaysia. Appropriate strategies to enhance rumen function and the means to administer supplements are of importance to ruminant feeding, as well as increase utilization of potential feedstuffs under the plantation environment. The need to utilize leguminous plants, selected herbal plants and lesser known plant species as potential feedstuffs for ruminant animals are highlighted in relation to their nutrition and health. Problems associated with limited application of the recommended technologies are discussed also. The need to increase number of feed mills specific for ruminant livestock, especially in the ECER region is also emphasized.

ANIMAL WELFARE ACT 2015: MOVING FORWARD WITH ITS IMPLEMENTATION

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The Animal Welfare(AW) Act 2015 was finally enforced from the 1st of July 2017 which meant that some provisions from the Act can be now be used to take legal action on offenders. After the enforcement date, the Animal Welfare Board was established. In addition, a consultative committee was also set-up comprising of stakeholders/non-government organisations involved in addressing animal welfare issues. The AW Board will regulate the Act while the committee can raise issues on animal welfare to the Board for considerations and solutions. More importantly sections 29, 30, 31, and 32 can now be used to charge people who are abusing animals.

There are four (4) regulations in the final stages of readiness and expected to come into force earliest three months from now which include: (i) Licensing (ii) Improvement Notice and Compoundable offences (iii) Appointment of Voluntary Animal Welfare Assistants and (iv) Research, Testing and Teaching using Animals while three(3) more regulations which are: (i) Responsible Animal Ownership (ii) Accepted Veterinary Procedures and (iii) Transportation of animals are planned to come into effect in six months' time. These regulations play an important role in the implementation of the Act.

There are already three codes of practices in place which are for pet shops, boarding and breeding of animals which provides the required guidelines and will be used as standards in the regulations.

The Department of Veterinary Services has embarked on a series of road shows for the officers involved in implementing the Act while keeping the public informed of its progress and creating awareness. The emphasis is more towards compliance to animal welfare through awareness rather than punitive actions. The vision is to work towards a caring society in which people care for their animals.

ZOONOTIC WILDLIFE PARASITES IN MALAYSIA: ENDEMIC PATHOGENS WITH GLOBAL CONSEQUENCES

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Wild animals are known to be reservoirs of numerous pathogens of veterinary and public health importance. It is estimate that 75% of the emerging infectious diseases of humans can be traced to infections in wildlife in the forests or peri-urban setting. With the increasing destruction of natural habitats worldwide and the escalating trend in land use change, the human-wildlife interface has narrowed considerably, affording efficient means of zoonotic disease transmission. The complex interaction between the zoonotic pathogens, humans and animals, the arthropod vectors or intermediate hosts, and the environment, pose a serious challenge for the control and prevention of these zoonotic diseases. In many instances, this is confounded by the paucity of sound epidemiological data. In Malaysia, wild animals are hosts to a myriad of parasites of which a number are zoonotic. These pathogens may be transmitted to humans either through an invertebrate vector or intermediate hosts, or by ingestion of the infective stages. While these parasites are endemic to the country, they pose a serious threat to visitors and may have negative impacts to the tourism industry. Of pivotal concern are two protozoan parasites which cause zoonotic primate malaria (*Plasmodium knowlesi*), and human muscular and enteric sarcocystosis (*Sarcocystis* spp.). The major natural reservoir host for *P. knowlesi* are the Long-tailed Macaques (*Macaca fascicularis*) which is the most common and widespread species of non-human primate in Southeast Asia. This apicomplexan haemoparasites is efficiently transmitted from macaques to humans by *Anopheles* mosquitoes. Zoonotic primate malaria is now considered the most common and most deadly form of human malaria in Malaysia. Sarcocystosis is transmitted by ingestion of the cystic tissue stages or environmental oocysts of *Sarcocystis*. The life cycle of the parasite involves intermediate and definitive hosts of which humans may assume both roles with varying pathological consequences. While the disease may be self-limiting, muscular infections can cause considerable clinical signs in humans. Both these protozoan parasites have global implications as they are known to infect travellers visiting the country. As such, it is necessary that veterinarians and public health workers be aware of these potentially fatal zoonotic parasites of our local wildlife, in order to facilitate timely and accurate diagnosis, treatment and control measures.

POPULATION DEVELOPMENT AND SUSCEPTIBILITY OF HOUSE FLY AGAINST THE CONVENTIONAL INSECTICIDES AT POULTRY FARM IN MALAYSIA

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Commercial poultry production has expended rapidly nationally to meet the high demand for eggs and chicken meat. Modern poultry houses today accommodate high densities of birds which generated high amount of manure. Thus, it provided a massive breeding ground for houseflies (*Musca domestica)* and caused serious problems in terms of economic, health and nuisance. This study determined the population changes of house fly and evaluated the effectiveness of selected insecticide were compared at LC50 between susceptible and wild strain. The knee points of a known population growth curve were determined by comparing the intrinsic rate of increase (rm) of five different densities of house flies in a simulated condition. Next, the toxicology of two larvicides [cyromazine (Neporex 50SP) and ChCy (combination of chlorpyrifos and cypermethrin, Naga 505)] and five adulticides [thiamethoxam (Agita 10WG), cyfluthrin (Responsar WP), lambda-cyhalothrin (Icon 2.8EC), fipronil (Regent 50SC), and imidacloprid (Toxilat 10WP)] were examined against the WHO/VCRU (World Health Organization/ Vector Control Research Unit) susceptible strain and the AYTW (Ayer Tawar) field strain of house fly. The rm values for 300 and 500 fly densities were significantly higher compared with the rm values at densities of 50 and 100 flies. Result indicates their representative indices as candidates for a control threshold. The larvicide laboratory study shown that ChCy was more effective than cyromazine, with a significantly lower LC50 value when administered topically or in the diet, although the AYTW population was susceptible to both larvicides with a resistance ratio (RR) <10. From the adulticide laboratory study, cyfluthrin and fipronil exhibited the lowest LC50 values for the adulticides, hence, indicated that they are both effective at controlling adult flies, although lambda-cyhalothrin showed moderate resistance (RR; 11.60 by the topical application; 12.41 by plywood treatment). Further investigation of ChCy, cyromazine, cyfluthrin, and fipronil under field conditions confirmed that ChCy and cyromazine significantly reduced larval density, and surprisingly, ChCy also exhibited adulticidal activity, which significantly reduced adult fly numbers compared with the control group.

COLISTIN RESISTANT *Escherichia coli* IN RAW CHICKEN MEAT AND BEAN SPROUTS (*Vigna radiata*) RETAILED IN KOTA BHARU, KELANTAN

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After being abandoned for few decades, the use of Colistin has been revived in clinical practice because of the emergence of multidrug-resistant Gram-negative bacteria and the lack of new antibiotics to combat their rise. A study was conducted to detect the presence of Colistin resistant *E. coli* in raw chicken meat and bean sprouts in Kota Bharu, Kelantan. A total of 100 samples comprised 50 raw chicken meats and 50 bean sprouts were collected and processed microbiologically. Kirby-Bauer method for antibiotic susceptibility test (AST) and molecular detection of the respective resistance genes by using polymerase chain reaction (PCR) were conducted. The results showed that 29% (29/100) *E. coli* isolates were positive for the Colistin encoding gene MCR-1. All the MCR1 positive *E. coli* isolates were from raw chicken meat and none of the *E. coli* from bean sprouts was positive for this gene. Furthermore, raw chicken meat showed higher percentage of antimicrobial resistance, 95.7% (22/23) against Amoxycillin/Clavulanic Acid, followed by Enrofloxacin 60.9% (14/23), Colistin 39.1% (9/23) and Gentamicin 30.4% (7/23). Whereas for bean sprouts, highest percentage of antimicrobial resistance was observed towards Amoxycillin/Clavulanic Acid at 33.3% (2/6), followed by Colistin 16.7% (1/6). These findings showed that raw chicken meat and bean sprouts may be contaminated by colistin-resistant *E. coli* and can potentially pose public health risk. Hence, prudent usage of antibiotics and hygienic handling of food items, especially chicken meat during processing helps to prevent and combat the risks of spreading of multidrug-resistant and the associated health risks in humans.

LEAST COST FEED FORMULATION AND BEST PERFORMING FEED WITH POAB IN BROILER CHICKENS

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Antibiotics are commonly used in poultry diets in order to prevent diseases and to improve the performance. However, there has been growing public concern about the risk of bacterial resistance associated with the routine use of Antibiotic Growth Promoter (AGP) in livestock feeds. Organic acids are natural constituents of plant and animal tissues and their use as feed additives is now being studied worldwide to replace antibiotics. The organic acid mixtures might be more efficient than some antibiotic growth promoter in improving broiler performance. The diet supplemented with organic acid and palm fat (POAB) in the broiler diet showed an increase in body weight gain (2757.24 g) compared to the control group (2574.83 g) at the end of 42 day of experiment. Matrix value is a significant value that shows how much amount of released nutrient that been added in the raw material. Matrix value of POAB was developed in this experiment to formulate the cheaper and better performing feed. The cost of the feed with the use of nutrient matrix values of POAB was cheaper compared with the conventional corn-SBM diet.

PREVALENCE AND ANTIMICROBIAL RESISTANCE OF SALMONELLA IN CHICKEN MEAT FROM POULTRY PROCESSING PLANTS IN CENTRAL REGION OF PENINSULAR MALAYSIA

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Salmonella is recognized as one of the major foodborne pathogens which caused a very serious public health problem in the world. The study determined the prevalence and antimicrobial resistance of Salmonella isolates that was recovered from raw chicken meat. One thousand and two hundred raw chicken meats were collected from 9 poultry processing plants in Central Region of Peninsular Malaysia (Selangor, Kuala Lumpur, Negeri Sembilan and Malacca) between February 2013 and November 2014. All the samples were analysed for the presence of *Salmonella*, serotyping and antimicrobial resistance testing. Salmonella was detected in 17% of the samples. Forty-one serotypes were identified with the most common were *Salmonella enteritidis* (40.7%), *Salmonella albany* (12%), *Salmonella gueuletapee* (7.1%), *Salmonella typhimurium* (6.2%) and *Salmonella corvallis* (6.2%). A total of 241 isolates of *Salmonella* spp. were tested for their susceptibility to 23 selected antimicrobial agents by the disk diffusion method, in accordance with the guidelines of the Clinical and Laboratory Standards Institute. High antimicrobial resistance rates were observed to ampicillin (81.9%), tetracycline (49.0%), carbenicilin (47.5%), doxycycline (43.6%), sulphonamides (40.7%), trimethoprim (34.8%), nalidixic acid (34.3%) and streptomycin (32.4%). Results of this study provides the baseline data on both prevalence and antimicrobial resistance of Salmonella in processed chicken meat from poultry processing plants in this region.

DIETARY EXPOSURE ASSESSMENT OF VETERINARY DRUG RESIDUE IN CHICKEN MEAT SAMPLE FROM SMALL AND MEDIUM SCALE CHICKEN SLAUGHTERHOUSES IN PENINSULAR MALAYSIA

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Dietary intake of significant amounts of veterinary drug residue can lead to adverse health effects and development of antimicrobial resistance in the population. The aim of the current study was to estimate potential public health risk to antibiotic residues through chicken consumption amongst children and adult group in Peninsular Malaysia. Estimates were made using deterministic and probabilistic methods and the resulted exposures were compared to the acceptable daily intake (ADI). Determination of veterinary drug residues was carried out from 637 chicken meat samples collected from selected chicken slaughterhouses throughout Peninsular Malaysia. Residues in the samples were screened using microbial inhibition test and confirmed with LC-MS/MS. The chicken consumption data were obtained from the Malaysian Adults Nutrition Survey (MANS) 2014 and Malaysian Dietary Guidelines for Children and Adolescents 2013. The average concentration of tetracyclines (TCs) residues in chicken meat was 193.4 µg/kg, approximately two times greater than the maximum residue limit (MRL) set by the Codex Standards. Among four different tetracycline analysed, doxycycline residue was the highest at 413.9 µg/kg and oxytetracycline was frequently detected in the sample (0.78%) at the average concentration of 105.25 µg/kg. Enrofloxacin was detected below MRL in 1 sample, whereas none of the sulphonamide was detected. Hence, estimation of dietary exposure was conducted on tetracyclines (TCs) group only. Through deterministic approach, higher estimated daily exposure to TCs were found in children aged group $1<y<3$ and $4<y<6$ (1.45617 and 0.97098 µg/kg bw/day), followed by adult (0.65682 µg/kg bw/day) and children aged $7<y<10$ at 0.64719 µg/kg bw/day. Based on probabilistic approach, dietary exposure of Malaysian adults to TCs through chicken meat consumption was estimated to range from 0.00174 - 0.35209 µg/kg bw/day. In comparison, for children group, the estimated exposure was higher in aged $1<y<3$ at 0.0137 - 1.9845 µg/kg bw/day followed by children aged $4<y<6$ and $7<y<10$ at 0.00718 - 1.3967 µg/kg bw/day and 0.00834 - 0.91841 µg/kg bw/day, respectively. However, the estimated risk calculated for all groups were < 10 % ADI. These indicate that toxicological risk with regard to the consuming of chicken meat could not be considered as a public health problem, but the result can be informative for the safety authorities to instigate policies to control the present potential risk.

A STUDY ON NUTRITIONAL QUALITY OF CHICKEN FEED FROM PENINSULAR MALAYSIA

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This study was conducted to monitor the nutritional quality of chicken feed obtained from different parts of Peninsular Malaysia. A total of 336 chicken feed samples from 320 poultry farms from East Coast Region (Kelantan, Terengganu, and Pahang), Northern Region (Perlis, Kedah, Penang, and Perak), Southern Region (Malacca, Johor) and Central Region (Selangor, Negeri Sembilan) of Peninsular Malaysia were randomly collected for this study. The chicken feed represented the following three categories which are broiler starter, broiler grower and broiler finisher. In this study, proximate composition was analysed using near infrared spectroscopy (NIRS) method while mineral composition was performed using inductively coupled plasma-mass spectrometry (ICP-MS). Proximate analysis indicated that the mean value of moisture content, crude protein, crude fat, crude fibre and total ash were varying according to region in each feed categories. The results found higher than Malaysian standard requirement for crude fibre in broiler starter, grower and finisher. There was no significant different ($p>0.05$) in moisture content, crude fat and total ash between different regions in each feed categories while the crude protein and crude fibre shows a significant different ($p<0.05$) between different regions in broiler grower and finisher. In this study, the results for mineral composition in broiler starter, grower and finisher met the requirement of Malaysian standard. In conclusion, this result warrants the need for surveillance and constant monitoring program to ensure the chicken feed is in good quality and as recommended by Malaysian standard requirement.

PRELIMINARY STUDY OF CANINE LEISHMANIOSIS IN PENINSULAR MALAYSIA

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Leishmaniosis is a Neglected Tropical Disease (NTD) that is caused by obligate, intracellular protozoan *Leishmania* (family *Trypanosomidae*). This disease is transmitted through the bites of the infected female phlebotomine sand flies that can impose important public health concern, as more than 23 species of *Leishmania* have been described most of which are zoonotic. Studies have been conducted around the globe but none in dogs in Malaysia. It is essential to get the current overview of Leishmaniosis in Malaysia to provide key information of the current free leishmaniosis status. In this study, 100 blood samples were collected from three states in Malaysia – Penang, Kedah and Johor to determine the prevalence of canine Leishmaniosis in those state where autochthonous foci of canine leishmaniosis is still poorly understood. DNA was extracted from the blood samples and later PCR were performed with *Leishmania* genus-specific oligonucleotide was used to amplify a fragment in the conserved region of *Leishmania* kDNA minicircles. Current screening revealed 5% prevalence rate for canine leishmaniosis in Peninsular Malaysia.

ALTERNATIVE TO ANIMAL TESTING: DERMAL ABSORPTION STUDIES

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Most research in dermatology field requires drug formulations to be delivered via transdermal application. Such skin products should be non-corrosive, non-irritant, non-sensitizing and have no toxicology effects. In the registration process, submission of product data on efficacy, safety and toxicology are required. To establish the product data and ingredient activity schedule, percutaneous absorption data is acquired via direct testing on animals. However, in addition to the risk of animal welfare violation, laboratory animal skin is not identical to human skin. With adherence to the 3Rs - which is a set of principles that outlines the use of animals in research – an alternative method of measuring percutaneous absorption is deliberated. One of the tools is in vitro release testing (IVRT) using skin sample and Franz Diffusion Cell. The technique is simple, standardized and reproducible. An additional advantage is the barrier model can be either from the synthetic membrane or ex-vivo human and animal skin. This in vitro test should be carried out in accordance with "OECD Guideline for the Testing of Chemicals Draft New Guideline 428: Skin Absorption in vitro method".

TYPICAL RIGHT SKEWED DISTRIBUTIONS OF FAECAL EGG COUNTS AMONG BOER GOATS FOLLOWING NATURAL AND DELIBERATE INFECTION OF GASTROINTESTINAL NEMATODES

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Gastrointestinal nematode (GIN) infection is one of the major diseases affecting small ruminants but chemotherapeutic control often leads to anthelmintic resistance. This study investigated FEC distributions among Boer goats. Faecal samples were collected per-rectum at four weeks intervals from Boer goats in a farm in Lancaster, England (n=158) where the goats grazed on pasture throughout the study between August and October 2014. Faecal samples were also collected twice a week for eight weeks from Boer goats in a farm in Selangor, Malaysia (n=30) between July and September 2015. The goats were kept indoors throughout the study. In the farm, five goats acted as controls while twenty-five each were orally infected with approximately 2400 L3 of *Haemonchus contortus, Trichostrongylus colubriformis* and *Oesophagostomum* sp. at 6 : 1 : 1 ratio. FEC were counted by the modified McMaster technique and L3 were harvested from faecal cultures for identification. The FEC distributions were typically right-skewed on each day of sampling in both locations. L3 of *Teladorsagia circumcincta* and *H. contortus* were the main GIN collected from the faecal cultures in England and Malaysia, respectively. Based on FEC distributions, most of the goats had low FEC while only a few had high FEC regardless of infection types, parasite species, experience of infection, management, location and climate. Nonetheless, these few goats with high FEC disproportionately contributed to environmental contamination and GIN transmission. Hence, identification, isolation and/or culling of heavily infected goats are crucial in controlling GIN infection and reducing dependence on anthelmintics.

DETECTION OF *Coxiella burnetti* AND *Babesia divergens* IN TICKS FROM GOATS

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Coxiella burnetti and *Babesia divergens* are zoonotic pathogens that are a public health concern worldwide. The pathogens are carried by tick such as *Rhipicephalus* spp., *Haemaphysalis* spp., *and Dermacentor* spp. However, the epidemiology of zoonotic tick-borne pathogen in goats has not been well studied in Kelantan. The objective of this study was to investigate the occurrence of *C. burnetti* and *B. divergens* in ticks infested goats from 5 selected small ruminant farms at Jeli, Kelantan. A total of 152 ticks were collected from these goats. The genus of the ticks was identified according to taxonomic keys and morphology of the capitulum. The results revealed that 71.71% (109/152) was *Haemaphysalis* spp., 25.66% (39/152) *Rhipicephalus* spp. and 2.63% (4/152) *Dermacentor* spp. The ticks were also screened for DNA of *C. burnetti* and *B. divergens* using PCR technique. The result of this study shows that *B. divergens* was detected from ticks from 4 farms and the genus of ticks were *Haemaphysalis* and *Rhipicephalus*. *C. burnetti* was not detected in this study. This is the first report from the authors' knowledge describing the molecular detection of *B. divergens* in ticks from goats in Kelantan. Further studies are required to examine human exposure during animal handling and prevention and control measure of the said disease that may lead to huge economic loss and public health impact.

EFFECTS OF CARBOHYDRATE SUBSTRATE AND BIOLOGICAL ADDITIVE ON GREENHOUSE GASES REDUCTION AND AMMONIA EMISSIONS FROM DAIRY SLURRY

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Greenhouse gases (GHG) and ammonia (NH_3) emission from cattle slurry during storage occurs in any season, albeit at different rates. Greenhouse gases and NH_3 emission inhibition were examined during slurry storage for 60 days (summer season) following the addition of brewing sugar (10% $^{w}/_{w}$), as a fermentable carbohydrate, and effective micro-organisms (EM) (5% $^{v}/_{w}$) in small scale 10 kg. The treatments were: i) untreated slurry (Ctrl); ii) slurry with 5% ($^{v}/_{w}$) Actiferm EM (EM); iii) slurry with 10% ($^{w}/_{w}$) glucose (0.56 M) (Sugar) and; iv) slurry with 10% ($^{w}/_{w}$) glucose (0.56 M) and 5% ($^{v}/_{w}$) Actiferm EM, (Sugar + EM). Slurry was stored without lid under shed with during entire period except during gas sampling period. Finding indicates, the addition of brewing sugar enhanced the microbial fermentation resulting in decreased of the slurry pH to <4.5 within 14 days. This 'self-acidification' led to a significant inhibition of net GHG emission (77%) and average NH_3 loss (92%) during storage period. Bio-augmentation using a commercial effective microorganism culture (EM) had no effect on GHG and NH_3 emission during slurry storage.

SEROPREVALENCE OF *Toxoplasma gondii* IN CATTLE AND GOAT MEAT FROM SELECTED ABATTOIRS IN SELANGOR, MALAYSIA

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Toxoplasmosis has been recognized globally as a disease capable of infecting all warm-blooded animals and causing major health concerns to human especially to unborn fetus and immunosuppressed individuals. In Malaysia, the seroprevalence of *Toxoplasma gondii* (*T. gondii)* among healthy people can be as high as 30% and this is indicative that this disease is common nationally. Consumption of undercooked meat or meat products is highly associated with toxoplasmosis as well as unpasteurized milk or accidental ingestion of oocysts from the environment. In Malaysia, studies on *T. gondii* in meat have been reported in poultry, wild boar and exotic animals but none in ruminants. The goal of this study is to determine the seroprevalence of *T. gondii* in ruminant meats collected from abattoirs in Selangor. A total of 198 meat samples from cattle and goats were collected from two abattoirs located in Shah Alam and Banting, Selangor. All samples collected were kept at -20^{o}C until further analysis. Samples were subjected to a commercially available ELISA assay using meat juice. The result showed 14/100 (14%) cattle and 38/98 (38.76%) goat meats were positive for *T. gondii*. Ruminant meat is one of the major sources of protein in Malaysia and the results from this study provide current baseline information of toxoplasmosis in ruminant meat that is destined for human consumption.

SERODETECTION OF LEPTOSPIRAL INFECTION IN A GROUP OF WORKING DOGS AND THEIR HANDLERS

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Recently, there has been an alarming worldwide re-emergence of leptospirosis which warrants for a collaborative effort to control and prevent this zoonotic disease. Dogs have been speculated as a source of infection to humans. More alarmingly, the infected dogs could subclinically harbour and shed the causative agent contaminating the environment. This study aimed to detect leptospiral infection in a group of working dogs and their handlers (i.e. dog handlers, dog trainers, kennel men) using microscopic agglutination test (MAT). Blood were collected from 33 apparently healthy vaccinated (inactivated *L. icterohaemorrhagiae* and *L. Canicola* bacterin) dogs and 43 dog handlers from a single institution. All blood samples were analysed using MAT against 18 leptospiral serovars with a seropositive cut-off titre point of $\geq$ 1:50. Six dogs were found to have leptospiral antibodies, 5 dogs were positive against serovar *icterohaemorrhagiae* (titres between 1:100 and 1:200) while 1 dog was positive for serovar *hardjobovis* (1:200). None of the dog handlers were tested positive. Absence of results among dog handlers may be due to proper sanitation and hygiene practices implemented. As a conclusion, the findings suggest that these working dogs might harbour the disease subclinically. However, the subclinical status should be investigated as the obtained result could be due to vaccination. Urine sample for polymerase chain reaction and culture is recommended to confirm subclinical leptospirosis. This study gives an insight to the role of dogs in maintenance and spread of leptospiral infection in Malaysia.

MANAGEMENT OF BLOCKED URETHRA IN GOATS: WHAT OPTIONS DO WE HAVE?

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Male goats can easily develop obstruction of the urethra with presence of urinary stones that have formed in the kidney and passed down into the urinary bladder. Very commonly in goats, the uroliths are in the form of a collection of numerous white sandy stones of various sizes in the bladder and along the urethra. There is a current trend in Malaysia where goats are kept as pet and companion animal. Research also have move on to large animal model for various biomedical research, hence increasing the value of goats used for this purpose. With the current diet of pelleted food and less roughages available to goats, they are prone to develop obstructive urolithiasis. The purpose of this report is to share our experiences at University Veterinary Hospital, UPM, on various clinical procedures and protocols that have been adapted to diagnose and resolve blocked urethra in goats. Amputation of urethral process, urethral catheterization, retrograde and normograde urohydropropulsion, urethrography, cystourethrography, bladder tube cystotomy, percutaneous bladder cystotomy and perineal urethrostomy are the diagnostic and treatment options available to help resolve and manage urinary obstruction in this species. Without surgical intervention, a completely blocked urethra will result in progressing bladder distension and ultimately bladder rupture leading to septicaemia and death.

COMPARISON OF PRE-WEANING PERFORMANCE OF KATJANG X BOER KIDS FED WITH EXPERIMENTAL CREEP FEED

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Majority of goat farms around Malaysia provide one or two types of concentrate feed for all stages of growth and production. Most of the time, the animals do not receive sufficient nutrient due to this feeding regime. In most cases, nurturing kids fully depend on the dam's milk up to weaning. In some scenarios, dams are unable to produce sufficient milk due to seasonal changes that affect pasture quality. Twelve pre-weaned Katjang x Boer kids were randomly allocated into two groups and fed with experimental creep feed or a commercial creep feed. The male kids fed experimental creep feed had an average weight and average daily gain (ADG) of 13.5 kg and 95.0 gm compared to 12.2 kg and 57.0 gm of those fed the commercial feed. Female kids fed the experimental feed had a significantly higher body weight (12.2 kg) and ADG (89.0 gm) compared to those commercial feed of 6.7 kg and 46.0 gm. It was also observed that kids commenced creep feed consumption between 38 to 45 days of age. The consumption of solid feed at 35 days would stimulate optimum rumen development in lambs which can be induced by VFA production. This aids to improve performance of kids on creep feed, besides reducing dependency on dams which has potentials to improve overall farm performances.

HYDATID HEPATIC-BRONCHOPLEURAL FISTULA

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Echinococcosis is a worldwide zoonotic disease caused by the larval stages or adult Cestodes belonging to the family *Taenlldae*, genus *Echinococcus*. The two-major species of medical, veterinary and epidemiology importance are *Echinococcus granulosus* and *Echinococcus multilocularis*, which cause cystic and or alveolar *Echinococcosis* respectively. Both parasite species are a cause of serious and severe diseases, with high mortality rates and poor prognosis if managed incorrectly. It is mainly affecting the liver and the lung, but no single other body tissue can escape from this parasite infestation. It may be asymptomatic or symptomatic with a diagnosis of malignant *Hydatidosis*. No single best treatment is available yet and a personalised way of treatment maybe suitable to a particular case. This paper describes a rare case presented of a 58-year-old woman who developed a hepatic-bronchopleural fistula following a hydatid hepatic cyst complication. The case emphasises on the importance of early recognition of a hepatic-bronchopleural fistula and the use of aggressive surgical treatment at an early stage, which has reduced the associated morbidity and mortality from the sequelae of this disease in majority of cases. To eliminate the main endemic focus of human *Echinococcosis*, it needs to eradicate the causative agent the *E. granulosa* from the primary (Definitive) hosts which are the dogs and dingoes, also to apply control measures on the infected intermediate animal hosts such as sheep, pigs, cattle, goats, horses, camels, wallabies and kangaroos. This can be achieved by a health promotion campaign implemented through the World Health Organization guidelines.

PROBLEM BASED LEARNING IN ONE HEALTH: FACILITATOR AND SELF-ASSESSMENT AMONG VETERINARY STUDENTS

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Tertiary education has evolved from traditional classroom teacher-centered learning to facilitating student-centered learning techniques (eg. Problem based learning). Over the past decade, appreciation of the 'One Health' approach for disease diagnosis and management has increased in importance. This paper reports the evaluation of problem based learning skills (PBLs) among final year veterinary students in three PBL cases related to One Health. The objectives of this study are to describe the facilitators' rating on the veterinary students' PBLs using a pre-defined rubric and to determine self-evaluation of the students on their ability to use FILA as a tool in solving One Health PBL cases. The skills assessed include: (1) participation and communication, (2) cooperation and team building skills, (3) knowledge and information gathering skills, and (4) comprehension and reasoning skills. A 5-scale rubric scoring method was used. Three new cases on Sporotrichosis, Rabies and Meliodosis were first developed and nine facilitators were involved in the assessment. Feedback from students on their experience using the FILA (Facts, Idea, Learning Issues and Action Plans) as a tool for solving problems related to One Health was obtained. More than 93% of students were able to identify FILA for the cases related to One Health. Students in this cohort achieved good and outstanding scores overall. A total of 63.6% students achieved HIGH levels in PBL competence and the rest fell under the category MODERATE and none in LOW competence. Collectively the PBL cases were able to trigger problem solving skills essential in veterinary education, as demonstrated in the performance scores.

SEGMENTAL COMMINUTED AND TRANSVERSAL DIAPHYSEAL FEMORAL FRACTURE REPAIR RESPECTIVE WITH STACK INTRAMEDULLARY AND INTRAMEDULLARY PINNING FIXATION IN RABBITS: A VETERINARY SURGERY CASE REPORT

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Intramedullary (IM) and stack IM pinning surgical techniques were used respectively in a complicated transversal diaphyseal and segmented comminuted femoral fracture in two rabbits. The rabbits were brought to the University Veterinary Hospital, Universiti Putra Malaysia in 2016 in separate occasions due to falling from a height during handling and self-inflicted trauma in the cage respectively. All fractures were closed in nature. Rabbit A, with right oblique diaphyseal femoral fracture indicates chronic femoral muscle pulling and swelling. The proximal femoral segment was partially removed when reduction procedure was unsuccessful. Hence, the partial removal of the femoral bone at the fracture side creates a transversal fracture. Approximately 10 millimeter in length of bone segment was removed to avoid excessive shortening of the limb. Rabbit B, whereas with segmental comminuted fracture indicates discontinuity at the proximal and distal third of the left femur bone. The surgical treatment approaches were achieved through standard retrograde pin placement. Good results were obtained from the traditional single IM pin in rabbit A, where rigid stabilization was achieved at the fracture side. In the case of rabbit B, the segmental fracture stabilization was not successful when stack IM pin migration complication arises. Better stabilization was achieved with suitable pin sizes used to stack and fill up the medullary canal. In both surgical methods, the rabbits could use their limbs or exhibit weight bearing lameness on 3 to 7 days post-operatively. Callus formations were seen via radiograph at day 14 and complete bone healing in 8 weeks post-surgical for both cases. Complications that developed relating to the stifle joint were observed during the healing process. In the current evaluation of these two cases, both surgical techniques and complications are briefly reviewed.

ORAL ANAESTHETIC IN PRIMATES AND ITS PHARMACOKINETICS

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This research involves the administration of the anesthetic agents through oral route in primates. Five species of primates were used in this research namely Concolor Gibbon, Pig-tailed macaques, Long-tailed macaques, Chimpanzees and Orang utans. Anesthetic agents used are Ketamine and Zoletil. The purpose of the primates to be anesthetized is for physical health examination, treatment and minor surgery. Anesthetic agent can be given through oral route as it can minimize stress, prevent traumatic injuries in primates and to reduce the risk of getting injury by the primates to the handlers. The objective of this research is to study the efficacy of oral administration of anesthetic drugs based on the onset of action and recovery. For methodology, it is divided into two. For drug administration, Zoletil or Ketamine was added into food or carbonated drinks and was administered orally to the primates. Sweetened condensed milk or honey was added to counteract the bitterness of the drug. Once the primate was sedated, all medical examinations and treatments were done. For analysing the data, time for the drug to give its effect (onset) and recovery rate are taken into consideration to study the efficacy of oral administration. All the data was collected and analysed by using Independent Student T-test. The result shows that the oral route has faster onset of action but slower recovery rate as compared to intramuscular route. Administration of anesthetic drugs through intramuscular route causes the primates to agitate and build up stress. Stressed primates have an increase in adrenaline level due to insufficient administration of the drug. Intramuscular route requires higher dose of anesthetic to achieve anesthesia. Oral route has slower recovery rate due to the slow rate of metabolism of the drug in primate body. There is no significance difference between both routes. Administering anesthetic agent through oral route has similar efficacy as intramuscular route. Aministering drug through oral route reduce the aggressiveness in primates. This will also reduce any injury to the animal handlers. Oral route administration of anesthetic is done effectively among primates. This is considered as a breakthrough in zoo and exotic animal anesthesia. We advocate clinical veterinarians to use oral anesthesia for primates for easy administration and less stress condition.

INTRAMUSCULAR AND INTRAVENOUS ANAESTHETIC DRUG ADMINISTRATION USING COMBINATION OF KETAMINE-XYLAZINE FOR SEMEN COLLECTION PROCEDURE IN RUSA DEER (*RUSA TIMORENSIS*)

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The demand for venison of *Rusa timorensis* is steadily increasing as an alternative source of meat which is an important food security component to Malaysia. One of the challenges in the deer industry is the low population of deer available for consumer due to the poor breeding strategy. Foundation of the reproductive pattern in deer will allow for applications of assisted breeding technology in order to improve the breeding plan in the industry. However, before the study in reproductive pattern can be conducted, a safe and reliable protocol for handling the animal for semen collection is warranted. The objective of this study is to compare between intramuscular and intravenous drug administration for anaesthesia prior to semen collection procedure in *Rusa timorensis*. Six healthy stags were selected from the Small Ruminant Unit, Taman Pertanian Universiti and managed with 20 hinds in a paddock. Animals were herded from the paddock into the dark house for the selection purpose. The stags were generally anaesthesized with combination of Ketamine-Xylazine for the electroejaculation procedure. The stags were revived with yohimbine, 0.03 mg/kg, intravenously (IV) once the procedure is completed. Result is presented in mean (standard deviation). The mean time taken for a successful electroejaculation in Rusa deer 24.5 min (20.57) with the ejaculation success of 90.32% (n=31) during the breeding season. The probe was inserted per-rectal with a mean depth of 12.33cm (4.06) and mean electrical stimulation of 12.33V (4.06). All stags recovered from anaesthesia uneventful with the mean time of 12.11min (3.82). Ketamine-xylazine combination is a safe and reliable protocol for semen collection in Rusa deer. This study emphasizes on the search of an acceptable collection method to shift the application of assisted reproductive technology such as artificial insemination (AI). The use of AI in Rusa deer is integral in order to drive the industry forward. In conclusion, IV route is the best route of general anaesthesia for semen collection.

MANAGEMENT PRACTICES OF ASIAN SEABASS (*Lates calcalifer*) IN FLOATING NET CAGE CULTURE IN MALAYSIA

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In Malaysia, Asian Seabass (*Lates calcarifer*) is one of the most important cultured fish species. Differences in management inputs can cause differences in the output produced. These information is not known in Malaysia. Thus, the aim of this study was to determine the current management practices of Asian Seabass floating net cage culture in Malaysia. A survey on seabass cage culture was carried out at Negeri Sembilan (n=2), Selangor (n=3), Perak (n=6) and Kelantan (n=18) between December 2016 to March 2017. Data were collected using a questionnaire that include questions on farmer's background, general diseases information, farm management. Data collected were inserted and edited in Microsoft excel ® (Microsoft Corp. Inc, Ithaca). The results from 29 cage cultures showed the average production of seabass per cycle at cage culture was 3,038 tails and the average seabass fingerlings bought at the beginning of the cycle was 6,022 tails. Average mortality rate was 52%. Measures taken by the farmers to control diseases were quarantine sick fish (n=14), use medication (n=17), ensure optimal fish density (n=29), ensure good water quality (n=3), burying dead fish (n=3) and disposed dead fish on land (n=17) and in the flowing river (n=12). Only 10% of the farmers monitor the water quality. The survey showed that 62% of the farmers did not have management record. The result suggests survivability of seabass is lower (50%) than recommended survivability (more than 70%). It is not known whether this is associated with poor herd health management.

DECOMPRESSION SICKNESS (DCS) IN A SEI WHALE (*Balaenoptera borealis*) STRANDED IN SOUTHERN PENINSULAR MALAYSIA

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Decompression sickness, a condition caused by bubble formation in certain body tissues from dissolved inert gases in whales. It occurs during transition from a high-pressure environment to one of lower pressure, resulting in a range of conditions from itching to joint pain, convulsions, and death. A stranded carcass of a Sei Whale, *Balaenoptera borealis*, found on the shores of southern coast of Peninsular Malaysia was presented for post-mortem. Investigation revealed that the male Sei Whale shown both, gross and histopathological lesions in the lungs and liver. There was formation of fibrosis, emphysema and edema in the lungs. Hepatic atrophy indicated chronic starvation. It was suspected that the whale was suffering from "Barotraumas or decompression sickness" which affected the ear or lungs and lead to unbalanced movement due to changes in air pressure. This condition may have caused the whale to beach and consequent of mortality. The pathologic lesions found give an insight into possible causes of deaths of stranded whales in Malaysia.

EDIBLE BIRD NEST ONCOLYTIC EFFECTS ON HUMAN CANCER CELL LINES IN VITRO

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The major mechanisms inhibition like cell apoptosis and edible bird nest (EBN) cytotoxic effects can be used to evaluate the toxicity and therapeutic efficacy on the different cancer cell-line. The objective of the study was to determine cytotoxic properties of both EBN substrate and filtrates to breast cancer MCF-7, lungs cancer A549 and cervical cancer HeLa through the IC_{50} value also to determine mode of cell death following EBN treatment under fluorescent microscopy. The cancer cell inhibition when treated with the different substrate and filtrates of ranch (house-EBN) were at IC_{50} value, while in comparison least when treated with cave-EBN. The results showed that ranch-EBN from Muar, Johor filtrate showed the highest cytotoxicity to all the cancer cell lines. With low concentration, this ranch-EBN filtrate result in 50% inhibition of lungs cancer A549 cells lines. The most cytotoxic activity was of Muar ranch-EBN and the least was fern wild-EBN. The results also showed that different EBN substrates and filtrates gave better cytotoxicity against different cancer cell-line. Images observed under fluorescence microscopy (FM) of A549 lungs cancer cell lines treated with different EBN extracts stained with AO and PI showed apoptotic, late apoptotic and necrotic effect at low EBN concentration. The major mechanisms inhibition like cell necrosis and EBN cytotoxic effects can be used to evaluate the toxicity and therapeutic efficacy on the different cancer cell-line.

PROPHYLACTIC EFFECT OF EDIBLE BIRD NEST AGAINST LEAD ACETATE TOXICITY INDUCED UTERINE AND HEPATIC CHANGES

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Lead acetate (LA) alters uterine and hepatic histology and function through various mechanisms including by induction of oxidative stress. Edible bird nest (EBN) reportedly can alleviate these damages, but no related studies have been conducted. This study aimed to evaluate the protective effect of EBN supplement on the uteri and liver of rats exposed to LA toxicity. Five treatment groups were established as follows: group 1 (positive control, C), which was given distilled water; group 2 (negative control, T0), which was administered with LA (10 mg/kg bw); group 3 (T1), 4 (T2), and 5 (T3), which were given LA (10 mg/kg bw) plus graded concentrations of 30, 60, and 120 mg/kg bw of EBN, respectively. Rats were euthanized at day 35 to collect uterus and liver for histomorphological study and the expression analysis of epidermal growth factor (EGF) and vascular endothelial growth factor (VEGF) and PCNA of uterus. Results revealed that LA causes destruction of uterine lining cells and necrosis of uterine glands and liver of exposed rats without EBN supplement while degree of damage decreased among EBN treated groups; T3 had ameliorating effect against toxicity of LA, as well as increase number of uterine glands. All immunohistochemistry results showed significantly higher EGF, VEGF and PCNA expression levels ($p < 0.05$) in T3. In conclusion, findings showed that EBN can ameliorate the detrimental effects of LA toxicity on the uterus and liver.

DETECTION OF VIRULENT SEROTYPES OF *Haemophilus parasuis* IN SELANGOR AND PERAK, MALAYSIA

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Haemophilus parasuis causing Glasser's disease is prevalent throughout pig farms in Malaysia. This is especially true in farms, which practices poor hygiene management. Despite the economic importance, the nature of the disease in this country is unknown. Currently, there is only one commercial vaccine that is available in Malaysia with origins of serotype 3, 4 and 5. Efficacy of the vaccine had been variable across farms, possibly due to incomplete cross protection between different serotypes. Henceforth, it is important for us to determine the *Haemophilus parasuis* serotype to have more ideal vaccination strategies. A total of 65 tissue or bodily fluid samples of various parts were collected from weaner pigs suffering from respiratory distress from farms at Selangor and Perak. A total of 56.72% of the samples were positive of *Haemophilus parasuis* using PCR. Highest detection was in the lungs with positive detection of 66.67%, followed by brain, joint and other bodily fluids. The positive samples were then subjected to multiplex PCR using 3 sets of primers targeting serotype 4, 5 and 13; which are three most prevalent serotypes around the world. It was found that all 3 of the serotypes were found in both states. Besides, there were *H. parasuis* positive samples that were negative to all 3 serotypes indicative of presence of virulent or non-virulent serotype(s) that was not screened. Surprisingly, each farm seems to have different serotypes distribution, however, only be conclusive if more farms participated the screening. In short, serotype 4, 5 and 13 are indeed present in Malaysia with more serotypes to be discovered.

MORPHOLOGICAL STUDIES OF HEPG2 CELLS DURING *Leptospira interrogans* INFECTION

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Leptospirosis, a reemerging zoonotic disease caused by pathogenic *Leptispira sp. Leptospira interrogans* a virulent *Leptospira sp*.; despite having its gene well established many features of its pathogenesis are still unknown. This study was designed to observe the morphological changes of HepG2 cells infected with *L. interrogans* and to understand the behavior of *L interrogans* during infection. We constructed our study design based on 30 minutes, an hour, 3 hours and 6 hours infection period *in vitro*. We utilized the transmission electron microscope (TEM) and scanning electron microscope (SEM) to identify the infiltration of *L. interrogans* towards HepG2 cells *in vitro*. The viability test was done using acridine orange and propidium iodine (AO/PI) staining and comparing between two concentrations of *L. interrogans*, multiplicity of infection (MOI) 100 and MOI 10. Signs of infiltration were acquired during TEM analysis and also formation of cell blebs with SEM during HepG2 infection with *L. interrogans*. Viability on MOI 10 for 30 minutes, 1 hour, 3 hours and 6 hours post infections were 4.98%, 20.02%, 15.91% and 26.57% respectively. However, viability for the MOI 100 showed 100% death. The *L. interrogans* showed affinity towards cells that are clumps. The results of this study showed a significant difference between HepG2 cells mortality during infection with MOI 100 and MOI 10. High concentration of bacterial infection causes severe necrosis, while mild infection causes mild apoptosis *in vitro*. This can be related to the high mortality of clinical cases when the host has come in contact with a high concentration of bacteria from the contaminated sources.

SUBCHRONIC TOXICITY STUDY OF ETHANOL EXTRACT OF *Morinda citrifolia* L. FRUITS IN MALE SPRAGUE DAWLEY RATS

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The objective of this study was to evaluate the toxicity of ethanol extract of *Morinda citrifolia* (*M. citrifolia*) fruits on 90-day sub-chronic toxicity study in male Sprague Dawley rats. A total of 40 6-week old male Sprague Dawley rats were used in this study. Rats were divided into 5 groups which consisted of 8 rats in each group namely; control, vehicle, (10% of DMSO), low dose (75 mg/kg of *M. citrifolia*), medium dose (125 mg/kg of *M. citrifolia*) and high dose (250 mg/kg of *M. citrifolia*). Ethanol extract of *M. citrifolia* fruits was administrated via oral gavage once daily. Body weight were determined weekly. At the end of experiment (day-90), all rats were humanely sacrificed and blood samples were collected for haematology and serum biochemistry evaluations. Liver and kidneys were collected for histopathological examination. Toxicity of *M. citrifolia* fruits was evaluated based on the changes of body weight ratio, haematology and serum biochemistry parameters and histopathology changes of liver and kidney tissues. No mortality signs were observed during the experimental period. Body weights, organ to body weight and haematological results showed no significant differences ($P>0.05$) in all groups. Aspartate aminotransferase (AST) and Lactate dehydrogenase (LDH) levels in medium and high dose groups were significantly decreased ($P<0.05$) compared to the control. Histopathology results showed significant ($P<0.05$) lesions such as inflammation, hydropic degeneration, centrilobular necrosis in liver and cellular and granular casts in the kidney tissues. Based on histopathology results, that 125-250 mg/kg of ethanol extract of *M. citrifolia* fruit induced hepatotoxicity and nephrotoxicity in male Sprague Dawley rats.

CORRELATION BETWEEN FLIES POPULATION AND SKIN LESIONS IN HORSES IN KELANTAN

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Stable cleanliness is one of the important factor for heavy flies' infestation. Increased number of biting flies causes allergy and itchiness, a most common contributing factor to the development of skin lesions in horses. Whilst blowfly's maggots commonly feed on fresh wound resulting in myiasis. In this study, flies from the selected stable were captured using modified sweep net and preserved using 70% ethanol. The flies' populations were quantified in correlated with the type of stable management. The flies were then identified and grouped according to their impacts on horses' skin problem. Lesions such as inflammation, allergies and self-inflicting trauma due to intense itch among horses were observed as well as myiasis. Skin lesions were identified and recorded in body maps. Result shows that flies' population in poorly managed stable are twice higher than those moderate and well managed with dung fly being the highest. Low number of horse fly and stable fly were captured from all types of stable management. The presence of putrefied leftover feeds and decaying feces in the stable are suspected to be the reason of high population of dung fly and blowfly. However, the percentage of skin lesions observed on horses from all types of stable management does not show any significant difference. This is coherent to the low number of blowfly and stable fly caught in this study. High population of dung flies' feeds on the blowfly and stable fly larvae and may have suppresses its' population.

EXTREME LEUKOCYTOSIS IN A FRIESIAN CROSS COW: A CASE REPORT

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A 7 years old, pregnant Friesian cross cow was recumbent. Initial differentials were hypoglycaemia, hypocalcaemia and systemic infection. Appropriate treatment for this cow was given, but minimal improvement was observed. Blood sample was taken for complete blood count and serum biochemistry analyses. Haemogram parameters were unremarkable, however, leukogram revealed marked leucocytosis (91.5 x 10^9/L; reference value of 4.2-12.0 x 10^9 /L) with extreme lymphocytosis (74.15 x 10^9 /L; reference value of 2.5-7.5 x 10^9 /L), left shift neutrophilia (segmented neutrophils was 11.9 x 10^9/L; reference value of 0.6-4.0 x 10^9/L; band neutrophils was 0.92 x 10^9 /L; reference value of <0.2 x 10^9 /L) and monocytosis (4.58 x 10^9/L; reference value of 0.05-0.8 x 10^9/L). Blood smear revealed numerous small and large lymphocytes which tallied with the differential WBC counts, however, malignancy criteria of the lymphocytes were not obvious. Alterations in the leukogram were suggestive of infection with concurrent chronic lymphocytic leukaemia or known as bovine enzootic leukosis. Blood calcium level was within reference range and there was also hypoglycaemia. The cow died after 12 days of treatment, post mortem revealed generalised moderate congestion of lungs, liver, abomasum, kidneys and segmental congestion of small intestine. A 3cm in diameter black rounded mass was found attached to right auricle. Histopathology of the black mass revealed well differentiated lymphocytes interspersed by lymphoid cells with big nuclei containing chromatin clumps, scarce cytoplasm and few mitotic figures, which were consistent with lymphoma. Lung histopathology examination revealed severe congestion, interstitial and alveolar oedema, activated BALT and presence of basophilic bacterial colony. Both liver and kidney were infiltrated with mononuclear cells that were consistent with chronic inflammatory response. The probable cause of death in this case is respiratory system failure due to bacterial pneumonia predisposed to suspected bovine enzootic leukosis. No further tests were done to confirm the aetiology of the disease.

COMPARATIVE STUDY OF IMMUNOPATHOPHYSIOLOGICAL RESPONSES IN MICE FOLLOWING ORAL INFECTION TO *Brucella melitensis* AND ITS LIPOPOLYSACCHARIDE

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Brucella melitensis is a major zoonotic pathogen in which lipopolysaccharide (LPS) is believed to play a major role in the diseases pathogenesis. To study the immunopathophysiological aspects, we established a mouse model experimentally infected with whole cell of *B.melitensis and its* lipopolysaccharide via oral route of inoculation. Eighty-four mice, BALB/c, both sexes with equal gender distribution and 6-8 weeks-old were randomly assigned into 3 groups. Group 1 (n=36) were orally inoculated with 0.4 ml 10^9 of *B. melitensis* while Group 2 (n=36) were orally challenged with 0.4 ml 10^9 of LPS. Group 3 (n=12) was challenged orally with phosphate buffered saline and served as a control group. Animals were observed for clinical signs, haematological and histopathological analysis for a period of 24 days post-inoculation. Our results revealed that *B.melitensis* infected group demonstrated significant clinical signs and histopathological evidence than the LPS infected group. However, both infected groups showed elevated levels of interleukins (IL-1β and IL6), antibody levels (IgM an IgG) as early as 3 days post-infection with predominance in LPS infected group. For hormone analysis, low levels of progesterone, estradiol and testosterone were observed in both *B. melitensis* and LPS challenged groups throughout the study period. Moreover, in *B. melitensis* infected groups, the organism was re-isolated from the organs and tissues of gastrointestinal, respiratory and reproductive systems; thereby confirming the possible transmission of the disease dynamics. Moreover, LPS stimulated significantly the innate and acquired immune system without significant systemic dysfunction, suggesting potentiality of the protective properties of this component as an alternative vaccine for brucellosis infection. This report is the first detailed investigation comparing the infection progression and host responses in relation to the immunopathophysiological aspects in mouse model after oral inoculation with *B. melitensis* and its lipopolysaccharide.

LABORATORY TECHNIQUE OF CULTURING PURE L3 FROM ADULT *Haemonchus contortus* EGGS

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Study on the *Haemonchus contortus* infestation in the gastro-intestinal tract of sheep and goat in Malaysia have been given attention in this recent years. Most of the studies involved in the collection of infective larvae (L3) which usually cultured from eggs that was found in faecal samples. The main challenge of this technique is that many nematodes eggs are alike and most of the times the L3 collected could be a mixture of various strongyle larvae. Therefore, this study aims to produce pure *Haemonchus contortus* L3 using modified Roberts and O'Sullivan method. Adult female *H. contortus* was collected from abomasum of dead goat. These intact dead helminths were grinded with sand, normal saline and then mixed with dried and fresh sheep faeces. The final mixtures were transferred to a large clear-glass jar, then covered with petri dish and left on lab bench in dim light at room temperature for 7 days. Finally, the jar filled with tap water and inverted into petri dish that contain tap water and left standing on the bench. L3 that migrate into the water in the petri dish were harvested and observed under microscope. Live L3 were kept at 4ºC and found to be alive until 36 days.

EFFICIENCY OF HISTOLOGICAL EXAMINATION, FLUORESCENT ANTIBODY TEST AND NESTED RT-PCR TECHNIQUES IN RABIES DIAGNOSIS DURING OUTBREAK

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Rabies is a fatal zoonotic disease and an outbreak was reported between the month of August to September 2015 in Malaysia compromise of the states of Perlis, Kedah and Penang and this requires immediate action in terms of disease control as well as capacity and capability of laboratory in diagnosing this disease. The question raised in addressing this issue, was which test is most reliable in diagnosis of rabies. Therefore, a study was designed to compare the laboratory techniques used for diagnosis of rabies during the outbreak where the comparison was made among the histological examination, Rabies Fluorescent Antibody Test (FAT) and nested RT-PCR. A total of 30 dog brain samples (hippocampus, brain stem and cerebellum) were obtained during the outbreak surveillance program. The samples were send for Histopathology, Rabies FAT and nested RT-PCR analyses. The results revealed that seven histopathology slides (23%) showed Negri bodies lesions in brain tissue. For PCR and FAT detected positive 5 (16%) and 28 (93%) respectively. Common cellular changes observed in histopathology study of rabies are vasculitis, foci of glial nodules and reactive blood vessels. In conclusion, Rabies FAT is a Gold Standard test and recommended by WHO and OIE. From this study, it was observed that histological technique is far less efficient from of Rabies FAT in detection performance. This may due to histological examination is less sensitive than the Rabies FAT, allowing the selected tissue area to be missed in observations and difficulty to detect in autolysed brain tissue. Therefore, histopathology is no longer recommended for Rabies as primary diagnosis tool.

PREVALENCE OF MRSA IN MILK FROM SELECTED DAIRY GOAT FARMS IN BESUT AND SETIU, TERENGGANU

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The emergence of antimicrobial drug resistant bacteria has been a concern worldwide. The common bacteria that been reported to develop resistance is Methicillin Resistant *Staphylococcus aureus* (MRSA). MRSA was initially present in hospital and found in human. However, recent studies showed that Livestock Associated MRSA (LA-MRSA) was found in domestic food animals and their handlers. It is well understood that the subsequent transmission LA-MRSA among humans and animals can be bi-directional with close contact being the common transmission pathway. The aim of this study is to investigate the prevalence of MRSA in goat milk from selected dairy goat farms located in Besut and Setiu. In this study, 96 milk samples were collected from 48 dairy goats. Then, isolation of *S. aureus* in the milk samples was done using Mannitol salt agar and were determined using biochemical tests and conventional Polymerase Chain Reaction (PCR). *S. aureus* isolates were also tested to for their susceptibility toward the antimicrobial drugs. Six samples were found to contain *S. aureus.* One of isolates was found to be resistant to 5 common antibiotics (Oxacillin, Cefoxilin, Vancomycin, Chloramphenicol and Amoxicillin) while the other four showed resistance to one type of antibiotic. However, the detection of *mec*A gene to determine the presence of resistance gene towards Methicillin have shown negative finding. This study provides useful data on the current statues of MRSA prevalence in goat's milk, which can be used to prevent transmission of LA-MRSA to human and other animals as well to emphasis responsible use of antibiotic in farm.

CONTAMINATION OF SOILS WITH *Toxocara spp.* EGGS IN PLAYGROUNDS IN IPOH, PERAK

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Toxocariasis known as important cosmopolitan zoonotic disease caused by parasitic roundworms called *Toxocara* spp., which is one of the important soil transmitted helminthes (STH) that infect animals as well as humans. In this study, 80 soil samples taken from four public playgrounds and six neighborhood playgrounds in Ipoh, Perak between October and December 2016 to determine the status of soil contamination with the eggs of *Toxocara* spp. Washing floatation technique using saccharose solution was used to recover the eggs of *Toxocara* spp. from the soil samples. The relationship between the soil condition and the occurrence of the *Toxocara* spp. eggs in soil was also investigated. Results showed that 32.5 % from total soil samples positive with *Toxocara* spp. eggs, i.e. 43.8 % positive from samples of neighborhood playgrounds while 15.6 % positive from samples of public playgrounds. Overall, 50 % of the sampling sites contaminated with *Toxocar*a spp. eggs. The finding showed that the increased of moisture and pH of the soils contributed to the increased of contamination with *Toxocara* spp. eggs. Sandy soils also found significantly contaminated with the eggs of *Toxocara* spp. compared to the clayey soils ($\chi^2(3) = 34.144$, $p<0.001$). Therefore, preventive measures such as regular deworming of dogs and cats as well as awareness program especially to the young children are important. It is also necessary to conduct survey on fecal samples of cats and dogs population in Ipoh to provide clearer information on the risk of transmission of *Toxocara* spp. to humans in this area.

Klebsiella pneumoniae INFECTION IN A COLONY OF DUSKY LEAF MONKEY (*Trachypithecus obscurus*)

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Klebsiella pneumoniae is an important emerging pathogen in humans and animals. The organism is an important public health concern because of nosocomial infections and antimicrobial resistance. Nonhuman primates in captivity are susceptible to *Klebsiella*, particularly when a stress factor is involved. Infections vary depending on the species but can cause significant morbidity and mortality. Seven baby dusky leaf monkeys from the age of one to six months from a colony of eleven died over a period of two weeks, with the predominant finding of gram-negative bacterial septicaemia despite clinical intervention. These animals had lethargy, pale mucosae, and dehydration before death. Post mortem was conducted to investigate the cause of death at Pathology Section of Veterinary Research Institute (VRI) Ipoh. In general, the animals were observed to be very haggard and anorexic. Numerous trauma marks were observed all-round the body. Post-mortem examination revealed severe bronchopneumonia and pericarditis. Peritonitis was also observed as well. Sample organs were submitted to laboratories for further diagnosis. Bacteriology examinations revealed positive findings for *Klebsiella pneumoniae* in all seven animals. However, Virology and Parasitology examinations revealed no significant findings. This case of *Klebsiella pneumoniae* infection in dusky leaf monkey is currently unreported and being documented for the first time in Malaysia from the authors' knowledge. It further shows that this organism is becoming increasingly important as a cause of morbidity and mortality in captive monkeys. Veterinarians and animal handlers should be aware of this infection and its zoonotic implications.

UNILATERAL RENAL AGENESIS AND ISOLATION OF *Mycoplasma canis* IN A DOBERMAN PUPPY

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Unilateral renal agenesis is a rare incidental finding in humans and animals that is usually compatible with life. Mycoplasmosis can either cause infections in the respiratory system, urinary and genital tract where they can result in various forms of diseased conditions. Due to location of the genital and reproductive system in proximity, infertility is a common finding along with pregnancies that abort or produce weak new-borns resulting in stillbirth or death while in embryo. A three-day-old still born Doberman puppy was presented at Veterinary Research Institute (VRI) for post mortem examination. The bitch had a history of abortions and still born during her last 2 pregnancies. Post mortem examination of lungs revealed congestion and pulmonary consolidation. Purulent exudate was present at the bronchi. The lungs were slightly haemorrhagic at the borders. Only one renal was located in the abdominal cavity which was markedly enlarged and very pale. *Mycoplasma canis* was isolated from the lungs and was confirmed by biochemical test. Hence the puppy was possibly diagnosed with Canine Mycoplasmosis. The study of canine mycoplasmosis is unreported due to the difficulties in isolation and identification to species level. As of the author knowledge, this is the first case to investigate the presence of individual Mycoplasma species in dogs with respiratory disease where mechanisms of pathogenicity and nature of the immune response to this pathogen are currently unknown. Thus, further studies should be conducted to understand the related mechanisms of pathogenicity and nature of the immune response of the pathogen.

EFFECTS OF FEED MANIPULATION ON CARCASS CHARACTERISTICS OF BRAKMAS CATTLE

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Red meat is claimed to contain high in saturated fatty acids, leading to artherosclerosis and subsequently heart diseases. Nevertheless, meat fatty acid composition has been modified via feed manipulation. Depending on the ability of animal to deposit fat within its carcass, fat constituent itself contains different type of fatty acids with different melting temperatures. The objective of the study was to evaluate the effect of by-pass fatty acid supplementation in feed on carcass characteristics. Twenty (20) heads of Brakmas yearlings were divided into four (4) groups receiving three (3) combinations of palmitic (%) and stearic (%) fatty acids or control feed. All animals were subjected to feeding trials for six (6) months. At the end of the study, all animals were Halal slaughtered and carcass evaluation was conducted subsequently. Fatty acid manipulation was observed to effect cold and hot carcass weights compared to the control. Increasing palmitic up to 40%; stearic acid up to 56% gives the lowest carcass weight loss. Carcases composition (meat %, fat %, bone %), was not influenced but a reducing the amount of fat content within a carcass was reduced. Reducing the amount of palmitic (%) while increasing stearic (%) to its optimal level may have effect a beneficial effect on red meat.

DEVELOPMENT OF ORAL VACCINE AGAINST *Haemorrhagic septicaemia*: PROFILING OF ANTIBODY TITRE IN BUFFALOES INFECTED WITH *Pasteurella multocida* TYPE B:2 AND ITS IMMUNOGENS (LPS AND OMP)

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The immune systems of buffaloes against haemorrhagic septicaemia (HS) are made of two important components known as innate and humoral immunity. The aim of this study was to investigate the clinical responses and humoral antibody changes in buffaloes infected with *Pasteurella multocida* type B: 2 (PMB2) and its immunogens lipopolysaccharide (LPS) and outer membrane protein (OMP). Twenty-one buffalo heifers were divided into 7 treatment groups. Group 1 buffaloes were orally inoculated with 10 mL of sterile phosphate buffered saline (PBS) at pH7 which act as negative control group. While Group 2 and 3 were subcutaneously and orally inoculated with 10 mL of 10^{12} colony forming unit (cfu) of PMB2, respectively. Group 4 and 5 buffaloes were inoculated with 10 mL of LPS broth intravenous and oral route, respectively. Buffaloes in Group 6 and 7 were administered with 10 mL of OMP broth subcutaneously and orally, respectively. During the post infection period, all buffaloes were observed for clinical signs and clinical response for 21 days. Blood samples were also collected according to time interval for analyses of antibody concentration. All buffaloes from Group 1, 3, 4, 5, and 7 survived throughout the experimental period of 21 days. Group 2 and 6 buffaloes survived for 12 hours and 3 days, respectively. Buffaloes in all treatment groups of PMB2 and its immunogens LPS and OMP showed significant increase in IgM, IgG and IgA concentrations throughout the study period. There were significant different ($p<0.05$) in all treatment groups comparing to control group of buffaloes. All buffalo inoculated orally showed significant increase in immunoglobulins level similar to other routes of inoculation that were normally used for HS vaccine administration. Information from this study will be an added knowledge in HS disease in buffaloes and development of oral vaccine through feed should be further investigated.

PHYLOGENETIC STUDY ON HEMAGGLUTININ GENE OF 2017 HIGHLY PATHOGENIC AVIAN INFLUENZA DETECTED FROM BACKYARD CHICKENS IN MALAYSIA

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Malaysia suffered the Highly Pathogenic Avian Influenza (HPAI) H5N1 outbreaks in 2004, 2006 and 2007. On end of February 2017, HPAI outbreak reoccurred in Kota Bharu, Kelantan and the virus was isolated from backyard chickens. Samples were submitted to Veterinary Research Institute (VRI) as a reference case without any HPAI suspicious lesion to detect for any presence of avian viruses and was later confirmed positive for Avian Influenza (AI). For further conformation, real time RT-PCR and virus isolation were conducted. All positive cases were subjected to subtyping test with all subtyped to H5N1. HA gene sequencing showed 99% similarity with Vietnam H5N1 strain isolated mainly from ducks in 2015. The cleavage site motif (PQRERRRKRGLF) in the HA gene indicates all isolates were highly pathogenic and belongs to clade 2.3.2. Phylogenetic analysis of HA gene revealed that all isolates were grouped among Indonesia and Vietnam strain that clustered under clade 2.3.2.1.c, which is the first reported in Malaysia. Based on these results, the authority bodies took immediate actions such as culling the birds and disinfect the infected area to control the virus from spreading, leading to declaration of free from HPAI H5N1 as of 1st July 2017 following no new occurrences of the disease after 90 days from the last case. Since the affected chickens were from backyard, this highlights the importance of biosecurity and awareness among small scale and backyard farmers to prevent future disease outbreaks.

QUALITY OF GOAT MILK AFTER MANUAL PASTEURISATION BY MEDIUM SCALE FARMER

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Food Act 1983 and Food Regulation 1985 updated 2014 stated that all fresh milk shall be pasteurised prior to distribution, sales or consume to ensure food safety. In 2014, human cases of brucellosis occurred in Penang due to consumption of unpasteurised goat milk. To date, they are still number of small and medium goat farmers as well as consumers who were not compliant with the regulation as they assumed the quality of milk will degrades due to the pasteurisation process. This study was conducted to determine the effect of manual pasteurisation process to the quality of milk. A total of 56 milk samples which comprises of 28 raw milks and 28 pasteurized milks were collected from medium scale farm located in Selangor for over a period of one month. All samples were tested for chemical properties; total solid, protein, fat, lactose, Solid non-fat (SNF) and microbiology counts; Total Plate Count (TPC), Coliform and *Escherichia coli.* The results show that 27 from 28 pasteurized samples had low microbiological counts; TPC (671 cfu), Coliform (19 cfu), *E. coli* (10 cfu) that indicates the samples were properly pasteurised. The chemical properties of total solid, protein, fat, lactose and SNF after pasteurisation were 12.99, 3.13, 4.29, 4.74 and 8.70 respectively, as compared to 13.30, 3.15, 4.54, 4.76 and 8.77 for unpasteurised milk. There was no significant difference between raw and pasteurised goat milk on the results for all five chemical properties tested. The study shows that manual pasteurisation process conducted by the farmer was safe for consumer and does affect the milk quality. However, further study is required to sampling from more small and medium scale farmers as manual pasteurisation procedures might differs from one farmer to another.

IMMUNOGENICITY OF MULTI-EPITOPE LEPTOSPIRAL DNA VACCINE AGAINST LEPTOSPIRAL INFECTION

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Leptospirosis is neglected emerging zoonoses, occurring both in urban environments as well as rural regions worldwide. Development of an effective vaccine against leptospirosis remains a challenge. This study was undertaken to develop a multivalent DNA vaccine that can induce a sterilizing immunity against leptospira infection. Antigenic B cell epitopes were predicted using bioinformatics, assembled and chemically synthesized and cloned into a pBudCE4.1 vector and expressed using Chinese Hamster Ovary cell line; which was later confirmed by indirect immunofluorescence test. 3-4 weeks old golden Syrian hamsters were immunized with 150µg of the vaccine in equal volume of Freund's adjuvant twice and later challenged with *L. interrogans* Copenhageni Fiocruz strain. Microscopic agglutination tests showed a raising antibody titre ($p<0.05$) in the immunized hamsters compared to the control. The antibodies reacted against several pathogenic leptospira strains belonging to different serogroups. Similarly, the vaccines elicit secretion of neutralizing antibodies that prevented the growth of a number of pathogenic leptospira species based on the *invitro* growth inhibition test. Furthermore, the vaccine was also able to significantly reduce renal colonization among the challenged hamsters. In conclusion, the multi-epitope chimeric DNA vaccine proves to be a promising antigen for the prevention of leptospirosis.

TOLL-LIKE RECEPTORS EXPRESSION IN FELINE INFECTIOUS PERITONITIS VIRUS INFECTION IN VITRO

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Feline infectious peritonitis (FIP) is a lethal disease caused by feline infectious peritonitis virus (FIPV). It is thought that FIPV infection causes aberrant immune response in cats such as upregulated pro-inflammatory cytokines, lymphopenia, depleted cell mediated immunity response, and increased antibody titer; in which the combination of all leads to mortality. In SARS coronavirus (SARS-CoV) and murine hepatitis virus (MHV) infection, innate immunity has been shown to be extremely crucial in controlling the coronavirus early during infection particularly by shutting down the production of Type I interferon (IFN) and antagonising its signaling. Type I IFN is known to have potent antiviral effects and other immunomodulatory functions and involved signaling through the Toll-like receptors (TLRs). There are four TLR families in the endosomal pathway that functions to detect viral nucleic acid – TLR 3 detects dsRNA, TLR 7 and 8 detects ssRNA, and TLR 9 detects CpG DNA motifs. The activation of these TLRs lead to the activation of several transcription factors and initiate the production of Type I IFN and other cytokines. Thus, this study investigated on the immunomodulation of endosomal TLRs (TLR 3 and 7) upon infection with FIPV *in vitro*. Results indicated that there were significant upregulation of TLR 3 and 7 after infection of CRFK cells with FIPV79-1146 for 3h and 24h. FIPV infection was confirmed using conventional PCR and immunocytochemistry. Based on the *in vitro* results, future study which includes the measurement of TLRs gene expression in CD14+ monocytes of FIPV-infected cats and assessment of the Type I IFN production and its correlation to TLRs expression are crucial. The results of this study will determine the correlates for immunologic failure to control FIPV infection and therefore, should facilitate the development of novel antiviral therapeutics.

PATHOLOGY OF PNEUMONIC PASTEURELLOSIS IN GOATS IN KELANTAN DURING WET AND DRY SEASONS

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This study described the gross and histopathological changes of caprine pneumonia due to natural infection with *Pasteurella multocida* and *Mannheimia haemolytica* from samples collected at 7 districts in Kelantan from November 2015 to August 2016. The gross pulmonary lesions observed were almost the same in both wet and dry seasons, which includes: pulmonary congestion, emphysema, atelectasis, oedema, white material thread like membraneous covering of partial or complete lung lobes and abscess formation. Fibrinous pneumonia was more frequently diagnosed in dry season (32%) than in wet season (20%). The most common inflammatory pulmonary lesions that occurred in the wet season were interstitial pneumonia (27.5%), bronchopneumonia (27.5%), necrotizing pneumonia (10.0%), verminous pneumonia (5.0%), and suppurative bronchopneumonia (5.0%). During the dry season, bronchopneumonia (28.6%), interstitial pneumonia (17.1%), suppurative bronchopneumonia (17.1%), fibrinous pneumonia (5.7%), fibrinous bronchopneumonia (5.7%) and pleuropneumonia (5.7%) were noted. In conclusion, pneumonic pasteurellosis due to *P. multocida* and *M. haemolytica* has become a significant respiratory infection of goats, in both sexes at all ages and in several breeds, specifically, in dry season in Kelantan, with a high morbidity due to inflammatory and non-inflammatory pulmonary lesions.

FOOD WASTE AS POTENTIAL ANIMAL FEED

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Increasing solid waste is one of the most crucial environmental problems in Malaysia. Food waste was the highest with 45% from the total of solid waste. Food waste used to be well utilized as animal feed especially for village fowl. The objective of this study was to analyze the nutrient content of food waste in student's cafe at Institut Kemahiran Belia Negara Alor Gajah. Food waste samples were collected twice a week over 3 weeks' period and were sorted and classified into chicken and fish waste. Results showed that the total food waste collected during 3 weeks of sampling is 118.5 kg. The food waste was dehydrated before analyzing. The results showed fish waste contain 18.3% crude protein, 65.3% dry matter, and 11% crude fat. Chicken waste contains 26.7% crude protein, 66.5% dry matter and 19.8% crude fat. In conclusion, results from this study shows that food waste has high nutrient contents and can be utilize as potential animal feed in future.

IMPORTED MEAT AND MEAT PRODUCTS: ARE THEY SAFE?

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Issues on the safety and quality of imported meat and meat products have always been a concern worldwide especially for importing countries. In Malaysia, a significant increase in importation trends in cattle for slaughter which has subsequently increased cost, insurance and freight (CIF) value of import from RM44.35 million in year 2011 to RM211.393 million in year 2015. The Malaysian government has a responsibility in ensuring that the meat and meat products of animal origin are hygienic, healthy, and wholesome as well as suitable for human consumption. Inspection of the disease status of the importing country as well as sanitary and phytosanitary aspect of meat and meat products at processing plants is overseen by the Veterinary Inspection Section, Department of Veterinary Malaysia with the help of Malaysian Department of Islamic Development (Jabatan Kemajuan Islam Malaysia), JAKIM on Halal aspect. Mandatory inspection of the importing country is a requirement. Application methods to import meat and meat products is as stated in APTVM 17(c): 1/2011 and the inspection of the abattoir and processing plants is as stated in the APTVM 23 (h): 1/2014. Therefore, meat inspection is an important requirement to ensure that consumers receive safe, wholesome and halal food.

CAT OWNERS' PERCEPTION TOWARDS FELINE HEART DISEASE

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Heart disease is a prevalent medical condition among cats. Unfortunately, monitoring of the cats health conditions especially patients diagnosed with heart disease are dependent on the pet owners' knowledge, their ability to identify clinical signs of a cat with heart disease and, their subsequent decision to seek treatments having been informed of their cats' medical conditions. Based on the theory of planned behavior, this study administered an interviewer-assisted survey to 139 respondents to examine cat owners' awareness and knowledge towards feline heart diseases, as well as perceived behavioral control as predictors to owners' intention to seek treatment for their cats. Findings of study showed that 69 respondents (49.6%) were aware that cats are susceptible to heart disease, of which 46 respondents (66.7%) could identify at least five symptoms associated with heart disease. While cost-related and time-related reasons topped the list on barriers that challenges owners in seeking treatment for their cat, only less than half of the respondents indicated that they would not find it troublesome to commit to life-long treatment regime. Results also suggested perceived behavioral control positively affected intention to seek treatments especially among respondents who scored lower on empathic concern. Aside from the need for continuous educational interventions to improve cat owners' awareness and knowledge about feline heart disease, this study also highlights the role of veterinarians in encouraging owners' treatment compliance for cats diagnosed with heart disease that require life-long therapy.

CASE REPORT SERIES: CANINE LEPTOSPIROSIS

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Dogs are considered as a maintenance hosts for Leptospira serovar *canicola*, incidental hosts for other serovars, and could be a potential source of infection to pet owners. Common risk factors for dogs includes exposure to or drinking from rivers, lakes or streams; and the risk may increase if managed as semi roamers with history of contact with rodents or small mammals. Diagnosis of canine leptospirosis using serological and molecular method in clinical cases can be very challenging. This case series highlighted the different presenting clinical findings from 2 vaccinated and 3 non-vaccinated dogs diagnosed with leptospirosis. Common clinical presentation findings were inappetance, diarrhea, vomiting and jaundice. All the dogs were diagnosed with kidney and liver failure based on the hematology and serum biochemistry profile. Serum obtained were further tested using Microscopic Agglutination Test (MAT) against 8 leptospiral serovars with a seropositive cut-off titer point of $\geq$ 1:100. Dogs were found positive for serovar *icterohaemorrhagia*e (n=2, both 1:320), *javanica* (n=1, 1:160), *australis* (n=1, 1:160) and *bataviae* (n=1, 1:320). All the blood samples were negative from Leptospira spp. using the molecular method (polymerase chain reaction) and this could be due to antibiotic administration prior to blood sampling. Despite aggressive treatment and intensive care given to all 5 dogs diagnosed with canine leptospirosis, all patients did not survive from the disease condition. The dogs were either euthanized or found dead due to the natural cause of the disease. It is recommended that urine culture is conducted for isolation and identification in future clinical cases.

MOLECULAR CHARACTERISATION OF AVIAN INFECTIOUS BRONCHITIS VIRUS ISOLATED IN MALAYSIA FROM 2012-2016

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Avian Infectious Bronchitis (IB) is a highly contagious disease which can cause huge economic losses to the poultry industry. Forty-five IB viruses (IBV) were isolated from kidney, tracheal, lung and pooled organ of poultry in Malaysia from 2014-2016. Phylogenetic analysis of the spike glycoprotein 1 (S1) gene revealed that all isolates were clustered into five genotypes. The predominant type of IBV isolated was QX strains (47%), second was 4/91 type (27%), followed by Malaysian strain MH5365/95 (13%), Massachusetts type (11%) and lastly Taiwan strains (2%). Four cleavage recognition motifs of S1 protein were found among the isolates which includes HRRRR, RRSRR, RRFRR and RRVRR. To our knowledge, this is the first report describing the motif RRVRR which was unique to Malaysian strains. Six IBVs were grouped in Malaysian MH5365/95 strains with 82-92% nucleotide identity to the later. Among these, one isolate (VRI-3929-2015) was differ from others where it only shared 82% identity to MH5365/95 strain and 83% to others, respectively. It formed its own branch in the Malaysian cluster hence, suggesting it may be a newly emerged variants strains in Malaysia. This study indicated at least 5 genotypes of IBV are circulating in Malaysia with the isolates mostly belonged to QX strains. It is noteworthy that the isolation of MH5365/95 strains had been increasing during the three-year period. As new IBV variants continue to emerge, further study need to be carried out to determine whether the current available vaccine is able to give protection against the circulating virus.

SEROPREVALANCE AND MOLECULAR DETECTION OF BOVINE VIRAL DIARRHEA VIRUS IN SELECTED FARMS IN TWO STATES OF MALAYSIA

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Bovine viral diarrhea virus (BVDV) is an important pathogen in cattle primarily, but it can infect most ruminant species. The BVDV infection range between subclinical to severe fatal diseases depending on the strains. The clinical manifestations of BVDV infection are diarrhea, immunosupression that exacerbates other respiratory diseases, orchitis, poor quality semen, chronic emaciation, mucosal disease, fetal abortion, and weak calf. Moreover, fetal infection in the first trimester can lead to a persistently infected animal (PI) that is immunotolerant and shed the virus for life. Reduce milk production, low conception rate, increase risk of clinical mastitis, retained placenta, increase cost in estrous stimulating treatment, and long calving interval were among the economic impact associated with BVDV infection. The aim of the study is to determine seroprevalance and molecularly detect BVDV in cattle in selected farms in Malaysia. Blood sample was obtained from both cattle and buffalo. Seropositive farms were identified by any BVDV positive antibody individual that was detected by ELISA method. Plasma from animal of seropositive farm was selected for antigen detection by reverse transcriptase polymerase chain reaction (RT-PCR). Preliminary findings show that one sample was positive with RT-PCR targeting 5'UTR region. Work is ongoing to detect antigen on other sample and to amplify other region of BVDV.

SEROLOGICAL STATUS OF AUJESZKY'S DISEASE IN PENINSULAR MALAYSIA BASED ON SAMPLES SUBMITTED TO UPM IN 2016

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Aujeszky's disease (AD) is a common swine disease that widespread throughout the world. It causes nervous signs, respiration signs and reproduction problems that lead to great economy losses to the industry. AD is endemic in Malaysia, where sporadic cases of outbreak had been detected during previous years. In Malaysia, ninety-five percent of the pig in the farms are vaccinated for AD. Despite the regular vaccination, the AD serological status remains unknown in this country. This study determines the AD serological status in Peninsular Malaysia in 2016 based on the samples submitted to Faculty of Veterinary Medicine, University Putra Malaysia. A total of 1532 serum samples from 43 farms were submitted for AD ELISA diagnostic test; pigs were grouped as 8 weeks, 12 weeks, 16 weeks, 20 weeks, gilts and sows with different parity. The samples were tested for AD antibody detection using commercial IDEXX ELISA test kits. A number of 31 farms practises good vaccination practice while 12 farms were detected with positive gI antibody which indicated that these farms were still facing challenge from Aujeszky's field virus. Among these 12 farms, three farms were having seropositivity higher than 25%. In general, vaccination of AD is ideal and stable in our countrybut we still need to be alert with the field challenge as it will be a threat to the industry.

ISOLATION OF *Staphylococcus aureus*: CLINICAL AND SUBCLINICAL MASTITIS INFECTIONS IN SHEEP AND DAIRY GOATS

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Staphylococcus aureus (*S. aureus*) is one of the most important etiological agents of mastitis in dairy animals. Mastitis is considered a major threat to the ruminant industry in term of animal health, milk production and economic impact. This study aims to detect the presence of *S. aureus* in clinical and subclinical mastitis infections in sheep and dairy goats. A total of 96 udder milk samples from lactating sheep (n=48) and goats (n=48) were collected from selected dairy farms located in Besut and Setiu, Terengganu. Subclinical mastitis was pre-examined using the California Mastitis Test (CMT) reagent, while the clinical mastitis was determined based on the clinical signs. *S. aureus* was isolated by routine bacteriological analysis. The positive samples were then subjected for Polymerase Chain Reaction (PCR) targeted the nuc gene. In the present study, subclinical and clinical mastitis were detected in 19/96 (19.8%; 5 sheep, 14 goats) and 2/96 (2.1%; 2 goats) respectively. The cultures and PCR results showed that 6 samples (28.6%; 4 subclinical and 2 clinical) were positive for *S. aureus.* This study provides information on the prevalence of *S. aureus* causes mastitis in small ruminant, which can be useful to determine the distribution pattern of *S. aureus* strains and emerging of multidrug-resistant *S. aureus* in small ruminant in the future.

SEROPOSITIVE MELIOIDOSIS CASES FROM SPECIMENS RECEIVED BY VETERINARY RESEARCH INSTITUTE, MALAYSIA

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A total of 145,347 samples (4,322 cases) were received for the passive surveillance of melioidosis in Serology Laboratory of Veterinary Research Institute from the year 2012 to 2016. From the samples received, 64.7% were positive, 33.9% were negative and 1.4% of the samples were not tested due to the samples condition that did not meet the standards for laboratory tests. The objective of this study is to determine seropositive rate and distribution of melioidosis in livestock based on cases received which comprise of sheep (53.44%), goat (36.39%), cow (9.18%) and buffalo (0.98%) within the period of 5 years. A geographical mapping of seropositive cases was designed using the data from the passive surveillance and the results were visualized in a geographical mapping which provides a clear visual description on the distribution of the diseases. Based on mapping, positive cases are reported in all states in Peninsula (86.23%), Sabah (10.38%) and Sarawak (3.39%). By 2016, most positive cases were concentrated on the state at east coast of the peninsula (63.6%) and Sabah (10.17%). To sum up, total number of seropositive cases of melioidosis in 5 years has reduced from 21.1% on 2012 to 12.9% on 2016. From the finding, this study can provide the data needed as the indicator for the evaluation of surveillance and vaccination programme, disease eradication planning and the distribution of seropositive cases of melioidosis in Malaysia.

A CLINICAL CASE REPORT OF 6th CERVICAL FRACTURE IN A FOAL

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The incidence of cervical fracture in horse mostly reported due to traumatic injury. It is the result of hyperflexion, hyperextension, or lateral bending of the neck when falling. However, the compression fractures of the vertebral region are varying. A 4-month-old male local indigenous pony was brought to Veterinary Clinic, Faculty of Veterinary Medicine, University Malaysia Kelantan (KVUMK), with a complaint of inappetence and refused to erect its neck to a normal position. Physical examination revealed that all parameters were in normal range except for slight elevation of temperature 39.1 ºC and pulse rate 45 bpm. The foal was also found circling, dragging its hind limbs and refused to erect its neck to normal position. There was also evidence of tissue swelling at the base of the neck. Radiography was done and revealed a fracture at the 6th cervical area. The foal was treated with intravenous lactated ringer's fluid, Dexamethasone (5mg/kg), and Cyanocobalamin (1000mcg/Ml) via subcutaneously administration respectively once. However, the foal died the next day due to poor prognosis. For future, clinical cases of cervical fracture surgical laminectomy is recommended as the choice of treatment compared to medical management and approaches.

A SURVEY IN DEFINING PROBLEMS FACED BY LIVESTOCK FARMERS

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Livestock is one of the most important industries in the agricultural sector of Malaysia and promise lucrative returns to individuals who involved successfully. In this survey, four main factors that could affect the livestock industry are highlighted, which are animal breeding, animal disease, farm management and animal feed. The aim of this study is to determine the problems faced by the livestock farmers. Data were obtained from a questionnaire that was completed by 57 respondents from two states in the Peninsular Malaysia. All respondents were from a variety of backgrounds in the livestock industry. Findings showed that the percentage of the respondents emphasizing problem on animal feed was the highest followed by animal breeding, which was 57.9% and 56.1% respectively. Meanwhile, only 26.3% of respondents highlighted problem on animal disease, whereas 24.6% of respondents highlighted farm management as a problem faced by the farmers. In conclusion, feeding and breeding were identified as the biggest challenge faced by most of our farmers, followed by animal diseases and farm management. In the effort to make sure the sustainability of this industry, there is a need to conduct research to the ground and transfer knowledge that is already known to the farmers to improve animal feed and feeding as well as other identified problems. In addition, extension programme via knowledge transfer programs should be expanded, extended and intensified to the farmers to provide assistance and guidance in addressing the problems faced. These findings are important as the basis in conducting research that will leads to efficient assistance to the farmers.

PRELIMINARY OBSERVATION OF PHYSIOLOGICAL RESPONSE OF PRE-WEANING KATJANG X BOER F1 KIDS IN ADAPTATION TO MALAYSIAN ENVIRONMENT

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The adaptation of each breed towards various types of climate depends on their unique characteristics. Not all breeds are suitable to be raised under Malaysian condition because of its high environmental temperature and humidity. Katjang goats are known for their prolificacy, robust and hardiness. The proposed crossbreeding of native breeds with exotic breeds was to fully utilize the indigenous breed for increased economic gains and local meat production. The objective of the study was to evaluate the physiological response of pre-weaned Katjang crossbred under Malaysian climatic condition. In this study, sixteen Katjang x Boer F1 kids, age 5 weeks old were used. The observation of physiological parameters such as respiratory rate, heart rate, rectal temperature and environmental temperature were performed periodically until period of weaning at four months age of the kids. All the data were collected weekly for 12 weeks. The mean results showed that the rectal temperature were in normal range during morning (38.0^0C±1.01) and evening (39.0^0C±0.56). Heart rate per minute (133.54±27.16) and respiratory rate per minute (60.39±10.43) of kids tend to be higher in the evening due to the increased in ambient temperature (31.1^0C ±3.36). However, the kids remain active which showed the effect of ambient heat has not affected the physical condition of the animals. Until weaning period, mortality rate for the kids is 0%. Further observation need to be done to ensure the consistency of the data collected for pre-weaning Katjang X Boer F1.

PREVALENCE, ETIOLOGY AND RISK FACTORS OF SUBCLINICAL MASTITIS IN DAIRY GOATS IN KELANTAN

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Lactating dairy goats are prone to intramammary infection (IMI) and often resulted in reduces milk production and alteration in milk composition. However, the reports on caprine subclinical mastitis are very limited in Malaysia. This study aimed to determine the prevalence, etiology and risk factors of subclinical mastitis in dairy goats in Kelantan. From March to May 2016, fifty-five dairy goats in Pasir Mas, Tanah Merah and Ketereh, Kelantan were tested for subclinical mastitis (SM) by using the California Mastitis Test (CMT). Association of risk factors (age, lactating period, health history of does; and hygiene of farms) with SM was evaluated by calculating the relative risk (RR). Milk samples from healthy udders were collected and cultured on blood and MacConkey agar. Of the 55 dairy goats tested, nineteen (34.5%) were tested positive using the CMT. The most common bacteria isolated from the milk was *S. aureus* (55.2% - 16/29), followed by *Streptococcus sp*. (17.2% - 5/29). Risk factor associated with subclinical mastitis were goats that had been affected with the disease (RR = 5.38, CI = 2.877 – 10.044). The prevalence of subclinical mastitis in dairy goats in selected areas in Kelantan was considerably high (34.5%). Dairy goat farmers should practice mastitis control and prevention strategies such as elimination of objects that can cause injury to the udders, cleaning of the pens, good milking procedures and hygiene such as routine washing of the udder with water (with or without a disinfectant) and drying it with a towel and apply teat dips after each milking.

SUITABILITY OF BALI BREED AS FEEDER CATTLE

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Bali cattle or *Bos javanicus* is a cattle breed originated from the Bali Island in Indonesia. The cattle are primarily used as beef cattle and is said to have superior meat quality compared to indicus cattle breed for example Brahman and Kedah Kelantan. Bali cattle have the ability to digest low quality roughage, however Bali cattle is mostly raised under extensive or semi-intensive systems. This study was designed to determine the viability of Bali cattle as feeder animals under feedlot systems. Fourteen Bali cattle calves were placed randomly in individual pens and were dewormed. The cattle were allowed to acclimatise to the surrounding environment for two weeks and given total mix ration (TMR) with ad libitum access to water. For four months, daily feed residue and daily feed intake data was collected to determine the daily feed intake of the calves. Feed offered was increased or decreased according to the intake of the cattle. The calves were weight every 30 days for 4 consecutive months to derive their average daily gain. The ideal standard average daily gain for feeder calves was 500 grams per day. From this study, the average daily gain ranges from 375 grams to 900 grams per day. More than 50 percent of the calves gained more than 650 grams daily indicating the potential of Bali calves as feeder cattle. In conclusion, Bali cattle has the potential to be used as feeder cattle.

EFFICACY OF *Haemorrhagic septicaemia* VACCINES FOR BOVINE PASTEURELLOSIS: A REVIEW

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Haemorrhagic septicaemia (HS) is among the main causes of economic loss in livestock industry worldwide and *Pasteurella multodica Type B:2* is the aetiological agent associated with the disease. The aim of this systematic review was to assess the efficacy of vaccines for HS and suggest any protocols in the past 10 years that have achieved the best and/or most promising results. An online search was made of the Elsevier, PubMed and any impact factor databases in March 2017. The experimental design, methodological quality, type of vaccines and result of the studies were analysed. Twenty-four papers were selected for this review. In general, most of vaccine are bacterin-toxoid vaccines with two common types (oil and alum based) were investigated in the studies selected. This systematic review suggests that vaccines that employ latest technology such as new adjuvant and recombinant vaccines that some long-standing bacterins have achieved good results which supports their use in the prevention and control of HS caused by *P. multocida*. However, methodology differences and in some case, lack of more severe scientific criteria may hinder the assessment of the effectiveness of these vaccines. This review critically examines efficacy of HS vaccine and comparing optimal immunotherapeutic protocol that have been developed. An online search was made of the well-known databases such Elsevier in March 2017. Only studies that tested vaccines in vivo in cows were included. The experimental design, methodological quality, type of vaccines and results of the studies were analysed. Twenty-four papers were selected for this review. In general, most of vaccine are bacterin-toxoid vaccines with two common types (oil and alum base) were investigated in the studies selected. Malaysia made HS vaccine produced by DVS shown impressive result were as good as some long-standing bacterins by other HS vaccine producers than that employ new technologies (DNA and/or recombinant protein vaccines) and, which supports their use in the prevention and control of HS. However, in future, this technology would be good finding for all researcher in producing better and stable HS vaccine.

A RETROSPECTIVE ANALYSIS AND ECONOMIC IMPACT OF *Brucella melitensis* INFECTION IN GOATS IN PENANG, MALAYSIA

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Ovine brucellosis, commonly caused by *Brucella melitensis* is an important zoonotic disease with a significant economic impact affecting goats, characterised by abortion, still birth, reduced milk production and infertility. The distribution of ovine brucellosis in goats has not been well described in Malaysia specifically at the northwest of Peninsular Malaysia, Penang. Therefore, in this study, a retrospective analysis and economic impact of *B. melitensis* infection in Penang was conducted to determine the pattern and trend of *B. melitensis* infection. The data was obtained from Department of Veterinary Services Penang (DVS Penang) and Makmal Kawasan Veterinar Bukit Tengah, Penang (MVKBT) from 2012 until 2014. Out of 13,724 goats tested for *B. melitensis*, 467 were found positive. The prevalence of *B. melitensis* infection in Penang from year 2012 to 2014 was 3.4%. The trend of *B. melitensis* infection in Penang dropped from 2012 to 2013 but increased again in 2014. Boer goats were found most susceptible (54%) to *B. melitensis* infection compared to other breeds. Seberang Perai Utara (SPU) had the highest prevalence of *B. melitensis* cases in Penang. The economic losses faced by farmers were about the quarter of a million (RM242, 418). These findings could initiate the interest of responsible local authority to do complete surveillance programme in order to control and prevent *B. melitensis* infection as it is important public health problem worldwide. Further studies are recommended to assess the risk factor of human exposure during animal handling in order to avoid the disease that which cause huge economic losses and public health impact.

DETERMINATION OF GROWTH CURVE OF *Salmonella pullorum* TOWARDS BIOMASS PRODUCTION OF SALMONELLA ANTIGEN

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Salmonella antigen has been widely used for detection of *Salmonella* infection in poultry. The growth phase of four *Salmonella enterica* serovar pullorum isolates (SP 9-25, SP 14/11, SP 690/79 and SP 7107/07) used in the antigen production were investigated based on colony enumeration and turbidity. This study aims to determine the growth curve of these *S. Pullorum* isolates for optimization towards biomass production of salmonella antigen from conventional method into bioreactor. It is hypothesised that production using bioreactor will maximised the yield of the bacteria cells. The isolates were cultured in nutrient broth, incubated aerobically with constant shake for 48 hours to determine the lag, exponential, stationary and the death phase of the bacteria. The number of colony was measured every two hours and turbidity of the broth was determined. The SP 9-25 strain showed maximum growth at 16 hours whereas SP 690/79 strain at 14 hours. The other two strains (SP 14/11 and SP 7107/07) demonstrated the best growth at 22 and 32 hours respectively. From this study, the SP 9-25 strain showed the highest growth in less than 20 hours followed by SP 690/79, SP 14/11 and SP 7107/07 strain. As the poultry industry in the country worth billions Malaysian Ringgit and *Salmonella* free is one of the worldwide issue, it is essential to establish a method for large scale production of Salmonella antigen to fulfil the demand.

SAFETY STUDY OF NEWCASTLE DISEASE VIRUS VACCINE OF DUCK ORIGIN IN SPECIFIC PATHOGEN FREE CHICKENS AT DIFFERENT AGE

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Newcastle disease (ND) still remains a serious problem in the poultry industry as it causes high mortality and economic losses. Vaccination using live or killed ND vaccine is recommended as disease control. This study evaluated the safety of Malaysian ND vaccine 1174/08 strain of duck origin in SPF chickens at different age. A total of 54 SPF chickens 5-day-old (d/o) and 54 SPF chickens 14 (d/o) were used and distributed into 4 groups, namely vaccinated group [A, 27 SPF chickens 5 (d/o) & C, 27 SPF chickens 14 (d/o)] and non-vaccinated group [B, 27 SPF chickens 5 (d/o) & D, 27 SPF chickens 14 (d/o)]. The vaccinated groups were vaccinated via orally once with 10 doses of ND vaccine 1174/08 strain per chicken. The non-vaccinated group (control) were inoculated with Phosphate-buffered saline (PBS) via the same route. Al chicken were fed *ad-libitum* feed and water and observed for 21 days. Serum sample, cloaca and trachea swabs were collected at 3, 5, 7 10, 14 and 21 days post vaccination (dpv). Samples were tested using Haemagglutination Inhibition (HI) test and undergo the re-isolation test. Three birds from all group were culled at 3, 5, 7, 14 and 21 dpv for the gross lesion and histopathological examination. The histopathological findings of both vaccinated group (A and C) showed the same mild scoring lesion. The finding of this study indicates that the ND vaccine 1174/08 strain of duck origin is safe to use in chickens at both age.

EFFECTS OF FENUGREEK SEEDS SUPPLEMENTATION ON MILK COMPOSITION OF THAI-FRIESIAN DAIRY CATTLE

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Fenugreek *(Trigonella foenum-graecum*) has traditionally been used to promote lactation and is the most commonly used herbal galactagogue. A study was conducted to evaluate the effect of supplementing different levels of fenugreek seeds on milk composition of Thai-Friesian dairy cattle. A total of 15 Thai-Friesian cows from middle to late lactation were fed 0.5% grounded fenugreek seeds (Treatment 1) and 1.0% (Treatment 2) into existing iso-nitrogenous and iso-caloric diets. Each inclusion was subjected to three weeks feeding trials. Milk samples were taken every week for analysis using MilkoScan FT1 for fat, protein, lactose, casein, solid non-fat, total solids, free fatty acid and urea. Fat and protein was significantly reduced (1.83% and 3.76% respectively) at 0.5% seed inclusion but did not differ at 1.0% inclusion. This is similar to those observed by Elmnan et al, (2013) on Sudanese Nubian goats which resulted in the concomitant decreased of milk fat from 3.56% to 2.72% when the level of fenugreek seed was increased to 15%. Lactose increased significantly from 4.16% to 4.36% at 0.5% but at 1.0% inclusion, only casein increased significantly at 2.91% while other composition remains unaffected. As a conclusion, fenugreek seed alters milk composition at different level of inclusion with reduced fat and protein but increased lactose and casein. However, the variation in these results has to be verified on a bigger scale.

COMPARISON OF TUBERCULIN SKIN TEST TO OTHER LABORATORY DETECTION METHODS IN DIAGNOSIS OF BOVINE TUBERCULOSIS IN DAIRY CATTLE

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Bovine Tuberculosis (bTB) in live animal can be diagnose based on delayed hypersensitivity, ELISA technique and Polymerase Chain Reaction. In this study, the detection method of bTB in dairy cattle in Kedah were determined. A total of 146 dairy cattle from 20 herds in the state of Kedah were tested by using three method of detection which are Bovine gamma-interferon (γ-IFN) enzyme immunoassay (Bovigam™), Polymerase Chain Reaction (PCR) and Tuberculin skin test. As a consequence, sensitivity and specificity between Tuberculin Skin Test with Bovigam and PCR were determined. The sensitivity of Bovigam to Tuberculin skin test is 8.3% and specificity 98.9%. Based on these finding, Tuberculin skin test is capable to detect higher percentage of bTB positive animals compared to the γ-IFN and PCR. In addition, caudal fold test of Tuberculin skin test is suitable as a primary screening test Cervical Comparative test as confirmatory test of bTB in corresponded to World Organization for Animal Health (OIE) recommendation. Nevertheless, PCR and γ-IFN assay are both useful as supplementary test to support the Tuberculin skin test. In conclusion, the Tuberculin skin test is primary test method compared to PCR and γ-IFN. This finding has added knowledge in identifying better diagnosis technique for bTB in Malaysia. Reliable diagnosis method in bTB is important to detect infected cattle and subsequence prompt control measures in the farm.

ISOLATION OF 324/2016 CASE OF AVIAN INFECTIOUS BRONCHITIS: A CASE STUDY

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Nephropathogenic avian infectious bronchitis (AIB) virus has been isolated in a clinical case of suspected avian infectious bronchitis in chickens at day-25 by egg inoculation technique. The isolate was identified by dwarf embryo and further tested by RT-PCR and sequencing analysis for confirmatory diagnosis. The result shows the usefulness of the identification of disease caused by-viruses for tracking prevalent diseases in a region of the country.

PREVALENCE OF PARASITIC GASTROENTERITIS IN GOATS FROM SELECTED FARMS IN SETIU, TERENGGANU

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Parasitic gastroenteritis can undermine the goat's health as well as lowering the overall production. The aim of this study was to investigate the prevalence of PGE in goats in Setiu, Terengganu, and to correlate PGE with PCV, Eosinophil count, and FAMACHA©. 46 samples of blood and faecal were collected randomly from two farms in area of Setiu, Terengganu. The FAMACHA© eye score used to read the colour of conjunctive of the eyes. The blood sample collected was subjected to eosinophil count, and the measurement of the PCV values. The faecal samples were subjected to McMaster egg count and faecal culture. Out of 46 samples, 26 (57%) were positively infected goats, where *Haemonchus contortus* was predominant (56.23%), followed by *Trichostrongylus colubriformis* (25.30%), *Oesophagostomum columbianum* (10.44%), *Cooperia sp.* (7.63%), and *Teladorsagia circumcincta* (0.40%). The prevalence of PGE was higher in female (58%) compared to male (53%). Farm 1 (63%) which located in a rubber plantation have significant prevalence compared to Farm 2 (52%) which located closer to the sea. Correlation between FEC with eosinophil count, PCV, and FAMACHA© was theoretically proven, where the increase in FEC, causing high anaemic level, resulting PCV to be low, and the FAMACHA© score to be high, as well as an increased in eosinophil count. The study conducted by the need to investigate the current status of PGE in the small ruminant farm within the area of Setiu, Terengganu, which will then provide information to help farmers in treatment decision and control for improving the productivity of the animals.

FIRST REPORT OF *Teredo navalis* DAMAGES ON FISHERMAN'S BOATS IN PONTIAN, JOHORE

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The shipworm *Teredo navalis* is a ubiquitous saltwater clam that causes damage worth millions of dollars every year all over the worldwide. *Teredo* is the most effective and harmful marine invaders. It has been found along the fishing harbour on the southern coast of Johore especially in district of Pontian. In April 2017, 25 out of 80 fisherman's boats were attacked by shipworms which were found burrowing through the wood after parking in the lagoon for a few weeks. *T. navalis* digs approximately 1 cm in width and burrows up to 0.6-1.0 m in length into the woods of the boat. It secretes calcium for sealing of the tunnel, known as hard Calcareous, on a wooden frame that covers the surface of the tunnel so that it is stable and not easily destroyed. *Teredo* feeds solely on wood by symbiotic cellulolytic nitrogen-fixing bacteria and harboured within the specialised epithelial cells (bacteriocytes) located in the gland of Deshayes in the gills. Water salinity played a major role in controlling the marine borer intensity and distribution. Freshwater is deadly to these invertebrates.

EFFECTS OF SYSTEMIC ADMINISTRATION OF GRANULOCYTE-COLONY STIMULATING FACTOR ON WHITE CELL COMPONENTS IN KATJANG GOATS: A PILOT STUDY

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Granulocyte-Colony Stimulating Factor (G-CSF) is a glycoprotein that has been used to stimulate the bone marrow to produce granulocytes and stem cells to be released into the bloodstream. It encourages proliferation, differentiation and increases the survival of these cells into mature neutrophils. It also induces haematopoietic stem cell mobilization from the bone marrow into the bloodstream as well as acting on neurons as a neurotrophic factor to induce neurogenesis thereby increasing neuroplasticity. G-CSF has been used to stimulate stem cells which are then harvested for various regenerative purposes. Our objective in this pilot study was to monitor the trends of the white cell counts and its component after subcutaneous injections of a Granulocyte-Colony Stimulating Factor in Katjang goats. Five male goats between the ages of 1-2 years, weighing about 15-25 kilograms were randomly chosen from a single farm. These goats were subjected to 5µg/kg of body weight of subcutaneous G-CSF daily for 3 days. Daily blood samples were taken at a specific time and white blood cell counts were recorded from Day 0 (before injection of G-CSF) to Day 4 (post injection of G-CSF). The results showed a consistent elevation of white blood cell counts over a period of 2-days which would provide a window of access to harvest peripheral blood stem cells for various clinical uses. Determination of the peak white blood cell counts post injections with Granulocyte-Colony Stimulating Factor would be useful for stem cell researchers using Katjang goats as animal model.

EFFECTS OF FASTING AND REFEEDING ON THE LIVER AND BIOMARKER LEVELS IN LABORATORY MICE

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Food availability affects the basal metabolism and therefore the function of the liver as the major metabolic organ. In experimental settings, fasting is practiced as a way to ensure uniform drug absorption and reduce the variability in glucose levels. To gather reliable baseline data, the hepatic GSH content, serum ALT levels, and the morphological features of the liver were assessed in male mice (CD-1 and C57BL/6J mice) that either consistently fed ad libitum, or was fasted and then refed at different time spans thereafter. After fasting, all mice had lost a proportion of body weight, the extent of which was variable and related to the time of day when the animals were first deprived of food, ranging between 5% and 12%. Surprisingly, they have already lost more than 10% of their body weight and will reach the endpoint of a permitted experience after a relatively moderate additional weight loss due to treatment. Serum ALT levels were highly variable in both fed and fasted mice, without any significant effect of fasting. GSH levels were consistently higher and followed a circadian rhythm. Fasting reduced the GSH levels but refeeding led to overshooting GSH levels for several hours. Upon completion of the fasting period, livers appeared devoid of glycogen; however, this rapidly restituted upon refeeding within 1 hour (C57BL/6J) and 4 hours (CD-1). Our results confirm the effect of fasting on hepatic GSH levels, but also highlight the further effect of refeeding. Therefore, these factors can affect the outcome of acute hepatotoxicity studies in mice.

THE ROLE OF SHIGA TOXIN-ENCODING PHAGES IN ENTEROHAEMORRHAGIC *Escherichia coli* O157:H7 COLONISATION OF THE BOVINE INTESTINE

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Shiga toxin (Stx) is a phage-encoded virulence factor of the Enterohaemorrhagic *Escherichia coli* (EHEC) O157:H7 implicated in the pathogenesis of renal tissue damage and bloody diarrhoea in human. Cattle are the main asymptomatic reservoir for EHEC O157:H7 with the lymphoid-follicle rich areas of the terminal rectum identified as the primary colonisation site. The objective of this study was to investigate if Stx-prophages significantly influences bovine intestinal colonisation by EHEC O157:H7. Bovine EHEC O157:H7 strains isolated from Scottish cattle farms in the Wellcome Foundation International Partnership Research Award in Veterinary Epidemiology (IPRAVE) study were used for a series of bacterial phenotypic characterisation assays. Verocytotoxicity and Stx levels produced by bovine-originated EHEC O157:H7 strains were significantly lower than clinical EHEC O157:H7 isolates. To assess if Stx-encoding prophages confers fitness advantage, the IPRAVE EHEC O157:H7 strains were co-cultured with its Stx2 prophage mutant derivatives in 10% bovine terminal rectal mucus. Results showed the possession of dual Stx2-prophage combination in a strain do not result in superior growth advantage over a strain carrying only one Stx2-prophage. Infection of *Galleria mellonella* larvae with the IPRAVE EHEC O157:H7 strains resulted in lower survival rates for larvae infected with isogenic Stx-prophage mutant strains than their parental strains containing Stx2-prophage(s). Overall, findings in this study suggest that Stx prophages are able to interact with some of the key virulence and survival traits for EHEC O157:H7, thereby manipulating the behaviour of the bacterial host in order to promote its own survivability. Future work is required to explain the mechanisms underlying the observed EHEC O157:H7 phenotypic changes.

COMPARATIVE STUDY OF FEEDING FORMULATED RATION BASED ON LOCAL BY PRODUCTS AND IMPORTED FEEDSTUFF ON GROWTH PERFORMANCE OF SUCKLING DORPER LAMBS

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Ewes' milk is the main source of nutrition for pre-weaned lambs. Sufficient supply of the nutrients in diets will ensure the ewes produce enough milk for their lambs. The cost of animal feed is volatile as the main components of the rations are imported. Locally available agro-industrial by-products have potential to be utilized as replacements for imported ingredients. This study was aimed at investigating effects of feeding the lactating ewes with ration based on agricultural by-products on the growth performance of suckling lambs. Twenty (20) lactating Dorper ewes with single lamb were randomly assigned into two groups; (i) Control (fed ration based on imported feedstuffs) and (ii) Treatment Group (fed ration based on local agro-industrial by-product). The ewes in each group were given 340g of the respective pellet and 1.5kg of Napier silage per head per day over 60 days trial period. Lambs were weighed after birth and weekly thereafter. There were no significant differences between Control and Treatment group on body weight at the end of the trial (16.48kg vs 17.28kg), average daily gain (0.22kg vs 0.23kg) and total weight gain (13.63kg vs 14.30kg). It is concluded from this study, that local agro-industrial by-products can be recommended as replacement to the imported ingredients which lower feed cost.

PRELIMINARY DATA ON POSITIVE DETECTION OF PLASMID MEDIATED COLISTIN RESISTANT GENE IN *Escherichia coli* ISOLATED FROM CHICKEN

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Emergence of multidrug resistant contributes to a major threat worldwide, and it became worst with the emergence of resistant towards antibiotic colistin. Colistin was recognized as the last resort antimicrobial agent infections in human and was widely discontinued since 1980s due to nephrotoxicity effects. However, colistin has been a second look as emergency solution particularly for treatment of multidrug resistant Gram negative bacterial, in spite of toxic effects. Later, this antibiotic has been widely used in many countries in farm animals as growth promoter. The plasmid mediated colistin resistant mechanism (*mcr-1*) present in bacteria itself contributed to the spread of colistin resistant among Enterobacteriaceae including *Escherichia coli*. Presence of this plasmid mediated gene assist in spreading of colistin resistance more easily between bacteria and animal than colistin resistance resulting from chromosomal mutation. Thus, trigger worst antimicrobial resistant problem in both human and animal health as the bacterial strains acquire *mcr-1* gene are very difficult to treat. Since the first description of plasmid mediated colistin resistant gene in *E. coli* from food animals in 2015, several reports revealed a worldwide spread of *mcr-1* gene including *E. coli* culture collection isolated from animals in Malaysia. This paper reports on detection of *mcr-1* gene in *E. coli* isolated from chicken samples submitted to VRI for diagnosis. A total of 103 *E. coli* isolates retrieved from monitoring and diagnostic cases from year 2014 until 2016 were screen for the presence of *mcr-1* gene using published primers via PCR. Of those *E. coli* isolates, *mcr-1* gene was 34.9% (36/103) and only detected among isolates obtained from monitoring cases. None of the isolates obtained from clinical cases found to harbour *mcr-1* gene. The increasing trend of *mcr-1* gene presence in *E. coli* was observed with from 12.9% in year 2014 to 39.5% for 2016.This finding supports the emergence of plasmid mediated colistin resistant in *E. coli* from chicken in the country. Therefore, more comprehensive epidemiological data in Malaysia are crucial to assess the impact on colistin usage in veterinary on development of resistance in bacteria.

ISOLATION AND DETECTION OF FELINE CORONAVIRUS RNA IN TISSUES OF NATURALLY INFECTED CATS

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Feline Infectious Peritonitis (FIP) due to coronavirus infection often caused high fatality and immune-mediated complex in both domestic and wild cats. Feline Coronavirus (FCoV) from tissue samples were submitted to Veterinary Research Institute (VRI) from 2013 to 2016. Clinical signs of cats with FIP symptoms were intermittent loss of appetite, depression, rough hair coat, weight loss and fever. The tissue samples were tested using nested reverse transcriptase PCR (RT-nPCR) and were also propagated in Crandell Rees Feline Kidney (CrFK) cells for virus isolation. Based on the results, out of 30 tissues samples tested, 17 (56.7%) samples were detected positive for FCoV with FIP symptoms. The amplified PCR products revealed a 223 bp and 177 bp amplicons after the first PCR and nested PCR, respectively. For virus isolation 43.3% (13/30) of the samples were able to adapt and multiply with the formation of cytopathic effect (CPE). The CPE was characterised with rounded, granular and clumped forming of syncytial cells. This study revealed that FCoV in cats that were correlated with FIP clinical symptoms can be diagnosed using RT-nPCR. However, further sequence analysis need to be conducted for biotypes determination of FCoV from naturally infected cats in Malaysia.

EFFECTS OF ARGAN OIL AS WOUND HEALING PROMOTER IN SELECTED CLINICAL CASES OF OPEN WOUND IN CATS

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Argan oil is extracted from *Argania spinosa* tree or locally known as Argan tree. Argan tree is widely distributed in southwestern Morocco. Traditionally, the oil has been used to cure skin pimples. Previously, many scientific studies demonstrated that the oil exhibits several pharmacological activities such as anti-inflammatory, antiseptic, antidiabetic and enhance wound healing process in human medicine. Therefore, the aim of this study is to evaluate the healing process of open wound from selected clinical cat cases of open wound. The argan oil **was** applied topically twice daily and the healing effect of the wound was observed and recorded for 4 weeks. The result of this study demonstrated that the extract improved wound healing closure with the less attention needed for wound cleansing and debridement compared to control group. Thus, findings suggest that *A. spinosa* extract (argan oil) promote effective wound healing process and could be the plausible natural therapeutic candidate for wound healing cases in cats.

SPINAL SHOCK PHENOMENON IN A PERSIAN CAT

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Spinal shock is a clinically relevant phenomenon in dogs and cats, characterised by temporary loss of muscle tone and spinal reflexes following severe injury to the thoracolumbar region. Identifying signs of spinal shock is paramount as it complicates lesion localisation which often lead to misdirected investigation. A 3-year-old male Persian cat was presented to the University Veterinary Hospital (UVH), Universiti Putra Malaysia (UPM) for investigation and treatment after falling from the third floor. Neurological examination revealed asymmetric paraplegia (L worse than R) with no deep pain sensation, intact patellar and perineal reflexes but flaccid muscle tone and absent of withdrawal reflex in both hind limbs. The cutaneous trunci reflex was present cranially but absent caudal to T12 vertebral body. The initial neurological findings were difficult to explain by a focal lesion. The absence of withdrawal reflex suggested a focal lesion at L6-S1 region however truncated cutaneous trunci placed the lesion at T9-T12 area. Plain radiographs of the spine confirmed T3-L3 localisation, revealed discontinuity of T12 vertebral body with collapsed intervertebral disc space at T11-T12 region. The potential occurrence of myelomalacia may also explain the mixture of neurologic signs, however examination on the third day demonstrated typical upper motor neuron injury with hyperreflexic patellar and gradual returning of withdrawal reflex in both hind limbs. The rapid recovery of withdrawal function confirmed the lack of structural disease in lumbosacral area and therefore suggestive of the existence of spinal shock phenomenon in this cat. Conservative option was elected by the owner, centered at pain and inflammation control, with strict cage rest for 4-6 weeks period. Both patellar and withdrawal reflexes were exaggerated but the cat remain non-ambulatory after three weeks.

FELINE CORONAVIRUS INFECTION IN *Panthera tigris* (HIMALAYAN TIGER)

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Physical examination during post mortem of an adult male *Panthera tigris* (Himalayan Tiger) from Zoo of Johore State, revealed good body condition, sunken eyes, clenching teeth and biting tongue. Post mortem lesion showed hydrothorax, lung congestion and edema, liver and heart congested, sandy spleen, and both kidney congested. The tiger was treated with Pentobarbital as a medication with the history of seizure since infant. Cause of seizure is unknown. Histopathology revealed the pulmonary edema, severe congestion, and presence of neutrophil and lymphocyte and liver shows numerous cytoplasmic lipid droplet (steatosis). Numerous haemolytic E. coli was isolated from all organ and RNA virus FCoV (coronavirus) was isolated from intestinal organ. Cause of death is respiratory failure due to drowny cause by body weakness due to septicaemia by secondary bacterial infection (E. coli) to all organs due to stress due to hepatic lipidosis cause by animal not eating because have an episode of seizure that cause by FCoV infection previously that might disturbing the body central nervous system.

CHARACTERISATION OF FELINE MORBILLIVIRUS FROM MALAYSIAN ISOLATES

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Feline morbillivirus (FmoPV) is a new emerging virus of domestic cats categorised under the genus *Morbillivirus* with negative sense, single stranded RNA genome. Molecular prevalence study of feline morbillivirus in Malaysia is 32.7% whereby there was a higher detection rate among client-owned cats compared to shelter cats. Phylogenetic analysis showed that Malaysian FmoPVs were clustered with other Asian FmoPVs and shares 71%-95% nucleotide similarities with Japan and China isolates. Therefore, the objective of this study was to characterise the feline morbillivirus from Malaysian isolates in culture. Ten different isolates have been isolated and propagated in Crandell-Rees Feline Kidney (CRFK); FM3, FM4, FM53, FM88, FM151, FM167, FM168, FM169, FM170 and FM178. Urine isolation method has been used where urine was diluted with Dulbecco's Phosphate-Buffer Saline (DPBS) at the ratio of 1:1. CRFK cells infected with feline morbillivirus showed cytopathic effect characterised by syncytia formation of rounding cells followed with cell detachment. To further confirm the FmoPV infection, RT-PCR was performed with primers targeting the L gene of FmoPV producing 401 bp. Overall, these isolates will be further propagated in order to obtain virus stock for the development of quantitative diagnostic assays for the detection of feline morbillivirus.

CERVICAL LUNG LOBE HERNIATION IN A DOG

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Lung hernia in dog is rarely reported worldwide. This case report is the first reported lung hernia in dogs to be reported in Malaysia. Lung hernia is defined as an abnormal protrusion of lung beyond the normal thoracic cage. It is classified into 3 categories; cervical, intercostals, and diaphragmatic. A 7-year-old Shih Tzu and was referred to UVH for diagnostic imaging work up and treatment. History obtained was that the dog suffered chronic coughing for the past 3 months and was treated at the private clinic. Physical examination revealed cyanotic mucous membrane, coughing and tacchypnoea. Upon auscultation, heart murmur grade IV/VI with prominent arrhythmias was heard. There was harsh lung sound, and upon observation, there was a soft fluctuant tissue swelling resembling a 'bird crop like appearance' on the ventral neck region. The swelling was projected during inspiration and collapsed during expiration and obviously seen during coughing. Radiographs findings were cardiomegaly with the vertebral heart scale (VHS of 11.5), the heart is displacing the trachea cranial dorsally, lung consolidation and gas opacity seen at right cervical region. The dog was diagnosed with chronic degenerative valve diseases (CDVD) via echocardiography. A confirmative diagnostic through fluoroscopy was carried out and the dog was diagnosed with cervical lung lobes herniation due to chronic coughing due to CDVD. Herrniorhapy was recommended but considering the high risk of anesthesia for the surgery, the dog was treated conservatively at home.

ISOLATION AND PHYLOGENETIC ANALYSIS OF PARVOVIRUS ISOLATED FROM DUCKS IN MALAYSIA FROM 1995-2014

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Goose parvovirus (GPV) and Muscovy duck parvovirus (MDPV) can cause high mortality and morbidity in geese and ducks. In the present study, virus isolation was attempted from the liver and intestine of confirmed parvovirus cases detected using PCR from 1995 to 2014 in Malaysia. Five parvoviruses from Muscovy ducks and one from Pekin duck were successfully isolated by inoculation into 9-10 day-old Muscovy duck embryos. Phylogenetic analysis was conducted using partial region of VP3 gene amplified and sequenced from each of the isolates. Sequence analysis showed that all isolates from Muscovy duck shared 100% sequence similarity with isolate from Taiwan (V443/TW05). Contrarily, the isolate from Pekin duck shared 99% sequence similarity with GPV strain YBLJ and YZYZ20130304 from China. Interestingly, phylogenetic analysis revealed that the Muscovy duck isolates from 1995 to 2000 were grouped under MDPV of Taiwan strains. In contrast, Pekin duck isolate from 2014 was clustered under Asian strains of GPV. Based on the results obtained, we may conclude that MDPV has not been circulated after year 2000. However, more study should be conducted since the reported cases for this disease are limited or under reported. The results and information from this study contributes to the understanding of the parvovirus disease and serve as a baseline information for epidemiology and disease control management in Malaysia.

SEROPREVALENCE OF *Toxoplasma gondii* IN PET AND STRAY CATS IN KLANG VALLEY, MALAYSIA

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Toxoplasma gondii, is a zoonotic protozoan with worldwide distribution that causes toxoplasmosis, a diseases of public health importance. Domestic cats are the definitive host for this protozoon where oocysts are shed in their feces during primary infection however, cats may or may not exhibit clinical signs when infected with toxoplasmosis. Re-shedding of oocyst may be seen when cats are immunosuppressed. The close contact between humans and cats (pet and strays) during oocyst shedding periods pose the risk of zoonotic transmission. To determine the seroprevalence of *Toxoplasma gondii* in cats, serum samples were collected randomly from 98 stray cats at Dewan Bandaraya Kuala Lumpur (DBKL). Another 100 serum samples were randomly collected from pet cats presented to University Veterinary Hospital, Universiti Putra Malaysia. IgG antibodies against *Toxoplasma gondii* were tested using a commercial indirect Enzyme-Linked Immunosorbent Assay (ELISA) (ID Screen® Toxoplasmosis Indirect Multi-Species). The seroprevalence among the stray cats (7.14%, n=7/98) was higher compared to the pet cats (4%, n=4/100), however, there was no significant difference between both groups ($P>0.05$). There was also no association between other potential risk factors such as age, gender and breed with the seropositivity of *Toxoplasma gondii* in cats ($P>0.05$).

ASSOCIATION OF SOMATIC CELL COUNT SCORE AND MILK PRODUCTION IN MAFRIWAL COWS

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Bovine mastitis is a major production disease causing considerable loss to the dairy industry. Indicators for mastitis are generally based on somatic cells count in milk, which reflects the level of mastitis. In most dairy farms in Malaysia, animals are selected based on milk production traits. But the unfavourable correlations between milk yield (MY) and clinical mastitis (CM) suggest that selection solely on MY will result in the increase of CM incidences. An experiment was carried out to study the association of somatic cell count (SCC) and MY in Mafriwal dairy cattle. Milk samples and data of MY of a group of lactating Mafriwal cows between 3-10 years were collected fortnightly. Milk SCC was quantified using Chemometex NucleoCounter® SP- 100TM. In this experiment, somatic cell score (SCS), which is accepted generally worldwide as an indicator for measuring subclinical mastitis was used. The association between SCS and MY were plotted and analysed. From the data, a negative relationship between SCS and MY was observed. The results suggest that MY will decrease subsequently with the increasing of SCS, indicating that the more severe the inflammation, the lower the production of milk in Mafriwal breed. Therefore, the relationships will help to identify the optimum MY in Mafriwal milk production. The optimum production was identified at 8.0 l/day for an optimum reading of SCS. This can be a MY threshold for targeting mastitis control in Mafriwal herd.

DISTRIBUTION OF INFECTIOUS BURSAL DISEASE DIAGNOSED IN NORTHERN REGION OF MALAYSIA FROM 2006-2016

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Data over a period of eleven years were analyzed for Infectious Bursal Disease (IBD) virus isolated from chicken samples submitted to the Regional Veterinary Laboratory at Bukit Tengah, Malaysia (RVLBT). A total of 247 suspected IBD cases were tested by Virology Section, RVLBT between years of 2006 to 2016. IBD virus was isolated using Agar Gel Precipitation Test (AGPT), where a bursal homogenate was used as an antigen against a known positive antiserum. Results showed 27 cases (11%) from a total of 247 suspected cases in chickens were positive for the presence of IBD. The positive detection rate of IBD may be influenced by age of chickens with an increase in the possibility of IBD occurring in chicken older than 3 weeks. Apart from that, both boiler and local chickens are highly susceptible to this disease. Therefore, awareness on the existing IBD cases indicates the importance of strict management procedures, proper management programmes, vaccination and immunization for chickens in Malaysia.

UTILIZATION OF PALM KERNEL CAKE AS FEEDSTUFF FOR RAISING CATTLE AND GOATS UNDER SMALLHOLDERS CONDITION IN BACHOK, KELANTAN

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Palm kernel cake (PKC), also known as palm kernel meal (PKM), or palm kernel expeller (PKE) is a commonly used feed for various ruminant species in Malaysia. The oil milling industry differentiates PKC as the solvent extracted type while PKE is the screw-pressed type. The meal is comparable to copra meal, rice bran or corn gluten feed. It's crude protein (CP) and crude fibre (CF) contents are 16 % and 17 % respectively with metabolizable energy (ME) value of about 10.5 MJ/kg for beef cattle. This study aimed at determining how PKC was utilized by the smallholders in Bachok, Kelantan as one of the main ingredients in the rations of beef cattle and goats. The inclusion levels of PKC in the beef and goat rations ranged from 10% to 40%, depending on the cost and location. Common feedstuffs used as a mixture to PKC include Napier grass *(Pennisetum purpureum*), Signal grass *(Brachiaria humidicola),* local grasses, grass or corn silage, soya waste, soya bean hull, rice bran, rice straw, molasses and combinations of roughages. PKC was used as partial or total replacement for commercial cattle or goat pellets. Our simple survey using a structured questionnaire revealed that 50% of the cattle farms visited in Bachok District (n: 8) fed PKC in the form of porridge (mixing PKC in drinking water) as compared to 12.5% in goat farms (n: 16). Problems associated with inappropriate feeding of PKC and practical methods to improve their feeding practises is discussed in relation to the animal daily nutrient requirements. The need of Calcium (Ca) supplementation and importance of maintaining appropriate Ca to P ratio is emphasised when PKC is used as the major component of ruminant rations. A practical method to utilize PKC and other locally available feed resources for raising cattle and goats in Bachok District is discussed.

GROWTH PERFORMANCE OF TILAPIA FED ON PALM KERNEL MEAL BASED DIET SUPPLEMENTED WITH PROTEINASE

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Supplementation of enzyme in feed can improve the growth performance of fish. Enzymes such as proteinase, non-starch polysaccharide degrading enzyme, phytase, lipase and others are the common enzymes used in the feed industry. Protein is the most expensive feed component. Proteinase can break down protein via proteolysis process and improve the protein digestion process. In the fish industry, proteinase is commonly used to degrade and release the protein trapped in feed ingredients and subsequently increase protein digestibility. Palm kernel meal (PKM) is a by-product of palm kernel oil extraction. In 2012, 2.40 million tonnes of PKM (MPOB, 2013) was produced in Malaysia. Palm kernel meal has the potential to be used as an alternative energy and protein source in aqua feed as it contains about 18% protein and 17.17 MJ/kg of gross energy. In this study, effect of supplementation of proteinase on palm kernel meal (PKM) based diet was studied. The diet in this study consisted of soybean meal, corn gluten meal, PKM, poultry by product, corn and others. The results suggested that proteinase can improve protein digestibility of feed. However, the growth performance of tilapia fed on proteinase feed was not significantly different with the tilapia fed on diet without proteinase. This might due to interference of protein absorption process by high hemicellulose content in PKM. Further study of supplementation of combination of enzymes in fish feed is suggested to optimise the nutrient digestibility of feed and subsequently producing a cost-effective feed.

ANTIGEN DETECTION OF FOOT AND MOUTH DISEASE AND ITS SEROTYPE FROM SAMPLE SUBMITTED TO REGIONAL VETERINARY LABORATORY KOTA BHARU FROM 2012 TO 2016

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In Peninsular Malaysia, foot and mouth disease (FMD) has been reported in early 1860's which then become sporadic and causing outbreak every year. Since then, Peninsular Malaysia has become endemic with FMD. The aim of this study is to provide findings of the current FMD occurrence and its serotyping in Peninsular Malaysia. An identification of Foot and Mouth Disease serotype was carried out in Peninsular Malaysia by the Regional Veterinary Laboratory Kota Bharu (RVLKB) only. Epithelial tissue samples were received from 10 states throughout Peninsular Malaysia from 2012 until 2016. Indirect sandwich ELISA was performed using ELISA kit for FMDV antigen detection supplied from the Institute of Animal Health, Pirbright Laboratory. All findings and result in this paper were based on samples received by RVLKB and does not reflecting overall cases reported to State DVS or DVS Malaysia. The results revealed that in the year of 2013 had the highest samples positive for FMDV 35% from 43 samples, followed by 2014 31% from 80 samples, 2012 with 24% from 122 samples, 2015 21% from 39 samples and the least is 2016 17% from 194 samples. Meanwhile, the most common FMDV serotype detected throughout 2012 to 2016 from 110 positive samples was Serotype O 80% followed by Serotype A 20% and none from Serotype Asia 1. Strict regulation, FMD vaccine evaluation by LPB ELISA and strict animal movement shall be considered to achieve FMD free in 2020.

A CASE REPORT OF HIGHLY PATHOGENIC AVIAN INFLUENZA OUTBREAK IN POULTRY IN KELANTAN

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Highly pathogenic avian influenza (HPAI) is caused by influenza virus A from the family orthomyxoviridae. It is a severe, systemic disease with high mortality in avian. The mortality can be as high as 100% in a few days. In February 2017, HPAI virus of H5N1 subtype was confirmed in village chickens from a rural village Kota Bharu Kelantan. It was the second outbreak of HPAI in Kelantan after the first reported case in August 2004. Most of the dead poultry showed similar clinical signs of sudden death with high mortality, cyanosis and edema of head, comb, wattle and snood as well as red discoloration of shanks and feet. Post mortem performed on the dead poultry showed generalized hemorrhages of all internal organs, congested mesenteric blood vessels and pin point hemorrhages on proventriculus. Histopathological examination revealed generalised pulmonary hemorrhages with moderate interstitial pneumonia, hepatic hemorrhages and hepatitis with multifocal area of hepatic necrosis, haemorrhagic myocarditis and hemorrhagic nephritis. Confirmation test was performed using RT-PCR and viral isolation at Veterinary Research Institute, Ipoh. Thirty-six foci were affected involving 5 Districts (Kota Bharu, Tumpat, Bachok, Pasir Mas and Tanah Merah) causing depopulation of 56953 poultry and 17531 eggs. Surveillance and control measures were taken by Department of Veterinary Services (DVS) to contain the disease from spreading to other area.

SEROPREVALENCE OF ZOONOTIC DISEASES IN DAIRY CATTLE AND FARMERS AWARENESS

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The objectives of this cross-sectional study are to estimate the prevalence of zoonotic diseases which are Brucellosis, Melioidosis, Salmonellosis, Caseous lymphadenitis (CLA), Leptospirosis and Bovine Tuberculosis (bTB) in dairy cattle at Kedah and to determine the awareness on zoonoses among the farmers. The most prevalence diseases are bTB and CLA. There are no reactors detected for other diseases. All the respondents do not realise there are diseases from cattle that are able to transmit to human. Ninety percent (90%) of the respondents understood and agreed that disease screening programme should be performed on their animal annually. There is no significant difference in zoonoses awareness between respondents in each district (P>0.005). The prevalence of each disease, herd prevalence and analysis on the questionnaire will be discussed in the paper. In conclusion, bTB and CLA are prevalence in the herds. The prevalence of the diseases considered low. Nevertheless, the infected animal may become source for spreading disease in the herd and human. The study had revealed the farmers have low levels of awareness on zoonotic diseases. As such, awareness of zoonotic diseases can be improved by intensifying an awareness program and continuous an extension program. These findings could be useful for veterinary authority to consider awareness levels by cattle farmers for effective disease control.

ASSESSMENT OF DAIRY FARMERS' PERCEPTION AND AWARENESS ON LAMENESS OCCURRENCE, ASSOCIATED RISK FACTORS AND CLAW HEALTH ASSESSMENT SYSTEMS IN SELANGOR, MALAYSIA

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Lameness is a major welfare problem with adverse effect in dairy cows. To influence farmers' decision in the management of lame cows, understanding their awareness of the problem is pertinent. This study assessed dairy cattle farmers' perception on lameness, associated risk factors and claw health management practices in Selangor, Malaysia. A structured questionnaire was adopted and distributed to 120 dairy farmers. The response rate was 68% (n= 82/120). Sixty eight percent (n=56/82) perceived lameness affects productivity. Higher number of respondents (n=63) were aware of herd level factors compared to perception on cow level factors (n= 36) associated with lameness. Self-assessment of claw health was practiced by 71% (n=58/82) of respondents. Fifty-two farmers (63%) stated immediate attention was not given to lame cows stating high cost of treatment and lack of professional services as main reasons. However, about 50% (41/82) of the respondents do not apply any of the considered welfare assessment methods while 45 (55%) and 31 (38%) respondents depended on non-weight bearing and obvious affected limb as signs of lameness. Higher level of education and more farming experience of respondents were significantly associated ($p < 0.05$) with knowledge of lameness and associated risk factors. Farmers in the region need to be enlightened on cow level risk factors and relevance of lameness detection methods to reduce lameness occurrence and its welfare implication in dairy cows.

HAEMATOLOGY AND SERUM BIOCHEMISTRY OF ICR-MICE IN ACUTE ORAL TOXICITY STUDY OF HYDROETHANOLIC LEAF EXTRACT OF *Moringa oleifera*

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Moringa oleifera (*M. oleifera*) Lam is one of the important multipurpose plants that are widely distributed and used in traditional medicine. This study investigated the acute oral toxicity of hydroethanolic leaf extract of *M. oleifera* in ICR mice. A total of 15, 8-week old female mice were used in this study. The mice were equally grouped into three groups namely groups A (control), B (vehicle; 5% DMSO) and C (treatment). A single dose of 2000 mg/kg *M. oleifera* hydroethanolic leaf extract was administered to the treatment group through oral gavage. The mice were then monitored closely for signs of toxicity and sacrificed humanely using CO_2 chamber at day 15. Blood samples were collected for haematology and serum biochemical analyses. Throughout the period of observation, the mice did not show any signs of toxicity nor mortality. There were no significant changes in the body weight of the mice in the treatment group compared to the control. Moreover, there were no significant changes in their relative organ weights, haematological and biochemical parameters in all groups It was concluded from this study that, single administration of *M. oleifera* hydroethanolic leaf extract at 2000 mg/kg does not exhibit any significant haematological and serum biochemical alterations in mice, and as there was no mortality observed, its lethal dose (LD_{50}) in mice is greater than 2000 mg/kg.

DERMAL EXPOSURE ASSESSMENT OF ETHANOLIC EXTRACT OF *Morinda citrifolia L.* FRUITS IN SPRAGUE DAWLEY RATS

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Morinda citrifolia known as 'Mengkudu' among Malaysians is a native plant in Southeast Asia and Polynesia. This study aims to evaluate acute and sub-acute dermal toxicity of ethanolic extract of *M. citrifolia* fruits to justify the traditional practice of this plant in treating dermal illness. This study was conducted according to the OECD guidelines (No. 402 and No.410), respectively. Each study comprised of 30, 8-week old female Sprague Dawley rats which were divided into 5 groups. In the acute toxicity study, each group (n=6) was topically applied with the plant extract on a shaved area of dorsal skin at concentrations of 2.5%, 5% and 10%, respectively, once at day 1 followed by daily observation for 14 days. In the sub-acute toxicity study (n=6), each treatment group received daily application of the extract at similar concentrations for 28 days. Control groups received white soft paraffin (vehicle) and no treatment respectively. All rats in both experiments were closely monitored for any changes in the physical activity and behaviour. Results of both studies showed no mortality, and all rats displayed normal physical activity and behaviour. Body weight, relative organ weight of kidneys, liver and spleen, haematology and serum biochemistry results revealed no significant differences ($p>0.05$) between treated and control groups in both studies. Gross and microcopic morphology of the kidney, liver and skin tissues also showed normal architectures. This study demonstrated that ethanolic extract of *M. citrifolia* fruits causes neither adverse skin reactions nor systemic toxicity in female Sprague Dawley rats.

GROSS MORPHOLOGICAL EVALUATION OF EXCISIONAL CUTANEOUS WOUND TREATED WITH ETHANOLIC EXTRACT OF *Morinda citrifolia* FRUITS IN SPRAGUE DAWLEY RATS

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This study aims to determine the optimum concentration of ethanolic extract of *M. citrifolia* fruits that can be used to promote wound healing activity. A total of 42, 8-week old male Sprague Dawley rats were divided into 3 treatment groups (low, medium and high-concentration herbal extract [% w/w]) and 3 control groups (parafin [vehicle], silver sulfadiazine [SSD] and no treatment [negative control]) consisted of 7 rats in each group. All rats were inflicted with a circular excisional wound of 500 mm^2 of size on the dorsal thoracic region and treated daily with the respective treatment for 21 days. The wound was examined daily for the presence of exudate, necrotic tissues and scabs. The rate of wound contraction was determined by measuring the changes in the size of the excisional wound at 4-day intervals of 21 days. Results revealed all rats treated with low, medium and high-concentration herbal extracts had less amount of exudate and scab, compared to the negative control and vehicle groups. The herbal treated groups also had a significantly ($p<0.05$) higher rate of wound contraction compared to the negative control and vehicle groups. Interestingly, rats applied with high-concentration herbal extract demonstrated the highest ($p<0.05$) rate of wound contraction compared to low and medium concentrations. Meanwhile, a similar wound contraction rate between high-concentration herbal extract group and SSD group (positive control) was recorded. Results in this study suggest that high concentration of *M. citrifolia* fruit extract is regarded as an optimum concentration that can be used to promote more rapid cutaneous excisional wound healing in rats.

IN VIVO EVALUATION OF ANTHELMINTIC ACTIVITY OF METHANOLIC AND AQUEOUS *Moringa pterygosperma* LEAF EXTRACTS

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The study was carried out to evaluate the ethnoveterinary anthelmintic medicinal herb of *Moringa pterygosperma* in Boer goats that were experimentally infected with *Haemonchus contortus* third stage larvae (L3). A total of 15, 2-year old clinically healthy female Boer goats, non-pregnant and non-lactating, were equally divided into five groups namely groups A, B, C, D and E, which were control, negative control, positive control, aqueous and methanolic herbal extract groups, respectively. Fresh *M. pterygosperma* was supplemented daily to the groups D and E goats for 105 days before L3 challenged infection was performed. The fresh herb was continuously supplemented until *Haemonchus*' eggs were significantly detected in the feaces. Once the eggs were detected, supplementation of *M. pterygosperma* fresh leaves to groups D and E goats was replaced with *M. pterygosperma* leaf methanolic extract (MPME) and aqueous extract (MPAE), respectively. The MPME and MPAE treatment were given daily and ended once low EPGs were discovered. Throughout the experiment, weekly body weights and complete blood counts were also evaluated. Results demonstrated that goats in groups D and E showed faster recovery from haemochosis and haemonchosis induced-haemorrhagic anaemia. The goats also had higher weight gain compared to the other groups. It is concluded that both aqueous and methanolic extracts of *M. pterygosperma* leaves possess potential anthelmintic activity against H. contortus.

IN VITRO ANTHELMINTIC ACTIVITY OF LEAF EXTRACTS OF *Moringa pterygosperma* AGAINST *Haemonchus contortus*

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Improper use of anti-parasitic drugs for controlling gastro-intestinal parasites in small ruminants has resulted development of anthelmintic resistance against these chemical anthelmintic drugs. This inspired an interest to search an alternative ethnoveterinary medicine for controlling these parasites. Previous studies reported *Moringa pterygosperma* (MP) leaf extract possesses antifungal, antibacterial, antioxidant and anti-inflammatory activities. In this study, the in vitro anthelmintic activity of MP was evaluated. Four different concentrations of MP leaf extracts, extracted using methanol (MPME) and water (MPAE), were evaluated for its anthelmintic effects on *Haemonchus contortus* larval mortality, and higher concentration of the extracts was tested on *H. contortus* adult worm motility. Results showed LC_{50} for MPME and MPAE was established at 5.62 mg/mL and 6.94 mg/mL, respectively, while LC_{90} was established at 10.11 mg/mL and 12.5 mg/mL, respectively. 100% paralysis of adult worms was observed at 6 hours upon exposure to either MPAE or MPME. The paralysed adult worms revived within 30 minutes after they were placed in PBS. On the other hand, adult worms treated with levamisole, remained paralysed after 30 minutes in the PBS. Based on the results, it can be concluded that both methanolic and aqueous MP leaf extracts exhibited anthelmintic activity against *H. contortus* L3 and adult worms.

Phyllanthus niruri REDUCES CD146 TRANSCRIPTION IN RATS WITH ADENINE-INDUCED CHRONIC RENAL FAILURE

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CD146 is expressed at the endothelial junction and its dysfunction is observed in chronic kidney disease (CKD) or chronic renal failure patients as early as in stage 1. Many measures were taken to slower the effects of CKD in human including through therapeutic and natural remedies. *Phyllanthus niruri* is the Malaysian herb known as 'pokok dukung anak'. It has been widely used as antiviral, antibacterial, treating diabetes, jaundice and breaking kidney stone. This study aims to evaluate the ethnopharmacological effects of *P. niruri* in reducing the transcription of circulating CD146 in adenine-induced CKD in rats using real time RT-PCR assay. Rats were divided into four groups, which were treated for 6 weeks with normal feed (control group), 0.75% (w/w) adenine-mixed feed (CKD group), *P. niruri*-mixed feed (PN group) and 0.75% adenine plus *P. niruri*-mixed feed (CDK+PN group). At the end of the 6th week, all rats were continually monitored for another 4 weeks and treated with the similar diet, except for the adenine-treated groups; the rats were given normal diet throughout the last 4 weeks of the experiment. Blood and a 12-hour urine collection were sampled at the end of the experiment (week 10). Adenine demonstrated to cause deterioration of kidney function and glomerular injury as shown by decreased creatinine clearance (CrCl) and escalation of urine protein ratio (UPC), respectively. Moreover, it caused a remarkable increase in the CD146 transcripts in the blood circulation. Interestingly, CKD rats treated with *P. niruri* showed improvement in the CrCl and UPC values and also expressed a significant decrease in the CD146 transcripts. Apart from that, *P. niruri* did not exhibit any adverse effects on the kidneys; it indeed improved kidney functions as shown by high CrCl value in rats of PN group. These findings suggest *P. niruri* could be used as a potential ameliorative agent in CKD patients.

Phyllanthus niruri ALLEVIATES THE PROGRESSION OF CHRONIC KIDNEY DAMAGE IN RATS

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Herbal medicine researchers discovered *Phyllanthus niruri* interferes the formation of calcium oxalate crystal in the kidneys, which protects the kidneys from further damage. This study aims to appraise the effects from *P. niruri* in rats with adenine-induced chronic kidney disease (CKD). A total of 24, 8-week old male Sprague Dawley rats were equally divided into 4 groups, which were control, 0.75% w/w adenine, *P. niruri*, and 0.75% adenine plus *P. niruri* groups. The experiment was conducted in a 10-week period. *P. niruri* was mixed in the feed and given to rats of *P. niruri* and adenine plus *P. niruri* groups throughout the study period. Adenine was also mixed in the feed, but only given to rats in the adenine and adenine plus *P. niruri* groups for the first 6 weeks of the experiment. Blood samples were collected weekly through tail veins for the evaluation of blood urea and creatinine levels. Kidneys were collected at the end of the experiment and examined for the gross and microscopic lesions. Oral adenine was successfully induced established CKD in rats, which was demonstrated by a persistent azotaemia and permanent renal lesions including interstitial fibrosis. *P. niruri* significantly reduced the azotaemic levels in CKD rats. The CKD rats that received *P. niruri* also demonstrated significantly less severe renal lesions, which include tubular necrosis, interstitial nephritis and adenine crystal precipitation. Based on the findings, further study should be carried out to fully understand the benefits of *P. niruri* that can be translated into perceived clinical benefits such as improved quality of life of CKD patients.

HISTOLOGICAL ASSESMENT OF KIDNEYS OF MALE SPRAGUE DAWLEY RATS IN SUBACUTE TOXICITY STUDY OF *Mariposa christia vespertilionis* LEAF ETHANOLIC EXTRACT

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Mariposa christia vespertilionis leaf or well known as rerama leaf has gained lots of attention in Malaysia for the past few years. The toxicity effects of this leaf on kidneys of rats have not been evaluated. Hence, the present study was conducted to evaluate the toxicity effects of *M. christia vespertilionis* leaf ethanolic extract on rats' kidneys that were administrated orally, daily, with the extract at three different concentrations for 28 days. A total of 30, 8-week old male Sprague Dawley rats were divided equally into two control groups; normal and 5% DMSO (vehicle) and three treatment groups; low (75 mg/kg), medium (125 mg/kg) and high (250 mg/kg) dose groups. The rats were observed daily and standard toxicology parameters including mortality, behavioural changes, motor-neuronal abnormalities, body weight and feed-water consumption pattern were recorded. At the end of the experiment, all rats were humanely sacrificed and blood samples were collected for analyses of renal serum biochemical parameters (urea and creatinine). Kidney histology examination was also performed to confirm the toxicological effects of the herb on kidney tissues. Histologically, granular cast, cellular cast, protein cast, inflammation, tubular degeneration and necrosis in the kidney tissues were examined. Results showed that mortality, and abnormal physical activity and behaviour were not observed. Renal biochemical parameters of all treated groups were within normal limits. Histological evaluation of kidney tissues also showed no significant ($p>0.05$) changes in all treated groups. It is concluded that *M. christia vespertilionis* leaf ethanolic extract does not induce renal toxicity.

Azadirachta indica AND THE L3: FATAL ATTRACTION!

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Gastrointestinal (GI) parasitism is an important cause for mortality and morbidity of small ruminants in Malaysia and many parts of the world. Neem plant (*Azadirachta indica*) has been shown to possess many medicinal properties such as antifungal, antibacterial, anti-inflammatory and anthelmintic activities. This study was conducted to determine the anthelmintic effect of neem leaves on the third-stage larvae (L3) of strongyles from sheep **in vitro**. Pooled faecal samples from 22 sheep with the history of GI parasitism were cultured to harvest the L3. In total 3000 L3 were used in the experiment, whereby 100 L3 per dish replicated in six petri dishes and divided into five groups. Three groups were tested with 5, 10 and 15mg/ml of the neem chloroform extract concentrations, Levamisole (10 mg/ml) as the positive control, and 0.01%DMSO + deionozed water as the negative control. The L3 mortality was measured at 2, 4, 6, and 24 hours post treatment. All L3 in Levamisole-treated group died within 2 hours. By the end of the 24 hours post treatment, the average mortality rate of L3 was over 80% for all neem extract-treated groups. Overall, all treated groups showed a significant anthelmintic efficacy against L3 compared to the negative control group ($KW=93.55$, $df=4$, $P<0.05$). In conclusion, the chloroform extract of *Azadirachta indica* in this study showed a significant larvicidal effect on the L3 of strongyles originated from sheep. Further studies using lower levels of concentration of the neem extract are suggested.

EVALUATION OF GOATS AS AN ANIMAL MODEL FOR URETHRAL REGENERATION STUDIES USING BIOENGINEERED GRAFTS

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Patients with hypospadias and urethral strictures require urethral reconstructive surgery. The ideal urethral graft should induce long-term functional regeneration, easy to use, cost effective and safe. This study aimed to evaluate the goat as a model for urethral regeneration using an engineered graft. A 4cm tubular urethral graft was implanted in an artificially created urethral defect in two goats with urinary catheters placed post-operatively. Goat 1, on day 1 post-operation, developed hematoma which led to suture breakdown and required evacuation. Four days later, a self-inflicted hematoma formed and another evacuation was done which led to wound infection and complete dehiscence and the animal was euthanized. Diathermy and multiple closure of fascial layers were done in Goat 2 to prevent post-operative bleeding. Goat 2 had an exposed and necrotized glans penis due to the tight closure of the dartos fascia. The tip was amputated but distal necrosis and a proximal fistula formed from the site of anastomosis. A percutaneous bladder catheter was inserted to allow drainage of urine for 14 days. Urine was dribbling from the amputated tip and the fistula. The animal was euthanized at 1-month post-op when the urinary stream was lesser and the fistula larger. Histologically, the graft site showed early onset of regeneration and in-growth of native tissue from the anastomotic edges. Even though histological data was encouraging, the anatomical variation with humans and the thin urethra of the goat makes it an unideal model for urethral clinical translation studies.

MICROSCOPIC AND MOLECULAR DETECTION OF *Giardia* spp. IN FECAL SAMPLES AMONG SHELTER DOG POPULATION IN SELANGOR

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Giardia spp. is a protozoan that can be found in faeces of human and animals and is considered to have zoonotic potential. In vertebrates, including mammals, birds, reptiles and fishes, clinical signs like diarrhoea, vomiting, weight loss and lethargy are frequently observed while in humans, various clinical manifestations have been reported ranging from asymptomatic to acute, intermittent or chronic diarrhoea. This study aimed to determine the occurrence of *Giardia* spp. in faecal samples from shelter dog population in Selangor by using microscopic and polymerase chain reaction (PCR) detection methods. Secondly, the occurrence of *Giardia* spp. was investigated for its association with occurrence of diarrhoea. This research was approved by the UPM IACUC and consent received from the five shelters. A total of 130 dogs were randomly selected based on convenience sampling. Faecal swabs were obtained and rolled onto glass slides, air-dried and stained with both Giemsa and Ziehl-Neelson and microscopically examined. Seventy faecal samples were sufficient for nested-PCR assay where primers specific for *Giardia* were used. Gel electrophoresis was further done to verify the PCR product sizes. Statistical analysis was done using SPSS where P-value<0.05 was considered significant. *Giardia* spp. was detected from four dogs out of 130 dogs (3.1%) on microscopic evaluation which was confirmed on PCR detection where all the four dogs was also positive. A total of 17.1% of the samples were positive for *Giardia* spp. by nested-PCR detection method. There was four times higher positive detection of *Giardia* spp. in dogs with diarrhoea and it was statistically significant through Pearson's chi-squared analysis. DNA sequencing and phylogenetic analyses was also done to confirm the Giardia sp. and homology to reported sequencing in the database. In conclusion, this study reports for the first-time molecular detection of *Giardia* spp. in 17.1% of shelter dogs in Malaysia. It is recommended that all shelter dogs should be periodically dewormed to prevent transmission of *Giardia* spp. among the shelter animals within the same enclosures and avoid potential zoonotic transmission to care takers of the shelter.

ANTHELMINTHIC RESISTANCE IN EIGHT SMALL HOLDER FARMS IN IPOH, PERAK

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Helminth infection has been recognised as the most important cause of mortality and morbidity in small ruminants in Malaysia. Nematode faecal egg count reduction tests (FECRT) were conducted on eight free grazing small holder goat farms in Ipoh, Perak over the period from 2013 to 2014. The four drug groups tested in this study were Benzimidazoles, Imidazothiazoles, Macrocyclic Lactones and Salicylanilides. In this study, 8 goat farms complaining of severe helminhiasis showed that at least 2 groups of anthelmintic (levamisole and closantel) were ineffective in 50% of the farms. Results of Farm 3, Farm 4, Farm 5 and Farm 8 showed these 4 farms were resistant to all 4 drug groups of anthelminthic that were tested and the major worm population identified from these farms were *Haemonchus contortus* (62.9%), *Trichostrongylus colubriformis* (20.0%) and *Oesophagostomum* sp. (13.0%). The results showed Farm 1, Farm 6 and Farm 7 had resistance to all the 3 drug groups except to Closantel (Flukiever). The worm population showed *Haemonchus contortus* (55.5%), *Oesophagostomum* sp. (10.2%) and *Trichostrongylus colubriformis* (8.8%). Farm 2 showed resistance to Benzimidazoles and Macroyclic Lactones and was susceptible to Closantel and Levamisole. The worm population in Farm 2 was *Haemonchus contortus* (76.4%), *Trichostrongylus colubriformis* (17.8%) and *Oesophagostomum* sp. (5.8%). To control helminths using alternative approaches such as cut and carry feeding, herbal medication using Neem leaves (*Azadirachta indica*) and rotational grazing were recommended. Awareness on correct anthelmintic use is advocated.

DIAGNOSTIC WORKLOAD AT THE REGIONAL VETERINARY LABORATORIES, MALAYSIA FROM JANUARY TO JULY 2017 IN MVK KOTA BARU, BUKIT TENGAH, KUANTAN, JOHORE BAHRU AND WILAYAH TENGAH

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The Department of Veterinary Services has five regional laboratories in West Malaysia which are dedicated to conducting diagnostic, monitoring and surveillance testing on animal samples submitted by farmers, State Veterinary Services as well as private veterinarians. Over the period from January to July 2017, a total of 91,668 tests were conducted in five Regional Veterinary Laboratories for bacteriology, public health, virology, parasitology, serology and pathology. The highest number of virology tests (3155) were conducted in March 2017 in MVK Kota Baru for diagnosis of Avian Influenza and Foot and Mouth Disease. The Highest number of Bacteriology tests (17,126) were conducted in MVK Bukit Tengah in March 2017. In MVK Wilayah Tengah too the highest number of tests conducted were bacteriology tests (2,410) in March. In MVK Kuantan and JB too, the highest number of tests conducted was for Bacteriology followed by Virology. On average, each lab conducts 18,334 tests for critical diseases such as Salmonellosis, Newcastle disease, and several others. The DVS regional laboratories support the field veterinary services and form an integral part of disease control and eradication programmes. The aim of this analysis is to highlight the diagnostic load and further analyse common trend in infections observed through diagnosis so that rapid action can be instituted to establish a disease free livestock enterprise in the country.

INDUCTION OF PERIODONTAL DISEASE VIA COMBINATION OF LIGATURE AND LIPOPOLYSACCHARIDE INJECTION IN A RAT MODEL

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Periodontitis is a chronic inflammatory condition that can results in progressive degradation of the periodontium and alveolar bone loss in both humans and small animals. This abstract aims to report the use of retentive ligatures and lipopolysaccharide (LPS) injections to induce periodontal disease in rats. Under isoflurane anaesthesia, a 4/0 nylon suture was bilaterally applied around the 2nd maxillary molars in 18 rats. An LPS from *Porphyromonas gingivalis* was injected to the palatal mucosa of the 2nd maxilla molar twice a week. Six rats were sacrificed at each of 7, 14, 30 days after induction of periodontitis. Grossly, the periodontal tissues showed increased gingival and plaque indices. Histologically, there were increased inflammatory infiltrates and blood vessels at the interproximate sections between first and second molar, and between second and third molar. There was connective tissue detachment, resulting in increased distance between the cement-enamel junction (CEJ) and alveolar bone crest (ABC). Microcomputed tomography further confirmed the increased CEJ-ABC distance. These degenerative changes were evident as early as 7 days post-ligature and LPS injection; remained until 14 days, and declined thereafter. In conclusion, the combined ligature and LPS injection technique was effective to induce acute periodontitis within 7 days. This predictable disease model may be useful to compare potential treatments for periodontal disease.

THE IMPACT OF DIFERENT FLOORING TYPES ON BEHAVIOURAL RESPONSE IN LOCAL DAIRY COWS

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Factors that can contribute to low milk production in dairy cows include among others, an increase in disease occurrence related to poor farm management and lack of enrichment program. Previous studies demonstrated that compared to concrete flooring, the use of anti-skid rubber flooring improved animals' behaviour and performance as these animals were able to express their natural behaviour freely even in a confined environment. Nevertheless, concrete floor is commonly preferred by a large number of farmers as this floor type can be easily installed, cheap, fairly durable and easy to clean. This study was conducted to determine the effect of anti-skid rubber flooring on neurobehavioural response and milk yield in dairy cows. A total of 40 dairy cows from two concrete-floor and two anti-skid floor farms were selected. Behaviour such as standing, lying, feeding and drinking was recorded and catalogued using an ethogram and video camera recording for 2 hours per day for five days. The frequency and duration for each behaviour observed were analysed using Solomon Coder© program. Results showed that cows tend to lay down more on anti-skid rubber mattress compared to concrete flooring. Milk yield from cows reared on anti-skid rubber mat was significantly higher than cows kept on concrete floor farms. Provision of an appropriate enrichment is therefore crucial in influencing milk production in dairy farms.

GROWTH PERFORMANCE OF DORPER SHEEP WEANED AT DIFFERENT AGE

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Productivity is an important indication to evaluate a farm performance. Early weaning has been reported to offer many advantages such as allowing ewes to return to breeding condition earlier, thus accelerating lambing programs. Early weaned lambs usually reach market weight earlier and this is directly associated with fast maturity. Therefore, this study has been carried out to evaluate the growth performance of Dorper sheep weaned at different ages. In this study, a total of 27 new-born male Dorper sheep were selected randomly and divided into three groups of 9 animals each. Animals in group 1, group 2 and 3 (n=9) were weaned at 30, 60 and 90 days, respectively. Group 3 served as control group based on current weaning practice. Creep feed was provided to the respective groups of lambs before weaning followed by grower feed after weaning at 3.5% of the animal mean body weight. Throughout this period, body weight was taken every month and the average daily gain (ADG) were recorded until they reached 270 days of age to monitor the growth performance of the lambs. Results of the growth performance of Dorper sheep weaned at different ages indicated no significant differences between 30, 60 and 90 days of weaning age. However, high mortality was recorded in group 1 (weaned at 30 days). In conclusion, lambs can be weaned as early as 60 days to minimize the risk of mortality and maximize the farm production emergency.

CUSTOMER SATISFACTION OF SERVICE QUALITY IN VETERINARY CLINICS IN MALAYSIA BY USING SERVQUAL MODEL

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The number of veterinary clinics in Malaysia has now increased by four-fold as compared to ten years ago. It is important for veterinary clinics to differentiate itself from others for example by improving its service quality. The objective of this study was to determine customer's service satisfaction at veterinary clinics in Malaysia. A survey was conducted in total at 14 veterinary clinics which were located at Kuala Lumpur (n=2), Johor (n=1), Melaka (n=2), Negeri Sembilan (n=1), Perak (n=1), Pulau Pinang (n=3), Sarawak (1) and Selangor (n=3) using SERVQUAL questionnaire. Questionnaire included questions on sociodemographic, overall satisfaction and service quality (tangible, reliability, responsiveness, assurance and empathy dimensions). Questions on service quality were divided into expectation set and perception set scored by using five-point Likert type scale. Gap score for service quality was defined as the difference between perceptions and expectation of the same order. Data editing and analyzing were done in Microsoft Excel® and IBM SPSS version 20. For overall satisfaction, 52% of customers were satisfied with the service and 64% think they wanted to come again. This showed there is room for improvement in veterinary clinics. For service quality gap score, customers were not satisfied with reliability, responsiveness and assurance dimensions (Gap score= -0.04, -0.01 and -0.07 respectively). Veterinarians could invest more on management skills so that they can give service they promised in due time and gain trust from clients. Customers were satisfied with tangible (Gap score=0.05) and empathy (Gap score=0.10) showing that veterinary clinics were equipped to treat patients and veterinarians genuinely care for patient.