10th Proceedings of the Seminar on VETERINARY SCIENCES

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Faculty of Veterinary Medicine UPM
23-27 February 2015

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Universiti Putra Malaysia Press
Serdang • 2015

First Print 2015

UPM Press is a member of the Malaysian Book Publishers Association (MABOPA)
Membership No: 9802.

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Seminar on Veterinary Sciences (10th : 2015 : Serdang, Selangor)
10th Proceedings of the Seminar on Veterinary Sciences
23-27 February 2015 / Editors Rasedee Abdullah, Mohamed Ariff Omar, Abdul Rahim Mutalib, Abdul Rani Bahaman, Saleha Abdul Aziz, Siti Suri Arshad, Gayathri Thevi Selvarajah, Wan Mastura Shaik Mohamed Mossadeq
Includes index
ISBN 978-967-344-498-4
1.Veterinary medicine-- Congresses. 2. Animal health – Congresses.
3. Livestock--Diseases--Congresses.
I. Rasedee Abdullah. II Mohamed Ariff Omar III. Abdul Rahim Mutalib
IV. Abdul Rani Bahaman V. Saleha Abdul Aziz VI. Siti Suri Arshad
VII. Gayathri Thevi Selvarajah VIII. Wan Mastura Shaik Mohamed Mossadeq.
IX. Title
636.089

Cover Design: Khairul Amin Bin Zainal Abidin
Type Face : Times New Roman PS
Font Size: 11/14.5 pt

Layout and Design
Universiti Putra Malaysia Press
43400, UPM Serdang
Selangor Darul Ehsan
Tel: 03-89468851/8854
Fax: 03-89416172
Email: penerbit@upm.edu.my

Printed by
Univision Press Sdn. Bhd.
Lot 47 &48, 49, 50, Jalan SR 1/9,
Taman Serdang Raya
43300 Seri Kembangan Selangor

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PREFACE

With the grace of ALLAH we managed to produce the 10th Proceedings of the Seminar on Veterinary Sciences. After 10 years, we can claim that the students' proceedings is now a tradition of the Faculty. The proceedings is a gift for the graduating veterinarians and given to them on the day of their induction into the veterinary profession. Producing the proceedings requires the dedication and single-mindedness of the editors. Competency in editorial work is an acquired skill enriched by unrelentless and untiring review of written submissions over many years. Thus, to ensure continuity, we feel that the Editorial Committee need to be expanded to include new volunteers working in cohort with the seniors.

The proceedings is a mix of 4 to 5 page extended and 1-page short abstracts. It should be noted that the number of extended abstracts has dwindled to 21 in the 10th Proceedings from 39 in the 9th Proceedings. Since one of the missions of veterinary education is to assist students in making informed decisions based on documented evidences, it would be more useful for future students in deciding on final year projects if past project reports are adequately detailed. As such, we would like to encourage more submissions of extended abstracts in future proceedings.

The editors wish to express their gratitude for all contributions to the Proceedings. However, we need to revive our enthusiasm in the contribution to the proceedings for the sake of the Faculty and students.

Thank you and God bless

The Editors
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Mohamed Ariff Omar
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Abdul Rani Bahaman
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EFFECT OF DIMETHYLSULFOXIDE AND GLYCEROL ON MOTILITY, MORTALITY AND MORPHOLOGY OF CRYOPRESERVED BULL SEMEN

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ABSTRACT

Cryopreservation of gametes and embryos is routinely and widely applied in mammals. Cryopreserved sperm, oocytes and embryos are used for artificial insemination and embryo transfer in the livestock industry. Hence, the ability to predict post-thaw sperm quality and fertility from a routine sperm function assay would be greatly beneficial to the success of cryopreservation. The aim of this study is to evaluate the effect of different concentrations of dimethyl sulfoxide (DMSO) and glycerol on motility, mortality and morphology of cryopreserved bull semen. Semen samples from two bulls were collected twice from each bull and frozen in egg-yolk Tris extender with variable DMSO and glycerol concentrations of 3 (control), 5, 10 and 20% glycerol. Semen quality parameters assessed after thawing were sperm percentage progressive, percentage total motile, percentage live and percentage abnormal morphology of sperms. The results showed that 5% glycerol produced the highest sperm survivability while 5% DMSO produced lower survivability at day 1 and 7 post-thaw compared to the control group. Other concentrations showed decreased survivability as the concentrations increased. There was no significant ($p>0.05$) difference in mean percentage abnormal morphology with glycerol and DMSO treatments. In conclusion, 5% glycerol in egg-yolk Tris showed good survivability of cryopreserved bull semen.

Keywords: glycerol, DMSO, bull semen, cryoprotectant

INTRODUCTION

Artificial insemination is widely used to produce good and valuable genetic materials. Among the many benefits resulting from the process of cryopreservation are increased breeding efficiency and increased ability to access superior genetics for a fraction of the price of buying a bull. Artificial insemination is extremely important for preservation of genes of superior animal (Lemma, 2011).

Cryoprotectant is any additive which can be provided to the cells before freezing and gives a higher post-thaw survival which cannot be obtained in its absence (Fuller, 2004). According to Büyükleblebici *et al.* (2014), the success of cryopreservation depends not only on preserving the viability of the spermatozoa but also on maintaining their metabolic functions. Cryoprotectant is added to extender to protect the sperm from damage during freezing. The amount and type of crypotectant also influence the viability of the spermatozoa. Therefore, the suitable cryoprotectant and extender are important for successful semen cryopreservation (Dorji *et al.*, 2014). Thus, this study was conducted to determine the effect of different concentrations of DMSO and glycerol on survival rate of cryopreserved bull semen and to evaluate the motility, mortality and morphology of cryopreserved bull semen on days 1 and 7 post-thaw using the cryoprotectants.

MATERIALS AND METHODS

Sample collection

Semen was collected from two adult Fresian bulls of approximately 2 years old from University Agriculture Park, Universiti Putra Malaysia. The semen was collected trice from each bull on different days using the electroejaculation method.

Extender and semen dilution

The extender was freshly prepared before the dilution. The Tris- egg yolk extender was prepared by dissolving with stirring 3.03g Tris buffer, 1.67g citric acid and 1.25g fructose, 500 IU Penstrep in 50 mL distilled water and the volume was adjusted to 60mL (Dorji *et al*., 2014). Each ejaculate was divided into six equal aliquots and diluted with the Tris-Egg yolk extender containing 5, 10 or 20% glycerol or 5, 10 or 20% dimethyl sulphoxide (DMSO).

Semen freezing and thawing

The extended semen was allowed to equilibrate for 2 hours in a refrigerator set at 4°C (Martins-Bessa *et al*., 2006) and loaded into 0.5mL straws using a modified 1mL syringe and a sealing machine. Then the straws were placed in a liquid nitrogen cooling tank at -85°C to vapour cool for 10min and plunged into liquid nitrogen tank at -85°C to store (Dorji *et al.*, 2014). At 24 hours and 7th day, the straws were thawed at 37°C for 30 to 60 sec.

Semen assessment

Sperm concentration, gross motility, progression and sperm motion were analyzed using a Computer-Assisted Semen Analyzer. Semen was stained with Eosin-Nigrosin stain to determine viability and morphology.

Statistical analysis

All data were analyzed using two–way analysis of variance (ANOVA) by using SPSS 20.0 version. Differences were considered significant at alpha=0.05.

RESULTS AND DISCUSSION

Cryprotectant concentration did not significantly ($p>0.05$) affect either semen concentration or percent abnormal morphology (Table 1). However, there was significant difference ($p<0.05$) in progressive total motile, total motile sperm and percent live sperm with cryoprotectant concentrations.

Table 1: Semen characteristics at different cryoprotectant concentrations

Cryoprotectant concentration (%)	Semen concentration (%)	Progressive motile sperm (%)	Total motile (%)	% Live	Abnormal morphology (%)
Control	109.3± 0.1	56.8^{a}±5.2	42.0^{a}±4.3	55.4^{a}±3.4	2.9±0.1
5	103.8±18.6	50.1^{b}±6.1	40.4^{b}±5.1	49.0^{b}±4.6	2.6±0.2
10	69.1±11.7	11.8^{c}±3.0	11.8^{c}±2.1	18.8^{c}±2.3	2.8±0.1
20	70.6±12.6	1.0^{d}±0.7	0.3^{d}±0.2	4.4^{d}±1.1	2.7±0.1

^{abcd}Means with different superscripts within column are significantly different ($p<0.05$)

Type of cryoprotectants did not significantly ($p>0.05$) affect the semen concentration and percent abnormal morphology of sperm (Table 2). However, there were significant ($p<0.05$) differences in progressive total motile, total motile sperm and percent live sperm with type of cryoprotectants. Glycerol produced higher ($p<0.05$) mean progressive motile sperm, total motile sperm and percent live of sperm compared to DMSO.

Table 2: Semen characteristic with type of cryprotectant

Cryoprotectant	Semen concentration (%)	Progressive motile sperm (%)	Total motile sperm (%)	% Live	Abnormal morphology (%)
Glycerol	89.9±13.2	36.5^{a}±4.7	28.0^{a}± 3.6	38.5^{a}± 4.2	2.8±0.1
DMSO	86.6±9.9	23.3^{b}±4.3	19.3^{b}± 3.5	25.3^{b}± 3.1	2.7±0.1

^{ab}Means with different superscripts within column are significantly different ($p<0.05$)

Day of thawing did not significantly affect ($p>0.05$) the percent abnormal sperm morphology (Table 3). Mean progressive motile sperm, total motile and percent live sperm were higher on day 1 than 7 post-thaw.

Table 3: Semen characteristics at different days post-thaw

Day post-thaw	Semen concentration (%)	Progressive motile sperm (%)	Total motile sperm (%)	% Live	Abnormal morphology (%)
1	59.7^{a}±10.6	40.6^{a}±5.3	31.9^{a}±4.2	37.1^{a}±3.9	2.7±0.1
7	116.7^{b}±11.2	19.3^{b}±3.1	15.4^{b}±2.3	26.7^{b}±3.5	2.8±0.1

^{a,b}Means with different superscripts within column are significantly different ($p<0.05$).

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ANTIMICROBIAL ACTIVITY OF *NIGELLA SATIVA* (BLACK SEED) OIL AGAINST *LEPTOSPIRA* SPECIES

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ABSTRACT

The antimicrobial activity of *Nigella sativa* oil was investigated against 5 serovars of *Leptospira interrogans*, which were *L. pomona, L. hardjobovis, L. australis, L. canicola,* and *L. icterohaemorrhagiae.* The minimum inhibitory concentration (MIC) was determined using broth microdilution method by observing complete motility inhibition of the *Leptospira* through dark-field microscopy at various incubation periods (1st hour, days 1, 3, and 7). The *N. sativa* oil was dissolved in dimethyl sulfoxide (DMSO) prior to further dilution in Ellinghausen, McCullough, Johnson, and Harris (EMJH) liquid medium with final concentration ranging from 0.1 to 50 mg/mL. All *Leptospira* serovars were sensitive to *N. sativa* oil dilution at every incubation period with MIC values varying from 0.52 to 5.21 mg/mL. *L. pomona* was more sensitive to *N. sativa* oil compared to the other strains, with the lowest MIC value obtained in every incubation period (1h=1.56 mg/mL, 1d=1.56mg/mL, 3d=0.78mg/mL, 7d=0.52mg/mL), while *L. australis* was the least sensitive towards *N. sativa* oil at 5.21mg/mL at day 7 of the incubation period. Penicilin G and DMSO were chosen as positive and negative controls, respectively. There were significant (p=0.010) differences among the *Leptospira* serovars treated with *N. sativa* oil on MIC values at 1h (p=0.014), 1d (p=0.016), 3d (p=0.026) and 7d incubation. However, there was no significant (p=0.332) difference among different incubation periods on the MIC values of *N. sativa* oil.

Keywords: *Leptospira*, *Nigella sativa,* Minimal inhibitory concentration (MIC)

INTRODUCTION

Leptospirosis is a zoonotic disease caused by any of the pathogenic members of the genus *Leptospira.* The disease occurs worldwide and is more common in tropical and subtropical areas with high rainfall (WHO, 2003). In Malaysia, the first diagnosed case of leptospirosis in human was in 1926 by Fletcher (Lim *et al*, 2011).

There are nearly 300 *Leptospira* serovars distributed worldwide among pathogenic and non-pathogenic species (Adler *et al.,* 2010). Most of them have their primary reservoirs either in wild, domestic animal or livestock. In humans, leptospirosis may be presented with broad range of clinical manifestations from mild influenza-like illness to severe infection with multiple-organ failure (WHO, 2003). In livestocks, leptospirosis could lead abortion, pre-mature birth, infertility, low milk production and death that would cause great loss to the livestock industry (JPV, 2011).

Various antibiotics have been suggested for the treatment of leptospirosis. In severe cases of leptospirosis, high doses of intravenous penicillin is recommended, while less severe cases can be treated with oral antibiotics like amoxicillin, ampicillin, doxycycline or erythromycin (WHO, 2003). Nevertheless, the development of antibiotic resistance should be of concern, especially with the use of the same antibiotics over an extended period, as well as improper antibiotic administration. Thus, there is a need to discover alternatives to antibiotic therapy.

Nigella sativa, commonly known as black seed or *Habbatussauda*, is herbaceous plant that is well-recognised for its medicinal properties in treating various diseases in humans. The black seed extract and essential oil were reported to have significant antimicrobial properties toward a variety of pathogenic bacteria including some strains with multidrug resistance (Salman *et al*., 2008). However, there is lack of information on the antimicrobial activity of *N. sativa* seed on *Leptospira* species. Hence, the objectives of this study were to investigate the antimicrobial activity of *N. sativa* oil against *Leptospira* species and to determine the minimum inhibitory concentration (MIC) of *N. sativa* oil on *Leptospira* species.

MATERIALS AND METHODS

Leptospira isolates

Five pathogenic *Leptospira interrogans* serovars were used in this study, which were *L. pomona, L. hardjobovis*, *L. australis*, *L. canicola,* and *L. icterohaemorrhagiae.* The *Leptospira* sp were obtained from Bacteriology Laboratory, Faculty of Veterinary Medicine, Universiti Putra Malaysia. The organisms were grown in Ellinghausen, McCullough, Johnson, and Harris (EMJH) liquid medium at 30°C for 7 d.

Nigella sativa oil dilution

A commercially available cold-pressed *N. sativa* oil was used in this study. *N. sativa* oil was dissolved in dimethyl sulfoxide (DMSO) to prepare a 200mg/mL stock solution. The working solution was prepared by mixing the stock solution with EMJH liquid medium to a concentration of 100mg/mL.

Dimethyl sulfoxide used as the negative control was diluted with EMJH medium to a concentration of 50% as the working solution. Penicillin G was

selected as the positive control. Penicillin G powder was dissolved in sterile distilled water to prepare a 1000µg/mL stock solution. The stock solution was mixed with EMJH liquid medium to prepare the 50µg/mL working solution.

Minimum Inhibitory Concentration

Broth microdilution method was used to determine the minimum inhibitory concentration. Two-fold serial dilution of the working solution of *N. sativa* oil, DMSO and Penicillin G was prepared up to 10 dilutions with EMJH medium in the 96-well microtitre plate. The initial volume for each well was 50µL. Then, a 50µL volume of *Leptospira* suspension was added to each well resulting in final concentrations ranging from 0.10 to 50 mg/mL for *N. sativa* oil and 0.05 to 25 µg/mL for DMSO. Another negative control (EMJH medium and leptospires without *N. sativa* oil) was also included in every plate. The plate was mixed well and covered with clean aluminium foil prior to incubation at 30°C for 7 d. During the incubation period, the plate was observed for complete motility inhibition of the leptospires under dark field microscope for 4 times at different incubation times; after 1 to 3 h, after 1, 3, and 7 d incubation. The MIC was defined as the lowest concentration of the *N. sativa* oil that exhibited complete motility inhibition of the leptospires. All tests were carried out in triplicate for *N. sativa* oil, and duplicate for DMSO and penicillin G.

RESULTS AND DISCUSSION

The present study showed that *N. sativa* oil is effective against all five *Leptospira* serovars, with the MIC values ranging from 0.39 to 6.25 mg/mL (Table 1). *L. pomona* was most sensitive to *N. sativa* oil at all incubation periods (1st hour=1.56mg/mL, day1=0.78mg/mL, day3=0.78mg/mL, day7=0.39 mg/mL), while *L. australis* was the least sensitive at most incubation periods (1st hour=3.13mg/mL, day1= 6.25mg/mL, day3=3.13mg/mL, day7=6.25mg/mL).

Statistical analysis revealed significant differences in MIC values for *Leptospira* serovars treated with *N. sativa* oil on at all incubation periods. On the other hand, there was no significant (p=0.332) difference in MIC values between incubation periods.

The antimicrobial effect of black seed oil could be due to its natural compound contents such as thymoquinone, thymohydroquinone, and thymol (Salman *et al*, 2008).

From the experiment, it was shown that DMSO has inhibitory effect on *Leptospira* serovars with MIC ranging from 12.5 to 25% (Table 2). Another study (Wadhwani, 2008) also supported similar effect of DMSO on bacterial growth.

Table 1. Minimum Inhibitory Concentration of *N. sativa* oil against *Leptospira* serovars

Treatment	Incubation Period			
	1st hour	Day 1	Day 3	Day 7
	Minimum Inhibition Concentration (mg/mL)			
N. sativa oil + *L. pomona*	1.56	0.78	0.78	0.39
N. sativa oil + *L. ardjobovis*	1.56	3.13	1.56	1.56
N. sativa oil + *L. australis*	3.13	6.25	3.13	6.25
N. sativa oil + *L. canicola*	6.25	3.13	3.13	3.13
N. sativa oil + *L. icterohaemorrhagiae*	6.25	3.13	1.56	1.56

Table 2. Minimum Inhibitory Concentration of DMSO and Penicillin G against Leptospira serovars

Treatment	Incubation Period			
	1st hour	Day 1	Day 3	Day 7
	Minimum Inhibition Concentration			
DMSO +*L. pomona*	-	25%	25%	12.5%
DMSO + *L. hardjobovis*	-	25%	12.5%	12.5%
DMSO + *L. australis*	25%	25%	25%	12.5%
DMSO +*L. canicola*	-	25%	25%	25%
DMSO + *L. icterohaemorrhagiae*	-	25%	25%	25%
Penicillin G + *L. pomona*	-	-	-	25µg/mL
Penicillin G + *L. hardjobovis*	-	-	-	-
Penicillin G + *L. australis*	-	-	-	25µg/mL
Penicillin G + *L. canicola*	-	-	-	-
Penicillin G + *L. icterohaemorrhagiae*	-	-	-	25µg/mL

In comparison to other study, Penicillin G revealed higher MIC values on the *Leptospira* serovars (MIC=25µg/mL) (Table 2). Seesom *et al*. (2013) reported the MIC values of Penicillin G against different Leptospira serovars ranged from 0.39 to 6.25 µg/mL. The difference between the results in this study to that reported earlier may be due to the difference in method used for preparing antibiotic. In the present study, the Penicillin G was diluted with EMJH medium instead of sterile distilled water used by the earlier study (Seesom *et al*., 2013).

To overcome the problem of antibiotic resistance, natural herbs like *N. sativa* seeds may be used as alternative treatment of Leptospirosis. However, more research need to be done to determine the efficacy *N. sativa* seed in treating the disease.

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EFFECTS OF MANGOSTEEN PEELS ON *IN VITRO* RUMEN FERMENTATION AND METHANE PRODUCTION IN GOATS

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ABSTRACT

Mangosteen fruit has been claimed to be a rich source of phenolic compounds such as xanthone, condensed tannins, and anthocyanins. In this study, the effect of mangosteen peels (MP) on rumen fermentation and methane production were evaluated using an *in vitro* gas production technique. Three groups comprising of control without MP (50% concentrate+50% alfalfa), medium mangosteen peel (MMP) (50% concentrate+25%, alfalfa+25% mangosteen peel) and a high mangosteen peel (HMP) (50% concentrate+50% mangosteen peel) group. The *in vitro* fermentation was carried out in a 100mL sealed syringe containing 0.25g of dried treatment material and 30mL of rumen fluid incubated at 39°C for 24h. The total gas production over 24h showed no significant ($p>0.05$) difference between groups, although the supplemented groups with MP showed lesser total gas production. The rate of gas production also showed a nonsignificant ($p>0.05$) lower rate for the MMP and HMP groups compared to the controls. There was no significant ($p>0.05$) difference between treatment groups for volatile fatty acid production, pH, and ammonia nitrogen. However, methane production in both MP groups was significantly ($p<0.05$) lower than the control after 24h incubation. There was significant ($p<0.05$) reduction in the total bacterial population in the HMP group compared to the MMP and control groups. The population of total methanogenic bacteria was also significantly ($p<0.05$) reduced in the two groups supplemented with MP. However, there was no significant ($p>0.05$) difference in the protozoal population between the groups. In conclusion, supplementation of goat diets with mangosteen peels under *in vitro* conditions showed no adverse effects on rumen fermentation parameters but reduced the population of methanogenic bacteria hence reducing the methane production that could result in reduced environmental pollution.

Keywords: mangosteen peels, *in vitro*, rumen fermentation, methane production, methanogens

INTRODUCTION

Purple mangosteen or scientifically known as *Garcinia mangostana* comes from the family species of Guttiferae. This tropical tree can be widely found in Southeast Asian countries such as Malaysia, Indonesia, and Thailand. The mangosteen fruit comprised three layers, mainly the pericarp, pulp and seed. The size of the fruit ranged from 3 to 7 cm. In the orient, the purple mangosteen is dubbed as the queen of tropical fruits due to its unique appearance, delicious taste, and many health benefits.

A report by MARDI (2009) showed that in Malaysia, although mangosteen plantation has declined in acreage from 7,630 (1998) to 6,060 ha (2010), the production has increased from 16,000 tons to more than 28,900 tons in the same period. The abundance of mangosteen and its availability in Malaysia makes it a good choice to be incorporated into small ruminant feeds. Furthermore the mangosteen fruit is a rich source of phenolic compounds such as xanthone, condensed tannins and anthocyanins (Mahabusarakam *et al*., 1987). The aim of this study was to determine the effect of mangosteen peels (MP) on the *in vitro* rumen fermentation and gas production.

MATERIALS AND METHODS

Rumen fluid was collected from a rumen-fistulated Katjang crossbred male goat weighing 30.39±0.74kg that had received a diet of 30% oil palm fronds and 70% commercial goat concentrate (W/W) twice daily at 08:00 and 17:00 hour for 3mo. The concentrate consisted of corn (25.44%), soybean meal (19%), palm kernel cake (35.87%), rice bran (11.69%), palm kernel oil (5%), ammonium chloride (1%) and a vitamin and mineral mixture (1%). Fluid was collected from different parts of the rumen before the animal was fed in the morning. The rumen contents were transferred into pre-warmed thermo flasks that were flushed with CO_2 and transported to the laboratory. The rumen fluid was blended using a laboratory blender for 30sec and filtered through four layers of cheesecloth. The filtered rumen fluid was placed in a 39°C water bath while gassing the headspace with CO_2. The rumen fluid was then mixed with readily made phosphate buffer and bicarbonate buffer.

The pulp of fresh mangosteen fruits bought from the local market were separated and the peels dried, ground, and filtered to obtain the MP powder. In the present study, four different treatment materials were used, including the control (CON, 50% alfalfa+50% concentrate), Medium MP (MMP, 50% concentrate+25% alfalfa+25% MP) and High MP (HMP, 50% concentrate+50% MP). Gas production was determined as described by Fievez *et al.* (2005). A total of 0.25 g dried test material was placed in a 100-mL calibrated glass syringe, and 30mL of rumen fluid

were added into each syringe. All the syringes were incubated at 39°C in a water bath incubator for 24h. At the same time, volumes of gas produced after 0, 2, 4, 6, 8, 10, 12 and 24 h incubation were measured and recorded. Methane production was analysed by taking 1mL of the headspace gas and injecting into a gas chromatograph. After 24 h, the pH of the rumen fluid were determined and recorded. Volatile fatty acids and ammonia-nitrogen were measured using gas liquid chromatography. Total bacteria, methanogenic bacteria and protozoa were determined using real-time PCR methods employing appropriate primers for identification.

For both gas production and VFA assays, each treatment group had 3 replicates, and the experiments were conducted in two repeated runs. Statistical analysis of experimental data was performed by the one-way ANOVA procedure of Statistical Analysis System (SAS, SAS Institute Inc., Cary, NC, USA) version 9.2. All statistical tests were conducted at 95% confidence level.

RESULTS AND DISCUSSION

There was no significant ($p>0.05$) difference in total and rate of gas production between all treatment groups (Table 1). However, there was significant ($p<0.05$) reduction in methane production in both groups supplemented with MP compared to the control group. Condensed tannins can reduce methane emissions and possibly help in reducing the occurrence of bloat in ruminants (Wannapat *et al.,* 2013). Since methane is the second most abundant greenhouse gases and one of the culprits causing global warming, the significant reduction of methane by mangosteen peel supplementation is good for the environment. The significant reduction of methane by mangosteen peel supplementation in ruminant diets might be a stepping stone towards green livestock farming. There was also no significant ($p>0.05$) difference in ammonia nitrogen production between the treatment groups. Dietary protein plays an important role in the nutrition of ruminants providing amino acids and as a source of nitrogen for the synthesis of microbial protein which are beneficial to ruminants.

There was no significant ($p>0.05$) difference in volatile fatty acid production between the treatment groups (Table 3). Steve (2001) reported that under optimal rumen fermentation conditions, the acetate to propionate ratio should be greater than 2.2. In this study, both groups supplemented with MP have a molar acetate to proprionate ratio of 2.4 while the control group had a ratio of 2. Therefore, the supplementation of MP had no adverse effect on the volatile fatty acid production.

There was a significant ($p<0.05$) reduction in total bacteria counts only in the HMP group (Table 4). The total protozoal counts in all the treatment groups were similar. However, there was a significant ($p<0.05$) reduction in methanogenic bacteria in both the MMP and HMP groups compared to the control. Some studies have demonstrated that tannins or saponins and saponin/tannin-containing plants have antimicrobial properties (Patra and Saxena, 2009). Jones (1994) explained that the inhibitory activity of tannins against bacteria has been implicated to the ability

of tannins to form complexes with the cell wall and membrane of bacteria causing changes cell morphology and excreted enzymes thus inhibiting methanogenic bacterial growth.

In conclusion, the mangosteen peel was able to reduce ruminal methanogenic bacteria and hence methane production without altering other rumen fermentation paramaters such as pH, volatile fatty acid production, and ammonia nitrogen. The mangosteen peel without adverse effect on rumen fermentation has potential to be incorporated into small ruminant feeds. Whether the results can also be applied to an *in vivo* situation needs further investigation. The ability of the mangosteen peels to reduce methanogenic bacteria and methane production augurs well for the environment.

Table 1: Effect of mangosteen peels on *in vitro* gas production after 24 hours incubation

Incubation Time (h)	Control	MMP	HMP
2	2.16±0.61	1.00±0.17	1.00±0.17
4	5.00±0.96	2.83±0.33	3.00±0.50
6	10.00±1.06	5.50±0.63	5.50±0.45
8	13.84±1.43	7.84±1.31	8.17±1.10
10	18.67±1.39	10.84±1.94	11.17±1.75
12	23.00±1.61	14.00±2.59	14.00±2.42
24	29.67±2.90	21.34±3.74	20.17±3.60
Gas (mL/h)	2.47±0.24	1.78±0.31	1.68±0.30
Methane (mL/g DM)	19.91^{a}±1.12	18.34^{b}±1.47	18.21^{b}±0.56
NH_3-N (ppm/mL)	3.79±0.04	3.68±0.14	3.83±0.05

Values expressed as Mean±SE, n=6

[a,b] Means with different superscripts within row are significance different at $p<0.05$

MMP=medium mangosteen peel; HMP=high mangosteen peel; DM=dry matter

Table 2: Effect of mangosteen peels on *in vitro* pH after 24 hours incubation

	Control	MMP	HMP
pH	7.21±0.01	7.20±0.01	7.22±0.01

Values expressed as Mean±SE, n=6

MMP=medium mangosteen peel; HMP=high mangosteen peel; DM=dry matter

Table 3: Effect of mangosteen peels on *in vitro* volatile fatty acid production after 24 hours incubation.

Volatile fatty acid (mM/mL)	Control	MMP	HMP
Acetic	56.35±3.61	61.09±0.26	60.72±0.51
Propionic	28.28±3.05	25.60±0.41	25.42±0.43
Butyric	15.37±0.92	13.32±0.56	13.86±0.54
Total	87.18±7.17	91.09±4.09	83.10±3.76

Values expressed as Mean±SE, n=6

MMP=medium mangosteen peel; HMP=high mangosteen peel; DM=dry matter

Table 4: Effect of mangosteen peels on *in vitro* microbial population after 24 hours incubation.

Total Counts (log_{10} cell/mL)	Control	MMP	HMP
Bacteria	8.44^{a}±0.06	8.37^{a}±0.06	8.11^{b}±0.11
Methanogen	5.64^{a}±0.08	5.44^{b}±0.05	5.38^{b}±0.04
Protozoa	5.78±0.35	5.66±0.08	5.23±0.06

Values expressed as Mean±SE, n=6

^{a,b} Means with different superscripts within row are significance different at $p<0.05$

MMP=medium mangosteen peel; HMP=high mangosteen peel; DM=dry matter

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PATHOGENICITY OF MALAYSIAN FOWL ADENOVIRUS ISOLATES IN SPECIFIC PATHOGEN-FREE CHICKENS

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ABSTRACT

Fowl Adenovirus (FAdV) is a non-enveloped virus that is the primary pathogen for inclusion body hepatitis (IBH) in chickens. The objective of the study was to determine the pathogenicity of Malaysian FAdV isolates in specific pathogen-free (SPF) chickens. Thirty-six one-day-old SPF chicks were divided into 3 groups namely A, B and C. The chickens were further divided into sacrifice and mortality sub-groups. Groups A and B were inoculated (0.5mL/chick) intraperitoneally with FAdV isolates A (UPM11134) and B (UPM1127), respectively. The Group C was the control and not inoculated. The chicks were observed twice daily for clinical signs and mortality. Liver, spleen, gizzard and trachea sampes were collected and fixed in 10% buffered formalin for histological examination. The study showed 100% mortality within 4 days post-inoculation (pi) in the mortality sub-groups of inoculated chicks. The sacrifice sub-group of Groups A and B chicks showed 100 and 90% mortality within 4 to 7 days pi, respectively. No mortality was seen in the control group. The livers of inoculated chicks were enlarged, yellowish with petechial haemorrhages. The spleens were also enlarged and pale. Histologically, the livers of inoculate chicks showed typical basophilic intranuclear inclusion bodies. The study showed that the Malaysian FAdV isolates are highly pathogenic to one-day-old SPF chicks inoculated via the intraperitoneal route.

Keywords: fowl adenovirus (FAdV), specific pathogen-free (SPF) chicks, intra-peritoneal route, intranuclear inclusion body.

INTRODUCTION

Fowl adenovirus (FAdV) belonging to the sub-group I of avian adenoviruses (Aviadenoviruses) is distributed widely throughout the world. The virus commonly affects domestic avian species of all ages (McConnell and Fitzgerald, 2003). In healthy birds, the infection can either be asymptomatic or associated with a variety clinical and pathological conditions. The virus has been associated with inclusion

body hepatitis (IBH), hydropericardium syndrome, gizzard erosion, enteritis, pancreatitis, decreased egg production syndrome, and respiratory disease (McFerran and Adair, 1977). The viral particles accumulate in the cell nucleus of infected organs, forming large, round, and eosinophilic or basophilic intranuclear inclusion bodies (McCracken and Adair, 1993).

Fowl adenovirus infection in chickens can cause sudden onset and sharp increase in mortality in birds at 3 to 4 days of exposure. Although inclusion body hepatitis is normally seen in broiler chickens or meat-producing birds at 3 to 7 weeks of age, it can also be occur early in 7 day-old or late in 20 week-old birds (Mahani and Azhar, 2006). The infection is usually characterised by acute mortality peaking at day 3 to 4 post-inoculation and waning by day 5 pi. Rate of mortality in infected birds is usually between 5 to 10% but can be as high as 30%. Clinical signs seen at 12 to 24 hours prior to death include depression, weakness, respiratory depress, ruffled feather, inappetance, prostration, loss of body weight, and white pasty dropping adhering to the feather around cloaca. Fowl adenovirus primarily affects the liver and haemopoietic system. The liver in birds with IBH is friable, pale, and enlarged. Some degree of petechial to ecchymotic haemorrhages can occur in the liver and skeletal muscle of infected birds.

The pathogenicity of FAdV vary with age, route of inoculation, and serotype. Experimental infection via natural routes or by direct contacts usually fails, however, the virus is highly pathogenic when inoculated parenterally. The virus can be found in the faeces, semen, kidney, nasal mucosa, and trachea, indicating that it can be excreted via various routes. However, high virus titers occur mostly in faeces (Saif, 2003). Vertical transmission is a very important route spread of the virus because infected hatching chicks may excrete virus in faeces from the time of hatching. However, chicks do not typically excrete the virus until 2 to 4 weeks of ages. Horizontal transmission only occur with the introduction of infected birds to healthy flocks. The virus can spread among farms via fomites. The incubation period is short about 24 to 48 hours, following natural route of infection. Horizontal spread of the infection in the flock is slow (McFerran, 1991; Saif, 2003).

MATERIALS AND METHODS

FAdV Isolates

Two different FAdV isolates (UPM 11134 and UPM 1127) used in this study, a gift of Professor Dr Mohd Hair Bejo, were from recent field outbreaks in Malaysia. These isolates were positive for FAdV with H1/H2 and H3/H4 of 1219 and 1319 bp, respectively (Juliana *et al.*, 2014).

SPF Chicks

One-day-old SPF chicks used in this experiment were obtained from the Malaysian Vaccine Pharmaceutical Sdn. Bhd. (MVP), Puchong, Selangor, Malaysia.

Experimental Design

Thirty-six one-day-old SPF chicks were divided into 3 main groups namely A, B and C. The chickens were further divided into sub-group named the sacrifice and mortality groups. Groups A and B were inoculated (0.5mL/chick) via intra-peritoneal route with FAdV isolates A (UPM11134) and B (UPM1127), respectively. The group C was the control group, not inoculated and physically isolated from inoculated chicks. The chicks were observed twice daily and clinical sign and mortality recorded throughout the trial. Three chicks from group C were sacrificed on day 0 pi for necropsy and histological examination. On days 7 and 14 pi, 3 chicks each from the sacrifice sub-group were weighed and sacrificed by cervical dislocation for examination of gross lesions. The gross lesions were recorded and samples of liver, spleen, gizzard and trachea collected and fixed in 10% buffered formalin for histological examination. The rate of mortality of chicks from the mortality group was recorded during the experimental period.

RESULTS AND DISCUSSION

Clinical signs

Weakness, inappetance, depression, and ruffled feathers were observed in chicks 12 to 24 hours prior to death. There was increased production of pasty white faecal material in the chicks that adhered to feathers around the cloaca region. The body score condition of affect chicks was low. Chicks that survived at day 7 showed loss in body weight.

Cumulative mortality

On day 4 pi, the rate of mortality in chicks inoculated with UPM 11134 and UPM 1127 FAdV isolates were 100 and 90.9%, respectively. The mortality of chicks from group A was 54.54% at day 2, 90.9% at day 3, and 100% at day 4 pi. In group B the mortality was 45.45% at day 2, 81.82% at day 3, and 90.9% at day 4 pi. No death was recorded in the uninoculated control group.

Gross lesion

Jaundice, hydropericardium with straw colour fluids, and empty crop were recorded in inoculate chicks that died between day 1 and 4 pi. The livers of inoculate chicks were enlarged, shiny, friable, yellowish with petechial hemorrhage (Figure 1). By day 2 to 3 pi, the spleens of these chicks were pale and enlarged.

Figure 1: Liver of chicks inoculated with UPM 11134 and UPM 1127 FAdV isolates were enlarged, shiny, friable, yellowish with petechial hemorrhage.

Histopathology

Chicks inoculated with UPM 11134 and UPM 1127 FAdV isolates showed the pathognomonic basophilic intranuclear inclusion bodies in hepatocytes (Figure 2). The gizzard of chicks inoculated with UPM11134 FAdV isolate showed basophilic intranuclear inclusion bodies in glandular epithelium at day 2 pi (Figure 3).

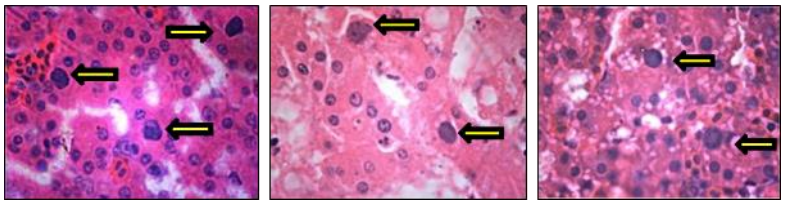

Figure 2. The liver of chicks inoculated with UPM 11134 and UPM 1127 FAdV isolates showing basophilic intracellular inclusion bodies in the hepatocytes (H&E, ×1000)

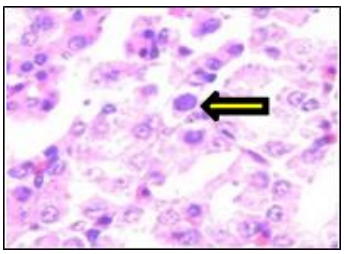

Figure 3: The gizzard of chicks inoculated with UPM 11134 and UPM 1127 FAdV isolates showing basophilic intranuclear inclusion bodies in glandular epithelium (H&E, ×1000).

The pathogenicity of FAdV in SPF chicks was determined by clinical signs, mortality, gross and histopathological lesions. The result from this experiment showed that both UPM11134 and UPM1127 FAdV isolates were highly pathogenic to one-day-old SPF chicks when inoculated via the intraperitoneal route. This was in contrast with a previous finding that showed that intraperitoneal FAdV-9

infection in one-day old chicks caused only 15% mortality (Erny *et al*., 1996). Subcutaneous inoculation of FAdV-9 was reported to cause 100 and 20% mortality to one- and 7-day old chicks, respectively (Alvarado *et al*., 2007). This suggests that the pathogenicity of FAdV vary with route of inoculation (Erny *et al*., 1996).

The present study showed that the FAdV-infected one-day-old SPF chicks showed clinical signs including weakness, depression, reduce body weight, ruffled feathers and white pasty dropping. The gross lesion caused by FAdV isolates was the similar, differing only in severity.

Although adenovirus is a secondary pathogen in bird immunosuppressed by infectious bursal disease and chicken anaemia virus infections, it is still a potential virus that can cause high mortality in birds.

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EFFECT OF MANGOSTEEN (*GARCINIA MANGOSTANA*) PEEL ON *IN VITRO* BIOHYDROGENATION OF OMEGA-6 AND OMEGA-3 FATTY ACIDS IN GOATS

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ABSTRACT

Supplementation of diets with plants containing bioactive compounds can affect rumen microbes involved in rumen biohydrogenation (BH). Studies have identified a wide range of plant extracts rich in polyphenols or tannins that influence rumen microbial population especially those that alter rumen biohydrogenation and favour endogenous synthesis of conjugated linoleic acid. The effects of mangosteen peels on rumen biohydrogenation of omega-6 and omega-3 fatty acids and microbial populations in the rumen were investigated using a standard *in vitro* incubation technique. The study uses 3 treatment namely control (C) (50% goat concentrate+50% alfalfa extract), low mangosteen peel (LMP) (50% goat concentrate+25% alfalfa extract+25% mangosteen peel extract), and high mangosteen peel (HMP) (50% goat concentrate+50% mangosteen peel extract). The experiment was repeated twice in three replicates. There was a non-significant ($p>0.05$) increase in ruminal fatty acids with increase in mangosteen peel extracts in the treatments. The mangosteen peels significantly reduced the population of the biohydrogenating bacteria, *Butyrivibrio fibrisolvens* resulting in reduced rate unsaturated fatty acids biohydrogenation. It can be concluded that mangosteen peels can be used as feed supplements in goat feed to produce healthier chevon.

Keywords: mangosteen peels, rumen biohydrogenation, *Butyrivibrio fibrisolvens*

INTRODUCTION

Ruminant meat is high in saturated fatty acids (SFA) and low in polyunsaturated fatty acids (PUFA) because of the extensive fatty acid biohydrogenation by rumen microbes (Morimoto *et al*., 2005). Condensed tannins have been reported to modify ruminal biohydrogenation (Khiaosa-Ard *et al*., 2011). In addition, these compounds affect the rumen protozoa population, which will alter rumen fermentation leaving

the rest of rumen biomass unaltered (Wang *et al*., 2000). Due increased consumer awareness on diet and health and the association between meat consumption and incidence of coronary heart diseases (CHD) (Cabiddu *et al*., 2009), research are now focusing on altering the fatty acid composition of meat. However, the composition of fatty acids of meat is highly resistant to manipulation because of the ruminal biohydrogenation of PUFA. This study investigated the effect of mangosteen peels on the *in vitro* rumen biohydrogenation of omega-6 and omega-3 fatty acids and the population of the biohydrogenating bacteria, *Butyrivibrio fibrisolvens* (Gomez-Cortes *et al*., 2007).

MATERIALS AND METHODS

Two rumen fistulated goats was given a diet of 30% oil palm fonds (OPF) and 70% goat concentrate (W/W) twice daily at 08:00 and 17:00 hour for three months. The concentrate consisted of corn (25.44%), soybean meal (19%), palm kernel cake (35.87%), rice bran (11.69%), palm kernel oil (5%), ammonium chloride (1%) and a vitamin and mineral mixture (1%). One litre of fresh ruminal content was taken in the morning, before the goats were given food. The ruminal contents were filtered to separate undigested food from ruminal fluid, and tranferred to pre-warmed thermo flasks flushed with CO_2 for transportation to the laboratory. Thirty millilitres of rumen fluid in buffer were mixed with 0.25g dried treatment materials in 100 mL gas-tight syringes and incubated at 39°C for 24 h. The volume of gas produced were determined after 0, 2, 4, 6, 8, 10, 12 and 24 hours incubation and the syringes shaken carefully to ensure complete mixing of the incubated contents.

Total fatty acids were extracted from the syringe content after 24 hours incubation based on the method of Folch *et al.* (1957) modified by Rajion *et al.* (1985) and Ebrahimi *et al.* (2012) using chloroform/methanol 2:1 (v/v) containing butylated hydroxy toluene to prevent oxidation during sample preparation. After complete separation, the lower phase was collected in a round-bottomed flask and rotary evaporated (Laborota 4000-efficient; Heidolph, Germany) at 70°C. An internal standard, heneicosanoic acid (C21:0) (Sigma Chemical, St. Louis, MO, USA), was added to each sample before transmethylation to determine the individual fatty acid concentration within the sample. Transmethylation of the extracted fatty acids to their fatty acid methyl esters (FAME) was carried out using potassium hydroxide (KOH) in methanol and 14% methanolic boron trifluoride (BF3). The FAME were separated by gas chromatography (Agilent 7890N), using a Supelco SP 2560 capillary column of 100m×0.25mm ID×0.2μm film thickness (Supelco, Bellefonte, PA, USA). One microliter sample was injected by an auto-sampler (Agilent Auto Analyzer 7683 B series, Agilent Technologies, Santa Clara, CA, USA) into the chromatograph equipped with a split/splitless injector and a FID. The flow rate of the carrier gas, nitrogen was 1.2 mL/min. The split ratio was 1:20 after injection of 1 μL of the FAME. The injector temperature was programmed at 250°C, and the detector temperature at 270°C. The column temperature program started to run at 150°C, for 2 minutes, warmed to 158°C at 1°C/minute, held for 28

min, warmed to 220°C at 1°C/min and then held for 20 min to achieve satisfactory separation. Sample peaks were identified and concentrations calculated based on the retention time and peak area of known standards (Sigma Chemical). The fatty acid concentrations are expressed as g/100g of the sum of identified peaks in each sample. The fatty acid concentrations are expressed as% of total identified fatty acids. A reference standard (mix C4-C24 methyl esters; Sigma-Aldrich, Inc., St. Louis, MO, USA) and CLA standard mix (cis-9 trans-11 and trans-10, cis-12 CLA, Sigma-Aldrich, Inc., St. Louis, MO, USA) was used to determine recoveries and correction factors for the determination of individual FA concentration.

The percentage biohydrogenation of PUFA was calculated by the decrease in the amounts of PUFA after 24 hours incubation from the amount of PUFA at 0 hour according to the following formula (Jayanegara *et al.,* 2011):

Biohydrogenation (%) = [PUFA (0 h) – PUFA (24 h)] × 100

PUFA (0h) = concentration (g/100g of fatty acid) of PUFA at 0 hour incubation
PUFA (24h) = concentration (g/100g of FA) of PUFA at 24 hours incubation.

As no distinction was made between esterified and non-esterified fatty acids in the current experiment, lipolysis plus isomerization were assessed together and corresponded to the proportional loss of C18:2n-6 and C18:3n-3 after 24 hours *in vitro* incubation, respectively.

Rumen microbes were identified and quantififed using quantitative real-time polymerase chain reaction (PCR) using suitable primers.

RESULT AND DISCUSSION

Fatty acid concentrations

C18:2n-6, C18:3n-3 and total C18 unsaturated fatty acids increased with increase in CLA C9T11 and CLA T10C12 after 24 hours incubation (Tables 1 and 2).

Rate of biohydrogenation

There was a significantly ($p<0.05$) lower rate of biohydrogenation of linoleic acid in the LMP and HMP treatments, and α-linolenic acid and total C18 unsaturated fatty acids in the HMP treatment compared with the control (Table 3).

Butyrivibrio fibrisolvens count

The population of *Butyrivibrio fibrisolvens* in HMP treatment was significantly ($p<0.05$) lower than the control (Table 4).

Table 1. Fatty acid concentration in treatment feed at 0 hour incubation

Treatments	Total identified fatty acid (%)		
	Control	LMP	HMP
C18:2n-6	32.64±0.94	32.62±1.93	31.64±1.31
C18:3n-3	0.75^{a}±0.18	1.05^{ab}±0.20	1.29^{b}±0.11
CLA C9T11	0.51±0.03	0.49±0.03	0.56±0.09
CLA T10C12	0.08±0.01	0.09±0.01	0.10±0.02
Total C18 UFA	56.27±1.55	56.35±2.45	55.99±1.40

Total C18 UFA is C18:1n-9(Oleic acid)+C18:2n-6(Linoleic acid)+C18:3n-3(α-Linolenic acid). Values expressed as mean±SE; n=6. ^{a,b}Means with different superscripts within row are significantly different at $p<0.05$. LMP=low mangosteen peel; HMP=high mangosteen peel; C18:2n-6=linoleic acid; C18:3n-3=α-linolenic acid; CLA C9T11=cis-9, trans-11 conjugated linoleic acid; CLA T10C12=cis-12; trans-10 conjugated linoleic acid; Total C18 UFA=unsaturated fatty acid.

Table 1.2. Fatty acid concentration in treatment feed after 24 hours incubation

Treatments	Total identified fatty acid (%)		
	Control	LMP	HMP
C18:2n-6	11.62±1.77	12.07±0.50	13.47±1.10
C18:3n-3	0.33^{a}±0.04	0.52^{a}±0.22	0.97^{b}±0.20
CLA C9T11	2.25^{a}±0.22	2.77^{ab}±0.15	3.00^{b}±0.15
CLA T10C12	0.39±0.06	0.46±0.03	0.51±0.05
Total C18 UFA	20.64±2.25	21.67±1.04	23.73±4.70

Total C18 UFA is C18:1n-9(Oleic acid)+C18:2n-6(Linoleic acid)+C18:3n-3(α-Linolenic acid). ^{a,b}Means with different superscripts within rows are significantly different ($p<0.05$). LMP=low mangosteen peel; HMP=high mangosteen peel. C18:2n-6=linoleic acid; C18:3n-3=α-linolenic acid; CLA C9T11=cis-9; trans-11 conjugated linoleic acid; CLA T10C12=cis-12; trans-10 conjugated linoleic acid; Total C18 UFA=unsaturated fatty acid.

Table 3. Percentage rate of *in vitro* biohydrogenation of linoleic, α-linolenic acid, and total C18 unsaturated fatty acids after 24 hours incubation

Fatty acid	Total identified fatty acid (%)		
	Control	LMP	HMP
Linoleic acid	64.26^{a}±1.09	62.33^{b}±2.23	57.05^{b}±1.78
α-linolenic acid	47.11^{a}±9.81	41.76^{ab}±9.66	22.97^{b}±5.95
Total C18 UFA	63.21^{a}±0.99	61.17^{ab}±1.71	57.47^{b}±1.07

Total C18 UFA is C18:1n-9(Oleic acid)+C18:2n-6(Linoleic acid)+C18:3n-3(α-Linolenic acid). LMP=low mangosteen peel; HMP=high mangosteen peel. ^{a,b}Means with different superscripts within rows are significantly different ($p<0.05$)

Table 4. *Butyrivibrio fibrisolvens* population after 24 hours *in vitro* incubation

Bacteria	Control	LMP	HMP
Butyrivibrio fibrisolvens (log_{10} cell/mL)	2.36^{a}±0.08	2.27^{ab}±0.05	2.15^{b}±0.04

LMP=low mangosteen peel; HMP=high mangosteen peel. ^{a,b} Means with different superscripts within rows are significantly different ($p<0.05$).

Biohydrogenating rumen bacteria such as *Butyrivibrio fibrisolvens* normally causes the conversion of linoleic and α-linolenic acid to stearic acid. The significantly ($p<0.05$) reduced rate of biohydrogenation particularly for linoleic and α-linolenic acid and the total C18 unsaturated fatty acids and elevation in intermediate fatty acids correlated the reduction in the population of biohydrogenating bacteria *Butyrivibrio fibrisolvens.* All fatty acids from the feed were digested by lipase and did not undergo further conversion by the biohydrogenating bacteria (Liu *et al.,* 2008).

The significantly ($p<0.05$) reduced *Butyrivibrio fibrisolvens* population in the HMP treatment suggests that there are substances in mangosteen peels that affect the rumen bacterial population. In fact, the decrease in rumen *Butyrivibrio fibrisolvens* is in proportion with increase in mangoteen peel used in the treatement, which is a similar finding to that of Gomez-Cortes *et al.* (2007). Condensed tannins and saponins were able to enhance the bacterial population, increase fermentation but suppress the biohydrogenating bacteria population (Khiaosa-Ard, 2011). The reduction in biohydrogenation causes increase in 18 unsaturated fatty acids, especially omega-3 fatty acids in chevon (Ebrahimi, 2012) and lamb (Goh, 2002) and this can be achieved through supplementation of feed with oil palm fronds.

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EVALUATION OF BEEF CATTLE PERFORMANCE IN UNIVERSITY AGRICULTURE PARK, UNIVERSITI PUTRA MALAYSIA

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ABSTRACT

The cattle population in Malaysia is on the decrease while beef consumption is on the increase. Thus, there is urgent need to improve performance of beef cattle to reduce importation of this commodity. In this study, a farm evaluation was conducted at the Beef Cattle Unit, Farm 16, University Agriculture Park, Universiti Putra Malaysia. The objectives were to evaluate the farm performance particularly the health and reproductive performances and to identify the associated risk factor. The farm was built mainly for teaching purposes, public exhibition and as a model for farmers. This study involved retrospective analyses of the records of beef cattle stock between 2011 and 2014. At the time of study, total stock was 516 heads, which consisted of 300 Kedah-Kelantan cross (KK) and 216 Brangus cross (Brangus) cattle. The most common health problems were wound (47%), lameness (19%), and suspected haemoparasites (7%), mostly observed in Brangus ($p<0.05$). The average rate of mortality was 6.52±9.4%, and the highest was recorded in 2014 (20.5%) due to lightning strike. Average daily gain (ADG) was 0.39±0.013kg and 0.33±0.012kg for Brangus and KK, respectively. The average calving interval for KK (426±53days; n=7) and Brangus (433±37days; n=9) showed non-significant difference ($p>0.05$). The age at first calving, however, was markedly younger in KK (1249±127days) than Brangus (1373±125days). There was strong positive correlation between rainfall and relative humidity with monthly ADG ($p<0.05$). Recommendations on various aspects to improve farm performance are given in the discussion.

Keywords: beef cattle, rainfall, farm performance, risk factor, Kedah-Kelantan, Brangus

INTRODUCTION

Cattle population in Malaysia showed slight decreasing trend from 860,491 in 2009 to 751,781 in 2013, contributing 23% of the livestock population (DVS, 2014a). Despite the decreasing trend, beef consumption by Malaysian had increased from 149,256 metric tonnes in 2009 to 180,835 metric tonnes in 2013 (DVS, 2014b). To cope with the local demand, cattle and its products were imported mainly from Australia and India, which causes negative balance of trade and preventing the growth of local beef industry. Therefore, there is need to improve the performance of beef cattle at local farms and eventually reduces the need of importation.

On-farm evaluation covers all components of farm environment and factors that limit production in the system. This preliminary study was conducted to measure the performance of beef cattle based on the farm records, particularly the health, growth and reproductive performances and to identify the risk factors that limit the performance of the beef cattle in the farm. The results of these evaluation should improve our understanding of the farm and can be used for improving farm performance.

MATERIALS AND METHODS

Study area

This study was carried out at the Beef Cattle Unit, Farm 16, University Agriculture Park, Universiti Putra Malaysia. The farm has 216 heads of Brangus cross (Brangus) and 300 heads of Kedah-Kelantan cross (KK) of various ages. The farm practices semi-intensive system including rotational grazing for adult breeders and feedlotting for calves. Natural mating was used for breeding at the ratio of 1 male to 20 females during the identified breeding seasons; April to May and October to November. Deworming and deticking were carried out every 4 months and vaccinations for foot and mouth disease and haemorrhagic septicaemia were carried out every 6 months.

Data collection

Data were collected from farm records between 2011 and 2014. Data on monthly rainfall, temperature and relative humidity between 2011 and 2014 were retrieved from the Department of Meteorology Malaysia. Field visits were made to gather information about the risk factors that could limit the farm performance.

The farm evaluation

The farm performances were evaluated following determination of health parameters, growth performance parameters and reproductive parameters.

RESULTS AND DISCUSSION

Health status

The number of treatment case was 49, 28, 34, and 20 for year 2011, 2012, 2013, and 2014, respectively. Most (110 cases) involved Brangus compared to only 15 for KK. Out of 137 treatment cases analysed, the top three problems in this farm were wound and injury (64, 7%), lameness (26, 19%), and suspected haemoparasites (9, 7%). The annual mortality rate was 1.46, 0.79, 3.31, and 20.50 %, respectively. Bulls in the farm usually get wounded following fights, which is considered a normal behaviour for intact males. To reduce fighting, extra bulls should be removed from the breeding herd and managed in a feedlot system. The bulls were only allowed to roam during the breeding season. Wounds also involve calves, mainly from ear tagging. The problem can be prevented by proper treatment and hygiene of the farm (Jackson and Cockcroft, 2002). Mortality was highest in 2014, at 21%, mainly due to an indirect lightning strike (7 of 8 deaths). Except for 2014, the average rate of mortality for the 4-year study period was 6.52±0.09%, which was acceptable. Lightning is in fact the second leading cause of weather-related deaths in livestock animals in the world (Ritenour *et al*., 2008).

Growth performance

Before 11 months old, the monthly bodyweight patterns were similar for both Brangus and KK. From then onwards, the growth was significantly ($p<0.05$) better in Brangus than KK. Nevertheless, overall growth performance of KK in this farm was better than reported elsewhere (Yasir, 1999) while Brangus in this study performed poorer except for the birth weight (Paterson and Samur, 1981; Neser *et al*., 2012). This differences in performance might be due to variations in climate where stressors in tropical environment reduce the performance of temperate breeds (Burrow, 2012).

Reproductive performance

The calving rate revealed increasing pattern throughout the study period except in 2014 (Table 1). The average annual calving rate was 71.3%. Age at first calving for KK was 1249±127d compared to 1023±143d in a study by Ng (1987). Calving interval of KK showed no significant ($p>0.05$) difference with the study by Johari (1993) but longer interval for Brangus (437±40d) than 402±96d reported by Paterson (1981). The most possible reason for the longer calving interval is due to breeding management since this farm practiced seasonal breeding to prevent calvings in rainy season. When the period between calving and breeding is long, the calving interval is also long (Drennan and Berry, 2006). Lower calving rate observed in this study was due to inadequate nutrition before and after calving. It is difficult to determine whether cows on pasture received adequate energy to permit good reproductive performance. Furthermore, cows that were given concentrate produced more calves than those given none (Richardson *et al*., 1975). Thus, the reproductive performance in this farm could be improved through the practice of flushing to increase the energy level.

Table 1. Annual calving rate of cattle at the Taman Pertanian Universiti, Universiti Putra Malaysia.

Breed	Calving rate (%)				
	2011	2012	2013	2014	Average
Brangus cross	27.1	66	85.3	52.8	57.8
KK cross	81	77.6	96.9	80.6	84

Rainfall

Generally, there was no significant ($p>0.05$) correlation between the rainfall and the number of treatment cases ($r=0.31$, $p=0.17$), rate of mortality ($r=0.18$, $p=0.43$) or monthly rate of calving for either breed (Brangus: $r=-0.25$, $p=0.25$; KK: $r=-0.34$, $p=0.125$). Only the monthly average daily gain (ADG) for both breeds showed significant ($p<0.05$) correlation with the rainfall (Brangus: $n=22$ $r=0.48$, $p=0.023$; KK: $n=22$ $r=0.56$, $p=0.007$). This is in contrast to the previous study by Shae and Hadrich (2012) who showed decreased ADG by 0.36kg for every additional 25.4mm of rainfall. The cattle in the University farm were given supplemented palm kernel cake during the rainy season.

In conclusion, the top 3 health problems were wound, lameness, and haemoparasitism. However, the number of treatment case showed decreasing trend over the study period. The mortality rate was at acceptable at less than 10%. The calving rate was relatively high but the calving interval was slightly longer for Brangus. However, the growth performance of KK was better than reported elsewhere, but for Brangus it was poorer. With time the growth and body weight of Brangus became better than the KK, although KK showed better reproductive performance than the Brangus.

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PREVALENCE OF INJURIES ASSOCIATED WITH HIGH-RISE SYNDROME IN CATS PRESENTED TO THE UNIVERSITY VETERINARY HOSPITAL, UNIVERSITI PUTRA MALAYSIA

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ABSTRACT

The identification of common high-rise syndrome (HRS) injuries in cats may help fill the information gap required to prevent and treat the injuries associated with this syndrome. The prevalence of the 21 injuries, three most common injuries, and the correlation between height of fall and severity of injuries were determined in this study. Logbooks and medical cases of cats presented to the UVH, UPM from 1 January 2002 until 31 December 2014 were reviewed. The criteria used for selected cases were cats diagnosed with HRS, fell from at least the 2nd storey of a building, had diagnostic imaging findings related to HRS, and must have at least one out of the 21 injuries associated with HRS in this study. The prevalence of injuries associated with HRS in this study were limb fractures at 12/20(60%), pneumothorax at 6/20(30%), epistaxis and vertebral luxation at 4/20(20%) each, wound, haematuria, and limb luxation at 3/20(15%) each, and laceration, pulmonary contusion, dental fractures, hard palate fractures, pelvic fractures, and vertebral fractures at 1/20(5%) each. Three most common injuries associated with HRS were limb fractures, pneumothorax, and epistaxis. The height of fall from 3rd to 6th storeys was positively and moderately correlated with severity of injuries in cats with HRS (r=0.622; p=0.031; n=12).

Keywords: high-rise syndrome, height of fall, injury, correlation, prevalence

INTRODUCTION

In cats, high-rise syndrome (HRS) is a term that refers to traumatic injuries sustained following a fall from a height of at least two storeys. The HRS is associated with a triad of clinical signs including epistaxis, cleft palate, and pneumothorax (Robinson, 1976). In Malaysia, the minimal height of a residential building storey in Malaysia is 2.5 metres (Uniform Building By-Laws 1984).

The objectives of the study were to determine the prevalence of 21 injuries associated with HRS in cats presented to the University Veterinary Hospital (UVH), identify the three most common types of injuries among the types of injuries stated in the first objective, and determine the correlation between height of fall and severity of injuries associated with HRS in cats admitted to the UVH, UPM. Based on these objectives the hypotheses of this study were the prevalence of injuries is the same for all 21 injuries, the top three highest prevalence rates depicts the most common injuries among the 21 HRS injuries, and there is no correlation between height of fall and severity of injuries.

MATERIALS AND METHODS

Study design and data collection

This is a retrospective study of HRS cases in cats admitted to the UVH, Universiti Putra Malaysia from 1 January 2002 to 31 December 2014. The reference number of the logbooks is FPV/UVH/L001/CLB. The criteria for case selection were diagnosis of HRS, fell from at least the 2nd storey, radiographic findings available, and the cats had at least one out of the 21 injuries associated with HRS in this study.

Data analysis

Data analysis was done using Statistical package of IBM SPSS Statistics Version 20 and Microsoft Excel 2010. The prevalence of the 21 injuries associated with HRS was determined through the findings of physical examination and diagnostic imaging. The numerator was the number of cats inflicted with one of the injuries, while the denominator was the total number of cats that fitted the selection criteria, which were 20 cats. Three most common HRS injuries are identified based on the three injuries with the highest prevalence. The height of fall was indicated by the number of storeys the cats fell from. The severity of injuries was indicated as summed-up value of injury score. Based on the method adopted from Vnuk *et al.* (2004), the score assigned to the injuries were: 1 - contusions, abrasions, wounds, lacerations, pulmonary contusions, haematuria, epistaxis, dental fractures; 2 - limb fractures, limb luxations, hard palate fractures, mandibular fractures, pelvic fractures, temporomandibular joint luxations, haemothorax, pneumothorax, abdominal wall rupture, diaphragmatic rupture, rupture of urinary bladder, vertebral fractures/luxations; and sum of injury score 1 and 2 (e.g 1+1+2+2=6) - multiple injuries. The correlation between the height of fall and severity of injuries was determined using Pearson correlation coefficient. The coefficient was interpreted based on the categorisation adopted from Hinkle *et al.* (1998).

RESULTS AND DISCUSSION

Limb fractures had the highest percentage in this study (Figure 1), which was consistent with Vnuk *et al.* (2004) and Papazoglou *et al.* (2001).

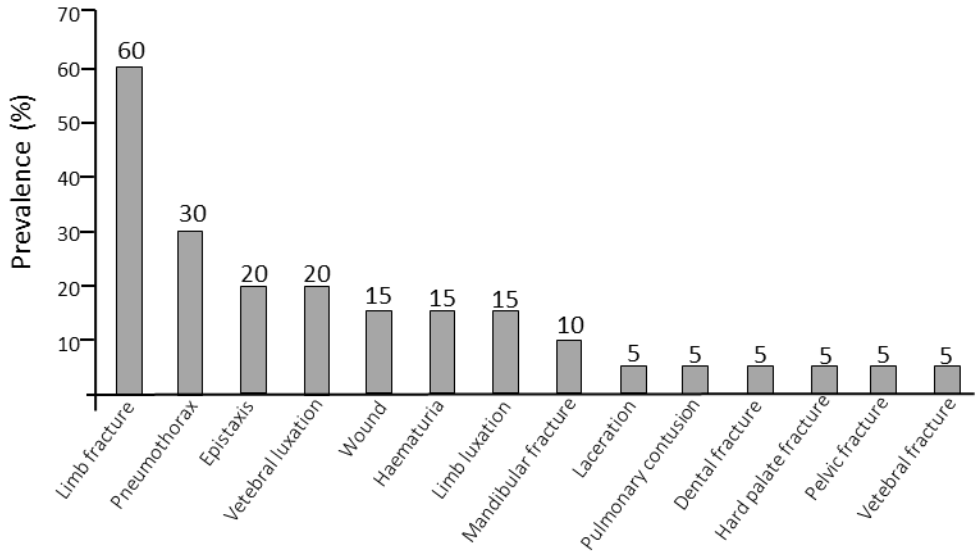

Figure 1: Prevalence of injuries associated with High-Rise Syndrome in cats presented to University Veterinary Hospital, Universiti Putra Malaysia.

Cats falling from heights that surpassed the fifth storey achieved the maximum velocity of 97 km h^{-1} and at this velocity; the stimulation of the vestibular system would cease (Kapatkin and Matthiesen, 1991; Silverstein and Hopper, 2009). Cessation of the stimulation resulted in the conformation of the feline body to a more horizontal position (Kapatkin and Matthiesen 1991; Silverstein and Hopper 2009), enabling the cats to use gyroscopic turns to adjust their posture during the fall (Whitney and Mehlhaff, 1987). Furthermore, absence of vestibular stimulation could minimise the injury due to extended body and limbs, whereby the impact force on landing is spread over a greater body surface area (Whitney and Mehlhaff, 1987). Since 67% of the cats afflicted with limb fractures in this study fell from heights that were lower than the 6th storey, limb fractures might have the highest prevalence due to partially extended limbs. Based on the prevalence of injuries in Figure 1, three most common injuries associated with HRS were limb fractures, pneumothorax, and epistaxis.Vertebral luxation also shared the same prevalence with epistaxis.

The relationship between height of fall and severity of injuries associated with HRS in this study was significant at the range of storeys 3 - 6 ($r=0.622$, $p=0.031$, $n=12$) (Figure 2).

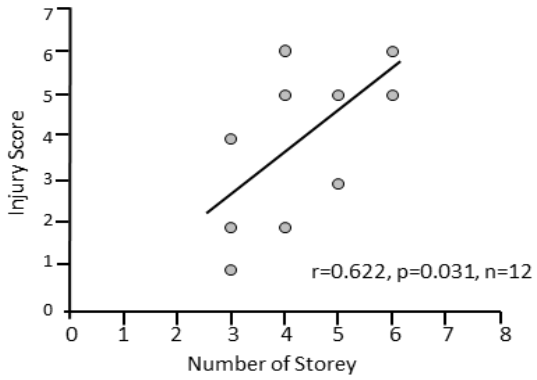

Figure 2: Correlation between height of fall and summed-up value of injury scores of cats with High-Rise Syndrome presented to University Veterinary Hospital, Universiti Putra Malaysia (n=12).

Findings from this study suggest that owners living in high-rise building should be aware of the risk of severe injuries associated with HRS in the cats.

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ZEBRAFISH (*DANIO RERIO*) AND CAVEFISH (*ASTYANAX MEXICANUS*) FOR COMPLEX BRAIN FUNCTION STUDIES

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ABSTRACT

The zebrafish *(Danio rerio)* has been used as a model organism for studies in developmental biology. In fact, several common and important developmental genes mechanisms have been identified in zebrafish, which are similar in mammals. There is also growing research in the cognitive and memory functions in the laboratory animals over the last decade, however the interest in the behavioural features of zebrafish are low. In contrast to zebrafish, the cognitive function for cavefish *(Astyanax mexicanus)* is based on mechanosensory systems and their lateral line, which is highly sensitive to fluctuating water movement and pressure. Many evolution researches done on these cavefish reported that they have better olfactory sense by having taste buds all over its head which help them find food more quickly in complete darkness. In addition, the mechanosensory lateral line system helps the fish to perceive their environment. The objective of this study is to compare the cognitive and memory functions of zebrafish and cavesfish using the Y-maze task with special visual queue at the end of all arms. The results showed that there is no significant ($p>0.05$) difference in cavefish entrance and time spent in all Y-maze arms. However, time spent and numbers of entries in the novel arm were significantly higher in the zebrafish. Thus, the cognitive function of cavefish is based on their special characteristics and the zebrafish is based on the visual queue of the Y-maze task.

Keywords: cognitive function, cavefish, zebrafish, Y-maze

INTRODUCTION

Zebrafish is a common and useful model organism for studies of vertebrate development and gene functions. The zebrafish has been used for decades as a model organism for studies in developmental biology such as in neurobehavioral science (Jörgens *et al.*, 2012) and diebetes (Intine *et al.*, 2013). Compared to other

commonly used laboratory animals such as mice and rats, zebrafish have the same metabolic function with less cost of maintenance, easier to breed and faster result obtained. This makes zebrafish a perfect vertebrate model for comparative cognitive study.

The cavefish is a unique fish because it either has visual perception nor eyes. This fish moves and find their way around by means of their lateral lines, which are highly sensitive to fluctuating water pressure (Yoshizawa *et al.*, 2010). This cavefish have been a powerful subject for scientists studying evolution. By not developing eyes the fish have more energy for growth and reproduction (Rétaux and Casane, 2013). This suggests that cavefish have their own cognition making it a perfect model for comparison of the cognitive function with the zebrafish. Therefore, this study compared the learning and memory functions of zebrafish and cavefish using the Y-maze test.

MATERIALS AND METHODS

Twelve fish (zebrafish; n=6 and cavefish; n=6) were kept in two groups in the Neurobehavioral Room, Physiology Laboratory, Faculty of Veterinary Medicine, Universiti Putra Malaysia. The fish were housed in 2 separate plastic aquariums with dechlorinated tap water and regulated by air pump. The water temperature was regulated at an ambient temperature of 25 to 27 °C. Room lighting was set at 70% brightness. This study was approved by the Institutional Animal Care and Use Committees (UPM/IACUC/FYP.2014/FPV.026).

The Y-maze test consisting of three equally spaced-arm (start arm, familial arm and novel arm) with visual queue and placed at the end of the arm. The working memory is based on spontaneous exploration and alternation between arms. The Y-maze performance was favourable when the number of entries and time spent in the novel arm were greater than those in the other arms. The total number of arm entries and time spent in the novel arm is an indicator of spatial working memory (Onaolapo *et al*., 2012).

During the first trial (5 minute training), fish were allowed to explore only two arms (start and familial arm), with the third arm (novel arm) being blocked. For the second trial (after 1, 3 and 6 hour intervals), the fish were placed back in the Y-maze with free access to all three arms for 5 minutes. Fish were placed in different arms as starting points in every experiment in order to randomize the maze ques. The time spent in each arm and number of entry to each arm was recorded and analyzed.

RESULT AND DISCUSSION

The cavefish shows equal number of entries (mean: start=9, novel=8, familial=8) and time spent (start=1.40mins, familial=1.33mins, novel=1.21mins) in all arms of

the Y-maze task. This could be due to the cavefish just exploring the arm based on their lateral mechanosensory and olfactory sensory bulb making it not significant between all arms. Their mechanosensory and olfactory bulb are more for finding food in complete darkness. In fact, the mechanosensory are very sensitive to fluctuating water movement and pressure (Yoshizawa *et al*., 2010). In this study, no stimulus, vibration or smell, was provided to the cavefish. The study showed that the cavefish do not know the differences between arms of the Y-maze.

For the zebrafish, higher number of entries in the novel arm (novel=14, start=8, familiar=10) and time spent in the novel arm (novel=2.98min, start=1.86min, familiar=2.27min) can be seen in this study. The result shows that the zebrafish have a higher exploratory behaviour indicating that this fish have a good learning function. In fact, when preferential exploration of novelty is established, the zebrafish memorised the novel arm and kept exploring the arm even after several hours (Al-Imari and Gerlai, 2008).

Comparing the number of entry and time spent in the novel arm between cavefish and zebrafish, it was shown that the zebrafish have a significantly ($p<0.05$) higher number of entries and time spent in the novel arm compared to the cavefish. This suggests the blind state of the cavefish prevented from differentiating the novel arm from the other two arms of the Y-maze and consequently they travel to the three arms at equal frequency. The zebrafish with their high exploratory behaviour travel frequently to the novel arm, resulting in higher average number of entries and time spent in the novel arm. The higher exploratory behavior of the zebrafish allow them to explore the environment. It is clear that the zebrafish and cavefish have significantly different characteristics in cognitive and memory functions.

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PREVALENCE OF ECTOPARASITE AND ENDOPARASITE INFESTATION IN JAVAN MYNAS

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ABSTRACT

Myna Sp are well-recognised in the country as pests that can potentially harm human health, cause crop damage, and compete with native wildlife. This study was undertaken to evaluate the prevalence rate of ectoparasites and endoparasites in Javan Mynas. Nineteen Javan Mynas were captured from the wild in Banting, Selangor, Malaysia using a mist net. The measurements taken were body weight, size of bill, head, body, wing, tarsus, and tail. Three species of ectoparasites identified to infest Javan Mynas were *Felicola* sp (21%), *Myrsidea* (79%), and mite *Falculifer rostratus* (79%). Two species of endoparasites found at postmortem were nematode *Diplotriaena* sp *(*53%) and *Pelecitus* sp (21%). There was no significant ($p<0.05$) correlation between number of ectoparasites and endoparasites in Javan Mynas. The study showed that Javan Mynas in Malaysia are carriers of many species of ectoparasites and endoparasites.

Keywords: Javan Mynas, ectoparasites, endoparasites, prevalence rate.

INTRODUCTION

The Javan Mynas are reported to be among the top 10 most commonly sighted birds in Peninsular Malaysia, Sabah and Sarawak (*www.mygardenbirdwatch.com*). The Myna species is relatively high in number and found close to the human population. Their dropping is a nuisance to humans (Yap *et al*., 2002; Lim *et al*., 2003) and is of public health concern. The Javan Mynas (*Acridotheres tristis javanicus*) also known as the white vented mynas, are predominantly black in colour with have white wing patches and they are mostly found perching on top of the water buffaloes in paddy fields. The Javan Myna is considered a pest, especially in urban areas which are their preferred inhabitat. A study was therefore conducted to determine the prevalence rate of ectoparasites and endoparasites infestation and morphological characteristics of Javan Mynas.

MATERIALS AND METHODS

Nineteen birds captured from the wild using a mist net consisted of Javan Myna sp (*Acridotheres javanicus*) from Teluk Panglima, Batu 10, Banting, Selangor, Malaysia. They were kept for 4 days in a close-netted pen. Measurements of external body characters (body biometrics) included bill length, head, body length, wing, tarsus, and tail. Blood sampling were obtained by manual restraint using body grab technique, then brachial vein swabbed with 75% ethanol, and pricked with a 25G needle. Blood was collected in heparinised capillary tubes. Thin blood films were prepared by placing a very small drop of blood from the tip of the micro-capillary tubes. The stained blood film was dried and examined for haemoprotozoa and haemoparasites under 100× magnification of the compound microscope.

In this study, pentobarbital (500mg/kg, 0.3mL/bird) was used to euthanise the birds by intracelomic and intracardiac injections and the bird left for 10 min to die. Presence of endoparasites were determined during postmortem and the intestines were collected and placed in labelled polyethylene bags. The digesta and mucosa of the opened intestine were scraped and placed in petri dishes and examined under a stereomicroscope. Helminths were mounted with lactophenol and identified using a compound microscope under 4×, 10×, and 40× magnifications.

Presence of ectoparasites was determine by soaking the whole body of the bird in 75% ethanol and left to stand for 30min. Sediments were examined under a stereomicroscope and the ectoparasites were mounted using the Hoyer's medium, left to dry on the slide warmer machine and incubated overnight and identified under 10× and 40× magnification using a compound microscope.

RESULTS AND DISCUSSION

The means measurements of external body characters are presented in Table 1. The endoparasite nematodes identified were *Diplotriaena* sp. (Spiruroidea) and *Pelecitus sp* (Filarioidea). Six birds were found to have helminths at a prevalence rate of 32%. The prevalence rate of *Diplotriaena* sp. was 53% and *Pelecitus* was 21% (Table 2).

Three major ectoparasites were identified in the Javan Mynas. The ectoparasites found in the feathers and body after soaking in alcohol were 2 species of lice (*Felicola* and *Myrsidea* sp.) and 1 species of mite (*Falculifer rostratus*). The prevalence rate of ectoparasites in Javan Mynas is summarised in Table 2. The mite *Falculifer rostratus* showed an infestation rate of 79%. The prevalence rate of the mite *Falculifer rostratus* and louse *Myrsidea sp* were the same at 79%. The prevalence rate of *Felicola* sp. was 21%.

There was no significant ($p<0.05$) correlation between number of ectoparasites and endoparasites in Javan Mynas. This indicates that high ectoparasite infestation do not necessarily mean high endoparasite infestation.

Table 1: Mean external body measurements of Javan Mynas

Parameter	Mean	Range of values
Weight (g)	100.30±0.69	100-102
Head (cm)	5.44±0.19	5-6
Bill (cm)	2.29±0.26	2-3
Body length (cm)	23.71±1.01	22-25
Wing (cm)	13.18±0.30	13-14
Tarsus (cm)	3.28±0.17	3-4
Tail (cm)	7.80±0.26	8-8

Table 2: Prevalence rate of parasite infestation in Javan Mynas

Parasites	Prevalence rate (%)	Mean/bird	Minimum	Maximum
Nematodes				
Diplotriaena sp.	53	6.7	1	22
Pelecitus sp.	21	N/A	N/A	N/A
Lice				
Felicola sp.	21	N/A	1	7
Myrsidea sp.	79	3.27	N/A	N/A
Mites				
Falculifer rostratus	79	9.13	1	50

N/A=not available

Falculifer rostratus can be found in Eurasia, Northern Africa, North and South America (Jacek and Serge, 1999). The results of this study revealed that *Diplotriaena* sp. was highly prevalent in bird gastrointestinal tracts with an infestation rate of 53%.

CONLUSION

It is seen that the infestation rates of mites and lice are high in Javan Mynas examined. The Javan Mynas in Malaysia can carriers of many species of ectoparasites and endoparasites.

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SKIN CONDITIONS OF DOGS PRESENTED TO UNIVERSITY VETERINARY HOSPITAL, UNIVERSITI PUTRA MALAYSIA

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ABSTRACT

Skin disorders are among the most common health problems in dogs. There are several risk factors in dermatological conditions in dogs and they includes, breed, age, and genetics. This a retrospective study to determine the prevalence of dermatological conditions in dogs presented to University of Veterinary Hospital (UVH), Universiti Putra Malaysia. Information acquired also included clinical manifestations, extent of clinical investigation, and risk factors for the most common skin conditions encountered. Of the 1827 dogs presented to UVH from 1st January to 31st December 2014, 615 dogs were presented with dermatological problems, with a prevalence of 33.66%. Erythema (15.99%) was the most common presenting clinical sign, followed by alopecia (13.38%), pruritus (12.88%), maculo-papular-pustular eruptions (11.01%), and scaling (9.33%). The five most common final diagnoses in descending order were malasseziasis, dermatophytosis, otitis externa, neoplasia and cutaneous myiasis. The acetate tape test (32.24%) was the most common diagnostic procedure performed, followed by trichograms (20.39%) and skin scrapes (13.93%). In dogs with malasseziasis, there was no association with age, sex, neuter status, or body condition score (BCS). However, dermatophytosis was significantly associated with the age where dogs above 6 years of age had a 70% lower risk to have the disease than younger dogs. Otitis externa was significantly associated with age, sex and BCS, where females had 50% lower risk of getting the disease than males. The relative risk for the dermatological conditions was almost twice higher in obese and older dogs than the others. The top five breeds presented with dermatological conditions were mixed breed dogs, Shih Tzus, German Shepherds, Poodles and Cocker Spaniels.

Keyword: canine, skin conditions, erythema, malasseziasis, acetate tape test

INTRODUCTION

It is a general impression in small animal practices that dermatological conditions in dogs are common reasons for owners to consult veterinarians. As a result, determination of the prevalence of skin conditions has become among one of the most popular studies conducted on dogs. In Canadian veterinary hospitals, dermatological problems accounted for 18.8% of all dog cases presented (Scott and Paradis, 1990). A more recent study conducted in 20 small animal practices in the United Kingdom showed that 24.1% of dog consultations in general veterinary practice were related to dermatological problems (Hill *et al*., 2006). In Iran, canine skin conditions accounted for 17% of all cases (Khoshnegah *et al.,* 2013). In Malaysia, skin disease is also among the most common conditions in dogs; however, there is a paucity of information on the prevalence of the disease. Thus, this study aimed to determine the prevalence, clinical manifestations, diagnostic tests, and risk factors of common skin conditions in dogs.

MATERIALS AND METHOD

A retrospective study was conducted at the University Veterinary Hospital (UVH), Universiti Putra Malaysia on dogs presented with skin conditions during the period of 1st January to 31st December 2014. The inclusion criteria in this study were all cases associated with abnormal skin and hair conditions. Patient files for these cases were obtained to retrieve information including signalment, history, clinical sign, dermatological procedure conducted, and final diagnosis. The sex, age, neuter status, breed, and body condition score (BCS) of the dogs were also recorded.

RESULTS AND DISCUSSION

The study showed that of 1827 canine cases presented to UVH during the study period, 615 were associated with dermatological conditions. The most common final diagnoses were malasseziasis, dermatophytosis, otitis externa, neoplasia, and cutaneous myiasis. In these cases, erythema (15.99%) was the most common presenting clinical sign, followed by alopecia (13.38%), pruritus (12.88%), maculo-papular-pustular eruptions (11.01%), and scaling (9.33%). In UVH, dermatological cases were commonly diagnosed using acetate tape test (32.24%), followed by trichograms (20.39%), and skin scrapes (13.93%). Among all skin conditions diagnosed at UVH, malasseziasis was most common at 20%, followed by dermatophytosis, and otitis externa at 9% each. Malasseziasis did not show any association with the age, sex, body condition score, or neuter status. Dogs above six years old had a 70% lower risk of having dermatophytosis than younger dogs. Otitis externa was significantly associated with age, sex, and BCS with females showing 50% lower risk for the disease than males. Obese dogs had almost twice

greater risk of acquiring skin conditions than old dogs. The top five breeds presented with dermatological conditions were mixed breed dogs, Shih Tzus, German Shepherds, Poodles and Cocker Spaniels.

Dermatological problems in dogs presented to UVH during the period of study were higher in number than those of other countries, and comprised 33.66% of all dog cases. Earlier studies showed that canine skin conditions varied with geographical regions. For example, the Canadian report (Scott and Paradis, 1990) showed that the most common final diagnoses were bacterial folliculitis, allergic dermatitis, and endocrinopathy. In the United Kingdom (Hill *et al.,* 2006) the aetiology of most dermatological cases undiagnosed in one study. The diagnosed cases, in order of frequency, were otitis and pyoderma.

Pruritis seemed to be the most common presenting signs in dogs with dermatological problems (Hill *et al.,* 2006; Khoshnegah *et al.*, 2013). However, this observation may be subjective because identification or recognition of pruritus varies with the attending veterinarian. In addition, owners when asked may not associate behaviours demonstrated in their dogs with pruritus resulting in acquisition of inaccurate history. Thus, it is crucial that for accurate diagnosis for the condition that thorough physical examinations are conducted by attending veterinarians.

Diagnostic procedures are dependent on tentative diagnosis. In the current study, the most common dermatological conditions diagnosed at UVH was malasseziasis. Thus, as expected, the acetate tape test was commonly used in the diagnosis of skin conditions of dogs presented to UVH.

The risk factors for malasseziasis, dermatophytosis, and otitis externa were determined by calculating relative risk of the disease against the age, sex, neuter status, and BCS. In this study, dermatophytosis and otitis externa were associated some of these animal parameters. There is no association between risk factors and the occurrence of malasseziasis in dogs, suggesting that the condition can occur in dogs of any age, sex, or breed (Chen, 1997)

CONCLUSION

In conclusion, the overall prevalence of canine skin conditions presented to UVH from 1st January to 31st December 2014 was 33.66%. The study suggests that the prevalence of skin conditions in dogs in Malaysia is higher than those of temperate countries. The most common clinical manifestations observed in canine dermatological conditions were erythema, alopecia, pruritus, and maculo-papular-pustular eruptions. The most frequently used tests were the acetate tape test, hair pluck, skin scrape, impression smear, and the Wood's lamp. These tests are all simple and are first conducted in skin conditions before other more advanced tests. Malasseziasis was most common skin condition at 20%, followed by dermatophytosis, and otitis externa at 9% each. Dermatophytosis was positively associated with age only while otitis externa with age, sex and BCS.

ACKNOWLEDGEMENT

Deepest appreciation to the staff of University Veterinary Hospital for their help and support, and to my family, for their support and unconditional love.

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PARASITIC INFESTATION IN PEKIN DUCKS REARED UNDER CLOSE-HOUSE AND OPEN-HOUSE FREE-RANGE SYSTEMS

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ABSTRACT

Parasitic infestation in commercial Pekin duck raised in close-house and open-house free-range system were investigated. A total of 16 matured ducks, 8 from each rearing system were randomly selected. Blood and feather samples were collected immediately after slaughter. Forty-eight fresh faecal samples were taken from the floor, 24 ducks from each system. Thin blood smear stained with Giemsa were negative for *Leucocytozoon* sp. The feather were also negative for ectoparasite. Simple floatation tests on intestinal contents were negative but faecal samples were positive for helminths. The present study shows that there is no difference in parasitic infestation between close-house and open-house free-range system for Pekin duck production.

Keyword: Pekin duck, helminth, ectoparasite, *Leucocytozoon sp*

INTRODUCTION

Pekin duck is a white colour breed with a medium-sized deep yellow coloured bill and curve neck. Besides being an excellent egg producer, the Pekin ducks are also reared for meat. Peking ducks originated from China and has a high growth rate and low feed conversion ratio (Padhi *et al.*, 2010).

The housing sytem for duck production vary around the world because of the differences in terrain, climate, market demand, and economic climate of the country. In the open-house free-range system the ducks are allowed to roam free in open water during the day and housed at night. In close-house systems there is total confinement of ducks with no access to open water (Cherry and Morris, 2008). The enclosures are cleaned and disinfected thoroughly the end each production period and this prevents build-up in parasites and infectious agents (Permin *et al.* 1999). In the open-house free-range system, the ducks are in contact with the natural environment, exposing them to a variety of parasite infestations.

This study was undertaken to determine the prevalence of parasites in Pekin ducks reared in close-house and open-house free-range systems.

MATERIALS AND METHOD

Samples were obtained from the Chong Lee Poultry Sdn Bhd Pekin ducks farm, located in Taiping, Perak, Malaysia. The ducks are reared under two types of housing systems, which are the close-house and open-house free-range systems. The farms practices all-in all-out system. Sixteen ducks, 8 each from close-house and open-house free-range system were randomly selected for the study. Blood was collected in EDTA tubes. Forty-eight fresh faecal samples, 24 from each housing system were also obtained. The feathers were plucked from various sites, including the wings and head of the ducks. The ducks were then slaughtered and the intestines removed and scrapped to collect intestinal contents. Sixteen each of faecal samples and intestinal contents were subjected to the simple floatation.

The slides were observed under a microscope at 40×, 60×, and 100× magnifications. Thin blood smear was made and the slides microscopically examined at 100× magnification. The plucked feathers were viewed under the dissecting microscope.

RESULTS

There was no parasite in the thin blood smears or the features. The sedimentation method failed to show presence of gastrointestinal helminthes. However, some fresh faecal samples were positive for parasites (Table 1).

Table 1. Parasites in samples from Peking ducks reared in close- and open-house free-range systems

Production system	Parasites		
	Positive	Negative	Total
Close-house	8	16	24
Open house free-range	14	10	24
Total	22	26	48

The results show no significant difference in prevalance of gastrointestinal helminths between Peking ducks reared in the close-hose and open-house free-range systems.

DISCUSSION

Absence of helminth in the intestinal content of the Pekin ducks suggests that the farm practices good biosecurity measures. The farm is well-fenced preventing the ducks from coming into contact with other animals outside the compound. This may have prevented introduction of parasites into the farm. The farms also practices other biosecurity measures, including use of disinfectant in vehicle and foot dip at the main and duck house entrance, respectively. For ducks raised under the open-house free-range system, feeding was at a secure feed house. This is also a means to minimise exposure of feed to wild birds that could be carriers of parasites. The farm also practices the all-in all-out system, which an additional measure for prevention of transmission of infections between batches of ducks. Absence of ectoparasites in the Pekin ducks in this farm may be also the result of their natural behavior of cleaning feathers and body in water.

CONCLUSION

There is no difference in parasitic infestation in duck raised in close-house and open-house free-range systems in the Chong Lee Poultry Sdn Bhd Pekin ducks farm. The relative parasite-free ducks in this farm is an attestament to the good biosecurity measures practices by the farm.

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IDENTIFICATION OF BACTERIAL PATHOGENS IN LOCALLY PRODUCED LABORATORY RATS

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ABSTRACT

Microbiological status of laboratory rats used in experiments can significantly influence the animals' welfare and compromise research findings. Laboratory rats used in research must be healthy since any infection even in the absence of clinical signs before or during the experiment period may result in inaccurate data. In this study, 15 laboratory rats were chosen randomly from 3 different suppliers (5 rats from each supplier). The rats were euthanized and then, samples from the respiratory tract and gastrointestinal tract were collected using sterile swabs. Isolation and identification of bacteria from the samples were carried out by culturing followed by series of biochemical tests. Ten bacterial species were monitored in this study. They include *Staphylococcus aureus, Bordetella bronchoseptica, Pasteurella pneumotropica, Streptococcus pneumonia, Corynebacterium sp., Salmonella sp., Citrobacter sp., Clostridium sp., Pseudomonas aeruginosa and Klebsiella pneumoniae.* A number of bacterial species were identified from the samples. These bacteria are known as opportunistic pathogens where immunocompromised animals may succumb to infection.

Keywords: Laboratory rats, bacteriology, isolation and identification

INTRODUCTION

Laboratory rats rank second to mice in the number used in biomedical research and both account for 90% of all mammalian species used (Hrapkiewicz and Medina, 2007). In selecting laboratory animals for research, proper consideration should be given to the quality of the animals and health is one of the major qualities. It is vital that animals used in research are healthy. The microbiological status of these animals can influence the validity of the research data as any form of infection with certain microorganism can interfere with the research. Animals used in research undoubtedly undergo tremendous amount of stress. Both mental and physical disturbance may cause stress but the latter is probably the most important. Stress is

often linked with the circumstances that contribute to development of diseases. The used of laboratory animals that are free from unwanted organisms are significant to achieve reliable and reproducible result with minimum number of animals. Due to what has been described, it is crucial that animals used in research have a microbiological status that is known. However, it is difficult to assess the microbiological status of the individual taking part in the experiment. For that matter, the status of the colonies is usually taken into consideration rather than individual status. If an agent is detected in the sample group, the larger population (such as the breeding unit or research animal room) should be considered contaminated (or infected) with the same detected agent (Weisbroth ***et. al.***, 1998).

MATERIALS AND METHODS

Five laboratory rats each from three different local suppliers, namely company A, B and C were chosen randomly and sampled three times.The rats were euthanized by an overdose of carbon dioxide gas in an airtight chamber. Sterile equipments were used to dissect the rats. Samples were taken using sterile swab from the nasal cavity and from the gastrointestinal tract, samples were from the caecum and ileum. Faeces were also collected for bacterial culture. Each sample was then streaked onto blood agar and MacConkey's agar. Then, this procedure was followed by examination of colony and cellular morphology using gram staining. Various colonies were subcultured on individual blood agar to obtain pure cultures. The pure cultures were subjected to biochemical tests as recommended in the laboratory manual (Jang *et al*., 2008) to identify the isolated bacteria.

RESULTS AND DISCUSSION

Samples of rats from Company B were tested positive for 4 bacteria namely *Pasteurella pneumotropica, Corynebacterium sp., Pseudomonas aeruginosa* and *Proteus mirabilis* from the monitored list. This is the highest number of positive result compared to rats from the other companies. This was followed by rats from Company C with 3 positive results for monitored bacteria where it was tested positive for *Corynebacterium sp., Klebsiella pneumoniae* and *Proteus mirabilis*. Rats from Company A had the least number of positive results in which only two bacterial species, *P. pneumotropica* and *Proteus mirabilis* from the monitored list were isolated (Table 2). These isolated bacterial species are mostly opportunistic pathogens where each of them has various ways to affect the host and thus may lead to misinterpretation or false conclusion in the research.Thus it can be concluded that rats produced by these three companies are not of very good quality.

Table 2. Bacteria isolated from the respiratory and gastrointestinal tract

Bacteria	Company A		Company B		Company C	
	n=5	%	n=5	%	n=5	%
Staphylococcus intermedius	4	80	1	20	1	20
Escherichia coli	5	100	5	100	5	100
Pantoeaagglomerans	2	40	0	0	1	20
Staphylococcus hyicus	1	20	4	80	0	0
*Pasteurella pneumotropica**	1	20	1	20	0	0
Proteus mirabilis	1	20	4	80	4	80
Aeromonas sp.	1	20	0	0	0	0
Enterococcus durans	1	20	0	0	0	0
*Corynebacterium sp.**	0	0	1	20	1	20
*Pseudomonas aeruginosa**	0	0	1	20	0	0
Edwardsiellatarda	0	0	1	20	0	0
*Klebsiella pneumoniae**	0	0	0	0	1	20
Actinomyces sp.	0	0	0	0	2	40
Bacillus cereus	0	0	0	0	1	20
Staphylococcus sp.	0	0	0	0	1	20
Streptococcus dysagalactiae	0	0	0	0	1	20
Morganella morganii	0	0	0	0	1	20
*Staphylococcus aureus**	0	0	0	0	0	0
*Bordetella bronchoseptica**	0	0	0	0	0	0
*Streptococcus pneumoniae**	0	0	0	0	0	0
*Salmonella sp.**	0	0	0	0	0	0
*Citrobacter sp.**	0	0	0	0	0	0
*Clostridium sp.**	0	0	0	0	0	0

* Refers to the bacteria included in the monitoring program.

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PESTICIDE AND ANTIBIOTIC RESIDUES IN MEAT OF DUCKS REARED UNDER CLOSE-HOUSE AND OPEN-HOUSE SYSTEMS

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ABSTRACT

Antibiotics and pesticides are rampantly used in animal production. These chemicals are detrimental to the health of consumers. In this study, we investigated the antibiotics and pesticides residues in the meat of commercial Pekin ducks reared in close-house and open-house free-range system. Sixteen mature ducks were the subjects of this study. The antibiotics and pesticides residue analyses were conducted using the 6-plate test, ELISA and QuEChERS methods. The 6-plate test method was used for qualitative detection of antibiotics present in animal tissues. All samples were negative for macrolides, aminoglycosides, tetracyclines, sulfonamides, β-lactam and quinolones. The samples were also negative for chloramphenicol, nitrofuran, and β-agonist. In addition, the results for pesticide residues were negative for all samples. In conclusion, antibiotics, pesticides, and banned drugs were absent in the meat of duck reared in these farms.

Keywords: duck meat, close-house, open-house, free-range, antibiotics, pesticides

INTRODUCTION

A few cases of excessive use of drugs and medications have been reported in the poultry industry in Malaysia. Antibiotics are often used in poultry production to improve growth performance and feed efficiency and to synchronize and control of reproductive cycle and breeding performance. This practice has lead to development of harmful residues in poultry meat (Nisha, 2008). Organochlorine pesticides for example, are present in the environment, especially in water bodies and may pose a threat to the reared near the area or have free access to the water supply from the contaminated ponds. In this study, the presence of pesticides residue in meat of ducks with free access to ex-mining ponds was examined.

MATERIALS AND METHODS

Duck

Samples were obtained from the Perak Duck Food Industry farm located at Trong, Perak, Malaysia. The farm practices the close-house and open-house free-range systems. Eight samples of duck carcass were taken from each housing system. Random sampling was done at the slaughter house without consideration for sex as a selection criterion. All of the ducks were fed commercial poultry feed. Prior to the slaughtering, the ducks received similar preslaughter treatments; that is relaxation and fasting for 24 hours with free access to water. The ducks were slaughtered on the 54^{th} day by the halal slaughter procedure.

Antibiotic

This method uses 6 media that had been cultured separately with different species of bacteria at certain pH level. The agar diffusion test was performed. The media prepared for this test contains nutrient that help to enhance the growth and multiplication of bacteria rapidly in 18 to 24 hours of incubation period. The six groups of antibiotics which can be quantitatively identified from various tissue samples using this method are: macrolides, aminoglycosides, tetracycline, sulphonamides, β-lactams, and quinolones. In this method, the sliced meat samples were placed on the media inoculated with *Bacillus cereus* spore (pH 6.0), *Bacillus subtilis* spore (pH 6.0, 7.2, and 8.0) or *Escherichia coli* (pH 8.0). Trimethoprime was added to the media to increase sensitivity detection of sulphanomide residue.

Banned drug

Detection of banned drug was by ELISA. The principle for this assay is based on the competition principle between the drug/metabolite in the sample and the drug enzyme conjugate for the limited number or specific antibody binding sites.

Organochlorine

Gas chromatography–mass spectrometry (GC-MS) is an analytical method that combines the features of gas-liquid chromatography and mass spectrometry to identify different substances within the samples. In this study, the samples were analysed for organochlorine pesticides. The GC/MS instrument separates chemical mixtures (GC component) and identifies the components at a molecular level (MS component).

RESULT AND DISCUSSION

All samples were negative for antibiotics, banned drugs, and organochlorines.

Drug abuse in animal production is mainly the result of lack of awareness, knowledge, failure to convey information to manufacturers, and lack of safe drugs (Nisha, 2008). However, the lack in observation of of the withdrawal period is the

most common cause of drug residues in animal products. Excessive use of antibiotics in the poultry industry is well-known. The residues of these substances and their metabolites in food products of animal origin will affect consumers' health. However, if the withdrawal period is carefully observed before processing, these products may be free of drug residues and therefore safe for consumption. The approved withdrawal period for drug use in production animals is two weeks before slaughter.

In the open-house free-range animal rearing system, there is increased risk of disease from contact with animal droppings and wild birds. In close-house system, however, there is relatively lower risk of disease. Disease like parasitism is more associated with hygiene and biosecurity practices by the farmer.

Duck reared under the open-house free-range system had free access to the ponds in the farm. Since the use of pesticide is quite rampant in the country, environmental contaminant is expected. Organochlorine pesticides are among the agrochemicals extensively being used for long periods in plantations and farms. These pesticides will accumulate in water bodies such as abandoned mining pools. In this study, the ducks expecially those raised in the open-house free-range system were free of pesticides. Thus it can be concluded that the farm is well-managed and the ponds in the farms are not contaminated with pesticide residues.

In conclusion, the meat of ducks which were reared in the close-house and open-house free-range systems was free of antibiotics, banned drugs, and pesticides.

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PREVALENCE OF HAEMOPARASITES IN KATJANG GOATS MANAGED UNDER INTENSIVE AND SEMI-INTENSIVE SYSTEMS

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ABSTRACT

The Katjang goat is a small local breed primarily reared for meat. In livestock including goats, the prevalence of parasites is associated with management systems. In this study, the prevalence of blood parasites was determined in goats raised in 4 farms practicing either intensive (n=21) or semi-intensive (n=21) management systems. Comparison between different systems, age groups and sex was done. Blood samples were collected from the jugular vein of 42 Katjang goats and placed into EDTA tubes. To identify the blood parasites, a thin blood smear from each blood sample was prepared and stained with Giemsa stain, and then the slide was observed under a light microscope. The prevalence rate of haemoparasites in Katjang goats in these farms was 21.4%. The type of management system showed significant ($p<0.05$) difference in haemoparasite burden among the Katjang goats. Katjang goats managed semi-intensively had higher prevalence rate (19%) compared to goats managed intensively (2.4%). Thus, raising goats intensively without allowing them to graze can reduce haemoparasite burden. There was no significant ($p>0.05$) difference between the age groups (kids, young and adults) in haemoparasite load in the Katjang goats. However, there was significant ($p<0.05$) difference between the sexes in haemoparasite load.

Keywords: Haemoparasite, prevalence, intensive, semi-intensive, management system

INTRODUCTION

Katjang goat is a small local breed that is primarily reared for meat. Poor management, poor nutrition, absence of herd health programme, and diseases can adversely affect the productivity of these goats. One of the diseases is blood parasitism, which include anaplasmosis, babesiosis, eperythrozoonosis, theileriosis and trypanosomiasis.

In Malaysia, goats are usually managed either intensively or semi-intensively. Goats under semi-intensive farming are let out for grazing in the afternoon from 2 to 5 pm, and thus these goats are exposed to parasites. In intensive type of farming the goats are kept in sheds with minimal exposure to parasites.

Tick-borne diseases can cause huge economic losses in developing countries like Malaysia (Kubelová *et al*., 2012). This disease is associated with parasites, vectors or immediate host, vertebrate host and also the environment. However this association also depends on climatic changes, type of soil and vegetation, livestock production system and how the disease is controlled on a farm (Angwech *et al*., 2011).

Katjang goat is quite resistant to diseases and ectoparasites, especially biting flies and ticks. In Malaysia, there is dearth of reports on the prevalence of haemoparasites in Katjang goats. Thus, the present study was conducted to determine the prevalence of blood parasites in Katjang goat and to compare the blood parasite load in Katjang goats reared intensively and semi-intensively and prevalence of haemoparasites among age groups and sex.

MATERIALS AND METHODS

Animals

Two groups of goats from 4 farms, A1, A2, B1, and B2 were used for blood collection. The first group comprised of goats from an intensive system and the second group consisted of goats from a semi-intensive system. The breed used was either purebred Katjang or Katjang crosses.

The first farm, Farms A1 and A2 practised the intensive management system. Farm A1 had 20 goats and 10 were Katjang goats while Farm A2 had 80 goats of mixed breeds of Boer, Katjang, and Jamnapari, but only 11 were Katjang goats.

Farms B1 and B2 practised the semi-intensive management system of farming with goats and sheep kept separately in different sheds. The goats were allowed to graze from 2.00 to 5.00 pm in the farm area. Blood samples were collected from the Katjang goats of Farms B1 and B2.

Body weight

The body weight of the goats was estimated using the tape method. Firstly, the tape was placed around the goat's heart to girth. Secondly, the distance from the point of shoulder to the pin bone was measured. Body weight was determined by the following formula.

$$\frac{\text{Heart girth} \times \text{heart girth} \times \text{shoulder to pin distance}}{300} \times 0.4535 = \text{Body weight (kg)}$$

Blood collection

Using a sterile 23G needle, blood was collected from the jugular vein into 3-ml EDTA tube. The tube was kept in a refrigerator at 4°C.

Microscopic examination of haemoparasites

A thin blood smear was made on a slide. The slides were dried before they were fixed in methanol for 3 minutes. Next the slides were stained with 10% Giemsa solution for 30 minutes. Then, the slides were washed under running tap water and left to dry. Lastly, the slide was examined under a light microscope at 1000× magnification under oil immersion for any blood parasite.

RESULTS AND DISCUSSION

In this study, the prevalence of haemoparasites in Katjang goats from 4 farms in Selangor was 21.4%. The hemoparasites detected were *Mycoplasma* sp (Figure 1) and *Theileria* sp (Figure 2). The highest percentage of haemoparasites detected was 0.3%. This showed that the prevalence of haemoparasites in Katjang goats was low. This is probably because Katjang goats being indigenous to Malaysia are wel-adapted to the Malaysian environment and have developed resistance towards the haemoparasites. There is lack of data regarding the haemoparasite status in goats in Malaysia. The last study was by Chandrawathani *et al.* (2009) but only in the state of Perak. That study showed a theileriosis prevalence of 27%. As reported by Ernie Muneerah *et al*. (2011), Katjang goats have the natural ability to tolerate heat and ticks under local climate.

This study revealed that goats in semi-intensive farms had higher prevalence of haemoparasites (21.4%) compared to the intensive farms (2.4%). This showed that goats in the semi-intensive system were more susceptible to haemoparasites than those raised under the intensive system. Without free grazing may reduce the haemoparasite burden in the Katjang goats.

Ticks are important vectors in haemoparasite infestation they are carriers of haemoparasites. The differences in the prevalence of haemoparasites between the management systems observed in this study may be due to the contact frequency with vectors. Engorged adult female tick infected with the protozoa will drop from the host into the soil to lay eggs. The eggs develop into larvae and when animals browse at the infected area they may acquire the larvae (Junquera, 2014).

Katjang goats under intensive systems have low contact with soil because they were inside the pens at all times accounting for the lower prevalence of haemoparasites than in goats under semi-intensive systems.

This study also revealed there was no significant ($p>0.05$) difference in haemoparasite prevalence among the age groups of the Katjang goats. However among the age groups, the highest prevalence of haemoparasites was in adults, followed by young goats and kids. Other than management systems, this study also showed there was significant ($P<0.05$) difference in haemoparasite prevalence between sex of goats. Female goats had higher prevalence of haemoparasites (22.7%) compared to male goats.

In Malaysia, there is a lack of studies on haemoparasites in goats, and there is also no study done describing the relationship between management systems and

haemoparasite infestation in goats. Thus there is need to conduct more studies to determine the prevalence of haemoparasites in goats of Malaysia.

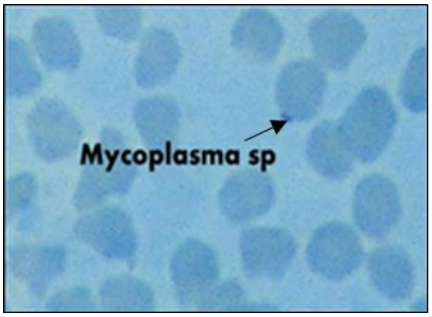

Figure 1. *Mycoplasma* sp in erythrocyte

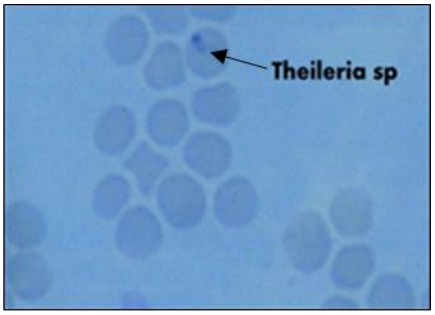

Figure 2. *Theileria* sp in erythrocyte

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EXPRESSION OF ZENK AND FOXP1 GENES IN PARROT BRAIN

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ABSTRACT

Parrots are popular companion animals. Vocalisation in a songbird or parrot is controlled by a few key genes in the brain. It has reported that FOXP1 is most likely related with speech disorder and vocalization. This study was conducted to determine the expression of ZENK and FOXP1 genes in the brain of a parrot. Brain sample collected was preserved and stored in -20°C. Total RNA was extracted from the brain sample using the RNeasy Mini Kit (Qiagen). Quantitative real time PCR assay was done using the StepOnePlus™ Real-Time PCR Systems. The results were recorded as CT values. The lowest CT values were at a RNA concentration of 170g/mL with values of 22.91 and 23.39 for ZENK and FOXP1 gene expression, respectively. The highest Ct values were with 0.02ng/mL RNA concentration at 23.94 and 23.99 for ZENK and FOXP1 genes, respectively. In conclusion this study reports that ZENK and FOXP1 genes are expressed in the brain of a parrot and the expression is directly proportionate with the concentration of RNA from the tissue.

Keywords: songbirds, gene expression, ZENK, FOXP1

INTRODUCTION

Parrots are a popular choice of companion animals because of their ability to mimic many sounds such as human speech, song and laughter. Among the most popular pet parrots are African Grey Parrot and Lovebirds because of their intelligence, affection and ability to talk and sing upon training.

Vocalisation in songbirds is controlled by a few genes in the brain. A previous study reported that FOXP1 is most likely related to speech disorder and vocalisation (Webb and Zhang, 2004). In another study (Teramitsu *et al*, 2004), it was shown that expression pattern and localization of FOXP1 and FOXP2 genes in the subcortical structures that function in sensorimotor integration, control of skilled and coordinated movement are similar to that of humans. The localisation of

FOXP1 and FOXP2 genes in several structures of the brain also suggests that mutations in FOXP1 gene may be associated with speech and vocalisation disorders (Teramitsu *et al*, 2004). Therefore, this study was conducted to determine expression of ZENK and FOXP1 genes in the brain of a parrot.

MATERIALS AND METHODS

Animals
Three-week old male Lovebirds (*Agapornis* sp.) were obtained from the Postmortem Room, Faculty of Veterinary Medicine, Universiti Putra Malaysia.

Brain sample and RNA extraction.
Brain samples were collected, preserved and stored at -20°C. RNA was extracted from the brain samples using the RNeasy Mini Kit (Qiagen, USA) and the product stored at -80°C.

Reverse-Transcriptase PCR
Reverse-Transcriptase PCR (RT-PCR) analysis was done on extracted brain RNA product to amplify the RNA for target genes. The primers sets of the desired gene were added with the master mix at 25µL total volume and subject to RT-PCR (Senso Quest Thermalcycler) assay.

Gel electrophoresis
The PCR product from RT-PCR analysis was subjected to gel electrophoresis to determine gene expression. Five 5µL of the product was mixed with 2µL loading dye and loaded into the wells of the gel. The gel was submerged in TAE buffer and electrophoresed at 85 volt for 45mins before visualisation under a UV transilluminator.

Real-Time PCR (qPCR)
qPCR was done to quantify the amplified RNA. Five concentrations of 170, 17, 1.7, 0.17, and 0.02 ngRNA/mL were used in the analysis. The qPCR assay was done using the StepOnePlus™ Real-Time PCR Systems. The results was recorded as Ct values.

RESULTS AND DISCUSSION

The expression for ZENK and FOXP1 genes in the brain of the parrot is shown in Table 1.

Table 1. Expression of ZENK and FOXP1 genes in the brain of a parrot

RNA (ng/mL)	Ct	
	ZENK	FOXP1
170.00	22.91	23.39
17.00	22.92	23.46
1.70	23.00	23.68
0.17	23.43	23.87
0.02	23.94	23.99
0.00	30.54	30.12

The study showed that both ZENK and FOXP1 genes can be detected with the use of high RNA concentrations. Since the Ct values are inversely proportional to the amount of target RNA in the sample, the lowest Ct value indicates highest amount of gene. The result showed that the highest RNA concentration was 170 ng/mL for ZENK and FOXp1 genes that gave the lowest Ct value. Ct value of >29 indicates strong positive reactions of abundant target nucleic acids in the sample.

A previous study reported that when songbirds hear a song or when they sing, the mRNA levels of the ZENK gene increases rapidly in areas of the forebrain involved in vocal communication. In fact, these birds upon hearing songs from other birds of the same species showed ZENK protein expression in the song control nuclei of the brain (Mello and Ribeiro, 1998).

In humans, the FOXP gene determines development of verbal ability (Lai *et al*., 2001). The expression pattern of FOXP1 and FOXP2 genes in human foetal brain are similar to those in songbirds. However, in songbirds, expression of FOXP1 in the brain nuclei overlaps with and higher than FOXP2 gene (Teramitsu *et al.,* 2004).

In conclusion, the study shows that ZENK and FOXP1 genes are present in the brain of parrots.

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PREVALENCE, PLASMA LIPID, AND ADIPONECTIN CONCENTRATIONS OF OBESE DOGS IN KLANG VALLEY, MALAYSIA

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ABSTRACT

With the improvement in living standards of the Malaysian society, obesity among pets, particularly dogs appear to become more prevalent. Currently, no study has been done on the characteristics of obesity in dogs in Malaysia. This study aims to determine the prevalence of obese dogs in Klang Valley, Malaysia. A portable bioelectric impedance device (BID) was used to determine the body fat of lean and obese dogs for comparison. In addition, an obesity biomarker, plasma adiponectin, together with alanine aminotransferase (ALT), total cholesterol and triglyceride concentrations were also estimated to determine differences between lean and obese dogs. One hundred seventy-two apparently healthy dogs were selected for the study; of which 12 lean and 13 obese dogs were selected for estimation of plasma parameter concentrations. A 5-point scale body condition score (BCS) and fat percentage measurements were employed for all dogs. The study showed that the prevalence of overweight and obese dogs based on BCS was 46.5% and based on BID was 56.0%. There was statistically significant correlation (r=0.70, N=172, p<0.01) between BCS and fat percentage among dogs. Based on BCS and fat percentage, there were positive correlations between age and obesity (BCS: r=0.22, N=172, p<0.01, fat percentage: r=0.38, N=172, p<0.01), and between sex status (p<0.01). Although there was no statistical significance difference in plasma ALT and total cholesterol concentrations among dogs, the fat percentage (p<0.01), triglyceride (p<0.01), and adiponectin concentrations (p<0.01) were significantly higher in obese than lean dogs. This study shows that the results from BCS and the BID analyses correlate with plasma adiponectin and lipid concentrations. The BCS and BID analyses are good methods for the determination of obesity in dogs.

Keywords: prevalence, dog, obesity, cholesterol, triglyceride, adiponectin

INTRODUCTION

Obesity, defined as excessive adipose tissue and weight of 20% more than ideal weight (Stone *et al.,* 2009), is becoming common in dogs in Malaysia. This is partly due to the improvement in the Malaysian economy and income of its citizens in recent years, allowing them to feed pets under their care well. Obesity in dogs, like in humans, poses a health risk, predisposing them to diseases like diabetes mellitus, cardiovascular disease, respiratory disorder, certain neoplasias, reproductive disorder, and early onset of degenerative disorders. Accumulation of fat has an association with important metabolic and hormonal changes in the body (Zoran, 2010).

At present, there is no report on the prevalence of obesity in dogs in Malaysia. The information from this study would be useful for owners in the management of their pets. Therefore, the objective of this study is to determine the prevalence of obesity in dogs in the Klang Valley.

MATERIALS AND METHODS

Animals

One hundred and seventy-two healthy client-owned dogs of various breeds and more than 1 year old, from three private clinics in Klang Valley, Malaysia were selected for the study. The study was conducted over a 3-week period.

Body Condition Score

The body conditions of the dogs were determined upon palpation and inspection, according to a 5-point Body Condition Score (BCS) described in Laflamme (1997). Measurement of fat percentage was done using the Bioelectric Impedance Device for dogs (IBF-D02, Kao Corporation, Haga, Tochigi, Japan). The score is based on the following; BCS 3=lean, BCS ≥3.5=obese. Lean and obese groups were classified based on the Kao Corporation referral parameters. The dogs were divided into 3 groups based on breed types. Group 1 is "Higher Ideal Body fat % Breed" that included Shetland Sheep dog, Pomeranian and female Cavalier. Fat percentage of ≥33 % in intact males and ≥36 % in females and castrated males were considered obese. Group 2 is "Lower Ideal Body fat % Breed" that included Jack Russell Terrier, French Bulldog and Bulldog. Fat percentage of ≥23 % in intact males and ≥25 % in females and castrated males were considered obese. Group 3 is "Typical Breed" that included other types of breed which did not fall under the first two groups. Fat percentage of ≥26 % in intact males and ≥30 % in females and castrated males were considered obese. Other parameters taken into consideration were sex status including neutered or intact, and types of diet.

Blood Sampling
A minimum of 3 mL postprandial blood samples (at least 12 hours after meal) from 12 lean dogs that were categorized as BCS ≤3 and 13 obese dogs categorized as BCS ≥3.5 were chosen for blood collection via jugular, saphenous, or cephalic venipuncture. The blood was collected into EDTA tube, centrifuged at 300×g for 8 minutes and plasma obtained and stored at -20°C.

Plasma Biochemical Parameters
Plasma alanine aminotransferase (ALT), total cholesterol (T-Chol), and triglycerides (TG) concentrations were estimated using the Hitachi 902 Automatic Analyzer (Boehringer Mannhein Diagnostica Inc, Indianapolis, IN, USA).

Adiponectin
Plasma adiponection concentration was determined using a commercial sandwich enzyme-linked immunosorbent assay (ELISA) kit (Millipore, Billerica, MA, USA) and fluorescent spectrophotometer (Infinite M200 Pro Tecan). The absorbances were obtained at 450 nm and 590 nm.

RESULTS

Prevalence of obesity
Eighty dogs classified as obese with BCS ≥3.5 had a prevalence rate of 46.5%. Based on the fat percentage referral parameters of the Kao Corporation, 96 were overweight with a prevalence rate of 56 %. The most common breeds of obese dogs were local (16%) and Shih Tzu (13%).

Body condition score versus age
The most frequent age group in the study was 6 to 10 years old dogs (36%). Based on BCS, there was a positive correlation between age and obesity (r=0.22, N=172, $p<0.01$). Obesity was more prevalent in old than young dogs.

Body condition score versus sex
There were 55 intact males, 36 castrated males, 27 intact females, and 54 spayed females in the study. The prevalence rates of obesity in dogs based on sex were 9.3% in intact males, 95% in castrated males, 4.65% in intact females and 18.6% in spayed females.

Fat percentage versus body condition score
There was a positive correlation between BCS and fat percentage (r=0.70, N=172, $p<0.01$).

Fat percentage versus age
In the study, 76 dogs were lean and 96 were obese. The correlation between age and fat percentage was positive (r=0.38, N=172, p<0.01).

Fat percentage versus sex
The prevalence of dogs that were considered obese was 13.37% intact males, 14.53% castrated males, 4.65% intact females and 23.26% spayed females.

Plasma parameter and body condition score
The blood lipid profile and adiponectin concentration of 12 lean and 13 obese dogs were compared against BCS. Obese dogs showed significantly (p<0.01) higher TG and adiponectin concentrations than lean dogs. The ALT and T-Chol did not differ between groups of dogs.

Fat percentage and body condition score
Independent t-test showed the fat percentage was significantly (p<0.01) higher in and obese dogs (36.30±2.50%) than lean (22.83±6.01%) dogs.

Plasma triglyceride concentration
Obese dogs showed significantly (p<0.01) higher TG concentrations (0.92±0.28mmol/L) than lean dogs (0.48±0.06mmol/L).

Plasma adiponectin concentration
The plasma adiponectin concentration was significantly (p<0.01) higher in lean (15.88±3.27 ng/mL) than obese dogs (9.60±6.55 ng/mL).

DISCUSSION

The prevalence of obesity in dogs was 46.5% based on 5-point BCS and 56.0% based on fat percentage using BID. There was correlation between 5-point BCS and fat percentage using BID. The BID was able to identify more obese dogs than the 5-point BCS; therefore, it is a useful device to be used together with the BSC for the quantification of body fat percentage (Stone *et al*., 2009).

The study showed a trend where sex and age correlated with obesity. In the Klang Valley, it seems that obesity is more prevalent in neutered than intact dogs. This corresponds with the finding of a previous study in France, which showed that neutered dogs were 2.23 times more likely to become obese (Colliard *et al*., 2006) than intact dogs.

There were significant differences in plasma TG and adiponectin concentrations between lean and obese dogs, with obese dogs showing higher TG and lower adiponectin concentrations. Increase in plasma TG concentration is a characteristic of liver lipid accumulation (Hsiao *et al*., 2007), which is reflected by increased in circulating lipid in obesity. The low adiponectin concentration is also characteristic of obesity, because increase in fat mass would result in decrease adiponectin gene

expression and consequently lowering circulating adiponectin concentration (Radin, 2009).

CONCLUSION

Body fat percentage measured by BID, plasma triglyceride and adiponectin concentrations are useful parameter to be used together with the 5-point body condition score for determination of obesity in dogs. Based on sample population in this study, the prevalence of obesity in dogs in Klang Valley was almost 50%, which is high. Precautions should be taken by owners in management of pets to prevent obesity. It is also the role and responsibility of veterinary practitioners to advice owners, although challenging, on the provision of nutrition with appropriate energy balance to ensure their pet dogs do not become obese.

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SUPPRESSION OF PCV2 VIRAEMIA WITH CHIMERIC PCV1/2 VACCINE IN PIGS

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ABSTRACT

Post-weaning multisystemic wasting syndrome (PMWS) in pigs is a disease associated with Porcine Circovirus type 2 (PCV2) infections. In 2007, sporadic cases of PMWS caused major economic losses to the Malaysian swine industry. PCV2 vaccines were suggested as an important strategy in the prevention of PMWS. Thus, a field trial was performed to evaluate the efficacy of the vaccine in reducing the PCV2 viraemia in pigs. Thirty piglets of three weeks old were randomly selected from 5 litters and equally divided into treatment and control groups each with 15 piglets. The treatment group was treated with 2mL PCV2 vaccine intramuscularly. Blood samples and body weight were obtained on day 0 (pre-vaccination), day 20 and 40 post-vaccination. Samples were tested using quantitative PCR (qPCR) assay to determine viral load in blood. This study revealed that on day 40 post-vaccination, vaccinated pigs showed lower PCV2 viral DNA copies (5.01 $\log_{10}$ copies/mL serum) compared to control pigs (6.18 $\log_{10}$ copies/mL serum). One pig was sacrificed from each treatment and control groups for postmortem examination at day 40. No significant change was seen in lymphoid tissues from both groups. The average body weight showed no significant difference between groups. This study demonstrated that PCV2 vaccine can reduce PCV2 viraemia in vaccinated pigs.

Keywords: post-weaning multisystemic wasting syndrome, porcine circovirus type 2, PCV2 vaccine, quantitative PCR.

INTRODUCTION

Post-weaning multisystemic wasting syndrome (PMWS) is a disease that clinically affects pigs aged 2 to 4 months at late-nursery and early-fattening phases of production (Segalés and Domingo, 2002).The oronasal route is considered the most likely route of PCV2 infection (Krakowka *et al*., 2000). Pigs with PMWS often showed clinical signs like wasting or unthriftiness, dyspnea, pallor, rough hair coat, diarrhea, and jaundice (Harding *et al*., 1998). During acute outbreaks, the overall

mortality due to PMWS can reach 10% (Allan and Ellis, 2000). In Malaysia, the prevalence of PCV2 infection was 88.1% (Jagananthan *et al*., 2011).

Real-time or quantitative PCR (qPCR) threshold in the serum was proposed as the diagnostic method for PMWS (Harding *et al*., 2008). A threshold of more than 1×10^7 PCV2 genomes/mL serum is suggested to be an indication of presence of PMWS lesions (Olvera *et al*., 2004). According to an experimental study, PCV2 vaccination can reduce viraemia status in pigs up to 78.5% and thus reducing the risks of acquiring PMWS (Opriessnig *et al*., 2009).

A field study has been done in a local pig farm to evaluate the efficacy of PCV2 vaccine to reduce PCV2 viraemia in pigs (Moo *et al*., 2014). However, since this study was conducted in pig farms with low field challenge and with history of 2 years vaccination against PCV2 infection, the results were not reliable. Hence, in this study, an isolated pig farm located in Perak with no previous PCV2 vaccination was chosen to determine the efficacy of PCV2 vaccine.

MATERIALS AND METHODS

Chimeric PCV1/2 vaccine (Zoetis, USA) is a killed virus vaccine that is indicated for active immunization in piglets aged from 21 days. This study was done in a commercial pig farm located in Perak, Malaysia. Thirty 21-day-old piglets from 5 litters were selected and divided into 2 groups designated the vaccination and control group. One dose of 2mL killed vaccine was given intramuscularly to piglets of treatment group, while control group received 2mL of sterile water. The body weight and blood samples were taken on day 0 (pre-vaccination), day 20 and day 40 post-vaccination. Serum samples were collected and processed for DNA extraction using DNeasy Blood and Tissue Kit (Qiagen, USA). DNA samples were analysed using SensiFAST™ SYBR No-ROX Kit (Bioline, UK) in a Bio-Rad CFX 96™ Real time PCR system (Bio-Rad, USA). Post-mortem and histopathological examinations were performed on day 40 post-vaccination on selected pigs to examine the lymph nodes.

RESULTS AND DISCUSSION

Vaccinated group showed significantly ($p<0.05$) lower mean genomic copy number of PCV2 DNA in serum than non-vaccinated group on day 40 post-vaccination (Table 1). This finding supported the previous research that one dose of chimeric PCV1/2 killed vaccine can reduce PCV2 viraemia in vaccinated pigs (Opriessnig *et al*., 2009). The treated piglets did not show any abnormal clinical sign. There was no significant ($p>0.05$) difference in mean body weight between treatment and control groups (Table 2). No abnormal gross or microscopic findings was observed in the inguinal lymph nodes of the piglets. All piglets had low mean serum PCV2 DNA copy number of $<1\times10^7$. In conclusion, this study showed that chimeric

PCV1/2 killed vaccine can reduce PCV2 viraemia in vaccinated pigs, thus reducing risk of developing PMWS.

Table 1: Serum PCV2 DNA copy number in PCV1/2-vaccinated pigs.

Groups	Viral DNA Copies Number ($\log_{10}$)		
	Day 0	Day 20	Day 40*
Treatment (Killed vaccine)	5.21±0.18	6.25±0.09	5.01±0.24
Control (Water)	5.15±0.21	6.04±0.12	6.18±0.10

*Significant difference between treatment and control groups ($p<0.05$)

Table 2: Mean values of body weight of pigs from the treatment and control groups on Day 0, Day 20 and Day 40 post vaccination with inactivated PCV2 vaccines

Groups	Mean Body Weight (Kg)		
	Day 0	Day 20	Day 40
Treatment (Killed vaccine)	4.58±0.18	10.45±0.35	22.29±0.70
Control (Water)	4.33±0.17	9.93±0.40	21.72±0.63

ACKNOWLEDGEMENT

This research was supported by Zoetis Malaysia Sdn Bhd.

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PROTEIN AND FATTY ACID CONTENTS OF HORSESHOE CRAB MEAT AND EGG

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ABSTRACT

Horseshoe crab is a delicacy among Malaysians. However, the fatty acid content of the Malaysian horseshoe crab meat and eggs is not known. In this study, 20 adult female horseshoe crabs were collected from Malacca, Malaysia: 10 from Pantai Puteri and 10 from Pulai to determine the nutrient composition of their meat and eggs. Twenty meat samples and 20 eggs were obtained from the harvested horseshoe crabs. The morphology of the crabs were determined based on perimeter of prosoma (cephalothorax), length of telson (tail), length of opisthosoma (abdomen), live weight and weight of meat and eggs. There was no significant ($p>0.05$) difference in these parameters between horseshoe crabs from Pantai Puteri and Pulai. The mean live weight, perimeter of prosoma, length of telson and length of opisthosoma were 1.7±0.05kg, and 64.9±1.06, 20.4± 0.46 and 9.0±0.12cm, respectively. Mean meat and egg yield of horseshoe crabs were 2.7±0.22 and 218.3±27.67g, respectively. The mean crude protein content of eggs was 17.2±0.77%. The saturated fatty acid content of the meat was 54.8±2.92%, unsaturated fatty acids 45.2±2.92%, monoenes 24.4±1.42%, α-Linolenic acid 2.00±0.20%, and docosahexaenoic acid 2.51±0.44%. The unsaturated fatty acid content of eggs was 64.81±0.51%, saturated fatty acids 35.20±0.51%, monoenes 29.03±0.69%, α-linolenic acid 1.79±0.08% and docosahexaenoic acid 3.39±0.16%. Mean blue blood volume collected was 150 mL/horseshoe crab. The similar morphological characteristics and fatty acid composition of these horseshoe crabs indicate that Pantai Puteri and Pulai have similar horseshoe crabs in their habitats.

Keywords: Horseshoe crabs (*Tachypleus gigas*), crude protein, fatty acids, morphology and blood.

INTRODUCTION

Horseshoe crab is an ancient chelicerata arthropod under Merostomata family that had been in existence for 600 million years. There are several horseshoe crabs species, namely *Tachypleus gigas*, *Tachypleus tridentatus* and *Carcinoscorpius*

rotundicauda in various estuarine locations in South East Asia. Horseshoe crabs are consumed by humans and considered as a delicacy. Horseshoe crabs are also harvested for their blue blood, which is claimed to have many medicinal and curative properties such as agglutination of bacteria by their blood component, amebocyte lysate (John *et al*., 2010). Currently, there is little information on the nutrient content of horseshoe crabs. By determining the protein and fatty acid contents of horseshoe crab meat and eggs, would allow for the understanding of the health benefits and risks of horseshoe crab consumption. Horseshoe crabs found in different locations such as mangrove swamps and river mouths may differ in their meat and egg chemical composition.

This study was conducted to determine the crude protein and fatty acid content in horseshoe crab meat and eggs and to determine the sampling blood volume, meat, and egg yields of horseshoe crabs.

MATERIALS AND METHODS

Samples collection and morphological measurements

A comparative study was conducted on horseshoe crabs (*Tachypleus gigas)* obtained from fishermen in Malacca, Malaysia. Samples of horseshoe crabs, 10 each were obtained from Pantai Puteri and Pulai. The two locations differ in the vegetation cover and exposure to the public. Morphological measurements such as length of telson, width of opisthosoma and circumference of prosoma were obtained.

Blood collection

Blue colour blood of horseshoe crabs was collected by cardiac puncture. The animal was chilled for an hour in a cold room before bleeding, following the method described by Armstrong and Conrad (2008). Bleeding began with the exposure of the hinge and the opisthosoma and prosoma placed in a right-angle position at dorsal recumbency with the opisthosoma flexed on the prosoma (John *et al.,* 2011).

Evisceration

Horseshoe crabs were put down by freezing in a refrigerator at -18°C (Van der Horst *et al.,* 1973). Evisceration is done by making an incision at the cranioventral edge of the prosoma and extending the incision with scissors. Eggs and meat were harvested and weighed.

Crude protein analysis

Kjeldahl method was used to determine crude protein content of horseshoe crab eggs and was calculated as per 1000 mg dry matter using the following formula:

$$\text{Nitrogen (\%)} = \frac{(\text{Titration}_{\text{Sample}} - \text{Titration}_{\text{Blank}}) \times \text{Conc. of Acid} \times 14.007 \times 100\%}{\text{Mass}_{\text{Sample}}\,(\text{mg})}$$

% Crude Protein = % Nitrogen x 6.25*****
(*Universal protein factor)

Fatty acids analysis
Fatty acid analysis was done by gas-liquid chromatography. Total lipid extraction by by the method of Rajion *et al.* (1985). Fatty acids methyl ester was prepared and gas liquid chromatography used to identify the fatty acids.

RESULTS AND DISCUSSION

There is no significant ($p>0.05$) difference in morphological characteristics, crude protein and fatty acid composition of meat and eggs between horseshoe crabs obtained from Pantai Puteri and Pulai, Malacca, Malaysia. The mean volume of blood collected from three horseshoe crabs was 150mL. Mean crude protein content of the eggs was 17.2±0.77g, which is similar to that reported by Chaterji *et al.* (1996). The mean total saturated fatty acids, total unsaturated fatty acids, total monoenes, α-linolenic acids, docosahexanoic acids contents of the crab meat was 54.8, 45.2, 24.4, 2.00, 2.51, and 7.6 %, respectively. In eggs, the mean total saturated fatty acids, total unsaturated fatty acids, total monoenes, α-linolenic acids, docosahexanoic acids and total omega-3 content was 35.20, 64.81, 29.03, 1.79, 3.39 and 22.33 %, respectively.

CONCLUSION

It can be concluded that Pantai Puteri and Pulai, Malacca, Malaysia have similar horseshoe crabs in their habitats that is reflected by similarity in their morphological characteristics and fatty acid composition.

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ORAL FRACTURES IN CATS AND DOGS PRESENTED TO UNIVERSITY VETERINARY HOSPITAL, UNIVERSITI PUTRA MALAYSIA: A RETROSPECTIVE STUDY

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ABSTRACT

Medical records and radiograph for dogs and cats diagnosed with oral fractures at University Veterinary Hospital, Universiti Putra Malaysia between years 2010 to 2013 were reviewed. One hundred and thirty-seven oral fracture cases were identified in this study in 88 cats and 4 dogs. The most common locations of oral fracture in cats and dogs were at the mandibles at 24 and 50%, respectively. Complete and transverse mandibular fracture was the most common fractures type in cats. In dogs, 50% were complete and oblique mandibular fractures. The majority of the cases were road traffic accident cases with rates of 59 and 50% in cats and dogs, respectively. Most cases were presented with single location fractures. The most common multiple fractures were at temporomandibular junction luxation with mandibular fractures and mandibular symphyseal separation, temporomandibular joint luxation with zygomatic arch fractures. The majority of cats were surgically stabilised, while dogs were stabilized with non-surgical treatment. The most common surgical method was cerclage wire repair both for cats and dogs. Most of cases stabilised surgically had malocclusion. The majority of cases stabilised surgically responded well.

Keywords: oral fractures, temporomandibular joint luxation, mandibular symphyseal separation, cerclage wire

INTRODUCTION

Fracture is defined as dissolution of bony continuity with or without displacement of fragments. The occurrence of bone fractures is influenced by extrinsic or intrinsic factors. Extrinsic factor consists of direct and indirect violences, such as bending, torsional, compressional, and shearing forces. Intrinsic factor consists of muscular actions and pathological conditions. Mandibular fracture was reported to be the more common type of oral fractures in cats and dogs. The major causes of fractures are trauma such as road traffic accident, high rise syndrome, fighting, gunshot and pathological conditions. Surgical approaches are one of the treatment options for

oral fracture. Tape muzzle as a non-surgical treatment provide temporary stabilisation for jaw fracture

This retrospective study was conducted to determine common types of and treatment approach for oral fractures in cats and dogs presented to University Veterinary Hospital, Universiti Putra Malaysia.

METHODS AND MATERIALS

A total of 133 cases of cats and four dogs that met the criteria of research objectives were included in the study. The log book from Radiological Unit, Universiti Veteinary Hospital, Universiti Putra Malaysia, was viewed to obtain information on cases of oral fractures in cats and dogs during the period from January 2010 to December 2013. The patient medical records were retrieved and reviewed. Euthanised oral fracture patients were also included in this study. The data collected from records included patient signalment, type of trauma, location of fracture, type of fracture, treatment regime, type of surgical approach, complication of fracture fixation, and response to treatment. Location and type of fracture were determined from radiographs. The locations of fracture were classified as temporomandibular junction luxation and maxillary, mandibular, and zygomatic arch. The sites of mandibular and maxillary fractures were also recorded. Types of fractures were categorized as transverse and complete, oblique and complete, comminuted and complete, transverse and incomplete, oblique and incomplete, and communited and incomplete fractures.

RESULTS AND DISCUSSION

Oral fractures are relatively more common in cats than dogs. The rate of occurrence of oral fractures were 55% intact male, 45% female, 4% castrated male, and 7% spayed female cats and 75% intact male and 25% intact female dogs. The predominance of fractures in intact male can be attributed to the aggressiveness and free-roaming activities of cats and dogs, making them prone to traumatic injury.

Cats <12 months old were categorized as junior cats (41%) and those older than 12 months as adult cats (55%). Young animal are more predisposed to fractures because of their inexperience in potentially dangerous situations such as heavy traffic and fights. In cats traumatic injuries were the result of road traffic accidents (59%), high rise syndrome (11%) and others (31%). These findings are consistent with that of Umphlet and Johnson (1988) that showed the causes of traumatic injuries, in decreasing order, were automobile trauma, fights and high rise syndrome. Among the 110 cases presented with clinical signs, 17% had deviated mandible, 16% with epistaxis, and 15% could not close their mouths.

Mandibular fractures was the most common location of fractures in cats (47%) and dogs (50%) (Table 1). Mandibular symphysis separation represents 23%, mandibular body fracture 3%, ramus fracture 2%, molar fracture 2%, and condylar

fracture 1% of all fracture cases in cats. The mandible is mobile and less bony compared to maxilla; therefore it is more prone to fracture (Subhashraj *et al*., 2007). In dogs, transverse and complete mandibular fractures (65%) are more common than oblique and complete mandibular fracture (50%). Among these case 46% were treated with surgical method, 32% with non-surgical method, 14% did not receive treatment and 8% of cats were put to sleep. Surgical treatment was indicated for most cases to restore normal occlusion, and stablilization of fractures. Stabilization of oral fractures using cerclage wire is the most common applied methods. The flexibility of cerclage wire makes it easier to maneuver around the oral cavity. Mandibular symphysis separation is easily stabilized using the cerclage wire. Tape muzzle may be indicated in young animal because they heal rapidly and to avoid tooth and oral skeletal development disruption.

Table 1. Location of oral fracture in cats and dogs

Location	Cat	Dog
Mandibular symphysis separation	31	0
Temporomandibular junction luxation	28	0
Zygomatic arch fracture	19	0
Mandibular fracture	32	2
Separation of nasal septum	14	1
Maxillary fracture	6	1
Tooth fractures	3	0
Total	133	4

The most common complications after surgery were inability to close the mouth (37%), malocclusion (42%), and suture breakdown (21%). The majority of cats that received treatments responded well.

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PARASITES IN LOCALLY PRODUCED LABORATORY RATS

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ABSTRACT

Good quality laboratory rats are categorised as specific pathogenic-free (SPF) while others that are somewhat of lower quality are categorised as conventional animals. Conventional animals however, do carry potentially pathogenic organisms that can harm both animals and humans. More importantly, the pathogenic organisms can interfere with research in many ways and results obtained from using such animal may not be valid. Therefore, the objective of this study is to screen for parasitic infestation in laboratory rats that are produced locally. Five laboratory rats each from three different suppliers were obtained and used in this study. The rats were euthanised under CO_2 before urine, faeces and furs as well as internal organs samples collected. The study shows that most of the laboratory rats from the three suppliers carried ectoparasites and endoparasites; *Ornithonyssus bacoti, Glycyphagus domesticus, Syphacia obvelata, Syphacia muris,* and *Aspiculuris tetraptera*. These parasites did not seem to affect the health of the rats. The study shows that the laboratory rats produced by the three suppliers harbors parasites indicating that these animals are less suitable for experimental studies.

Keywords: specific pathogen-free (SPF) animals, conventional animals, parasitic infestation

INTRODUCTION

Although specific pathogen-free animals should be used in experimental studies, it is not common practice. More often conventional animals are used, because they are cheaper and easily accessible. Conventional animal models may be contaminated or infected with pathogens or potential pathogens that can cause diseases to the animals and human handlers from direct exposure.

Ectoparasites are a diverse and highly adapted group of organisms that infest external body surfaces of vertebrates. These organisms live on or burrow under the skin surface of their host. The host is important for the parasites as it provide a

conducive environment and source of food. In laboratory rats, the most common ectoparasites are mites (*Ornithonyssus bacoti, Laelaps nuttali, Laelaps echidninus, Laelaps sculpturatus* and *Listrophorvides* sp.), lice (*Polyplax spinulosa* and *Hoplopleura pacifica*) and ticks (*Ixodes granulatus*) (Syazana *et al.,* 2013). The endoparasites live inside the body of the host and usually invade tissues. These parasites include helminths and also single-celled protozoa. Nematodes form the largest group of helminth parasites in laboratory animals (Baker, 2007). Among the important helminths are pinworms or oxyurids, which are intestinal nematodes belonging to the family Oxyuridae (Taffs, 1976).

The health of the laboratory rats used as an animal model will influence the outcome of a study. Pathogenic organisms can affect the animal. Therefore, results obtained from these animals are not reliable.

This study was undertaken to determine parasitic burden in locally produced rats.

MATERIALS AND METHODS

The animals obtained were from three laboratory animal facilities and screened for endoparasites and ectoparasites. Five laboratory rats each, regardless of sex, of species *Rattus norvegicus* or Norway Rats, were obtained from of Company A, B, C. The rats were immediately euthanised under CO_2 immediately upon arrival. Samples were collected by fur combing, skin scraping, perianal tape impression and urine smear. Direct examination of intestines, faecal floatation, and direct examination of internal organs were performed at the Parasitology Laboratory, Faculty of Veterinary Medicine, Universiti Putra Malaysia. Data collected were analysed using SPSS version 20.

RESULTS AND DISCUSSION

The only ectoparasites found were mites. Three different species of mites were identified from the rats supplied by the three companies. Mites were recovered in rats from Company A 5/15 (33.3%), Company B and C 1/15(6.7%). *Ornithonyssus bacoti* was identified in rats from Company A, an unidentified mite from Company B, and *Glycyphagus domesticus* from Company C. The study shows that rats from Company A were more infested with ectoparasites than Company B or C.

Helminths recovered from the rats are mostly oxyurid nematode commonly known as pinworms (Table 1). The endoparasites species found were *Syphacia muris, Syphacia obvelata*, and *Aspiculuris tetraptera*.

Table 1. Parasites in rats from three local suppliers.

Endoparasites	Company A	Company B	Company C	p Value
Ova	1/15 (6.7%)	3/15 (20%)	4/15 (26.7%)	0.301
Adult	0/15 (0%)	5/15 (33.3%)	5/15 (33.3%)	0.001

From perianal tape impression, *Syphacia sp.* ova were found in all rats provided by the three suppliers. Among ectoparasites species found, the most important was *Ornithonyssus bacoti*. This species of mite is known as tropical rat mite found in rats, mice, gerbils, hamsters and various other small mammals (Baumstark *et al.,* 2007). The developmental stages of this parasite feed on the blood of their hosts (Beck and Folster-Host, 2009). It is known that when the animal host is not available, humans become victims of the mite infestation. People infested with the tropical rat mite will develop pruritic insect bite-like cutaneous lesions.

Syphacia muris was the endoparasite found in intestinal content, *Aspiculuris tetraptera* in faeces and *Syphacia muris* and *Syphacia obvelata* on perianal tape impression. These are expected findings since Taffs (1976) showed that mixed *A. tetraptera* and *S. oblevata* infestations in rodents are common. The study also showed that pinworms infections of laboratory rodents are non-pathogenic and symptomless.

It can be concluded that rats provide by local supplier harbor parasites, thus may not be suitable to be used as an animal model in experimental studies.

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USE OF ANTIMICROBIALS AND EFFECTIVE MICROORGANISMS IN BROILER FARMS IN WEST COAST PENINSULAR MALAYSIA

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ABSTRACT

There is a rising concern on the use of antimicrobials in farms as they contribute to antibiotic resistance. Effective microorganisms (EM) is one of the proposed alternatives to antimicrobials. The aim of this study was to investigate the use of antimicrobials and EM in local broiler farms. A cross-sectional survey was conducted in 24 randomly selected broiler farms in the West Coast of Peninsular Malaysia. All farms in the study used at least one antimicrobial agent in prophylaxis and treatment. Amoxicillin (62.5%) is the most commonly used antimicrobial. Eight farms (33.3%) reported the use of EM. Out of the 8 farms, five farms (62.5%) reported the use of EM via spraying onto chicken faeces, while 3 farms (37.5%) added EM into drinking water. Seven of 8 (87.5%) farms reported a decrease in faecal odour with use of EM, while 3 of the 8 (37.5%) farms reported drier chicken manure. This study indicated that antimicrobials are more commonly used in local broiler farms compared to EM. There is need for development of strategies to promote more rational and prudent use of antimicrobial and antimicrobial alternatives in local broiler farms.

Keywords: antimicrobials, effective microorganisms, broiler farms, West Coast Peninsular Malaysia

INTRODUCTION

Antibiotics for prophylactic purposes and as growth promoters in farms contribute to the emergence of antimicrobial-resistance microorganism. Effective microorganisms (EM) developed by Dr. Teruo Higa of the University of Ryukyus, Japan in the 1980s, is one of the alternatives for farmers to use in the agricultural industry. The EM is a mixture of photosynthetic bacteria, lactic acid bacteria, yeasts, actinomycetes and fermenting fungi (Higa and Wididana, 1991).

In Malaysia, there is increasing popularity in the use of EM in poultry farms as an alternative growth promoter. However, limited publications are available on its use and its proclaimed beneficial effects in the local poultry industry. Thus, there is

a need for more studies to be done on the subject to determine its effect on local broiler production. Although there are several reports on antimicrobial resistant bacteria in animals in Malaysia, the extent antimicrobial agent used in Malaysia farm is not known.

The objective of this study was to investigate the usage of antimicrobials and EM in broiler farms in the West Coast Peninsular Malaysia. This study also aims to determine the frequency, methods and impact of usage of EM and antimicrobials in broiler farms.

MATERIALS AND METHODS

Study Population

The study was conducted in 24 randomly selected farms in Johor (9 farms), Malacca (2 farms), Negeri Sembilan (3 farms), Selangor (1 farm), Perak (2 farms) and Kedah (7 farms), Malaysia. The informants were farm-owners or the responsible farm-managers.

Study Procedure

A cross-sectional survey was conducted during the period of January 2015 to February 2015. The study was conducted by interviewing farm-owners or managers using a questionnaire. The questionnaire covered information on basic production data and management practices, with a focus on the use of effective microorganisms and antimicrobial agents. The questions were open-ended and follow-ups were done when necessary.

Data Analysis

Data management and collation was done using Microsoft Excel. For statistical analysis, the states were categorized into 3 regions, namely Northern (Perlis, Kedah, Penang and Perak), Central (Selangor and Negeri Sembilan) and Southern (Malacca and Johor). Statistical analysis was done using Kruskal-Wallis test, followed by Mann-Whitney U-test with SPSS version 20 and significance value of $p=0.05$.

RESULTS AND DISCUSSION

The broiler population of the farms ranged from 7500 to 70,000 birds. Twenty-two (91.7%) of the poultry farms practiced open-house management system; while two (8.3%) practiced close-house system. According to Malaysia Competition Commission (2014), approximately 70% of the broiler farms in Malaysia practices the open-house system leaving 30% practicing the closed-house system. Although close-house system is recommended, it is less commonly practiced because of the high capital investments and operational costs.

Antimicrobial agents

All farms reported use of at least one antimicrobial agent. The average number of antimicrobials used in these farms was 5.3. The average number of antimicrobials used in the Southern region was 3.8, while 8 in the Central Region, and 6 in the Northern Region. The fewer antimicrobial agents used in the Southern Region may be due to these farms exporting a portion of their produce to Singapore, a country that imposes strict regulations on use and residue of antimicrobials in their imported meat. These farmers had to limit use of antimicrobial agents in order to meet the requirements of the importing country.

Nineteen antimicrobial compounds belonging to 11 classes were used in the poultry farms (Table 1). The most commonly used antimicrobial agent in the farms of this study were amoxicillin, ilmicosin, tylosin florfenicol, erythromycin, colistin, and methenamine (41.7%).

Table 1: Antimicrobial agents used in some poultry farms in Malaysia

Classes of antibiotics	Antibiotics	Number of farms (%)
Aminoglycosides	Streptomycin	3 (12.5)
	Neomycin	3 (12.5)
	Gentamicin	2 (8.3)
	Spectinomycin	1 (4.2)
Amphenicols	Florfenicol	11 (45.8)
Cephalosporins	Cephalexin	8 (33.3)
Lincosamides	Tilmicosin	13 (54.2)
	Lincomycin	1 (4.2)
Macrolides	Tylosin	13 (54.2)
	Erythromycin	10 (41.7)
Penicillins	Amoxicillin	15 (62.5)
Peptides	Colistin (polymyxin E)	10 (41.7)
	Fosfomycin	7 (29.2)
	Polymyxin B	1 (4.2)
Quinolones	Enrofloxacin	6 (25.0)
Sulfonamides	Sulfadiazine/Trimetoprim	3 (12.5)
	Sulfachlorpyridazine	2 (8.3)
Tetracyclines	Doxycycline	9 (37.5)
Others	Methenamine	10 (41.7)

The route of administration of antimicrobial agents in all farms is through drinking water with typical course of 3 to 4 days. All the farms used antimicrobials for prophylaxis and therapeutic purposes. According to the farmers, prophylactic application of antimicrobials was usually done on chicks during the first 3-5 days of arrival at the farm and in immunosuppressed bird given live attenuated vaccine.

Effective Microorganisms

Only 8/24 (33.3%) from 3 and 5 farms from the Central and Southern regions, respectively used EM. Some farmers were not convinced of the efficacy of EM for their birds. The applications of EM were mainly by spraying faeces of the chickens and in drinking water. The faeces spraying method was according to the recommendation of the Department of Veterinary Services, Malaysia.

The use of EM had either reduced faecal order or resulted in the more desirable drier chicken manure. According to the farmers, EM did not improve performance of the chickens. Since the majority of farms practiced the open-house system with raised slatted flooring that allows faeces to drop to the ground, the chicken had no contact with the faeces. Thus, that could be the reason for the lack of improvement in chicken performance with the spraying of EM on the faeces.

In conclusion, the study shows that poultry farms in West Coast Peninsular Malaysia, more commonly used antimicrobials than EM. The current practice of using EM, however, did not seem to improve performance of chicken in these farms. There is need to determine the rate of antibiotic resistance in the Malaysian poultry farms and to determine the economic impact in using antimicrobials and EM on the poultry industry.

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COMPLIANCE TO PROPER HERD HEALTH PROGRAMME IN *LADANG ANGKAT* GOAT FARMS, FACULTY OF VETERINARY MEDICINE, UNIVERSITI PUTRA MALAYSIA

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ABSTRACT

Good herd health management will assist in preventing development and spread of diseases and minimise economic losses. However, there is lack of information regarding compliance to proper herd health programme (HHP) practices by the small ruminant farms in Malaysia. Therefore, a survey was conducted to determine farmer compliance to HHP in 6 goat farms of the *Ladang Angkat* programme, Faculty of Veterinary Medicine, Universiti Putra Malaysia. All farms in the study were managed intensively for meat production. A questionnaire was developed based on the *Skim Amalan Ladang Ternakan* (SALT) of the Department of Veterinary Services, Malaysia. The scores were according to the farmers' knowledge and practices on each component of HHP. Most farmers (83.3%) were aware of herd health programme. Farmers scored 56±7% for overall HHP practice with high scores on waste management (75%) followed by environmental management (73%), parasite control programme (70%), biosecurity (67%), feeding management (59%), drug management (59%), and disease monitoring programme (54%). The score for reproductive management (48%) was the lowest. None of the farmers practiced vaccination in their farm. However, all farmers were willing to invest in a herd health programme that guarantees long-term profits. In conclusion, farmer education on HHP must be intensified to improve farm performances.

Keywords: herd health program, survey, meat goat, compliance

EFFECT OF SELENIUM ON OXIDATIVE STRESS IN GOATS

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ABSTRACT

Selenium is an essential trace anti-oxidant vital for normal growth and health of animals. The aim of this study is to determine the effect of selenium (Se) supplementation on oxidative stress status and growth performance in goats. Twelve post-weaning kids were assigned into either the control or treatment groups. The kids in the control group were given 2ml of normal saline subcutaneously while the treatment group was given a single dose of 100mg sodium selenite subcutaneously. Blood collections were done before injection and these were repeated subsequently for up to four times every 3 to 4 days interval. There was no significant difference on the average daily gain, blood malondialdehyde, superoxide dismutase and glutathione peroxidase levels between the treatment and control groups. It is concluded that supplementation of Se is not effective in reducing oxidative stress and promoting growth in post-weaning kids.

Keywords: selenium, oxidative stress, antioxidant

INFLUENCE OF MANAGEMENT PRACTICES ON ENDOPARASITISM AND ANTHELMINTIC RESISTANCE IN GOAT FARMS IN SELANGOR AND NEGERI SEMBILAN, MALAYSIA

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ABSTRACT

Gastrointestinal nematodes is one of the major threats to the small ruminant industry in Southeast Asia. Among risk factors to nematode infestation are farm management and husbandary practices. Thus, this study was conducted to determine the influence of farm management practices on endoparasitism and resistance of gastrointestinal strongyles to anthelmintics in goats. Faecal examination was conducted at 6 farms of *Ladang Angkat*, Faculty of Veterinary Medicine, Universiti Putra Malaysia. The farms are located in Selangor and Negeri Sembilan, Malaysia. Faecal samples were collected from 40 goats from each farm and subjected to the modified McMaster technique for determination of faecal egg count (FEC). A standardized questionnaire was directed to the owners to obtain information on management practices in their farms. The study showed that the FEC was higher in farms that allowed animals to graze on pasture compared to those that did not. Farms that used goat manure to fertilise pasture had relatively higher FEC than those that did not. The goats of farms providing improved grasses as feed were of better body condition score than those that allowed goats to graze on native grasses. However, the better nutrition afforded by the improved grass was negated by concurrent diseases and dirty water sources in two farms. Faecal egg count reduction test was conducted in a farm with high FEC in their goats to determine resistance to the anthelmentics; albendazole, ivermectin, closantel, and levamisole. Based on FEC, the strongyle population in the farm was susceptible to levamisole while resistant to albendazole, ivermectin and closantel. Infective larvae identification in faecal cultures showed the main strongyle species on the farms in this study was *Haemonchus contortus*.

Keywords: anthelmintic resistance, endoparasitism, husbandry practices

PREVALENCE OF INTESTINAL HELMINTHS OF HOUSEHOLD DOGS AND CATS AND OWNERS' PERCEPTION OF ZOONOSIS

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ABSTRACT

In Malaysia, with the increasing number of companion animals, there is more contact between domestic animals and people, exposing humans to various zoonotic agents. The lack of awareness among pet owners on potential zoonotic diseases harboured by their pets puts them in higher risk of exposure. This study was aimed to update the prevalence of zoonotic intestinal helminths in pet dogs and cats in Ipoh area and to find out the level of awareness on parasite zoonoses among pet owners. Fresh faecal samples were collected per rectum digitally from pet dogs and cats brought to Ipoh Garden Animal Clinic for veterinary services. Owners were then requested to fill up a questionnaire. Detection of intestinal helminth ova was done using the simple floatation technique. The survey of 62 dogs and 17 cats revealed the prevalence rates for intestinal helminths as follow: In dogs, *Ancylostoma* Sp. (27.4%), *Toxocara* Sp. (8.1%) and *Trichuris vulpis* (3.2%) while in cats only *Ancylostoma* Sp. (47.1%). The overall prevalence of parasitism in both dogs and cats was 38%. Risk calculation revealed that prevalence of parasitism especially toxocariasis was significantly ($p<0.05$) higher in the less than 6-month age group. Ancylostomiasis prevalence was less affected by the age factor. There was a higher risk in above 6-month-old dogs being infected with more than one helminth. Dogs which were walked by their owners were five times more at risk of being infected with helminths. Of the 79 owners interviewed, only 33% dewormed their pets more than twice per year. Most owners (44%) spent more than 2 hours/day with their pets. More than half of the owners allowed their pets to lick or kiss their face and enter their bedrooms while 34% of them slept with their pets. Long contact hours and intimate relationship put these owners at higher risk of contracting zoonotic helminth infections. Lastly, 51% of the owners were aware of pet-associated zoonotic parasites. In conclusion, the prevalence of intestinal helminths in pet dogs and cats in Ipoh area is considered high while the perception of zoonoses among owners is moderate. The veterinary profession should help to educate clients about zoonoses as they are of public health concern.

Keywords: *Ancylostoma* Sp, *Toxocara* Sp, zoonotic, dogs and cats, social interactions, owner awareness

BLOOD PARASITES IN BOER GOATS REARED UNDER INTENSIVE AND SEMI-INTENSIVE SYSTEMS

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ABSTRACT

Blood parasites can cause great economic losses in animal production. This study was conducted to compare the prevalence of blood parasites in 38 Boer goats raised in two farms in Selangor practicing two management systems: intensive and semi-intensive. Age group and sex of each goat were determined during blood sampling. Blood samples were obtained from the jugular vein of the goats, thin smear made and examined under light microscopy (100×). The results showed no significant difference in prevalence of blood parasites between management system (p=0.232), sex (p=0.363), and age (p=0.106) of goats. The cumulative prevalence rate of blood parasites in the farms was 21.1% with intensive system contributing 5.3% and semi-intensive system 15.8%. The prevalence rate was found to be higher in young and adult female goats than adult male goats. Therefore, it could be concluded that blood parasites can infect Boer goats of different ages, sex and management systems equally.

Keywords: Boer goats, blood parasite, prevalence rate

DETECTION OF PORCINE BOCAVIRUS IN MALAYSIAN SWINE HERDS

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ABSTRACT

Porcine bocavirus (PBoV), which was first discovered in Swedish pigs in 2009, has since been detected in 11 other countries. Since Malaysia has a significant swine livestock industry, this study aimed to describe PBoV in local swine herds. Using the convenience sampling method, 11 pigs were sampled from three farms located in the states of Perak and Selangor, Malaysia. Each tissue sample obtained from necropsy were subjected to conventional PCR assay using specific primers designed to target the conserved nonstructural protein 1 (NS1) gene. Based on PCR, 10 pigs were positive for PBoV. For further confirmation, partial nucleotide sequencing of the NS1 gene was performed, and the sequence compared to reference isolates. In addition, phylogenetic analysis was performed to determine the genetic relationship of Malaysian PBoV strains to reference isolates. Bioinformatics analysis determined that the Malaysian strain was highly similar (95%) to the United States of America PBoV3 isolate. With this study, Malaysia becomes the 13th country in the world to describe PBoV in swine herds by PCR assay and partial sequencing of the NS1 gene.

Keywords: porcine bocavirus, PCR, sequencing, swine, phylogenetic analysis

PREVALENCE OF INFECTIOUS BOVINE KERATOCONJUNCTIVITIS IN DAIRY CATTLE HERDS OF *LADANG ANGKAT* FARMS, FACULTY OF VETERINARY MEDICINE, UNIVERSITI PUTRA MALAYSIA

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ABSTRACT

Infectious bovine keratoconjunctivitis (IBK) or commonly referred to as 'pink eye', is one of the major diseases of ruminants that may cause major economic losses particularly in the agricultural sector. This disease is caused by *Moraxella bovis* and is governed by multifactorial factors such as vectors (flies, ticks and etc.), environment and breed predisposition. There is limited information on the prevalence of IBK among dairy cattle in Malaysia. Therefore this study was designed to determine the prevalence of IBK in dairy cattle herds in farms under the *Ladang Angkat* Program, Faculty of Veterinary Medicine, Universiti Putra Malaysia. In this study, subconjunctival swabs were collected from a total of 50 heads of dairy cattle. Samples were then subjected to polymerase chain reaction (PCR) technique where the causative agent was isolated and identified. The result from this study indicated that the prevalence rate of IBK in dairy cattle in farms of the *Ladang Angkat* programme, Faculty of Veterinary Medicine, Universiti Putra Malaysia was 2%. In addition, there were no significant ($p>0.05$) correlation between the disease and risk factors in these farms. In conclusion, the low prevalence rate of IBK may not be a contributing factor to the production loss in *Ladang Angkat* dairy farms.

Keywords: dairy cattle, infectious keratoconjunctivitis, pink eye, *Moraxella bovis*, prevalence

MANAGEMENT OF MALAYAN SUNBEAR *(HELARCTOS MALAYANUS)* IN BORNEAN SUNBEAR CONSERVATION CENTRE WITH EMPHASIS ON DEWORMING PROGRAMME

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ABSTRACT

Endoparasites play an important role in the health status of captive wild animals. This study aims to determine the effectiveness of deworming on Malayan sunbears. A cross sectional study was done on 18 Malayan sun bears managed in semi-captive and captive systems in the Bornean Sunbear Conservation Centre in Sepilok, Sandakan, Sabah, Malaysia. The sunbears were given anthelmintic Drontal® plus (praziquantel/pyrantel pamoate/febantel) three months before the study. Fresh faecal samples were collected from the floor of the bear cages. Standard parasitological techniques comprising of direct fecal smear, simple floatation, simple sedimentation method and another sensitive technique of formal ether sedimentation were used to detect the presence of ova in the faeces. Results showed no helminths ova were present. The management factors encompassing routine cleaning, disinfectant used, stocking density and food hygiene appeared effective in preventing endoparasitism in these bears. The results of this study provide evidence that once every three months of Drontal® adopted in this centre has successfully controlled helminth infestation. This study is a first documentation of the effectiveness of the deworming programme in a Malayan sunbear conservation centre.

Keywords: Malayan sunbear (*Helarctos malayanus)*, deworming program, management, standard parasitological techniques, formal ether sedimentation

EFFECT OF ZERUMBONE-LOADED NANOSTRUCTURED LIPID CARRIER ON A CANINE MAMMARY GLAND TUMOUR CELL LINE

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ABSTRACT

Zerumbone (ZER) from the rhizomes of the wild ginger, *Zingiber zerumbet* (L.) Smith, is a natural dietary lipophilic compound with antitumour, antiinflammatory, antioxidant, antimicrobial, antinociceptive, hepatoprotective and immunomodulatory properties. However, therapeutic application of zerumbone is plagued by poor water-solubility and subsequent poor absorption, bioavailability and delivery to target tissues. To overcome this limitation, ZER was loaded into nanostructured lipid carrier (NLC) (ZER-NLC). In this study the anticancer effect of ZER-NLC was determined on a canine mammary gland tumour (CMT-stylo) cell line. It is postulated that loading of ZER into NLC does not compromise the anticancer properties ZER. Using the MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) assay, the proliferation of CMT-stylo cells after treatment with 1.7 mM of ZER was at 64.30±9.87, 42.06±9.00, 37.81±10.04% while with 1.8 mM ZER-NLC at 102.77±12.68, 38.42±9.16, and 41.13±11.72% after 24, 48 and 72 hours treatment, respectively. The half maximal lethal dose (LD50) for ZER and ZER-NLC at 72 hours was 100 and 90 μM, respectively. The half maximal growth inhibition dose (GI50) for ZER and ZER-NLC after 72 hours treatment was 20 and 25μM, respectively. The anticancer effect of ZER and ZER-NLC was also visualised using the acridine orange/propidium iodide double staining method. Zerumbone and ZER-NLC induced apoptosis of CMT-stylo cells as shown by the membrane blebbing, nucleus margination and chromatin condensation. This study, for the first time, shows that ZER-NLC is a potentially effective drug delivery system for the treatment of canine mammary gland tumours. The ZER-NLC is an innovative, novel, and safe, for cancer therapy.

Keywords: zerumbone, nanostructured lipid carrier, zerumbone-loaded nanostructured lipid carrier, canine mammary gland tumour, anticancer, apoptosis

MOLECULAR SCREENING OF FELINE MORBILLIVIRUS

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ABSTRACT

Feline morbillivirus (FmoPV) is a negative-sense, single stranded RNA virus that belongs to the family *Paramyxoviridae*. The FmoPV has been recently detected in cats in Hong Kong and Japan, and is associated with tubulointerstitial nephritis. In this study, urine and blood samples were collected from 35 client-owned cats presented to the Universiti Veterinary Hospital, Universiti Putra Malaysia and private veterinary clinics. Healthy and renal/urinary-diseased cats were included in this study. Serum urea-creatinine and urine specific gravity analyses were performed to assess the renal or urinary disease status in these cats. FmoPV screening of the collected samples were conducted using two-steps conventional reverse-transcriptase polymerase chain reaction (RT-PCR) assay amplifying a part of the N-gene sequence of the virus. Among 25 screened cat blood samples, 1 cat was tested positive for FmoPV. In addition, 17 of 27 (63.0%) screened cat urine samples tested positive for FmoPV. From 17 cats screened for both blood and urine samples, 1 cat tested positive for FmoPV. The prevalence of FmoPV in Malaysia is estimated at 48.6%. There was no significant ($p>0.05$) association between renal/urinary diseased cats and FmoPV ($p=0.11$).

Keywords: feline morbillivirus, cats, renal/urinary diseased cats, prevalence, conventional RT-PCR assay

MILK COMPOSITION OF DAIRY GOATS WITH AND WITHOUT INTRAMAMMARY INFECTION

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ABSTRACT

Intramammary infections (IMI) adversely affect milk quality and composition. This study was carried out to compare composition of milk from dairy goats with and without the subclinical IMI, determine the effect of subclinical IMI on the milk composition, and determine the relationship between somatic cell count (SCC) and milk composition. Twenty Saanen goats from one farm of the *Ladang Angkat* programme, Faculty of Veterinary Medicine, University of Putra Malaysia were used in this study. The California matitis test (CMT) was used to identify subclinically infected and uninfected does. The milk composition parameters, fat, protein, casein, lactose, total solid, solid non fat, acidity, and free fatty acid were analysed using FOSS Milkoscan^{TM} FT2. The study showed no significant ($p>0.05$) difference in milk composition parameters between subclinically intramammary infected and uninfected does. However, a significant ($p<0.05$) difference was observed in SCC between subclinically infected and uninfected does. In addition, the correlation coefficient ($r<0.5$) between SCC and all the milk composition parameters was low. The study suggests that milk composition parameters are not the obsolute indicators of subclinical IMI.

Keywords: dairy goats, milk compositions, subclinical intramammary infection, somatic cell count

SKULL DIMENSION AND DENTITION IN RELATION TO BITING FORCE IN ROTTWEILER, DOBERMANN, GERMAN SHEPHERD, AND LOCAL DOGS IN MALAYSIA

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ABSTRACT

The craniofacial architectures of dogs (*Canis lupus familiaris*) have evolved and become modified as a result of human interventions. Several studies have described the biting forces of specific breeds; however no such investigation has been conducted in Malaysia dogs. Thus, the purpose of this study was to determine skull dimensions and dentition, and to estimate and compare the biting forces in Rottweiler, Dobermann, German Shepherd and local dogs in Malaysia. Twenty skulls were obtained from male dogs (5 of each breed) disposed at the Postmortem Laboratory, Faculty of Veterinary Medicine, Universiti Putra Malaysia. Skull dimensions were determined with a pair of Vernier caliper on defleshed-dried skulls. Bite forces were estimated using the Kiltie lever model. Increasing zygomatic width has a stronger correlation ($p<0.01$) with biting forces compared to skull length. Rottweiler has the strongest biting forces, compared to Dobermann and German Shepherd. Local dogs have smaller zygomatic widths than imported breeds, thus their canine and molar biting forces are weak. The skull dimensions and dentition of local dogs are also relatively smaller ($p<0.05$) than the imported breeds, accounting for their lower biting forces. The present study revealed that every breed has distinct skull dimensions, dentitions and biting forces. There is also great variation in body, skull size, and overall appearance among Malaysian local dogs. Information from study would be useful for the Malaysian local forensics and crime investigators.

Keywords: skull dimension, dentition, bite force, dogs

DIVERSITY AND TEMPORAL ACTIVITY PATTERN OF DIPTERA ASSOCIATED WITH CAPTIVE WILD MAMMALS AND EFFICIENCY OF TRAPPING METHODS

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ABSTRACT

Diptera are arthropods of veterinary and medical importance as a large number are efficient vectors of diseases for both animals and humans. This study was conducted to determine the diversity, abundance and activity patterns of Diptera associated with captive wild mammals at a local zoo, as well as the efficiency of five different fly traps (Nzi, Malaise, Intercept, Centers for Disease Control and Prevention with ultraviolet lights (CDC-UV) traps, and Centers for Disease Control and Prevention baited with carbon dioxide (CDC-CO_2) traps. A total of 1800 trap hours were conducted in the enclosure of six species of wild mammals; Ankole Cattle, Spotted Deer, Asian Elephant, White Rhinoceros, Barking Deer and Tapir. The traps were placed approximately 10m apart. The Nzi, Malaise, Intercept traps were checked at 3-hour and CDC traps at 12-hour intervals between 0700 – 1900 hours. Night catches were also collected. The flies were put down with ethyl acetate or freezing, dry-mounted, and examined under a stereomicroscope. Identification of the flies was done following published taxonomic keys. Six families of Diptera (Ceratopogonidae, Culicidae, Psychodidae, Muscidae, Sarcophagidae and Calliphoridae) comprising 17 genera and 38 species were encountered in this study. Twenty species of mosquitoes (Culicidae) were trapped, of which *Culex quinquefasciatus*, and *Aedes albopictus* were dominant. Biting midges (*Culicoides peregrinus*, *Culicoides gutiffer* and *Culicoides actoni*) and sand flies (*Sergentomyia* Sp.) were also encountered. The majority (90%) of the filth flies were of the genus Musca, followed by *Stomoxys* and *Sacrophaga.* Among the 38 species, there were 14 disease vector species of veterinary and medical importance. The Nzi traps collected a significantly ($p<0.05$) higher number of large flies compared to Malaise and Intercept traps. The CDC-UV traps caught 73% more mosquitoes compared to CDC-CO_2. There was an ascending diurnal activity pattern for the large flies that peaked between 1600-1900 hours. The mosquitoes were mostly nocturnal with peak activity between 1900-0700 hours. The high diversity and abundance of Diptera associated with captive wild mammals is of concern as these arthropods can be vectors for haemoparasites and viruses.

Keywords: Diptera, captive wild mammals, temporal activity, trapping methods

OCCURRENCE OF MULTIDRUG-RESISTANT *ACINETOBACTER BAUMANNII* AND *ESCHERICHIA COLI* IN VETERINARY HEALTH CARE FACILITIES IN KLANG VALLEY, MALAYSIA

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ABSTRACT

Multidrug-resistant organisms (MDROs) such as multidrug-resistant (MDR) *Acinetobacter baumannii (A. baumannii*) and *Escherichia coli (E. coli)* are important pathogens associated with nosocomial infections in human and animal health care facilities. Surfaces of inanimate objects at health care facilities can serve as sources of infection. However, studies on prevalence of these pathogens in veterinary settings are lacking in the country. Therefore, the objectives of this study were to determine the occurrence of *A. baumannii* and *E. coli* and MDR isolates on surfaces of inanimate objects in veterinary health care facilities in Klang Valley, Malaysia. In this study, swab samples were taken from 65 surfaces of inanimate objects that included door knobs, examination tables, labcoats, stethoscopes and weighing scales. The swab samples were cultured and all isolates were subjected to antibiotic sensitivity tests. The study revealed that the occurrence of *A. baumannii* was 9.23% and 5 of 6 (83.33%) *A. baumannii* isolates were classified as MDR. However, no *E. coli* was isolated. In conclusion, surfaces of inanimate objects can be a source of MDR *A. baumannii* in veterinary health care facilities.

Keywords: *Acinetobacter baumannii, Escherichia coli,* nosocomial infection, antibiotic sensitivity test

HAEMATOLOGICAL STRESS INDICATOR IN LAYER CHICKEN RAISED IN OPEN-SIDED AND CLOSE-HOUSE SYSTEMS

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ABSTRACT

Layer hens in Malaysia are raised in different types of housing to include open-sided and close-house systems. Previous studies have shown that level of stress in layer hens raised vary with housing systems. Thus, this study was conducted to evaluate the heterophil: lymphocyte (H/L) (stress indicator) of layer hens raised in open-sided and close-house systems. A total of 120 Lohmann Brown birds were randomly obtained, 20 each from 3 open-sided and 3 close-houses. Blood samples were obtained once from the birds for the determination of H/L. The environmental parameter, temperature, relative humidity, and air velocity were recorded in the morning, afternoon and evening of the same day as blood sampling. The heat stress index was calculated as the sum of the temperature and the relative humidity. Two of 6 open-sided houses were free of disease outbreak. The results show that the H/L of unhealthy birds (1.113) was higher ($p<0.05$) than of healthy birds (0.646) reared in open-sided houses and unhealthy birds in close-houses (0.836). Although the heat stress index for both types of houses did not exceed the 107°C limit, mean air velocity in the open-sided houses was lower ($p<0.05$) at 0.4m/s than in close-houses at 1.8m/s. Hence, it is suggested that low air velocity in the open-sided houses contributed to the ineffective convection heat regulation by the birds that may be the cause of stress and elevated H/L.

Keywords: heterophil: lymphocyte (H/L), Lohmann Brown, heat stress index

RESPONSE TO FLUID THERAPY IN ENDURANCE HORSES WITH METABOLIC AILMENTS

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ABSTRACT

Endurance riding is a fast-growing Fédération Equestre Internationale discipline. In endurance horses eliminated during race because of metabolic disorders generally necessitate fluid therapy. This study evaluates the physical, haematological and biochemical changes of eliminated endurance horses due to metabolic disorders given fluid therapy. This study also determines the correlation between riding speed and distance travelled and physical, haematological and serum biochemical abnormalities. Nine of 61 endurance horses participating in an endurance ride eliminated because of metabolic disorder were admitted to the Royal Terengganu Endurance Stable/Universiti Putra Malaysia Equine Hospital. The horses were examined by veterinarians and intravenous fluid therapy was indicated with 0.9% saline solution at rate of 5-10L hr^{-1}. Jugular blood samples were obtained before and after fluid therapy. Heart rate, skin tenting duration, mucous membrane colour, capillary refill time, and gastrointestinal sounds improved significantly ($p<0.05$) following fluid therapy. Haematology and biochemistry parameters were consistent with haemodilution but several became normal following fluid therapy. There was no significant ($p>0.05$) correlation between riding speed and physical, haematological and biochemical parameters. However, there were significant ($p<0.05$) correlation between distance travelled and icterus index, bilirubin, and urea concentrations. The study shows that intravenous fluid therapy positively affects physical, haematological, and biochemical parameters of endurance horses eliminated because of metabolic disorders.

Keywords: endurance, horse, metabolic, fluid therapy

USE OF ORAL FLUIDS FOR DETECTION OF PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME USING ELISA

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Porcine reproductive and respiratory syndrome (PRRS) is a disease that is highly contagious and of great economic importance in Malaysia. Therefore, reliable and improved diagnostic methods are needed in disease surveillance. This study evaluates compare between oral fluid and serum samples in the detection of PRRS using the IDEXX ELISA test kit. The study involved two pig farms located in Perak and Selangor, Malaysia. Thirty-five pigs from each farm were used as subjects. The pigs were divided into 7 different categories: gilt, young sow, old sows, and 4 weaner groups which were 10-week, 15-week, 20-week, and 25-week old. Oral fluid and serum samples were collected from these animals individually whereas pen oral fluid samples were collected from weaner groups only. The oral fluid and serum samples were tested with IDEXX PRRS Oral Fluid Antibody Test Kit and IDEXX PRRS X3 Antibody Test Kit, respectively. There is significant, strong, and positive correlation between samples for both Farms A ($p=0.0001$, $r=0.681$) and B ($p=0.0001$, $r=0.601$). In conclusion, oral fluid instead of serum samples can be used in PRRS surveillance.

Keywords: porcine reproductive and respiratory syndrome, oral fluid, serum, (PRRS)IDEXX PRRS Oral Fluid Test Kit, IDEXX PRRS X3 Test Kit

PREVALENCE OF BOVINE VIRAL DIARRHOEA VIRUS INFECTION IN CATTLE IN SELANGOR, MALAYSIA

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ABSTRACT

Bovine viral diarrhea disease is caused by a small, enveloped, single-stranded RNA virus. The virus can cause significant economic losses to the livestock industry from reduced performance and immunosuppression leading to secondary infections. The aim of this study was to investigate the prevalence of bovine viral diarrhea virus (BVDV) infection in cattle population of selected farms in Selangor, Malaysia, and its interaction with risk factors. A total of 407 blood samples were collected from 5 farms of the *Ladang Angkat* programme, Faculty of Veterinary Medicine and University Agriculture Park, Universiti Putra Malaysia. Serum or plasma samples were obtained and stored at -20°C until analyses. Direct ELISA (PrioCHECK®BVDV antibody) was used to estimate concentration of serum antibody towards BVDV. The results show that the overall prevalence of BVDV infection was 135/407(33.2%). There was a significant ($p<0.05$) difference in the prevalence among farms; 66/87(75.9%), 66/254(26.0%), 2/15(13.3%), 1/36(2.8%), and 0/15(0%), for farm A, E, B, C, and D, respectively. There was significantly ($p<0.05$) more females (35.5%) than males (16.3%), more adults (36.7%) than young calves (15.2%), more pregnant (42.9%) than non-pregnant (31.1%), and more lactating (51.1%) than non-lactating (25.8%) cows affected with BVDV. According to breed, dairy Friesian-Sahiwal and Jersey crosses were most affected while beef cattle breeds such as Kedah-Kelantan were least affected. In conclusion, the study revealed that BVDV infection is highly prevalent in cattle in Selangor, Malaysia, and the infection varied with farm, breed, sex, age, lactation, and pregnancy status. This is a first study to determine the status of BVDV infection in cattle populations in Malaysia.

Keywords: BVDV, cattle, risk factor, direct ELISA, prevalence

PREVALENCE OF *RHODOCOCCUS EQUI* INFECTION IN CATS PRESENTED TO THE UNIVERSITY VETERINARY HOSPITAL, UNIVERSITI PUTRA MALAYSIA

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ABSTRACT

Rhodococcus equi is facultative, intracellular, gram-positive coccobacilli. The possible routes of *R. equi* infection in animals are inhalation and ingestion. In cats, *R. equi* infections can be presented as cutaneous or pulmonary forms (pyothorax). The objectives of this study were to determine the prevalence of *R. equi* infection among cats presented to the Universiti Veterinary Hospital (UVH), Universiti Putra Malaysi (UPM), to describe the signalment, clinical signs, blood profile, treatment and outcome in *R. equi*-infected cat, and to determine the antibiotic sensitivity profiles of *R. equi* isolates of Malaysian origin. The information on cats positive for *R. equi* isolates were obtained from bacteriology laboratory records of the Veterinary Laboratory Services Unit, Faculty of Veterinary Medicine, UPM for the period of 2009 to 2014. The medical records of affected cats were obtained from UVH. Phone interview with owners were conducted to determine the current outcome of the cats discharged from the hospital. Associations between clinical outcome and risk factors the infection were identified and statistically analysed. Thirty-nine cats with *Rhodococcosis* were diagnosed over the 6-year period. The prevalence of the infection was 0.00165 among cats presented to UVH. The majority of infected cats were less than 1-year old (55%), with the Domestic Shorthaired breed (77%), male cats (69%), intact (87%) and outdoor managed cats (57%) over-represented. Pulmonary disease (64%) including pyothorax was the predominant form, mostly presented with abdominal breathing. The cutaneous form of the infection includes superficial wounds and ruptured abscess (54.5%). Cytology analyses of 16 wound and pyothorax samples revealed presence of predominantly macrophages (100%) and neutrophils (93.8%, which are typical for the infection. Findings from blood analyses included thrombocytopaenia (53.8%), neutrophilia (46.2%), and monocytosis (38.7%) while serum biochemistry abnormalities were hypoalbuminaemia (23%) and hyperkalaemia (23%) and hyperglobulinaemia (19.2%). Other parameters were unremarkable. Antibiotic

sensitivity profiles for 13 *Rhodococcus* isolates revealed high resistance to cephalexin (100%) and high susceptibility to marbofloxacin (100%) and enrofloxacin (91%). There was no significant ($p>0.05$) association between infection and age, sex, management, breed, or neuter status. Twenty-three (59%) cats died despite exhaustive medical intervention. In conclusion, *Rhodococcosis* in cats is become increasingly prevalent in Malaysia, with moderately high mortality of infected cats. Local *R. equi* isolates from cats appear to have variable multidrug resistances and exclusively resistant to cephalexin.

Keywords: *Rhodococcus equi,* feline, prevalence, Malaysia, antibiotic sensitivity

ANTI-CANCER ACTIVITIES OF *SALMONELLA ENTERICA* SEROVAR AGONA ON CANINE MAMMMARY GLAND TUMOUR CELLS

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ABSTRACT

Canine mammary tumour is the most common neoplasm in female dogs with epidemiological, clinicopathological, and biochemical characteristics similar to human breast carcinoma. Some bacteria have anti-cancer properties. One of the most commonly investigated bacteria as anti-cancer agent is *Salmonella typhimurium.* To ensure safety of this therapy, the virulence of the bacteria must be attenuated to reduce the pathogenic effects. Recently *Salmonella agona,* wild type strain (WA32) was genetically engineered to silence the metabolite and virulence genes for the development of a genetically modified/attenuated strain (4KA32) to be used in cancer therapy. In this study, real-time cell analysis (RTCA) bacterial invasion assay was conducted in a canine mammary tumour cell line (CMT-Stylo) to determine the cytotoxic effect of WA32 and 4KA32 bacteria in comparison with *S. typhimurium* and doxorubicin. The CMT-Stylo cells were grown in e-plates for 24 h and treated with 10^4, 10^5, 10^6 CFU bacteria. Real-time data on impedance measurement, expressed as cell index (CI) was recorded over 48 hours of treatment. Treating CMT-Stylo cells with WA32 and 4KA32 bacteria produced significant ($p<0.05$) cytotoxicity and 60 to 80% lower e-cell index than untreated control, and up to 90 % lower than doxorubicin-treated cells. No significant ($p>0.05$) difference in CMT-Stylo cell cytotoxicity was observed between WA2 and 4KA32 bacteria treatments. Microscopic examination revealed cell round-up in treatment groups at 48 hours that could be due to apoptosis. This is the first report on the cytototoxic effect of attenuated and wild type *S. agona* strains on a canine mammary tumour cell line. Since the cytotoxicity effect of attenuated strain and wild-type *S. agona* is similar, the attenuated bacteria is recommended for anti-cancer therapy.

Keywords: canine, mammary tumour, *Salmonella enterica* serovar Agona, cytotoxicity

MOSQUITO BIOCONTROL EFFICIENCY OF CLIMBING PERCH (*ANABAS TESTUDINEUS*) AND THREE-SPOT GOURAMI (*TRICHOGASTER TRICHOPTERUS*)

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ABSTRACT

Over one million people die from mosquito-borne diseases every year. This is a comparative study on mosquito biocontrol efficiency of two species of native Anabantoids, namely the climbing perch (*Anabas testudineus*) and three-spot gourami (*Trichogaster trichopterus*). In this study, mosquito larvae of 5 to 6mm in length were placed in a tank containing either *A. testudineus* or *T. trichopterus*. Three fish per species were used to determine maximum daily intake of mosquito larvae over 3 consecutive days. The number of mosquito larvae fed was determined by enumerating total number of larvae eaten by the fish each day. There was significantly ($p<0.05$) higher mean maximum daily intake of mosquito larvae by *A. testudineus* (71.1±4.37) than *T. trichopterus* (39.2±1.57). The differences in the intake may be due to the higher predatory capacity of *A. testudineus* compared to *T. trichopterus. A. testudineus* was also placed in tanks filled with three different water sources: lake water, drain water or non-chlorinated water, and mean maximum daily intake of mosquito larvae by the Anabantoid was again determined over 3 consecutive days. The results showed that maximum daily intake of mosquito larvae by *A. testudineus* did not vary with water source.

Keywords: Anabantoids, climbing perch (*Anabas testudineus*), three-spot gourami (*Trichogaster trichopterus*), mean maximum daily intake, mosquito larvae

OPERATION EFFICIENCY ANALYSIS OF THE SMALL ANIMAL CLINIC, UNIVERSITY VETERINARY HOSPITAL, UNIVERSITI PUTRA MALAYSIA

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ABSTRACT

Turnaround time (TAT) is an important determinant for workflow efficiencies in various healthcare facilities, including veterinary facilities. The objectives of this study were to determine the TAT of services stations during consultation and treatment at the Small Animal Clinic, University Veterinary Hospital, Universiti Putra Malaysia and to identify factors affecting TAT. A clinical workflow structure was determined. The service stations identified were reception, examination/biopsy/treatment, minilab, X-ray/ultrasound, interpretation and diagnosis, verification/dispensary, payment, and dispensary. Turnaround time for each service station during consultation were recorded. Details of the cases and other relevant information were also obtained. Mean TAT for each service station ranged from 1.96 minutes (dispensary) to 42.10 minutes (reception). Factors determining TAT included attribute of the case and human factors. The average revenue for the duration of the study was RM166.10/case, with the highest recorded on Mondays (RM194.23/case) and lowest on Saturdays (RM77.99/case). In conclusion, this study showed that the TAT is closely related to the nature of cases and human inputs.

Keywords: turnaround time, nature of cases, human resources, revenue, small animal clinic

TOXOPLASMA GONDII INFECTION IN *AYAM KAMPUNG* IN SELANGOR AND MALACCA, MALAYSIA

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ABSTRACT

Toxoplasmosis is a worldwide zoonosis caused by the protozoa *Toxoplasma gondii*. *Ayam Kampung* (*Gallus domesticus*) or loca free-range chickens have recently been reported to be an important component of the epidemiology of toxoplasmosis. This study determined the common sites of *T. gondii* infection, histopathological changes in affected tissues, and serology. Fifty serum samples from *Ayam Kampung* from Selangor (20 from 4 farms) and Malacca (30 from 6 farms), Malaysia, were collected and analysed by using serological kits. The *T. gondii* antigen was detected in 20% of samples by ELISA and anti-*T. gondii* antibody detected in all *T. gondii*-positive samples using indirect haemagglutination test. Histopathological examination revealed cysts and tissue changes including inflammation and degeneration (necrosis) in 18% (n=9) of brain, 22% (n=11) of liver and 10% (n=5) of spleen samples. These findings suggest that *T. gondii* localises primarily in the liver and to a lesser extent other tissues. This is the first report on the detection of *T. gondii* in *Ayam Kampung* of Malaysia.

Keywords: *Toxoplasma gondii*, *Ayam Kampung*, serology, histopathology

ELIMINATION OF HORSES DURING ENDURANCE RACES IN TRENGGANU, MALAYSIA

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ABSTRACT

Endurances horses are eliminated from races for various reasons including physical and metabolic disorders. In this study, the cause of elimination of horse from an endurance race was determined in the Sultan Mizan Cup 2014 held in Trengganu, Malaysia. The subject of the study was 488 horses comprising of 171, 215, 87, and 15 horses participating in the 40, 80, 120, and 160 km race distance, respectively. Among these horses, only 340 horses (69.7 %) completed while 32, 72, 36, and 8 were eliminated (30.3 %) from the 40, 80, 120, and 160 km race category, respectively. In the 40 km race, elimination of horses was mainly due to lameness (46.9 %), elevated heart rate (46.9 %) and abnormal intestinal motility (6.2%). In the 80 km race, eliminations were due to lameness (63.9 %), elevated heart rate (31.9 %), and abnormal intestinal motility (4.2 %). In the 120 km race, the rate of eliminations due to lameness was 55.6 %, elevated heart rate 38.9%, and abnormal intestinal motility 5.5%. Meanwhile, in the 160 km race all eliminations were due lameness.

Keywords: endurance race, completion, elimination, lameness, elevated heart rate, abnormal intestinal motility

EVALUATION OF GROWTH AND REPRODUCTIVE PERFORMANCES OF TIMORENSIS DEER AT UNIVERSITY AGRICULTURE PARK, UNIVERSITI PUTRA MALAYSIA

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ABSTRACT

The deer industry is a relatively new and growing industry in Malaysia. Growth of animals is an important factor as it determines productivity and economic returns of the farm. Therefore, a retrospective study was conducted to determine the health and reproductive performance of timorensis deer kept in Field 16, University Agriculture Park, Universiti Putra Malaysia. The farm was developed as a model for student teaching and farmers, and for exhibitions. Farm records between 2011 and 2014 were collected and analysed. However, data on age at first fawning, mean birth weigh, fawning intervals, litter size, age at first parturition and parturition interval were not available. Most fawning occurred between October and December each year with apparent peak in December. The mean fawning rate for the past 4 years was 60% while the average mortality rate was low at <10%. The average daily gain was 0.02±0.02 kg (n=140) and there was no significant ($p>0.05$) difference between average daily gain (ADG) between years. Monthly rainfall showed significant ($p<0.05$) negative correlation with ADG and positive correlation with fawning rate ($p<0.05$). There seemed to be a breeding season for timorensis deer on this farm, which was during the mildly dry months of February to March; thus the fawning season is in the rainy months of October to December.

Keywords: on-farm evaluation, deer, health status, reproductive status

OCCURRENCE AND ANTIBIOTIC RESISTANCE OF *SALMONELLA SP.* IN MUTTON SOLD AT THE WET MARKET IN SERDANG, SELANGOR, MALAYSIA

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ABSTRACT

Salmonella sp. is the major pathogenic bacteria found in humans as well as in animals, which causes acute gastroenteritis. Salmonellosis remains an important public health problem worldwide especially in developing countries. The objectives of the study were to determine the occurrence and antibiotic resistance patterns of *Salmonella sp*. isolated from mutton obtained from the wet market in Serdang, Selangor, Malaysia. A total of 30 samples of mutton were collected from different butcher stalls in the wet markets. The samples were processed for isolation of *Salmonella* sp. by inoculating samples into Rappaport-Vassiliadis enrichment broth. After overnight incubation, loopfuls of the enriched cultures were streaked onto xylose-lysine-deoxycholate and Brilliant Green agar. All samples were negative for *Salmonella* sp. This study shows that mutton sold at the wet market was free of *Salmonella* sp., indicating that good hygiene is practiced by the slaughterhouse and market.

Keywords: mutton, wet market, Serdang, Malaysia, *Salmonella* sp., antibiotic resistance

OCCURRENCE OF *SALMONELLA* AND *CAMPYLOBACTER* SP. IN EXOTIC BIRDS IN THE WETLAND, PUTRAJAYA, MALAYSIA

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ABSTRACT

Putrajaya Wetlands is the first constructed freshwater wetland and the largest of its kind in the tropics. The Putrajaya Wetlands is home to a variety of exotic birds and wildlife. This study was conducted to determine the state of antibiotic resistance of *Salmonella* and *Campylobacter* Sp. in exotic birds. Cloaca swab samples were taken from 50 apparently healthy birds from the quarantine areas, flamingo pond, and view deck. The birds sampled were water birds; namely Black swan, Egyptian goose, Radjah shelduck, Greater flamingo, White pelican, Pink backed pelican and White swan. *Campylobacter coli* was isolated from 7 (14.0%) cloaca swabs from Black Swan, White Pelican and White Swan. *Campylobacter lari* was isolated from 2 (4.0%) cloaca swabs from Black Swan only. Since *Salmonella* Sp. colony was not obtained, antibiotic resistance test was not done on the bacteria. All *C. coli and C. lari* isolates were resistant to clindamycin but sensitive to gentamycin. A total of 55.5% isolates were resistant to one antibiotic while 22% were resistant to 2 antibiotics. None of the isolate was resistant to three antibiotics. However, 22.2% of isolates were resistant to four antibiotics, indicating that *Campylobacter* Sp. isolated from exotic birds in Wetland, Putrajaya has multidrug resistance.

Keywords: exotic birds, *Salmonella* Sp., *Campylobacter* Sp., antibiotic resistance

EFFECT OF *MACARANGA* AND *MALLOTHUS* SP. ON GOAT RUMEN DEGRADABILITY

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ABSTRACT

Livestock feeds typically account for about 70% of total goat production cost. Due to animal-human feed competition and lack of land for planting grass, there is need to find an alternative animal feed among local plants. In this study *Macaranga* (*lebar daun*) and *Mallothus Sp.* (*balik angin*), two common local plants, were assessed for their *in vitro* ruminal degradability with respect to total gas and volatile fatty acids (VFA) production. The study groups were LD (*Macaranga Sp.*), BA (*Mallanthus* Sp.), N (Napier, control), MX (50% *Macaranga* Sp. and 50% *Mallanthus* Sp.) and MW (20% *Macaranga Sp.*, 20% *Mallanthus* Sp. and 60% Napier grass). The plants were incubated for 24 hours in rumen fluid obtained from fistulated goats. The results showed that *Macaranga* Sp. produced the highest amount of acetate (94.30%), while *Mallanthus* Sp. produced the highest amount total VFA (772.46 mM/mL). A mixture of *Macaranga* and *Mallanthus* Sp. produced the highest amount of butyrate and propionate among groups. Production of total gas from *Macaranga Sp.* and *Mallothus Sp.* did not significantly ($p>0.05$) differ from the control group (Napier grass). Thus *Macaranga* and *Mallothus* plant species can be used as alternative fibre sources for goat feed without adversely effecting rumen degradability.

Keywords: *Macaranga Sp., Mallothus Sp.,* rumen degradability, volatile fatty acid, total gas production

DETECTION OF ORF VIRUS IN GOATS OF *LADANG ANGKAT* FARMS, FACULTY OF VETERINARY MEDICINE, UNIVERSITI PUTRA MALAYSIA

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ABSTRACT

Contagious ecthyma is an acute, contagious, debilitating and economically important viral skin disease of sheep, goats and some other domesticated and wild ruminants. The etiological agent for this disease is Orf virus where the virus is under the genus Parapoxvirus and family Poxviridae. Two farms from the programme Ladang Angkat of UPM had outbreaks with contagious ecthyma. Three samples were obtained from the outbreaks. The scab samples collected from the animals were homogenized and the DNA was extracted manually. The targeted DNA were then amplified by using Polymerase Chain Reaction (PCR). Four sets of primers were used in both interferon resistant (VIR) gene of the virus (VIRF-VIRR; ORFVO59F-ORFV059R) and the major envelope proteins (PPP1-PPP4, semi nested PPP3-PPP4, ORFVO11F-ORFVO11R). Phylogenetic trees were built by comparing the complete coding area for both 011 and 059 genes. The result of this study showed that there was no significant difference ($p>0.05$) between the primers used. Both samples 2 and 3 were so close phylogenetically to each other compared to sample 1 according to B2L whole coding gene. The Orf virus based on B2L gene isolated from these cases was different from the virus strain from eastern south Asia strains. Based on 059 gene from this case, the Orf virus was different from each other but closely related to some Chinese Orf virus strains.

Keywords: goat (*Capra hircus*), Orf virus, diagnosis, polymerase chain reaction

ANTIBIOTIC PROPERTIES OF MALAYSIAN HONEY AGAINST PATHOGENIC WOUND-CAUSING BACTERIA

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ABSTRACT

Honey has been used for medicinal purposes since ancient civilisations because of its known antimicrobial, anti-inflammatory and healing properties. This study aimed to investigate the antimicrobial properties of local Malaysian honey towards common pathogenic wounds in animals. Five types of local honey (Kelulut, Multifloral, Propolis), artificial and imported honey (Manuka) were tested for their antibacterial activity against 8 bacteria of which 4 were Gram-positive (Methicillin Resistant *Staphylococcus aureus* (MRSA), Vancomycin Resistant Enterococci (VRE), *Bacillus subtilis* and *Staphylococcus intermedius* and 4 Gram-negative (*Proteus mirabilis*, *E. coli*, *Pseudomonas aeruginosa, Pasteurella multocida*) bacteria. The well diffusion method was performed to determine the effect of pure undiluted honey on bacteria by determining the zone of inhibition. The Minimum Inhibitory Concentration (MIC) for each honey was also determined using the microbroth dilution method. The most susceptible bacteria was *P. multocida* with mean inhibition zone of 20.96±3.56mm while *P. mirabilis* with mean inhibiting zone at 5.71±3.86mm was the least susceptible. There was a significant ($p<0.05$) differences in inhibition zone among type of honey with Manuka showing the most effective antibiotic effect, followed in order by Propolis, Kelulut, Multifloral, and artificial honey. The MIC by Kelulut was the lowest at 18.13±5.82%, followed by Propolis (31.25±8.44%), Manuka (34.38±9.38%), and artificial honey (34.38±9.38%). Multifloral honey barely inhibited bacteria when diluted. It was noted that honeys that were not effective in pure form were effective when diluted. This phenomenon may due to the release of hydrogen peroxide from the honey upon dilution. The study shows that Malaysian honey possess antimicrobial properties towards important pathogens and can potentially be used in wound treatment.

Keywords: wound, pathogens, animal, honey, antimicrobial properties

ULTRASTRUCTURE OF SWIFTLET LIVER

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ABSTRACT

In swiflets, the liver is part of the digestive system and is responsible for the production of edible bird nest. The study was conducted to determine the gross structure and ultrastructure of the swiflet (*Aerodramus fuciphagus*) liver using light and transmission electron microscopies. Grossly, the liver of the swiftlet is located around the gizzard and comprises of three lobes; a large right, a small left, and an even smaller dorsal left lobe. Under the light microscope the liver parenchyma is largely made up of hepatocytes, central veins and portal triad. The parenchyma of this avian species does not demonstrate the presence of a typical or classical lobule formed by the central vein and portal triads at the corners of each lobule. Under transmission electron microscopy the hepatocyte has a large, centrally located vesicular nucleus with a prominent nucleolus. The cytoplasm of the hepatocyte is largely occupied by mitochondria with layers of ribosomes appearing like they are surrounding the mitochondria. The cytoplasm also contains vacuoles with electron-opaque content that is most probably stored glycogen. The membrane of hepatocytes showed modifications when facing van Kupffer cells and bile canaliculus. The cell membrane of hepatocytes facing van Kupffer cells are thrown into numerous folds while those facing the bile canaliculi form microvillus extensions. It is also interesting to note that the liver of swiftlets contain numerous canaliculi.

Keywords: swiftlet, liver, ultrastructure, bile canaliculi, bile

PREVALENCE OF *MORAXELLA OVIS* INFECTION IN GOATS OF *LADANG ANGKAT* FARMS, FACULTY OF VETERINARY MEDICINE, UNIVERSITI PUTRA MALAYSIA

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ABSTRACT

Infectious keratoconjunctivitis or pink eye disease is recognised as one of the common diseases affecting small ruminants. The purpose of this study is to determine the prevalence of *Moraxella ovis* infection in goats, economic impact of pink eye disease and role of flies as a vector for *M. ovis* in the goat farms under the *Ladang Angkat* programme of Faculty of Veterinary Medicine, Universiti Putra Malaysia. Sixty goats were randomly selected from 4 farms (15 each) and subconjunctival swab samples were taken from the animals. A fly-trap was set in the farm. A questionnaire regarding the status of pink eye disease in the farms was given to the owner. Both subconjuctival swabs and flies caught in the fly-trap were subjected to blood agar cultures and the resultant colonies screened under Gram staining. Pure isolates were subjected to conventional polymerase chain reaction (PCR) to detect the bacteria. Eighteen samples (30%) were positive for *M. ovis* with Farm B showing the highest (40%) and Farm C the lowest (20%) prevalence. None of the fly samples were positive for *M. ovis*. The questionnaire showed that 3 out of 4 farmers (75%) believed that pink eye disease is a common finding but not a disease of importance in the farms. According to the farmers, the average rate of infection in their goats was 16.5%. Farm C had the highest (50%) and Farm D the lowest (2%) rate of infection. The rate of goats becaming emaciated following clinical signs of pink eye disease was 7.25%, with Farm C showing the highest rate (20%) and Farm D the lowest (1%). The majority of the farms (75%) used eye ointment or spray as the course of treatment of pink eye. Other farms included include systemic antibiotics with the eye ointment or spray treatments. The study showed that the prevalence of *M. ovis* infection among the goats in farms under the *Ladang Angkat* programme is 30%. Only 7.25% of the farms documented significant emaciation in their goats following typical clinical signs.

Keywords: infectious keratoconjunctivitis, pink eye disease, *Moraxella ovis,* polymerase chain reaction, economic impact.

OCCURRENCE OF *CORYNEBACTERIUM ULCERANS* AND *PASTEURELLA MULTOCIDA* IN PET CATS AND DOGS IN KLANG VALLEY, SELANGOR, MALAYSIA

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ABSTRACT

Pets, especially cats and dogs are reservoirs for *Corynebacterium ulcerans* and *Pasteurella multocida*. *Corynebacterium ulcerans* produceS diphtheria toxin and cause diphtheria-like symptoms in humans. This infection is an emerging public health threat in developed countries, with incidence sometimes higher than that of *C. diphtheriae*. *P. multocida* is often associated with bite wounds and scratches that cause infections leading to significant morbidity and mortality in humans. Therefore, this study was conducted to determine the occurrence of *C. ulcerans* and *P. multocida* in pet cats and dogs in Klang Valley, Selangor, Malaysia and their antibiotic resistance profiles. Nasal and pharyngeal samples were collected from apparently healthy animals comprising of 26 cats and 29 dogs presented to 4 veterinary health care facilities in Klang Valley. The isolates were tested against six antibiotics commonly used in small animal practice. *C. ulcerans* was not isolated in this study whereas the occurrence for *P. multocida* was low (10.9%). *P. multocida* isolates showed low resistance (16.7% each) to amoxicillin-clavulanic acid, tetracycline, trimethoprim-sulfamethoxazole, and cephalexin. This is a first description of the isolation and antibiotic resistance profile of *C. ulcerans* and *P. multocida* in pet cats and dogs in Malaysia. This study demonstrated the risk of owners acquiring infections from their pet cats and dogs.

Keywords: *Corynebacterium ulcerans*, *Pasteurella multocida*, cats, dogs

EFFECT OF LIDOCAINE-BUPIVACAINE BLOCK ON CATS UNDERGOING CASTRATION

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ABSTRACT

The effect of lidocaine-bupivacaine block in cats undergoing routine castration were determined in a controlled, randomised, and blinded study. Twelve cats were randomly assigned to 2 groups. Cats in Group 1 (Local Block, n=6), were given a mixture of 1 mg/kg 2% lidocaine and 1 mg/kg 0.5% bupivacaine subcutaneously at the scrotal sac. Cats in Group 2 (Control, n=6) did not receive the local block. Group 1 and 2 cats were induced with 15 and 0.1 mg/kg ketamine-acepromazine intramuscularly, respectively, and maintained on sevoflurane via facemask. The systolic (SAP), diastolic (DAP), and mean arterial blood pressure (MAP), heart (HR), and respiratory rate (RR) were measured intra-operatively at specific events. Post-operatively, all cats received meloxicam, 0.2 mg/kg subcutaneously. Pain scores were determined at 4, 8, and 24 hours post-operation. The mechanical pressure threshold (MPT) values were determined at 2, 4, 8, and 24 hours post-operation. Intra-operatively, the blood pressure and HR tended to be higher in the control group. The hemodynamics peaked during traction and autoligation of the first spermatic cord in the control group. There was no treatment difference in RR. Post-operatively, pain scores in the group given local blocks were lower than the control group at 4 hours post-operation. There was no treatment difference in HR, RR, SAP, DAP, MAP, and MPT values. Thus, it can be concluded that subcutaneous administration of lidocaine-bupivacaine into the scrotal sac before castration improved intra-operative hemodynamic stability, and provided better analgesia up to 4 hours post-castration.

Keywords: lidocaine-bupivacine block, castration, cat

AWARENESS AND HERD HEALTH COMPLIANCE AMONG DAIRY CATTLE FARMERS OF *LADANG ANGKAT* FARMS, FACULTY OF VETERINARY MEDICINE, UNIVERSITI PUTRA MALAYSIA

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ABSTRACT

Dairy industry in tropical Asia failed to keep pace with the rate of development in western countries. With the increase in the number of cattle in dairy farms, health management approach in these farms has now become preventive rather than curative. To assist local farmers cope with the change, a herd health program (HHP) was introduced to the dairy cattle farms of *Ladang Angkat* programme (PLA) of the Faculty of Veterinary Medicine, Universiti Putra Malaysia. Even with the introduction of HHP in September 2011, the level of HHP awareness and compliance of the farmers under the programme remained unknown. Thus, the aims of this study were to determine the level of farmer awareness and compliance on 14 components in HHP, association between farmer awareness and compliance on HHP, and to recommend basic HHP to the farmers. All dairy cattle farms of PLA (n=5) were assessed by a questionnaire given to the owners. The state of farm environment was recorded by Faculty veterinary consultants during their visits. Total percentage of farmer compliance and awareness on each component of HHP was calculated and the association between farmer awareness and compliance of HHP were analysed using Spearman's rho. Farmers that are aware did not necessarily comply with HHP. Accordingly, mean percentage of farmer awareness was higher than mean percentage of farmer compliance. There was significant ($p<0.05$) low positive correlation between farmer awareness and compliance. Factors affecting farmer compliance were identified and recommendations to improve HHP compliance were made to the farmers. It is expected that improving farmer compliance on HHP can gradually improve the Malaysian ruminant industry.

Keywords: farmers' awareness, herd health, compliance, dairy cattle, *Ladang Angkat*

EFFECT OF *CURCUMA LONGA* AND LEVAMISOLE ON *IN VITRO* SURVIVAL RATE OF SHEEP STRONGYLES

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ABSTRACT

Gastrointestinal helminth is a global problem in small ruminant production. Many parasites were found to develop resistance after prolonged use of chemical anthelminths. The present study evaluated *Curcuma longa* (turmeric) as a biological nematicide in the treatment of strongyles in sheep. The objectives of the study were to compare the efficacy of *C. longa* and Levamisole on the survival rate of the strongyles in sheep and to determine the most effective concentration of the *Curcuma longa* extract for larvacidal activity against strongyle third stage larvae (L3) under *in vitro* conditions. *C. longa* rhizomes were washed thoroughly in water, cut into small pieces and dried at room temperature for 4 d. The dried turmeric were powdered and stored at room temperature. The L3 of the strongyles were cultured from faeces of naturally infected sheep. After 7 d, the L3 were harvested from the faecal cultures. Methanolic extract of *C. longa* were prepared at concentrations of 50, 100 and 200 mg/mL to determine the efficacy of the extract on L3 strongyles *in vitro*. Levamisole at the concentrations of 1.5 and 3.0 mg/mL were used as the positive control. The *C. longa* methanolic extract showed anthelmintic activity in a dose-dependent manner with 78% worms dying within 24 hours of exposure to 200 mg/mL. Levamisole at 1.5 mg/mL cause motality in 72% worms after 24 hours of exposure. Therefore, the present study indicated that there is no significance difference between the effect of *C. longa* methanol extract and Levamisole suggesting that the extract is an effective *in vitro* anthelminthic.

Keywords: *Curcuma longa*, strongyles, L3, Levamisole

PARASITES OF WILD MALAYSIAN PLANTAIN SQUIRREL (*CALLOSCIURUS NOTATUS*), GREY-BELLIED SQUIRREL (*CALLOSCIURUS CANICEPS*), AND TREE SHREW (*TUPAIAGLIS*)

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ABSTRACT

Plantain and Grey-bellied squirrels are rodents belonging to the *Sciuridae* family, whereas the common tree shrews are not rodents (order Scandentia) belonging to the *Tupaidae* family. Tree shrews are similar to squirrels in appearance and habits and are usually mistaken as squirrels, thus the Malay word *tupai* is used for both squirrels and tree shrews. These adaptable species are commonly found in lowland forests, oil palm plantations, and urban environment in Malaysia. Although these mammalian species play an important role in seed dispersion and maintenance of ecosystem, they may also be a source of various viral, rickettsial and bacterial pathogens that may be zoonotic. Therefore, this study was carried out to determine the role of ectoparasites and endoparasites in the transmission of diseases from these mammals to other animal species. A total of 9 animals comprising of 3 species of squirrels and shrew were caught in the suburban area of Senawang, Negeri Sembilan, Malaysia for the detection of ecto-, endo-, and hemoparasites. The species caught were *Callosciurus notatus*, *C. caniceps* and *Tupaia glis*. From these hosts, 2 genera of ectoparasites, *T. glis and C. caniceps* (mesostigmatid mites of *Laelaps* sp. and possibly *Haemolaelaps* sp.), 1 genus of nematode (*Spirura* sp.) and 1 genus of cestode (*Tupaiataenia* sp.) from *T. glis* were identified. No blood parasite was observed in thin blood films or wet blood mounts. It can be concluded that these squirrels and shrew were apparently healthy.

Keywords: squirrels, tree shrews, ectoparasites, endoparasites, blood parasites

IDENTIFICATION OF BACTERIAL FLORA IN GUTTURAL POUCH OF HORSES

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ABSTRACT

Guttural pouch is a paired extension of the auditory tube, which is one of the important structures of the upper respiratory tract of horses. Under specific conditions, changes in the microflora along the respiratory tract can lead to respiratory diseases. There is limited information on the types of bacteria isolates from the guttural pouch of horses in the tropics. The aims of this study were to determine the presence of *Streptococcus equi ss equi* among the normal flora and describe the histology of the guttural pouch of horses. Four horses were humanely euthanised and the guttural pouches approached using the Viborg's triangle technique. Sterile phosphate buffered saline (PBS) was introduced into the guttural pouch and aspirated to obtain samples that were cultured on blood and McConkey agar. Bacterial isolates were identified by biochemical tests. Nine species of bacteria were identified including *Staphylococcus aureus* (17.65%), *Klebsiella pneumoniae* (17.65%), *Stapyhlococcus intermedius* (11.76%), *Pasturella Sp.* (11.76%), *Corynebacterium Sp.* (11.76%), *Actinomyces Sp*. (11.76%), *Pasturella caballi* (5.88%), *Moraxella equi* (5.88%), and *Rhodococcus Sp.* (5.88%). *Streptococcus equi ss equi* was not isolated. Polymerase chain reaction confirmed the absence of *Streptococus equi ss equi.* Gram-positive were more frequently isolated compared to Gram-negative bacteria. Histologically, the guttural pouch of all four horses appeared normal and was lined with pseudostratified ciliated epithelium containing goblet cells with glandular cells in the lamina propria. Based on these findings, it can be concluded that in the tropics, several bacterial flora reside in the guttural pouch of healthy horses and the majority of these bacteria are similar to those found in horse in temperate countries.

Keywords: horses, healthy, guttural pouch, bacteria

EXPERIMENTAL INFECTION OF JAPANESE QUAILS (*COTURNIX COTURNIX JAPONICA*) WITH NEWCASTLE DISEASE VIRUS STRAIN AF2240

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ABSTRACT

Many birds are susceptible to Newcastle disease virus (NDV), thus the disease has become a concern to the poultry industry. Quails may be a potential carrier for Newcastle disease virus. The current experiment was conducted to determine the susceptibility of the Japanese quails (*Coturnic corturnix japonica*) towards Newcastle disease virus (NDV) AF2240 strain. The AF2240 strain is a Malaysian viscerotropic velogenic strain isolated during an outbreak in the 1960s. Twenty-four quails of 2 weeks of age were randomly selected and equally divided into four equal groups. Groups A, B, and C were intramuscularly inoculated with 0.1, 0.2, 0.3 mL antigen (EID_{50} 7.3log10/0.1 mL), respectively. Uninoculated birds served as controls. On day six post-infection, clinical signs including ruffled feathers, depression, incoordination, lameness, anorexia, diarrhoea, recumbency, and wing and leg paralysis were observed in some infected quails. The clinical signs became significantly ($p<0.05$) severe from days 6 to 9 post-challenge. These signs did not differ significantly ($p< 0.05$) among quails of the infected groups. Using ELISA, none of the quails showed increase in antibody titre during experimental period. Significant lesions observed at post-mortem examination of the infected quails included congestion and haemorrhages of the intestine, congestion of liver, brain, pectoral muscles, heart and lungs. There was no significant ($p<0.05$) difference in lesion between treatment groups. In conclusion, Japanese quails are susceptible to Newcastle disease virus Strain AFF2240 infection, which may cause severe clinical manifestations and even mortality. However, this study also suggested that severity of clinico-pathological manifestations and antibody titres are not neccesarily dependent on dose of the virus.

Keywords: Newcastle disease virus AF2240 strain, viserotropic velogenic, NDV antibody

MILK YIELD, REPRODUCTIVE PERFORMANCE, AND HEALTH OF DAIRY COWS REARED ON CONCRETE AND RUBBER MAT FLOORING

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ABSTRACT

Flooring system in dairy farms is important for hoof and leg health of cows. The current trend in dairy farming is to use rubber instead of concrete flooring. The objectives of this study were to compare the milk yield, reproductive performance and health between dairy cows in farms that used rubber mat flooring (RF) and concrete flooring (CF). Two farms of the *Ladang Angkat* programme, Faculty of Veterinary Medicine, Universiti Putra Malaysia were selected. One farms with RF is located in Lenggeng, Negeri Sembilan, Malaysia and one farm using concrete floor is in Kajang, Selangor, Malaysia. Thirty lactating cows from each farm were selected and the milk yield recorded for 9 consecutive days. Farmers were interviewed to obtain information on reproductive performance and health status of the cows. Clinical mastitis was assessed based on udder and milk abnormalities and lameness by locomotion score. The results revealed that the average daily milk yield of cows from RF farm was 18.01±1.50L, whereas cows from CF farm was 8.3±1.4L, showing that cow raised on RF produced significantly ($p<0.05$) more milk. Farms with RF had significantly ($p<0.05$) lower prevalence of clinical mastitis and lameness than those with CF. This study shows that dairy cows reared on RF perform better than those on CF.

Keywords: dairy cows, rubber mat flooring, milk yield, reproductive performance, lameness, mastitis

FRACTURE INJURIES IN RACEHORSES IN MALAYSIA

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ABSTRACT

Musculoskeletal injuries are among the most common causes of loss during training and racing in Thoroughbred racehorses. There were many studies on catastrophic musculoskeletal injuries (CMI), however non-catastrophic injuries are not well described. The present study was performed to determine the frequency of fractures injuries in Thoroughbred racehorses during training and flat races in Malaysia. Radiographic and CMI records for horses presented at Selangor Turf Club Equine Hospital were assessed for occurrence of fracture injuries. A total of 107 cases were included in this study. Fractures of carpus (31.8 %) were the most common finding and the highest incidence was fracture of the radial carpal bone (15 %). There were significant ($p<0.05$) differences among age group, gender, location of fracture and fractured limb. In 5 to 8 year old geldings, the carpus and the left forelimb were most prone to fractures. However, these factors were not significantly associated with CMI. Both non-catastrophic and CMI commonly occurred at the forelimb. Fracture injuries were significant in Thoroughbred racehorses during training and racing.

Keywords: musculoskeletal, fracture, racehorse, age, gender

NUTRIENT CONTENT OF LOCAL PLANTS USED IN GOAT DIET

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ABSTRACT

In Malaysia, many small holder goat farmers integrate local plants such as *balik angin* (*Mallotus* sp) and *lebar daun* (*Macaranga* sp) into the total feed ration of livestock animals. Apart from reducing dependency on expensive conventional feedstuff, local plants are also continuously available even during the rough seasons. One farm under the Faculty of Veterinary Medicine, Universiti Putra *Ladang Angkat* programme that opted for this practice was selected as the farm for the study. The local plants were collected at locations selected by the farm workers while the Napier grass was harvested from the farm's pasture. *Balik angin, lebar daun* and Napier grass were labeled as BA, LD and N, respectively. The *balik angin* and *lebar daun* mixture was labeled as MX while three forages mixture were labelled as MW. Proximate analysis was performed to determine the dry matter (DM), ash, crude fibre (CFi), crude fat (CFa) as well as crude protein (CP) values of each diet. The results revealed significant ($p < 0.05$) differences in all the nutrient contents, with the exception of ash, between BA and LD samples and N. Moreover, *balik angin* had the highest DM, ash and CFa contents while *lebar daun* had the highest CP but least ash and CFi. The MW had the highest CFi but least DM and CFa, while MX has the least CP. Thus, the information on the nutritive values of these forages is useful for the formulation of feed using *balik angin* and *lebar daun* as components of the livestock animal diet.

Keywords: local plants, *lebar daun, balik angin,* proximate analysis, nutritive value

ASSESSMENT OF STRESS-RELATED BEHAVIOUR OF *CERVUS TIMORENSIS* IN CAPTIVITY

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ABSTRACT

Cervus timorensis or Javan Rusa originated from New Caledonia. This species of wild deer is found in deciduous forests, plantations, and grasslands in the islands of Southeast Asia. *C. timorensis* have been commercially reared in captivity for their meat. In some societies the velvet antler is used for medicinal purposes. In captivity, these animals face a number of challenges including exposure to micro-climate, modified environmental disturbances, altered diet, and small size and characteristics of the enclosure. Captivity causes development of stereotypic behavior such as pacing, crib-biting, coprophagia and excessive vocalisation in these animals that reflect inability of the deer to interact with the new environment. A study on the effect of captivity on a herd of 140 *C. timorensis* was conducted at Ladang Rusa 16, University Agriculture Park, Universiti Putra Malaysia. Observation of deer was through camera traps placed at four locations; adjacent to feeding area, on the right side of the feeding (resting) area, on a tree near a pond (resting area), and on top of a hill (walking area). Movements of deer were recorded for a period of 5 to 6 days. The behavior of *C. timorensis* during the observation period was summarised in an ethogram. The results showed that resting and ruminating (23.9%) were the most observed behaviour followed by walking (17.8%), grooming (15.0%), feeding (10.3%), grazing (9.7%), standing (8.1%), salt licking (2.9%), vocalising (1.1%), milking (0.9%), displaying (0.3%), running (0.3%), sleeping (0.2%), and possible mating (0.1%). However, the deer did not display stress-related behaviour. In conclusion, the *C. timorensis* in captivity at UPM were not under stress.

Keywords: *Cervus timorensis*, captive behavior, stereotypic behavior, stress

EFFECT OF CONCRETE AND ANTI-SKID RUBBER FLOORS ON BEHAVIOUR AND STRESS LEVEL OF JERSEY COWS

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ABSTRACT

Farmers in western countries use rubber flooring in dairy farms because of its advantage in terms of production and hoof health over concrete flooring. Little is known about the effect of rubber flooring on the behavioral and the stress level of dairy cows in Malaysia. Hence, this study was conducted to compare the effect of concrete (CF) and anti-skid rubber flooring (RF) on some behavioral traits and stress level incows. Thirty Jersey dairy cows of 5 years of age in second lactation were selected from two farms each using RF (n=15) and CF (n=15). The feeding management of the farms was similar. Behaviors of the cows such as standing, lying, walking, feeding and drinking were observed and recorded for a period of 2 hours daily for nine days using an ethogram. Blood samples were collected on the tenth day for haematological analysis. The frequency of cows lying down was significantly ($p<0.05$) higher in RF (10.1±0.5) compared to CF (3.9±0.3) farms while the frequency of cows standing (13.8±0.2) and walking (5.1±0.3) was significantly ($p<0.05$) higher in the CF (and 7.6±0.4, respectively) compared to RF farm. There was no significant ($p>0.05$) difference in the feeding and drinking behaviour between cows of the two farms. The farm with CF had higher ($p<0.05$) neutrophil:lymphocyte compared to that with RF, suggesting that the cows in CF farm experienced a higher level of physiological stress. The study showed that anti-skid rubber flooring reduces stress in dairy cows, and thus improving their welfare.

Keywords: anti-skid rubber flooring, concrete flooring, behavior, stress, dairy cows

GASTROINTESTINAL NEMATODE INFESTATION IN SHEEP OF A SMALLHOLDER FARM

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ABSTRACT

The prevalence of gastrointestinal (GI) nematodes was determined in 50 sheep raised in a smallholder farm in Salak Tinggi, Selangor. The sheep comprising of 27 Damara and 23 Barbados Blackbelly crosses were divided into two age groups: young (<12 months) and adult (<12 months). Faecal samples were examined for strongyle nematode egg and counted as egg per gram (EPG) using the modified McMaster technique. Severity of infestation was categorized into mild, moderate and heavy, based on EPG. FAMACHA score was used to determine the anaemic condition. Five sheep were randomly chosen and slaughtered for adult GI nematodes identification using the total worm count (TWC) method. The study showed that the prevalence of gastrointestinal nematode infestation based on EPG was 88 %, of which 84.1 % of the sheep had mild infection. Among the Barbados Blackbelly crosses, adult showed significantly (p=0.002) higher EPG counts than young sheep. The correlation between severity of GI nematode infestations and FAMACHA score was significant (r=0.289; p=0.042). From the TWC, *Haemonchus* was the most predominant nematode followed by *Trichostrongylus,* and *Oesophagostomum*. The correlation between EPG and TWC in sheep with *Haemonchus* infestation, although positive, was not significant (r=0.85, p=0.066). It can be concluded that FAMACHA score correlates well with severity of nematode infestation and the score can be used to assess strongyle nematode burden in sheep.

Keywords: prevalence, gastrointestinal nematode, FAMACHA, EPG

AMELIORATIVE EFFECT OF BLACK SEED (*NIGELLA SATIVA*) ON OXIDATIVE STATUS AND PATHOLOGY OF RED HYBRID TILAPIA (*OREOCHROMIS* SP.) INFECTED WITH *STREPTOCOCCUS AGALACTIAE*

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ABSTRACT

Streptococcosis has become a global challenge to the aquaculture industry. *Nigella sativa* is a natural plant with antioxidant and prophylactic properties. The objectives of the study were to determine the effect of *N. sativa* on the oxidative stress in and pathology of Red hybrid tilapia with *Streptococcus agalactiae* infection. One hundred twenty fish were randomly divided into four groups, A, B, C and D of 20 animals each with replicates for groups C and D. Groups A (negative control) and B (positive control) were fed with 100 % commercial diet. Groups C and D (treatment) were fed for 14 d with commercial diet incorporated with 8 and 15% *N. sativa*, respectively. At the end of experiment, all the fish in groups B, C and D were challenged with 100 µL of 10^7 CFU/mL *S. agalactiae*, intraperitoneally. Blood and tissue samples were taken at days 7, 14, 17, and 18 post-feeding. Plasma was harvested and analysed for malondialdehyde (MDA) while haemolysates for superoxidase dismutase (SOD) content. There was significant ($p<0.05$) higher MDA and lower SOD concentrations in the *N. sativa*-treated than the untreated control fish. Histopathology examination at 18 hours post-infection (day 18 post-feeding) revealed significant ($p<0.05$) lesions in the brain and kidneys of treated fish. The study shows that incorporation of *N. sativa* in feed could ameliorate stress and reduce mortality from streptococcosis in fish.

Keywords: *Nigella sativa*, Red hybrid tilapia, *Streptococcus agalactiae*, stress biomarkers, histopathology

OCCURRENCE OF LEISHMANIASIS IN SHELTER DOGS IN SABAH AND SARAWAK, MALAYSIA

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ABSTRACT

Leishmaniasis is a vector-borne disease caused by the obligate intracellular protozoa of genus *Leishmania*. *Leishmania infantum* is the most common cause of canine leishmaniasis. Although, two cases of human leishmaniasis were reported in Malaysia in 1995 and 2007 and veterinarians from private clinics claimed to have treated dogs with clinical signs similar to leishmaniasis, to date there is no reported case of canine leishmaniasis in Malaysia. To determine the presence of Leishmania sp., cephalic vein blood samples were taken from 54 and 50 dogs in Sabah and Sarawak, Malaysia, respectively. The blood was obtained aseptically and subjected to DNA extraction and conventional PCR using the primers targeting the *L. infantum* kinetoplast minicircle DNA. Amplification products were analysed by electrophoresis on agarose gels in 1.5× trisacetate EDTA buffer. Out of 54 samples from Sabah, 31 were positive for *L. infantum* with a prevalence of 57.4%. In dogs from Sarawak, 33 out of 50 samples were positive for the protozoa with a prevalence of 66%. The presence of *L. infantum* in Malaysia could be due to the sandfly, a vector that inhabits caves in Sabah and Sarawak. This is a first report of canine leishmaniasis in Malaysia.

Keywords: leishmaniasis, dog, blood, DNA, PCR

HAEMATOLOGY OF CAPRINE SUBCLINICAL AND CLINICAL MASTITIS

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ABSTRACT

Mastitis is an important economic disease affecting dairy animals. Haematological analysis is one of the diagnostic procedures that can provide significant information on mastitis, additional to physical examination. The purpose of this study was to compare the haematological parameters in healthy does and does with subclinical and clinical mastitis. Blood samples were collected from 16 healthy, 16 subclinical mastitic and 13 clinical mastitic cross-bred does at three farms of *Ladang Angkat* programme, Faculty of Veterinary Medicine, Universiti Putra Malaysia. The packed cell volume, haemoglobin concentration, and total erythrocyte and leucocyte counts, mean corpuscular volume, and mean corpuscular haemoglobin concentration were determined. The results revealed no significant ($p>0.05$) difference in haematological parameters among the three groups of does. However, the total leucocyte counts in clinical mastitic does were significantly ($p<0.05$) higher than that of the healthy does, suggesting inflammatory and immune responses to mastitis. To obtain a more complete picture of the disease, haematological analysis should be supported by other laboratory techniques such as somatic cell count, bacteriological examination and electrical conductivity of the milk.

Keywords: subclinical mastitis, clinical mastitis, goats, haematology

HAEMOTROPIC *MYCOPLASMA OVIS* INFECTION AMONG GOATS OF *LADANG ANGKAT* FARMS, FACULTY OF VETERINARY MEDICINE, UNIVERSITI PUTRA MALAYSIA

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ABSTRACT

Haemotropic mycoplasmosis affects sheep and goats causing economic losses. In Malaysia, there is still a lack of information on *Mycoplasma ovis* infection among goats. In this study, 10 goats each from five farms in the *Ladang Angkat* programme, Faculty of Veterinary Medicine, Universiti Putra Malaysia were sampled. *M. ovis* infection and intestinal parasite burden were determined using Giemsa stain and modified McMaster technique, respectively. Fly-traps were used to trap biting fly. Farm information was obtained via a questionnaire given to the owner of the farms. Out of 50 samples, 47 samples (94.0%) were positive for *M. ovis* infection. Among the positive samples, 44 samples (93.6%) were of mild infection and 3 (6.4%) were of moderate infection with the highest rate of 38.5%. No biting fly was trapped. The questionnaire revealed that all farms were located in endemic areas with the presence of carrier animals. There were no significant ($p>0.05$) difference in egg/gram (EPG) and oocyst/gram (OPG) among goats and sheep. There was also no significant ($p>0.05$) correlation between rate of *M. ovis* infection and EPG or OPG. The study showed that the occurence rate of *M. ovis* is high among sheep and goats of the *Ladang Angkat*; however, the level of parasitemia was generally low.

Keywords: *Mycoplasma ovis*, Giemsa stain, infection rate, modified McMaster technique, goats

PATHOGENICITY OF MALAYSIAN FOWL ADENOVIRUS ISOLATES IN SPECIFIC PATHOGEN-FREE EMBRYONATED CHICKEN EGGS

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ABSTRACT

Fowl adenovirus (FAdV) is the primary pathogen of inclusion body hepatitis (IBH) and can cause high mortality in susceptible chickens. The objective of this study was to determine the pathogenicity of the recent Malaysia FAdV isolates in specific pathogen-free (SPF) embryonated chicken eggs. Thirty-nine 8-day-old SPF embryonated chicken eggs were divided into three equal groups. Twelve eggs from groups A and B were inoculated with 0.1mL/egg of FAdV isolate A (UPM11134) and B (UPM1127), respectively via the chorioallantoic membrane (CAM) route. Fifteen eggs from Group C were left uninoculated and served as the control. Three eggs from the control group were sacrificed prior to FAdV inoculation. All eggs were candled twice daily and mortality if any was recorded throughout a 14 d period. Samples of liver, gizzard and CAM of the dead embryos were fixed in 10% buffered formalin for histological examination. The study showed that both FAdV isolates caused 100% mortality within 3 to 8 days post-inoculation (pi) when inoculated in 8-day-old SPF eggs. The CAM was thickened and cloudy as early as day 3 pi. The liver was enlarged with ecchymotic haemorrhage at day 3 pi. Hydropericardium and multifocal areas of necrosis were observed in the liver on day 7 pi. The gizzard was normal for both groups. Histologically, basophilic intranuclear inclusion bodies were observed in CAM, liver and gizzard of groups A and B. The control group did not exhibit any mortality or show remarkable change throughout the trial. In conclusion, the Malaysian FAdV isolates is highly pathogenic to SPF embryonated chicken eggs and the embryonic liver may be used for isolation and propagation of the virus.

Keywords*:* fowl adenovirus (FAdV), specific pathogen-free (SPF) embryonated chicken eggs, pathogenicity, chorioallantoic membrane (CAM), intranuclear inclusion body (INIB)

BEHAVIOUR OF SAMBAR DEER IN CAPTIVITY

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ABSTRACT

The natural habitat of Sambar deer (*Rusa unicolor)* is primarily the woods or areas with dense scrub bush. Although Sambar deer are kept in captivity their utility still limited. The objective of this study was to observe and identify normal captive and stress-related behaviour of the Sambar deer. This study was conducted at Ladang Rusa, University Agriculture Park, Universiti Putra Malaysia for 14 days from 12 to 26 January 2014. A herd of Sambar deer consisting of 3 males, 5 females and 2 fawns were the subjects in the study. Behaviour detection was done through camera trapping using a motion sensor infra-red camera at 3 locations inside the deer enclosure. The camera recorded video of any movement for 30 seconds during a 24-hour period. The results showed that daily activity budget of captive Sambar deer consisted of 45% feeding, 26% resting while ruminating, 5% resting, 5% grazing, 5% standing ruminating, 4% standing, 4% walking, 2% drinking, 2% standing alert, 1% grooming, and 1% interacting. The Sambar deer interacted well with Timor deer in captivity. Possible mating was also observed once during the period of study indicating that the animals were not under stress. Only 2% of alert standing behaviour was recorded in the deer; this behaviour is a state of high alert in response to surrounding noises.

Keywords: Sambar deer (*Rusa unicolor*), captivity, behaviour

PREVALENCE OF VECTOR-BORNE DISEASES IN DOG SHELTERS

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ABSTRACT

Vector-borne diseases are a major problem in dog shelters. The diseases are transmitted by arthropod vectors such as mosquitoes, ticks, lice, and fleas. Some vector borne diseases can be zoonotic. The aim of this study was to determine the prevalence of vector-borne diseases in 3 animal shelters in Malaysia. The 3 animal shelters practice different types of management. Disease determination was done on 90 dogs using the SNAP 4Dx Plus Test kit that detects antigen for *Ehrlichia canis, Ehrlichia ewingii, Borrelia burgdorferi, Anaplasma phagocytophilum*, *Anaplasma platys,* and *Dirofilaria immitis.* The serum samples revealed that *Ehrlichia* Sp. was the most common disease (55.5%), followed by *Anaplasma* Sp. (16.7%), and *Dirofilaria immitis* (10%). All *Dirofilaria immitis*-positive dogs were from the same shelter. Fourteen out of 90 animals were positive for more than one disease. This study emphasises the importance of shelter management in the control vector-borne diseases among dogs.

Keywords: vector, prevalence, zoonotic, dog, shelter

HISTOLOGY OF SWIFLET KIDNEY

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ABSTRACT

The swiftlet (*Aerodramus fuciphagus*) is a unique avian species that forages on microscopic insects in the upper strata of the atmosphere. Currently there is no documentation of the structure of the swiftlet kidney. The study was conducted to determine the histological structure of the swiftlet kidney. Six live swiflets were obtained from Kluang, Johore, Malaysia. Six swiflets were humanely sacrificed and the kidneys obtained and processed for histological assessment. The kidneys of swiftlets are surrounded by very thin layers of connective tissue that penetrates the parenchyma and dividing the kidney into a number of lobules. Each lobule comprises of the cortex, medulla and pelvis. At cross-section view, the renal corpuscle is arranged in rows close to the cortico-medullary junction. The main part of the cortex is occupied by the proximal convoluted tubules arranged in parallel rows traversing the thickness of the cortex. The proximal convoluted tubules continue a short distance into the medulla as distal convoluted tubules lined by simple cuboidal epithelium resembling the epithelium of the descending and ascending limbs of mammalian loop of Henle. The loop of Henle is absent. The loopless nephron of the swiftlet can be classified as reptilian. The distal convoluted tubule in the medulla continued a short distance into the cortex to pass close to the renal corpuscle forming the macula densa. The convoluted tubules then continue to form the collecting ducts located in the pelvis of the kidney. It can be concluded that the kidney of the swiftlet is simple yet an efficient filtering organ.

Keywords: swiflet, histology of kidney, reptilian nephron, proximal convoluted, glomerulus

EFFECT OF VITAMIN E ON GROWTH AND SURVIVABILITY OF JUVENILE AFRICAN CATFISH, *CLARIAS GARIEPINUS*

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ABSTRACT

Vitamin E is an important nutrient for the fish immune system and can reduce mortality and improve fish performance. Vitamin E is widely used in aquaculture for enrichment of feed to improve the growth, resistance to stress and disease, and survival of fish and shrimp. In the current study, the effect of vitamin E supplementation in feed on the growth and survivability of juvenile African catfish, *Clarias gariepinus* was determined. Eighty African catfish juveniles were divide into two groups (40s/group) each comprising of 4 equal subgroups. The fish were kept in eight separate tanks (10/tank) under constant temperature (25 °C) and pH 7. The feed of both groups were supplemented with either 0, 100, 300 or 500 mg vitamin E/kg BWt. The weight gain of fish in the first group was determined by 2 weeks of supplementation. After 2 weeks the second group was challenged with *Aeromonas hydrophila* (10^5 cfu/mL, 0.1 mL), intraperitoneally, and their survivability determined. It was shown that unchallenged fish showed decrease in average weight gain with increasing dose of vitamin E. Challenged fish of vitamin E supplemented showed lower mortality than the non-supplemented group. Tissue samples from all fish were processed for histopathological evaluation. Challenged fish showed hepatic and pancreatic degeneration, hepatic vacuolation, and brain oedema while the tissues of unchallenged fish were normal. The study shows that the growth rate of African catfish was inversely proportional to amount vitamin E supplementation in diet. However, vitamin E supplement decreased mortality thus increasing survivability of African catfishes challenged with *A. hydrophila*.

Keywords: *Clarias gariepinus, Aeromonas hydrophila,* vitamin E, growth, survivability

EFFECT OF C5aR ANTAGONISM ON SKIN HISTOPATHOLOGY AND BLOOD PARAMETERS OF MOUSE WITH CHLORHEXIDINE-INDUCED CONTACT DERMATITIS

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ABSTRACT

Chlorhexidine is used in the medical field as a disinfectant. Although chlorhexidine elicits hypersensitivity reactions in human, its effect on animals remains unclear. In this study, we investigated the effect of C5aR antagonism on skin histopathology and blood parameters of mice following chlorhexidine-induced contact dermatitis. Twenty-four 6-weeks old BALB/c mice were randomly divided into four equal groups. Dermatitis was induced with 4% chlorhexidine in 3 groups. Group 1 mice were treated subcutaneously with dexamethasone (30 µL) and corticosteroid (Dexakel, 5 mg/mL) (positive control), Group 2 with Chlorphenamine maleate (0.15) and anti-histamine (Histamil, 10 mg/mL) and Group 3 with C5a antagonist (PMX205, 5 mg/mL) and saline solution. Group 4 was untreated and served as the negative control. Blood samples were taken for haematological while skin samples for histopathological analyses. Skin reaction was determined using the Magnusson and Kligman Grading Scale. Serum IgE concentration was determined by ELISA. The study showed that treatment of chlorhexidine-induced contact dermatitis with C5aR antagonist reduced severity of the skin lesions, in a similar manner as anti-histamine and corticosteroid treatments. Serum IgE was elevated in mice with contact dermatitis, suggesting a hypersensitivity reaction. There was no significant change in blood parameters. As a conclusion, C5aR antagonism is an alternative treatment for chlorhexidine-induced dermatitis.

Keywords: chlorhexidine, chlorhexidine-induced contact dermatitis, C5aR antagonist

EFFECTS OF ASCORBIC ACID ON GROWTH PERFORMANCE AND SUSCEPTIBILITY TO *Aeromonas hydrophila* INFECTION IN JUVENILE AFRICAN CATFISH (*Clarias gariepinus*)

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ABSTRACT

African catfish, *Clarias gariepinus*, is one of the most popular freshwater food fish. Due to high demands for human consumption, the fish is intensively reared in Malaysia. Ascorbic acid (vitamin C) is an essential dietary supplement for normal physiological functions of animals and plays an important role in the maintenance of fish health. However, catfish cannot synthesise their own vitamin C. This study was conducted to determine the effect of vitamin C supplementation in the diet on growth performance and *Aeromonas hydrophila* infection in juvenile African catfish. Eighty African catfish juveniles were divided into two groups (40/group) each comprising of 4 equal subgroups. The fish were kept in eight separate tanks (10/tank) under 27 to 28 °C, pH 7 to 8, and 4 ppm dissolved oxygen. The fishes were weighed and fed twice daily with commercial diet at 10% of total body weight (bwt) and supplemented with vitamin C at 0, 30, 90, and 240 mg/kg Bwt. On day 11, the fish in the second group were challenged intraperitoneally with *A. hydrophila*. The body weight and survival rate of fish were recorded every 5 d for 20 d. It was found that the growth rate in unchallenged fish decreased with increase in concentration of vitamin C supplementation. No mortality was observed in the unchallaenged fish. The growth rate of challenged and unchallenged fish were similar; however, the survival rate of fish increased with increase in concentration of vitamin C supplementation. Tissue samples were taken from 3 surviving fish/tank and processed for histopathological evaluation. The results showed mild degenerative lesion only in the liver of challenged fish supplemented with with 30 mg/kg Bwt vitamin C. Other organs were normal. In conclusion, the study showed that vitamin C supplementation produced a mild positive effect on the susceptibility of juvenile African catfish to *Aeromonas hydrophila* infection.

Keywords: *Clarias gariepinus,* vitamin C, growth, susceptibility, *Aeromonas hydrophila*

GROWTH PERFORMANCE OF BROILERS WITH INSECT CHITIN SUPPLEMENTATION IN FEED

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ABSTRACT

Chitin is a white, hard, inelastic, nitrogenous polysaccharide found in the exoskeleton and internal structure of invertebrates. Insect chitin (IC) as dietary supplement has been claimed to improve growth performance of livestock. In this study, 21-day old Ross broiler chicks were randomly allocated to 3 treatment groups of 12 chicks each to determine the effect of IC dietary supplementation on the growth and blood composition of broilers. The control group was given a non-supplemented basal diet consisting of corn, soybean meal, and grain by-products. The second group received basal diet supplemented with 1g IC/kg diet, and the third group received 2g IC/kg diet. The growth performance and blood metabolite indices were measured at the beginning and every 7days during the 21 d experimental period. The results showed that broilers in the control group demonstrated the highest average daily gain (ADG) compared to other treatment groups, although the difference was not significant ($p>0.05$). There was no significant ($p>0.05$) difference in ADG between broilers fed 2g and those fed 1g IC/kg diet. The blood profile of chickens for all treatment diets were not remarkable. In conclusion, dietary supplementation of IC appeared not to improve ADG and blood composition of broilers. Poor responses of broilers to IC supplementation in this study were probably due to either the use of low quality IC product or the level of IC in the experiment was too low to affect response.

Keywords: insect chitin (IC), feed supplement, growth performance, broilers

CONCENTRATION OF SERUM AMYLOID A IN CLINICALLY NORMAL MALAYSIAN ENDURANCE HORSES

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ABSTRACT

Endurance horses undergoing continuous strenuous training may experience injuries giving rise to inflammation that leads to an acute phase reaction with production of the acute phase protein serum amyloid A (SAA). This study was conducted to determine the concentration of SAA in clinically normal rested endurance horses. The concentration of SAA was ascertained *via* sampled sera from 40 horses from 3 stables in Malaysia, using a two-site enzyme linked immunoassay. The highest concentration of SAA was observed in horses rested between 12 to 24 months, while those rested for more than 24 months expressed the lowest concentrations. All horses aged between 6 and 11 years had high SAA concentrations. Mares had higher SAA concentrations than geldings or stallions. The low SAA concentrations in horses rested for more than 24 months was most probably because the horses had recovered well from injuries sustained during an endurance races. During the rest period, the SAA concentrations of Thoroughbred horses were comparatively higher than Arabian horses. The SAA reference range for the endurance horses in Malaysia is between 2.09 and 8.09 mg/L, which is higher than horses from other countries.

Keywords: serum amyloid A, endurance horse, strenuous training, age, rest interval

HEPATOPROTECTIVE EFFECT OF *PHYLLANTHUS NIRURI* ETHANOLIC EXTRACT ON RAT LIVER DAMAGE INDUCED BY ALCOHOL AND CHOLESTEROL

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ABSTRACT

Phyllanthus niruri, locally known as *dukung anak* is well-known for its therapeutic effect in hepatitis, urolithiasis, dysentery, influenza, jaundice, and bacterial infections. Alcoholic liver disease in humans is characterized by a spectrum of manifestations from hepatic steatosis to steatohepatitis, and in chronic cases, cirrhosis. In this study, the hepatoprotective effect of *Phyllanthus niruri* ethanolic extract was evaluated on alcohol- and high cholesterol-induced liver damage in rats. Twenty Sprague-Dawley rats were randomly divided into 5 equal groups of A (control), B (alcohol and high cholesterol-treated), C, D, and E (alcohol and high cholesterol-treated with *Phyllanthus niruri* ethanolic extract supplementation at 75, 150, and 250 g/kg body weight, respectively). The rats were treated once daily for 3 weeks. Serum liver-specific enzymes and lipid parameters were determined at week 3. The rats were euthanised and liver tissues were processed for histopathological evaluation. The results revealed that the relative liver weight of rats from group C (3.36±0.07g), D (3.35±0.11g) and E (3.15±0.19g) were significantly ($p< 0.05$) lower than group B (3.84±0.22g). The serum low density lipoprotein concentration were significantly ($p<0.05$) higher in group B (0.88±0.14mmol/L) than either Group A (0.49±0.05mmol/L), D (0.62±0.06mmol/L), or E (0.62±0.11mmol/L). There was no significant ($p>0.05$) difference in serum liver enzyme concentrations among groups. The liver of rats from group B showed the highest steatosis score while the score for groups A and E were comparable. In conclusion, *Phyllanthus niruri* ethanolic extract has potential hepatoprotective effect in alcohol- and high cholesterol-induced liver injuries in rats.

Keywords: alcohol, hepatic steatosis, relative liver weight, LDL, *Phyllanthus niruri*

ESTIMATION OF EARLY POSTMORTEM INTERVAL IN DOGS

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ABSTRACT

Postmortem interval (PMI) is the elapsed period from moment of death until time discovery of the body. Despite substantial documentation on PMI, most were those of temperate regions. This study was conducted to determine the changes in postmortem parameters in the brain, liver, and muscle of dogs and to identify types of carrion insects in carcasses. Three short hair coat local breed dogs weighing between 12.5 to 18 kg were humanely euthanised and the carcasses left on the examination table. Postmortem changes were observed and recorded periodically while postmortem examination was done after 24 h. The temperature of the rectum, liver, and brain were recorded every 60 sec for 24 hours using Pt100 P-series thermocouple probes to determine carcass cooling rate. The carcass cooling rate, pathology, and entomology were employed to estimate PMI. Biopsies from the brain, liver, and epaxial muscle were collected at 0, 12, 18, and 24 hours of PMI. The samples were then routinely processed for histology and viewed under light microscope. Flies, at various stages of their life-cycle, surrounding the carcasses were collected, placed in 70% ethyl alcohol and identified. The rate of decrease in temperature of the organs was exponential with strong regression. The data were used to generate the formulae for estimation of PMI. The temperature changes correlated well with normal postmortem changes during the study period. Fly species collected from the carcasses were *Musca domestica, Chrysoma megacephala,* and *Megaselia scalaris.*

Keywords: postmortem interval, pathology, temperature-based method, entomology

SEROPREVALENCE AND MOLECULAR DETECTION OF LEPTOSPIROSIS IN A DOG SHELTER IN SELANGOR, MALAYSIA

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ABSTRACT

Canine leptospirosis can be caused by at least 4 species of leptospira serovars; canicola, icterohemorrhagiae, grippotyphosa, and pomona. This study was conducted to determine the seroprevalence of and to molecularly detect canine leptospirosis in a shelter in Selangor, Malaysia. Eighty blood samples were obtained from clinically healthy dogs. Sera were obtained for Microscopic Agglutination Test (MAT) for 10 Leptospira serovars. Whole blood samples were subjected to polymerase chain reaction (PCR) assay using primers targeting 531 bp pathogen-specific and 331 bp genus-specific Leptospira genes. In MAT, 3 of 80 dogs (3.8%) tested positive for *Leptospira bataviae*. The seroprevalence of the other 9 Leptospira serovars was not evident in this study. Using PCR, all the dogs tested negative for leptospirosis. The study suggests that both MAT and PCR are necessary to determine the prevalence Leptospirosis, because these tests detect the disease at different stages. In conclusion, canine leptospirosis due to *L. bataviae* was detected in dogs in the animal shelter. This is the second report of serovar Bataviae infection in dogs in Malaysia.

Keywords: canine leptospirosis, seroprevalence, molecular detection, MAT, PCR, *Leptospira bataviae*

LABORATORY EVALUATION OF COMMERCIAL PORK MEAT QUALITY

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ABSTRACT

In Malaysia, the swine industry is second only second to the poultry and layer industry. Maintenance and improvement of pork meat quality is important to ensure continuous consumer acceptance. This study determined the commercial pork quality in Malaysia through laboratory evaluation. Measurement of pork quality included initial pH (pH_{45min}), ultimate pH (pH_{24h}), colour, shear force, drip loss, and cooking loss. Ten commercial 3-way cross pigs from a farm in Kucing, Sarawak, Malaysia were slaughtered. Each carcass was cut in halves and blast-chilled at -15 °C for 45 min. Samples of 10×10cm longissimus dorsi muscle were taken from the lumbar areas caudal to last ribs at the left half of the carcass and stored frozen at -20°C. At the same time, a pH electrode connected to a portable pH meter was inserted at a point on the left carcass and the carcass chilled at 4°C for 24 hours to obtain the pH_{24h}. The average initial and ultimate pH values were 6.88 and 5.76 respectively while the average shear force was 12.30 kg. The average lightness (L*), redness (a*) and yellow (b*) of the pork were 47.17, 5.64 and 16.58, respectively. Drip and cooking loss averaged at 10.31 and 27.81%, respectively. The results showed that some of the pork quality traits were significantly correlated, which included initial pH and drip loss (r=-0.667, $p<0.05$), ultimate pH with L* (r=-0.678, $p<0.05$) and b* (r=-0.637, $p<0.05$), a* with shear force (r=-0.634, $p<0.05$) and cooking loss (r=-0.744, $p<0.05$). There was positive and significant correlation betwen colour parameters L* and b* (r=0.887, $p<0.01$). This study showed that pork quality traits are interrelated. In conclusion, the overall pork quality in Malaysia is good.

Keywords: pork quality, laboratory evaluation, Longissimus dorsi

METABOLIC AND MUSCULOSKELETAL PARAMATERS OF HORSES DURING COMPULSORY 30 TO 40 MINUTE REST PERIOD IN AN ENDURANCE RACE

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ABSTRACT

Due to the long duration of the endurance races, compulsory re-examination at the veterinary gate is conducted to ensure the health and well-being of the horse is protected. The study was conducted to determine changes in metabolic and musculoskeletal parameters of endurance horses at compulsory 30 to 40 minute rest after completing a distance of at least 40km. Metabolic and musculoskeletal parameter data in the logbooks of horses participating in 80 to 160 km ride distances were recorded. These parameters were heart rate, cardiac recovery index, mucous membrane colour, capillary refill time, skin recoil, gut sound, muscle tone, and gait that were determined before and after compulsory rest. The data were analysed by the Wilcoxon Signed Ranks Test. For 80 and 120km rides, the heart rate of the horses were significantly ($p<0.05$) lower after compulsory rest. In the 160km ride, the gut sound was significantly ($p<0.05$) lower after than after compulsory rest. Other parameters did not differ significantly between before and after compulsory rest period. The study shows that the heart rate is the most significant parameter for determination of recovery in endurance horses.

Keywords: horse, endurance race, compulsory rest period, compulsory re-examination, recovery

PREVALENCE AND RISK FACTORS OF MASTITIS IN GOATS OF *LADANG ANGKAT* FARMS, FACULTY OF VETERINARY MEDICINE, UNIVERSITI PUTRA MALAYSIA

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ABSTRACT

Caprine mastitis is one of the main diseases adversely affecting the local dairy goat industry. Mastitis affects the quality and quantity of milk. This study was conducted to determine the prevalence of clinical and subclinical mastitis, pathogens in milk, and the relationship between risk factors and mastitis in goat farms of the *Ladang Angkat* programme, Faculty of Veterinary Medicine, Universiti Putra Malaysia. A total of 158 milk samples from 8 farms were collected aseptically. Clinical mastitis was assessed based on physical abnormalities of the udder and milk. Subclinical mastitis was determined on-site using the California mastitis test, bacteriological culture, and Kirby-Bauer disk diffusion method. A questionnaire was used in the investigation. Mastitis was observed in all farms in the study. Overall prevalence of mastitis at half level was 49% (clinical, 5%; and subclinical, 44%). Of the 70 milk samples cultured, coagulase-negative staphylococci was predominant (73%), followed by *Bacillus sp*. (11%), *Streptococcus agalactiae* (7%) *Streptococcus viridans* (7%), *Staphylococcus aureus* (4%), *Staphylococcus hyicus* (4%) *Staphylococcus intermedius* (3%), *Enterococci* (3%), and *Klebsiella pneumoniae* (3%). The least isolated pathogens (1% each) were *Escherichia coli*, *Acinetobacter iwoffii*, *Achromobacter sp*., *Streptococcus dysagalactiae*, *Proteus mirabilis*, and *Pseudomonas fluorescence*. Thirty *Staphylococcus sp*. isolates showed the highest resistance towards penicillin (37%), followed by neomycin (20%), oxacilin (17%), and streptomycin (3%). There was significant ($p<0.05$) association between mastitis, teat lesion, and feed supplement. The results show that there is a need for *Ladang Angkat* goat farmers to institute preventive and control measures for mastitis to minimise prevalence and reduce losses.

Keywords: Goat, mastitis, prevalence, bacteria, antibiotic, resistance, risk factors

SEMEN COLLECTION AND EVALUATION IN CAPTIVE MALAYSIAN ESTUARINE CROCODILE, *CROCODYLUS POROSUS*

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ABSTRACT

Information on semen collection and evaluation in estuarine crocodile is limited. Therefore, this study was conducted to determine the volume, pH, motility, concentration, and morphology of crocodile semen. Sperm morphometry and changes of semen motility over time were also evaluated. Collection was done in January 2015 during early crocodile mating season. Four matured male crocodiles (314.25±9.70cm) housed in the same enclosure were physically restrained and digitally manipulated to retrieve semen. Three types of semen extenders were used; 0.01M phosphate buffer saline (PBS), 0.01M PBS with 0.07M fructose and 0.01M PBS with 5% egg yolk. The results showed semen total volume of 0.55±0.12mL, wave pattern of 2.75±0.48, pH of 7.13±0.24, sperm concentration of 396.88±43.41 × 10^6sperm/mL, and general motility of 45±17.56%, forward movement of 37.13±5.12%, and rotating and vibrating movement of 9.56±5.38 and 53.13±1.92%, respectively. The length of normal sperm from acrosome to tail was 88.96±0.52µm. The most significant sperm abnormality was cytoplasmic droplets at 28.25±2.29%. Among extenders, PBS with egg yolk had the best preservation properties upon storage at 4°C. With this extender, the motility stored sperm was restored and survived for 11 d. This is the first report on semen collection and evaluation in captive Malaysian estuarine crocodiles.

Keywords: reproduction biology, semen, Malaysian estuarine crocodile, morphometry, electron microscopy

EFFECT OF *GENDARUSSA VULGARIS* METHANOLIC EXTRACT ON REPRODUCTIVE ORGANS OF FEMALE MICE

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ABSTRACT

Gendarussa vulgaris (syn. *Justicia gendarussa)* is widely distributed in Malaysia, Indonesia, Sri Lanka and Bangladesh. Extracts of this plant exhibit antiangiogenic, hepatoprotective, anti-inflammatory, antioxidant, antibacterial, anti-helmintic, analgesic and anti-cancer properties, in addition to enhancing bone-cell proliferation in bone fractures and reducing level of plasma uric acid in hyperuricemic rats. In this study, we investigated the effect of the *G. vulgaris* methanol extract (GVME) on the reproductive organs of female mice. Twenty-four 24 mice were divided into three equal groups and orally treated with either 0.35 mg/kg Bwt clomiphene citrate (positive control group), 0.9% NaCl (negative control group) or 300 mg/kg Bwt GVME, once daily for 10 days. At the end of the treatment period, the mice were euthanised and their reproductive organs harvested for histopathological evaluation. Congestion/hemorrhage of the ovaries and uterus did not differ ($p>0.05$) significantly among treatment groups. However, the uterine inflammation score were significantly ($p<0.05$) higher in GVME- than clomiphene citrate-treated mice. In conclusion, GVME is not very effective in reducing development of lesions in the reproductive organs of female mice.

Keywords: *Gendarussa vulgaris*, methanolic extract, reproductive organs, female mice

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