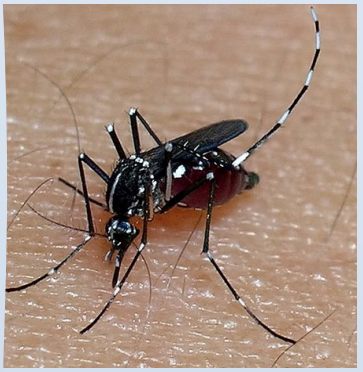
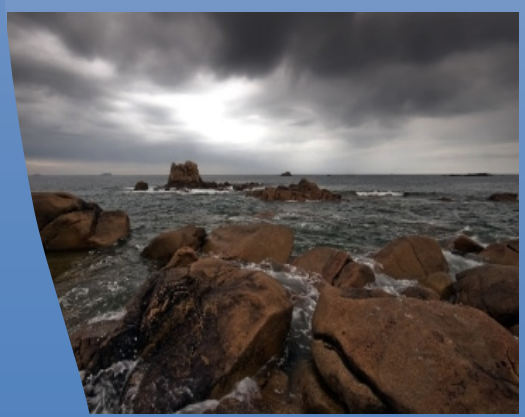
PROGRAM AND ABSTRACT BOOK

47th Annual Conference of the Malaysian Society of Parasitology & Tropical Medicine

3 & 4 March 2011
IMU Bukit Jalil, Kuala Lumpur Malaysia



Climate Change and its Impact on Public Health



Officiated by
Tan Sri Dato' Dr Abu Bakar Suleiman
President
International Medical University, Kuala Lumpur

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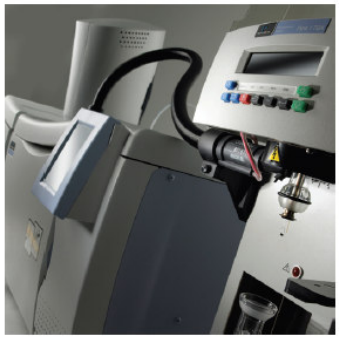

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Message from
Tan Sri Dato' Dr Abu Bakar Suleiman
President, International Medical University, Kuala Lumpur, Malaysia

I am deeply honoured to have been invited by the Malaysian Society of Parasitology and Tropical Medicine to write this message on the occasion of their 47th Annual Scientific Conference this year.

It is both timely and appropriate that the focus this year is on the theme 'Climate Change and its Impact on Public Health'. Malaysia has continued to develop rapidly over the last three decades and this has resulted in many challenges regarding the management of environmental issues that impact on the people's wellbeing. As the country progresses, changes to our environmental landscape is inevitable. Therefore we have to be vigilant and be in the forefront of development to adapt relevant guidelines and measures to manage the emerging issues for the unimpeded progress of Malaysia towards its vision of 2020, that is, to achieve a developed nation status.

The impact on human health due to environmental degradation is usually subtle, and the cause, effect and manifestation of symptoms are realized much later. Therefore adaptation and mitigation measures must be effective and enforceable. Scientists in Malaysia and the region have contributed much to the development of appropriate guidelines to address and deal with environmental health problems appropriately over the years. Nevertheless, there is still need for more research that is current and relevant to prevailing and emerging environmental conditions and its impact on health.

This conference, I believe, will deliberate on issues that are relevant to the global scenario on environment and health and bring forth recommendations that will protect public health against the combined effect of the complexities of modern life and the prevailing environmental pollution.

I wish the conference every success.

Message from
Associate Professor Dr Stephen Ambu
President, Malaysian Society of Parasitology and Tropical Medicine

It gives me great pleasure to convey this message on the occasion of the 47th Annual Conference of the Malaysian Society of Parasitology and Tropical Medicine (MSPTM). The theme of this year's conference is 'Climate Change and its Impact on Public Health'. The conference aims to provide a platform for scientists from Malaysia and abroad to discuss the various issues relating to environmental degradation resulting in human sufferings such as increased disease burden and its consequences on the economy of the affected countries.

The MSPTM has always been in the forefront of biomedical research for the last 47 years, contributing to the promotion of health, be it human or animal, by addressing current issues for the benefit of mankind.

In all sincerity I hope that the deliberations at this conference will be of benefit to scientists and policy planners in the region as well as other countries in Asia, Europe and the Americas.

I would also like to place on record the appreciation of IMU/MSPTM to all those companies which have made financial contribution for the running of this conference. Our special thanks to Lee Foundation for their financial donation given in support of the conference. My gratitude is also extended to MSPTM Council Members, Joint Committee members at IMU, friends and colleagues who have worked tirelessly to make this conference a success.

Last but not least our appreciation goes to Tan Sri Dato' Dr Abu Bakar Suleiman, President, IMU for mooting the idea of holding a climate change conference at IMU and to Professor Dr Mak Joon Wah for his support given to make it a reality.

Thank you.

Honorary Member
Professor Dr Mak Joon Wah

Dean of Postgraduate Studies and Research
International Medical University, Kuala Lumpur, Malaysia

Prof Mak Joon Wah, MBBS (Singapore), DAP & E (Malaysia), MPH (Mal), MD (Singapore), FRCPath (UK), FAMM, FASc

Professor Dr Mak Joon Wah became a member of the MSPTM in 1972 and has since remained an active member by contributing to the continuous growth of the Society. He has served in the Society as Council Member 1978 -1980 and 1983; Vice-President 1981; President 1982; Chairman Scientific Committee Second International Congress of Parasitology and Tropical Medicine. He is the founder/ editor of the MSPTM Journal 'Tropical Biomedicine' which was started in 1985. He continues to be on the editorial board.

His role in the World Health Organisation has been - Member of the Expert Advisory Panel on Filariasis, World Health Organization (1981 – 1997); Member of the Steering Committee of the Scientific Working Group on Filariasis; and Consultant and Temporary Advisor on many assignments over the years.

At the National level in Malaysia, he was Chairman, Sub-committee on Medical Biotechnology, National Biotechnology Programme, Ministry of Science, Technology and Environment(1991 – 1997); Member, Panel for Research Projects under the Intensification for Research in Priority Areas, Ministry of Health (1991 – 1997); Member, Panel for Research Projects under the Inten-sification for Research in Priority Areas, Ministry of Science, Technology and Environment, Malaysia, for Universiti Kebangsaan Malaysia (1993-1994); Member, Research and Ethics Committee, Ministry of Health, Malaysia (2001 to date); Chairman, Research Grants Sub-Committee, Ranjeet Bhagwan Singh Research Grant Committee (1999 to date); Member, Technical Evaluation Committee (Health Sector), IRPA, University of Malaya (2001 to date) and Foundation Fellow of the Academy of Science (15 March 1995).

Over the years he has been bestowed with various awards such as: Malaysian Society of Parasitology and Tropical Medicine Medal (1981); National Science Award (Anugerah Sains Negara), Malaysia (1985); Kesastria Mangku Negara (1986); Sandosham Medal, Malaysian Society of Parasitology and Tropical Medicine (1989); Excellent Service Award, IMR (1992); Excellent Service Award, Ministry of Health (19930; Johan Setia Mahkota (1997).

Prof Mak has published over 300 scientific papers and still very actively promotes research among the younger generation in the areas of bioactive molecules and cellular mechanisms, cancer biology, pharmaceuticals and drug delivery systems, environmental health research, stem cell research, clinical research and medical education research at the International Medical University todate.

Silver Medal Award
Dr Reuben Sharma

Senior Lecturer
Faculty of Veterinary Medicine, University Putra Malaysia

Reuben Sharma graduated with a Doctor of Veterinary Medicine (DVM) degree from Universiti Putra Malaysia and subsequently pursued a Master in Veterinary Science (MVSc) in wildlife diseases at the same university. He was later awarded a PhD in molecular parasitology from the University of Cambridge, UK. Reuben is also a Chartered Biologist (CBiol) and a Member (MIBiol) of the Institute of Biology London, and a Fellow of the Royal Society of Tropical Medicine and Hygiene UK.

His main research focus is on the molecular biology, antigenic variation and genetics of parasitic haemoprotozoa. His research findings has contributed to the revision of the life cycle and ontogeny of the infective cell stages of *Trypanosoma brucei*, a representative member of the kinetoplastida that cause debilitating disease in man and animals. His work has also shed light on chromosome dynamics, mitotic cell division and gene expression during meiotic recombination in these haemoprotozoa. Reuben has published over 100 scientific articles in peer-reviewed journals, conference proceedings and technical reports. He is also keenly interested in morphological and molecular taxonomy and systematics of Malaysian parasitofauna, wildlife diseases, ecology and conservation. Together with co-authors, has described 2 new species of parasitic nematodes and redescribed an additional 2 from chelonians.

Reuben has received 3 international awards for his efforts in the conservation and medicine of Malaysian wildlife, and has secured additional research grants from the Ministry of Science, Technology and Innovation (MOSTI), and the Ministry of Higher Education (MOHE) for the study of parasites and wildlife diseases in Malaysia. He has also received the Excellent Service Award from Universiti Putra Malaysia.

Over the years Reuben has supervised/co-supervised 17 undergraduate projects and 21 postgraduate candidates (14 Master and 7 PhD). He has been appointed as consultant/expert resource person to various NGOs and governmental organizations including World Wide Fund for Nature (WWFM), the Ministry of Human Resources Malaysia, Ministry of Natural Resources and Environment Malaysia, and the Veterinary Laboratory Services Unit, UPM. He is also on the editorial board of the Malaysian Veterinary Journal.

Reuben has served as a council member of the MSPTM for four terms and was the Hon. Secretary of the 45th MSPTM Council. He is currently a senior lecturer, coordinator of the parasitology laboratory and coordinator of the research committee at the Faculty of Veterinary Medicine, UPM.

47th COUNCIL OF THE MALAYSIAN SOCIETY OF PARASITOLOGY AND TROPICAL MEDICINE

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Facilities Management and Administration Department

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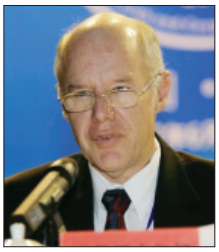
ITS Department

PLENARY SPEAKERS



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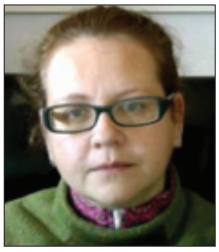

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PROGRAMME AT A GLANCE
3rd MARCH 2011 THURSDAY (DAY 1)
INTERNATIONAL MEDICAL UNIVERSITY

TIME	EVENTS	
0800 – 0830	Registration / Breakfast **Atrium / Dewan Cancelor**	
0830 – 0845	Arrival of Guests **Auditorium 2**	
0845 – 0900	Arrival of Tan Sri Dato' Dr Abu Bakar Suleiman **Auditorium 2**	
0900 – 0910	Welcome Address **Auditorium 2**	
0910 – 1000	**OPENING CEREMONY** **Auditorium 2**	
1000 – 1030	Presentation of MSPTM Honorary Membership Certificate MSPTM Silver Medal Award **Auditorium 2**	
1030 – 1100	Visit to Exhibition Poster Arena / Tea Break **Dewan Cancelor**	
1100 – 1130	Presidential Address **Auditorium 2**	
1130 – 1215	**PLENARY SESSION 1** **Auditorium 2**	
1215 – 1315	**LUNCH** **Dewan Cancelor**	
1315 – 1415	**PLENARY SESSION 2** **Auditorium 2**	
1415 – 1515	**ORAL SESSION 1**	**ORAL SESSION 2** **Learning Room 4.07**
1515 – 1615	**Auditorium 2**	**ORAL SESSION 3** **Learning Room 4.07**
1615 – 1645	**TEA BREAK** **Dewan Cancelor**	
1645 – 1745	**PLENARY SESSION 3** **Auditorium 2**	**BLASTOCYSTIS SYMPOSIA** **Learning Room 4.07**
1745 – 1945	**47th MSPTM AGM MEETING (FOR MEMBERS OF MSPTM ONLY)** **Auditorium 2**	
1945	**DINNER** **Dewan Cancelor**	

PROGRAMME AT A GLANCE
4th MARCH 2011 FRIDAY (DAY 2)
INTERNATIONAL MEDICAL UNIVERSITY

TIME	EVENTS	
0730 – 0800	Breakfast and Arrival of Delegates Dewan Cancelor	
0800 – 0900	PLENARY SESSION 4 Auditorium 2	
0900 – 1000	ORAL SESSION 4 Auditorium 2	STUDENTS ORAL PRESENTATION (Postgraduates) Learning Room 4.07
1000 – 1030	TEA BREAK Dewan Cancelor	
1030 – 1145	STUDENTS QUIZ COMPETITION (Undergraduates) Auditorium 2	STUDENTS ORAL PRESENTATION (Postgraduates)
1145 – 1230	PLENARY SESSION 5 Auditorium 2	Learning Room 4.07
1230 – 1430	LUNCH Dewan Cancelor	
1430 – 1600	STUDENTS ORAL PRESENTATION (Postgraduates) Auditorium 2	ORAL SESSION 5
1600 – 1700	PLENARY SESSION 6 Auditorium 2	Learning Room 4.07
1700 – 1800	CLOSING CEREMONY AND PRESENTATION OF STUDENTS QUIZ COMPETITION AND BEST ORAL PRESENTATION AWARD Auditorium 2	
1800 – 1830	TEA BREAK Dewan Cancelor	

DAILY PROGRAMME
3rd MARCH 2011 THURSDAY (DAY 1)
INTERNATIONAL MEDICAL UNIVERSITY

TIME	EVENTS
0800 – 0830	Registration of Delegates / Breakfast
0830 – 0845	Arrival of Guests
0845 – 0900	Arrival of Tan Sri Dato' Dr Abu Bakar Suleiman, President, International Medical University
0900 – 0910	Welcome Address by the President of MSPTM and Chairman of the Organising Committee of the 47th Annual Conference of MSPTM Associate Professor Dr Stephen Ambu
0910 – 1000	**OPENING CEREMONY** Opening Speech and Keynote Address by Tan Sri Dato' Dr Abu Bakar Suleiman, President, International Medical University ***Chairperson: Emeritus Professor Dato' Dr CP Ramachandran***
1000 – 1030	Presentation of the MSPTM Honorary Membership Certificate to Professor Dr Mak Joon Wah By Tan Sri Dato' Dr Abu Bakar Suleiman (Citation by Associate Professor Dr Stephen Ambu) MSPTM Silver Medal Award – Dr Reuben Sharma
1030 – 1100	Visit to Exhibition Poster Arena / Tea Break
1100 – 1130	Presidential Address
1130 – 1215	**PLENARY SESSION 1** **Climate Change and Health: Impacts on National and Local Policy Responses** By Dr Brent Powis Director, WHO Collaborating Centre for Environmental Health, University of Western Sydney cum Consultant, Climate Change Programme in China ***Chairperson: Associate Professor Dr Stephen Ambu***
1215 – 1315	**LUNCH**

TIME	EVENTS
1315 - 1415	**PLENARY SESSION 2** **Vector-borne Diseases and Climate Change** By Dr Indra Vythilingam Principal Research Scientist, Environmental Health Institute (EHI), National Environment Agency (NEA), Singapore ***Chairperson: Professor Dr Mak Joon Wah***
1415 – 1615	**ORAL SESSION 1** ***Chairperson: Dr Brent Powis*** **Vector and Vector-borne Infections**
1415 – 1430	**OS1.1:** LONGEVITY AND INFECTIVITY OF *TRYPANOSOMA EVANSI* ISOLATED FROM THE GUT OF THE STABLE *FLY STOMOXYS CALCITRANS* (DIPTERA: MUSCIDAE). **GUMAR YS**
1430 – 1445	**OS1.2:** OUTDOOR EVALUATION OF TMOF-Bti IN VARIOUS FORMULATIONS AGAINST FIRST INSTAR OF (*AEDES AEGYPTI LINNAEUS)* IN THE AREA OF UKM CAMPUS. **SAIFUL AN**
1445 – 1500	**OS1.3:** OVIPOSITION SITE SELECTION OF A LABORATORY STRAIN OF *AEDES AEGYPTI* (LINNAEUS). **AZAHARI AH**
1500 – 1515	**OS1.4:** EVOLUTIONARY DYNAMICS AND MULTIPLE IMPORTATIONS AS DRIVING FORCES IN SINGAPORE DENGUE EPIDEMIOLOGY. **KIM-SUNG LEE**
1515 – 1530	**OS1.5:** PARASITIC INFECTIONS IN DOGS AND CATS FROM DOMESTIC AND HOMELESS ENVIRONMENT. **NURHAINIS OGU SALIM**
1530 – 1545	**OS1.6:** KNOWLESI MALARIA SITUATION IN MALARIA SURVEILLANCE PROGRAMME IN SARAWAK. **ADELA IJ**
1545 – 1600	**OS1.7:** FIELD EVALUATION OF IMR AUTOCIDAL TRAP DEVICE FOR *AEDES* CONTROL. **NURULHUSNA AH**
1600 – 1615	**OS1.8:** IMPACT OF PREDATION ON *TOXORHYNCHITES SP*. FED ON WILD TYPE AND TRANSGENIC *AEDES AEGYPTI* (L) LARVAE: IMPLICATION OF RIDL GENE TRANSFER. **OREENAIZA MN**
1415 – 1515	**ORAL SESSION 2** ***Chairperson: Dr Indra Vythilingam*** **Molecular Approaches to Environmental Assessments of Parasitic and Other Diseases**
1415 – 1430	**OS2.1:** DETECTION OF SCRUB TYPHUS DISEASE USING PCR TECHNIQUE IN CHIGGER AND TISSUES OF SMALL MAMMALS. **AZIMA LH**
1430 – 1445	**OS2.2:** POINT MUTATIONS IN DHPS AND DHFR GENES OF *PLASMODIUM FALCIPARUM* ISOLATES FROM SABAH. **NOR AZRINA NORAHMAD**
1445 – 1500	**OS2.3:** PCR AMPLIFICATION, CLONING AND SEQUENCING OF A GENE ENCODING AN ERYTHROCYTE INVASION PROTEIN OF *PLASMODIUM KNOWLESI*. **ATIQUE AHMED**
1500 – 1515	**OS2.4:** OPERATIONAL RESEARCH IN SABAH TO ASSESS THE STATUS OF THE PROGRAMME FOR ELIMINATION OF LYMPHATIC FILARIASIS. **RAHMAH N**

TIME	EVENTS
1515 – 1600	**ORAL SESSION 3** ***Chairperson: Professor Dr Suresh Kumar Govind*** **Climate Change and Zoonotic Diseases**
1515 – 1530	**OS3.1:** LONG-TERM BIOMONITORING FOR ZOONOTIC WATERBORNE PATHOGENS: NEW GLOBAL STRATEGIES FOR ASSESSING THE EFFECTS OF CLIMATE CHANGE. **CONN DB**
1530 – 1545	**OS3.2:** HUMAN SCHISTOSOMIASIS IN THE KINGDOM OF SAUDI ARABIA. **SOUAD M ALSAQABI**
1545 – 1600	**OS3.3:** CRYPTOSPORIDIOSIS IN A DAIRY CATTLE FARM. **NORHAMIZAH AH**
1615 – 1645	**TEA BREAK**
1645 – 1745	**PLENARY SESSION 3** **Climate Change and Respiratory Infections** By Professor Dr Richard Loh Respiratory Physician, Penang Medical College, Penang, Malaysia ***Chairperson: Dr Donald Chen***
1645 – 1745	**BLASTOCYSTIS SYMPOSIA** ***Chairperson: Professor Dr Mak Joon Wah***
1645 – 1700	**BS1:** *BLASTOCYSTIS* – PAST, PRESENT AND FUTURE. **SURESH K**
1700 – 1715	**BS2:** MOLECULAR ASPECTS OF *BLASTOCYSTIS* SP.: THE ENIGMA CONTINUES. **TAN TC**
1715 – 1730	**BS3:** *BLASTOCYSTIS HOMINIS* INFECTION: COULD IT BE LINKED WITH CANCER? **CHANDRAMATHI S**
1730 – 1745	**BS4:** *BLASTOCYSTIS* SP. IN WATER SOURCES: CURRENT CHALLENGES AND FUTURE DIRECTIONS. **LEE IL**
1745 – 1945	**47th MSPTM AGM MEETING (FOR MEMBERS OF MSPTM ONLY)**
1945	**DINNER**

DAILY PROGRAMME
4th MARCH 2010 FRIDAY (DAY 2)
INTERNATIONAL MEDICAL UNIVERSITY

TIME	EVENTS
0730 – 0800	Breakfast and Arrival of Delegates
0800 – 0900	**PLENARY SESSION 4** **Climate Change and Emerging Zoonoses** By Professor Dr Mak Joon Wah Public Health Specialist in Tropical Diseases Parasitologist, International Medical University ***Chairperson: Associate Professor Dr Rehana Abdullah Sani***
0900 – 1000	**ORAL SESSION 4** ***Chairperson: Mr Heo Chong Chin*** **Entomology**
0900 – 0915	**OS4.1:** DISCOVERY OF A NEW SPECIES OF BLOWFLY FROM CRIME SCENE INVESTIGATION IN MALAYSIA. **KAVITHA RAJAGOPAL**
0915 – 0930	**OS4.2:** A PRELIMINARY STUDY OF FORENSIC INSECT DIVERSITY IN A HIGH RISE BUILDING IN SENTUL TIMUR, KUALA LUMPUR. **CHEW WK**
0930 – 0945	**OS4.3:** IMPLICATIONS OF MAGGOT INFESTATION IN INDUSTRY – FIRST REPORT OF INDUSTRIAL FORENSIC ENTOMOLOGY. **NAZNI WA**
1000 – 1030	**TEA BREAK**
1030 – 1145	**STUDENTS QUIZ COMPETITION (Undergraduates)**
1030 – 1045	BRIEFING TO PARTICIPANTS AND JUDGES
1045 – 1145	PARASITOLOGY QUIZ AND COLLECTION OF PAPERS ***Chairperson: Associate Professor Dr Yvonne Lim Ai Lian***
1145 – 1230	**PLENARY SESSION 5** **Characterisation of Macrophage Inhibitory Factor (MIF) in the Chicken as well as in Species of *Eimeria* Infectious to Chicken** Dr Katarzyna Miska Molecular Biologist, USDA-ARS, Animal Parasitic Diseases Laboratory, Beltsville, MD ***Chairperson: Dr Chandrawathani Panchadcharam***

TIME	EVENTS
0900 – 1000	**STUDENTS ORAL PRESENTATION (Postgraduates)** ***Chairperson: Dr Nazni Wasi Ahmad***
0900 – 0915	**OP1:** MOLECULAR AND MORPHOLOGICAL CHARACTERISATION OF MALARIA PARASITES IN ORANGUTANS FROM SABAH. **VOON S**
0915 – 0930	**OP2:** CYTOPATHIC EFFECT OF CLINICAL AND ENVIRONMENTAL ISOLATES OF *ACANTHAMOEBA SPP.* ON RABBIT KERATOCYTES. **NG SL**
0930 – 0945	**OP3:** SARCOCYSTIS SPECIES IN MALAYSIA: A MOLECULAR CHARACTERIZATION USING DNA PROFILLING. **PETER AM**
0945 – 1000	**OP4:** MOLECULAR DETECTION OF *BARTONELLA HENSELAE* AND *B. CLARRIDGEIAE* (CAUSATIVE AGENTS OF CAT SCRATCH DISEASE) FROM ANIMAL ECTOPARASITES IN MALAYSIA. **AIDA SYAFINAZ M**
1000 – 1030	**TEA BREAK**
1030 – 1230	**STUDENTS ORAL PRESENTATION (Postgraduates)** **Continued** ***Chairperson: Professor Dr Chua Tock Hing***
1030 – 1045	**OP5:** COMPARISON OF ENTOMOFAUNA POPULATIONS ON CARCASSES PLACED ON THE GROUND AND AT HIGH RISE BUILDING IN KUALA LUMPUR, MALAYSIA. **SYAMSA RA**
1045 – 1100	**OP6:** GENOTYPING OF *TOXOPLASMA GONDII* STRAINS ASSOCIATED WITH HUMAN TOXOPLASMOSIS: A CURRENT STATUS. **ANDIAPPAN H**
1100 – 1115	**OP7:** IMMUNE RESPONSES OF GOATS INFECTED WITH *TRYPANOSOMA EVANSI* TO INTRANASAL PNEUMONIC *MANNHEIMIA* VACCINATION. **ABUBAKAR IA**
1115 – 1130	**OP8:** DEVELOPMENTAL RATE OF SCUTTLE FLY, *MEGASELIA SCALARIS* (LOEW) (DIPTERA: PHORIDAE) AT DIFFERENT LABORATORY TEMPERATURES. **ZUHA RM**
1130 – 1145	**OP9:** GENETIC DIVERSITY OF *PLASMODIUM FALCIPARUM* ISOLATED FROM PENINSULAR MALAYSIA BASED ON MSP1 AND MSP2 GENES. **WAHIB M ATROOSH**
1145 – 1200	**OP10:** *BLASTOCYSTIS* SP.: EVIDENCE OF ITS OCCURRENCE IN WATER SOURCES IN PENINSULAR MALAYSIA. **LEE IL**
1200 – 1215	**OP11:** RECOGNITION OF POTENTIAL ANTIGENIC PROTEINS FOR DIAGNOSIS OF AMOEBIC LIVER ABSCESS USING TWO DIFFERENT ANTIGEN PREPARATIONS. **WONG WK**
1215 – 1230	**OP12:** HUMAN HYDATIDOSIS IN SUDAN: PREVALENCE AND STRAIN IDENTIFICATION. **RIHAB ALI OMER**
1230 – 1430	**LUNCH**

TIME	EVENTS
1430 – 1600	**STUDENTS ORAL PRESENTATION (Postgraduates)** **Continued** ***Chairperson: Dr Lee Han Lim***
1430 – 1445	**OP13:** MOLECULAR AND MORPHOLOGICAL CHARACTERISATION OF HAEMOSPORIDIAN PARASITES IN SMALL MAMMALS FROM SARAWAK. **HATTA HN**
1445 – 1500	**OP14:** PHENOTYPIC AND GENOTYPIC CHARACTERIZATION OF *TRICHOMONAS VAGINALIS*. **AFZAN MY**
1500 – 1515	**OP15:** DETERMINATION AND PHYSIOCHEMICAL CHARACTERIZATION OF *IN VITRO* ANTIBACTERIAL ACTIVITY OF *LUCILIA CUPRINA* (WIEDEMANN) (DIPTERA: CALLIPHORIDAE) LARVAL EXTRACT AGAINST SELECTED PATHOGENIC BACTERIA. **TEH CH**
1515 – 1530	**OP16:** METRONIDAZOLE INCREASES SPIRAMYCIN PENETRATION TO BRAIN IN A MOUSE MODEL. **CHEW WAI KIT**
1430 – 1615	**ORAL SESSION 5** ***Chairperson: A/P Dr Stephen Ambu*** **Free Paper Session**
1430 – 1445	**OS5.1:** EVALUATION OF EFFECTIVENESS OF TWO COMMERCIAL DISINFECTANTS AGAINST HOUSE DUST MITES *DERMATOPHAGOIDES PTERONYSSINUS* AND *DERMATOPHAGOIDES FARINAE* (ACARI: PYROGLYPHIDAE) IN THE LABORATORY. **SUHAILI ZA**
1445 – 1500	**OS5.2:** ANTHELMINTIC RESISTANCE IN GOAT FARMS IN TERENGGANU. **NOR AZLINA AA**
1500 – 1515	**OS5.3:** ASSOCIATION OF HEALTH PRACTICES, ENVIRONMENT AND SANITATION WITH THE PREVALENCE OF INTESTINAL PARASITISM IN FAMILIES LIVING ALONG THE COASTAL AND DUMPSITE AREAS IN METRO MANILA, PHILIPPINES. **LAGROSA GINO ANTONIO**
1515 – 1530	**OS5.4:** HIGH LEVEL OF SERUM LIPID DAMAGE IN BREAST CANCER PATIENTS INFECTED WITH INTESTINAL PARASITES. **CHANDRAMATHI S**
1530 – 1545	**OS5.5:** DAILY MOVEMENT PATTERNS OF A COMMON SPECIES OF TREE-SHREW, *Tupaia glis,* SURROUNDING HOUSES OF OTOACARIASIS CASES IN KUANTAN, PAHANG, MALAYSIA. **MARIANA A**
1545 – 1600	**OS5.6:** ACCUMULATION OF *ANGUILLICOLOIDES CRASSUS* IN EUROPEAN EEL IN THE UK RIVER SYSTEMS. **ROSILAH ABDUL AZIZ**
1600 – 1615	**OS5.7:** PARASITOLOGY AND HEMATOLOGY OF HORSES EXPERIMENTALLY INFECTED WITH *TRYPANOSOMA EVANSI*. **ELSHAFIE EI**

TIME	EVENTS
1600 – 1700	**PLENARY SESSION 6** ***Chairperson: Emeritus Professor Dato' Dr CP Ramachandran***
1600 – 1630	**The Buzzy Business of Genetic Modified *Aedes aegypti* and Dengue** By Dr Lee Han Lim Institute for Medical Research, Kuala Lumpur, Malaysia
1630 – 1700	**Malaysia's First Open Release of Transgenic *Aedes aegypti*** By Professor Dr Seshadri Vasan CEO of Oxitec Limited, Oxford, UK
1700 – 1800	**CLOSING CEREMONY AND PRESENTATION OF STUDENTS QUIZ COMPETITION AND BEST ORAL PRESENTATION AWARD** By Associate Professor Dr Stephen Ambu, President of MSPTM (2010-2011)
1800 – 1830	**TEA BREAK**

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PP2	**MODELLING THE EFFECT OF TEMPERATURE CHANGE ON THE EXTRINSIC INCUBATION PERIOD OF PLASMODIUM**	**CHUA TH**
PP3	**PROTECTIVE IMMUNITY AGAINST *PLASMODIUM BERGHEI* LETHAL CHALLENGE ELICITED BY RECOMBINANT 19 KDA MEROZOITE SURFACE PROTEIN 1 (MSP1) IN ALUM**	**WAN OMAR A**
PP4	**EXTENDED SURVIVORSHIP OF MOSQUITOES TREATED WITH SPACE-SPRAYED PYRETHROID FORMULATIONS**	**KHADRI MS**
PP5	**MOLECULAR DETECTION OF *PLASMODIUM FALCIPARUM* CHLOROQUINE RESISTANCE IN YEMEN**	**ABDULSALM AL-MEKHLAFI**
PP6	**COMPARATIVE BIOEFFICACY OF TWO LONG-LASTING NETS, PERMANET AND OLYSET AFTER FIELD USE IN LAOS**	**ROHANI A**
PP7	**COMPARATIVE FIELD EFFECTIVENESS OF A CYFLUTHRIN AND PERMETHRIN SPACE-SPRAY FORMULATION AGAINST *AEDES* MOSQUITO**	**KHADRI MS**
PP8	**A NOVEL MOSQUITO FEEDING SYSTEM FOR ROUTINE BLOOD-FEEDING OF AEDES AEGYPTI AND *AEDES ALBOPICTUS***	**DENG LU**
PP9	**ENTOMOLOGICAL SURVEILLANCE FOR MALARIA**	**PANG SC**
PP10	**BIOCHEMICAL MECHANISMS OF *AEDES AEGYPTI* IN SINGAPORE**	**KOOU SY**
PP11	**USING SATELLITE IMAGERY FOR MAPPING MALARIA TRANSMISSION RISK AREA IN POS LENJANG, PAHANG**	**WAN NAJDAH WMA**
PP12	**COMPARATIVE DISPERSAL AND LONGEVITY OF A FIELD AND LABORATORY MALE *AEDES AEGYPTI* STRAINS DETERMINED BY MARK-RELEASE-RECAPTURE EXPERIMENT**	**WONG HM**
PP13	**ENTOMOLOGICAL INVESTIGATIONS OF CHIKUNGUNYA INFECTIONS IN THE STATE OF KELANTAN, MALAYSIA IN 2009**	**ROSILAWATI HARUN**
PP14	**IMMUNOGENICITY OF NEWCASTLE DISEASE VIRUS CAPSIDS DISPLAYING THE EV71 VP1 FRAGMENT IN MICE**	**CH'NG WC**
PP15	***BLASTOCYTIS HOMINIS* IN COLONIC LAVAGE SAMPLES FROM COLORECTAL CANCER PATIENTS**	**VINOTH K**
PP16	***BLASTOCYSTIS HOMINIS* AND MICROSPORIDIA AS OPPORTUNISTIC INFECTIONS IN CANCER PATIENTS**	**CHANDRAMATHI S**

PP17	**HIGH FREQUENCY OF MIXED SUBTYPE INFECTIONS OF *BLASTOCYSTIS* SP. IN AN ABORIGINE COMMUNITY AT PAHANG, MALAYSIA**	**TAN TC**
PP18	**RECOVERY OF *BLASTOCYSTIS* SP. CYSTS: FLATBED MEMBRANE FILTRATION SYSTEM VERSUS CENTRIFUGATION**	**LEE IL**
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PP36	**APPLICATION AND IMPORTANCE OF REAL-TIME CONTINUOUS MONITORING SYSTEM IN THE ASSESSMENT AND MANAGEMENT OFENVIRONMENTAL POLLUTANTS**	**OOI SS**
PP37	**GENERATION AND CHARACTERISATION OF THE PORIN CDNA SEQUENCE FROM *EIMERIA TENELLA***	**LEE XW**
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PP42	**THE DOG LOUSE *HETERODOXUS SPINIGER* FROM STRAY CATS IN PENANG, MALAYSIA**	**NORHIDAYU S**
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ABSTRACTS

Plenary Session 1

CLIMATE CHANGE AND HEALTH IN CHINA: BUILDING NATIONAL AND LOCAL POLICY

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China lacks an overarching mitigation and adaptation policy framework to address the health impacts of climate change. Current barriers include the lack of good quality information and research on the impacts of climate change on health and the need to develop more effective environmental health management systems. Effective management of the environment and health interface is critical to achieving the overall goal of sustainable development to reduce vulnerability and increase the resilience to climate change impacts. Specific areas to build environmental health capacity include: workforce development; legislative frameworks; planning, and monitoring and information system development.

This paper provides an overview of the nature, scope and scale of the WHO led, UNDP- Spanish MDG Program on Climate Change and Health that commenced in 2008. The China National Environment and Health Action Plan (CNEHAP) forms the framework for the delivery of outputs related to Climate Change. As such there are four interrelated domains addressed in the Program:

- Enhancing EH leadership and management capacities
- Implementation of the CNEHAP to local levels
- Developing capacity in risk assessment
- Developing more effective EH information/monitoring systems.

This paper explores of the process to date, the context within which health issues were integrated into the Program, the interrelationship between the Program and the China National Environment and Health Action Plan and the nature of the specific 'Health' activities implemented in 2008-2011. In doing so emerging models for both national and local adaptation and mitigation policies to address health impacts are presented.

Plenary Session 2

CLIMATE CHANGE AND VECTOR BORNE DISEASES

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Vector borne diseases are governed by many factors such as seasonal weather variation, socioeconomic status, vector control programmes, environmental changes, deforestation and drug resistance. In recent years much information has been churned out on climate change and its impact of vector-borne disease epidemiology. However, the role of the vectors has always been neglected. An important factor to consider is the increase in global travel particularly to and from vector borne disease endemic areas. Thus, with climate change, this will increase the incidence of vector borne diseases in temperate countries due to the non immune population and the introduction of pathogens and vectors. Climate change will play a crucial role in the survival and transmission rate of vectors and their pathogens. The role of these factors in relation to climate change will be discussed.

Plenary Session 3

CLIMATE CHANGE AND RESPIRATORY INFECTIONS

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The impact of climate change on respiratory health is due to several factors including those of extreme temperature events, increased concentration of ground level ozone, long range air pollution resulting from fire or aerosols, and altered distribution of allergens. Another important impact relates to the alteration of the frequency of some respiratory infections such as respiratory syncytial virus resulting from earlier ending of winter, or tuberculosis due to migrationwith overcrowding. Vectors relevant to respiratory infections like water birds for avian influenza viruses will also likely to be effected by climate change. While many will suffer some respiratory effects of climate change, those primarily affected are individuals with pre-existing lung conditions like asthma, rhinosinusitis, chronic obstructive pulmonary disease and lung fibrosis. The degree of impact however remains uncertain and unpredictable, reiterating the need for better prediction models for estimation of respiratory health impact by climate change. Low-income countries are likely to be worse affected than others. Global efforts to mitigate climate change and to adopt adaptation measures are clearly paramount to reduce the harm on respiratory health.

Plenary Session 4

CLIMATE CHANGE AND EMERGING ZOONOSES

Mak JW

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Concerns have been expressed globally on the deleterious effects of climate change on the environment and human health. These effects have been documented in countries ranging from the polar region to the tropics.

The Intergovernmental Panel on Climate Change (IPCC) defines climate change as temporal change in climate whether due to natural variability or to human activity (IPCC, 2007). Global warming has occurred as is evident through the increase in the average air and ocean temperatures, as well as the melting of polar ice and snow leading to an increase in the average sea levels. The global surface temperature (GST) 100-year linear trend (1906-2005) is 0.74 (0.56 to 0.92)ºC and this has increased the ocean depths by at least 3000m, increasing the global average sea level by 3.1 (2.4 to 3.8) mm per year from 1993 to 2003. These changes have a considerable impact on the environment.

Effects of climate change on human health can be directly due to extreme physical effects or indirectly through their modifying effects on various determinants of the transmission cycles of infectious diseases. Furthermore, climate change effects on human and animal behaviour need to be considered in relation to the transmission of such diseases. However, while effects on transmission of infectious diseases have been mostly studied, those influencing non-infectious diseases have not been addressed adequately. Climate change effects on cancers, nutritional disorders, cardiovascular and other non-communicable diseases will need to be addressed, but will not be covered in this review.

Emerging zoonoses in the last few decades have been attributed directly or indirectly to climate change. It is important to know that more than 60% of microbes affecting humans have a zoonotic origin and that at least a third of these can be further spread from human to humans after successful human infections.

In Malaysia as in other countries, common zoonotic microbial infections include parasitic (mainly protozoa, like cryptosporidiosis, giardiasis, microsporidiosis, etc), bacterial (leptospirosis, salmonellosis, *Escherichia coli* 0157, melioidosis, etc.), and viral (Hantaviruses, Nipah virus, SARS, etc.). Most of these are water or food-borne infections and are associated with floods, environmental degradation, and human encroachment to wildlife domains.

This review will cover only some of the important non-vector borne zoonotic infections to avoid overlap with the other presentations. It will discuss the direct and indirect effects of climate change on the transmission of these zoonotic infections and the required inter-sectorial cooperation as well as the global response needed to combat them.

Plenary Session 5

CHARACTERIZATION OF MACROPHAGE INHIBITORY FACTOR (MIF) IN THE CHICKEN AS WELL AS IN SPECIES OF *EIMERIA* INFECTIOUS TO CHICKEN

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In previous studies we have identified The Macrophage Inhibitory Factor (MIF) in apicomplexan parasites, *E. tenella* and *E. acervulina* that are responsible for causing coccidiosis in chickens. Additionally, MIF from the host (*Gallus gallus)* was also identified. Following molecular characterization of this molecule each of the three proteins were expressed and polyclonal antisera were generated. This study describes the localization of MIF in the parasite as well as the host. In the parasite, MIF appears to be present in high amounts in the developing oocyst. In the host, MIF appears to be present in many normal tissues, suggesting that chicken MIF has functions outside of immuno-modulation. Functional analysis of *Eimeria* MIF shows that the purified molecules are capable of inhibiting the migration of chicken macrophages *in vitro*. Taken altogether, it is possible that at least one of the functions of MIF in protozoa is to modulate the immune response of the host.

Plenary Session 6

THE BUZZY BUSINESS OF GENETIC MODIFIED *AEDES AEGYPTI* AND DENGUE

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Dengue fever has been known since the 18th century, but the more serious form, dengue haemorrhagic fever, was only first known in 1952 in Manila. Today more than 100 countries are affected by dengue with 50-100 million cases yearly. There are about 500,000 hospitalisation due to dengue yearly and about 2.5% of cases die. In the continued absence of an effective tetravalent vaccine and specific treatment, dengue can only be controlled via suppression and elimination of the *Aedes* vectors. Present vector control technology, however, appears to be ineffective to control the disease, often resulting in massive outbreaks. There is a need to search for more effective dengue vector control technology such as the possible use of genetic control in which sterile males are released to mate with the wild type females, resulting in death in the larval stage, thereby sustained relaese will be able to suppress the natural population to level below the transmission threshold. Recent advances in biotechnology have resulted in a strain of *Aedes aegypti* habouring a lethal gene killing the larvae. The technique, known as Release of Insects with Dominant Lethality (RIDL) has been investigated in the Institute for Medical Research (IMR) since 2006 under the IMR-Oxitec Joint Initiative. Extensive laboratory studies indicated the bionomics, life history, vectorial capacity (dengue and chikungunya), insecticide susceptibility, oviposition behaviour, interspecific mating behaviour and horizontal gene transfer were all similar to the wild type; showing the introduced RIDL gene has not affected other biological functions of the mosquito. In semi-field trial, the mating competitiveness of RIDL *Ae aegypti* males was similar to that of wild type. These findings indicated that genetic control of *Ae aegypti* was promising and field release application was subsequently sought. The first release to study the longevity and dispersal of the RIDL *Ae aegypti* was successfully conducted on 21 December 2010 in a forested uninhabited area after following an extensive process described by my collaborator. Preliminary analysis of results reveals that the two strains have comparable daily survival probability, while the OX513A strain does not disperse quite as well as the unmodified laboratory strain even though the farthest point of recapture was similar for both strains.

MALAYSIA'S FIRST OPEN RELEASE OF TRANSGENIC *AEDES AEGYPTI*

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Dengue is the fastest-growing vector-borne disease of the world. In Malaysia, for instance, reported cases have increased dramatically from 7103 cases in 2000 to 46171 cases in 2010. Several countries are evaluating the biosafety and efficacy of the RIDL-Sterile Insect Technique – a new tool developed at Oxford University (United Kingdom) and its part-owned company Oxitec – to suppress the *Aedes aegypti* vector population and thus combat dengue and chikungunya. As of 2010, Brazil, Cayman Islands (UK Overseas Territory) and Malaysia have approved open field demonstration, with open releases having taken place in the latter two countries. Since 2009, Cayman Islands authorities have released around 3.3 million male mosquitoes of this strain in inhabited locations and reported 80% suppression in vector population. Malaysia conducted a limited release – the first open release outside the UK and its Overseas Territories – in an uninhabited forest in December 2010, four years after it became the first endemic country in the world to import the OX513A strain for contained evaluation. In the intervening years, the Institute for Medical Research (IMR) has conducted extensive evaluation of this strain's biosafety and efficacy, including the world's first semi-field trials (2007-08), dedicated workshops on risk assessment (2008) and risk communication (2010), and extensive national consultation with numerous committees, the public and NGOs (2009-10). IMR's MRR experiment in the uninhabited site seems to indicate that the genetic modification has not adversely affected survival of adult male mosquitoes in the field; however, it is necessary to repeat this experiment in inhabited locations (the natural habitat of *Aedes aegypti*) to reconfirm this encouraging result. These steps – laboratory and semi-field trials, MRR trials in uninhabited and inhabited sites, followed by suppression trials – represent a measured series of experiments of increasing scale and sophistication; this is widely viewed as the appropriate way to evaluate a new technology for potential field use, and is consistent with a step-wise approach advocated by regulatory authorities worldwide prior to deployment of an area-wide control programme.

Oral Session 1

OS1.1

LONGEVITY AND INFECTIVITY OF *TRYPANOSOMA EVANSI* ISOLATED FROM THE GUT OF THE STABLE *FLY STOMOXYS CALCITRANS* (DIPTERA: MUSCIDAE)

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Stable fly *Stomoxys calcitrans* is one of the blood-sucking flies prevalent in tropical and subtropical countries which is resemble to house fly *Musca domestica* (Family Muscidae). Two generations of stable flies were used at age 24 and 48 hours. The flies were fed on infected mouse blood with *Trypanosoma evansi* through chicken's skin placed on glass container in water bath at 37ºC. The fed flies were killed by chloroform and dissected under the stereo-microscope at different intervals: immediate, 1, 12, 24, 26, 27, 28, 29 and 30 hours post-feeding (ten flies for each interval). Smears were prepared from isolated trypanosomes and then inoculated via intraperitoneally to four mice. Three serological tests were employed to detect the antigenic variation of *T. evansi* namely agglutination, indirect immunoflurescent antibody (IFAT) and gel diffusion. All mice were positive for *T. evansi* for all intervals except 27, 28 and 29 hours post-feeding. The parasites were disintegrated at 30 hours of exposure. Sign of longitudinal binary fission was observed at 12 hours post-feeding. Indirect immunofluorescent antibody test showed cross-reaction between different isolates of *T. evansi* in comparison with agglutination and gel diffusion tests. In conclusion, the infectivity was decreased with time of feeding and this might be correlated with the loss of external coat of the parasites. In addition, the depletion of nutritional supply in the blood might leads to disintegration of the parasites. In IFAT, the cross reactivity was attributed to the specific and common antibody-antigen reactions.

OS1.2

OUTDOOR EVALUATION OF TMOF-Bti IN VARIOUS FORMULATIONS AGAINST FIRST INSTAR OF (*AEDES AEGYPTI LINNAEUS)* IN THE AREA OF UKM CAMPUS

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Bacillus thuringiensis israelensis (*Bti*) is a naturally occurring soil bacterium registered for mosquito larvae control which is commonly used as larvicidal agent. Trypsin modulating oostatic factor (TMOF), a hormone that stops mosquitoes from producing enzyme called trypsin, preventing them to draw nutrients from food causing them to starve to death. This study was conducted to evaluate the effectiveness and residual effect of 4% TMOF + 4% Bti rice husk, 2% TMOF + 2% Bti rice husk and TMOF-Bti wettable powder formulations on *Ae. aegypti* larvae at UKM Campus Kuala Lumpur. 20 first instar *Ae. aegypti* larvae were placed in a plastic bucket containing 4 liters of water supplied with crushed dried leaf powder as their source of food. Combination of TMOF-Bti in rice husk formulation with the following weights viz: 10 mg, 25 mg, 50 mg and 100 mg in duplicate were distributed in the buckets; while TMOF-Bti in wettable powder formulation each weighing viz; 2mg, 5 mg, 10 mg and 20 mg in duplicate were also placed in the buckets. The control buckets runs in duplicate with 4 liter of water and 20 first instar *Ae. aegypti* larvae. All buckets were covered by mosquito netting. Larval survival was recorded after 24 hours and weekly for five weeks. A new batch of 20 1st instar larvae *Ae. aegypti* was introduced into the buckets weekly without additional TMOF-Bti rice husk formulation or wettable powder. The result of the study showed that all formulations were very effective on the first two weeks by giving 0% larval survival for all concentrations applied. On the third week to fifth weeks, the larval survival increased gradually from as high as 70% for the 24 hour larval survival on the fifth week and dropped to 30% after a week in the fifth week. Thus, all these 3 formulations of TMOF-Bti could retain their residual effect on killing the first instar *Ae. aegypti* larvae for 5 weeks at least effectively.

OS1.3

OVIPOSITION SITE SELECTION OF A LABORATORY STRAIN OF *AEDES AEGYPTI* (LINNAEUS)

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Oviposition site selection behavior of the gravid female of a laboratory strain of *Aedes aegypti* (L) was studied to understand the natural pattern of breeding preference in the field. Three sets of experiment were conducted: First set was to determine the number of eggs laid by a single gravid female mosquito released into a cage containing only one ovitrap; second experiment was conducted to examine the oviposition behaviour when the mosquito was given a choice to oviposit. In the later, four oviposition cups i.e.: without larvae, with low, medium and high number of larvae at L1, L2, L3 and L4 instar, respectively. Similar experiment was also conducted using the pupae A gravid *Aedes aegypti* was introduced into the cage and the oviposition was determined after 24 hours. The third experiment was conducted to determine the oviposition behaviour in the presence and absence of paddle in the ovitrap. The results of the first experiment indicated that a female gravid *Aedes aegypti* deposited all her eggs into the ovitrap on the first day of oviposition. In the second experiment, skip oviposition was observed when different oviposition choices were provided. Generally it preferred to oviposit in container without L1 larvae, without L2 larvae or with low number of L2 larvae, high number of L3 larvae, low number of L4 larvae and without pupae or with low number of pupae.. Finally, there was no significant difference in the oviposition behaviour in the absence or presence of paddle which did not play an important role in ovitrapping.

OS1.4

EVOLUTIONARY DYNAMICS AND MULTIPLE IMPORTATIONS AS DRIVING FORCES IN SINGAPORE DENGUE EPIDEMIOLOGY

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Singapore is hyperendemic for dengue, with all 4 serotypes found circulating in the island. Dengue serotype 2 (DENV-2) has been the predominant serotype since 2007 after it replaced DENV-1 and caused a major outbreak in that year. Analysis of the envelope (E) protein gene showed that the 2007 outbreak was also accompanied by a clade replacement within the Cosmopolitan genotype; new clade viruses replacing the old clade viruses (sampled before 2007). Interestingly, sequence analysis of recent samples showed an increased in viral diversity within the new clade DENV-2, with two distinct lineages emerged as a result of local viral evolution. Phylogeographic analysis of the complete genome of new clade DENV-2 also revealed varying degrees of viral diversity at spatial level. Viruses originating from the central region had higher level of genetic diversity, suggesting that the transmission intensity was relatively higher compared to other parts of the island. The trend of mixing and exchanges of DENV-2 indicates that the central part was highly likely the mixing ground for hyperendemic transmission. In addition, our virological surveillance revealed multiple importations and co-circulation of various strains of DENV-2, DENV-3 and DENV-4 that were uncommon to Singapore. In particular, phylogenetic analysis of DENV-3 showed substantial diversity with multiple strains that were closely related to dengue viruses previously reported around the Asian region. These findings highlight the importance of viral migration and evolution in dengue epidemics and suggest that cross-border surveillance programme and regional collaborations are needed in an effort to control the disease.

OS1.5

PARASITIC INFECTIONS IN DOGS AND CATS FROM DOMESTIC AND HOMELESS ENVIRONMENT

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Animals do harbor a significant number of parasites that are transmissible to man either by direct ingestion of eggs (fecal-oral route) or skin penetration by larval forms of the parasites. Personal hygiene certainly plays a major role in ensuring accidental infections do not take place. In an environment where animals and human mingle, such as in close relationship between pets and owners, unintentional infections could still take place. We assume the risk of acquiring infection is minimal since owners take their pets for regular de-worming and vaccination. This study was aimed to determine the prevalence of parasitic infections among dogs and cats from two different environments: domestic (pets) versus stray animals with the assumption that regular de-worming and/or vaccination minimizes the parasitic infections among dogs and cats of domestic origins as compared to stray animals. Stool specimens of dogs and cats from Dewan Bandaraya Kuala Lumpur (DBKL's) animal pound in Jalan Setapak and SPCA Jalan Ampang temporary shelters for animals and from 3 veterinary clinics in Shah Alam, Taman Tun Dr Ismail Jaya and Jalan Gasing were collected and examined by stool concentration methods and microscopy. Stool examination showed a higher prevalence rate of intestinal parasitic infections among stray dogs and cats as compared to domestic cats and dogs, with 58.6% versus 28.1%, $p < 0.001$, respectively. The most common parasitic infections found in these dogs and cats were hookworms (25.1%), *Ascaris lumbricoides* (21.1%), *Trichiuris trichiura* (18.3%) and *Giardia lamblia* (0.6%). No other intestinal protozoas were detected. In conclusion, results showed a higher percentage of ova and cysts in stools of dogs and cats of homeless origin compared to domesticated ones. Our postulate is that vigilant veterinary management and owner awareness of animal health had played a significant role in minimizing parasitic infections in pets and owners should continue their animal regular medical check-ups and antihelminthic/vaccination programs.

OS1.6

KNOWLESI MALARIA SITUATION IN MALARIA SURVEILLANCE PROGRAMME IN SARAWAK

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Malaria incidence in Malaysia is still under control with 4,484 cases in 2010 (from January to August, VBDCP, 2010). The highest endemic state affected by this disease is Sabah and the most prevalent malaria species is *Plasmodium vivax* (56%). Since the report of naturally acquired *P. knowlesi* in Kapit, Sarawak (2004), the Malaria Control Programme in Sarawak has diligently screened all blood films for *P. knowlesi* from all divisions. As a result, in 2009, Sarawak had a large number of BFMPs identified microscopically as *P. knowlesi* / *P. malariae*. However, due to morphological similarities between *P. knowlesi, P. malariae and P. falciparum*, a total of 809 BFMPs earlier microscopically confirmed as *Pm/Pk* by Sarawak SH were sent to IMR (Malaria Reference Centre for the Ministry of Health) for re-confirmation. All BFMPs were re-examined by trained microscopists in IMR for identification of malaria parasites, estimation of parasitaemia and molecular confirmation. A nested PCR as described by Singh et al was used to identify *P. knowlesi* and human malaria parasites infections. 377 slides completed re-examination by PCR and microscopy. By microscopic re-examination, 326 blood films were identified as Pm/Pk by IMR, followed by *P. malariae* (19/377) and other malaria species (32/377). By PCR, 30.5% out of 377 blood slides were positive and 69.5% were PCR neg. An approximate 59% of blood films identified as *Pm/Pk* by microscopy were found to be *P. knowlesi* by PCR and surprisingly, 60% of blood films earlier identified as *P. malariae* turned out to be *P. falciparum* by PCR and only 20% were *Pk* by PCR and none of blood films were *Pm* by PCR. This results shows that identification of *P. knowlesi* by microscopy alone could be misleading. Although PCR is still needed, it is highly dependent on the quality of DNA received. In contrast, identification by microscopy is highly dependent on the skills of microscopists and the quality of smears being made.

OS1.7

FIELD EVALUATION OF IMR AUTOCIDAL TRAP DEVICE FOR *AEDES* CONTROL

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Study on effectiveness of the IMR Autocidal Trap in controlling field *Aedes* mosquito population was conducted from 8th July to 3rd Sept 2010 in Malacca Tengah viz. Taman Peringgit Jaya and Taman Kenanga. The autocidal trap device is a modification of traditional ovitrap and is capable of monitoring and controlling *Aedes* species. The trap is equipped with a floater fitted with copper wire-mesh and a transparent round sticky strip that can trap not only the larvae but also the adults. Resident in 85 houses out of a total of 1761, (5%) houses in both selected areas participated in this study, after informed consent was obtained. Each house was installed with three autocidal traps. The traps were filled with tap water and placed at suitable location indoor and outdoor of the house. Every two weeks the sticky strip was collected and the insects trapped on the strip were identified and recorded. The results showed that three main species of mosquitoes were trapped on the sticky strip: *Aedes aegypti* (L.), *Aedes albopictus* Skuse and *Culex quinquefasciatus* Say. Female *Ae. aegypti* was the highest mosquito group trapped (43%) on the sticky trap, followed by female *Cx. quinquefasciatus* (18%) and female *Ae. albopictus* (6%). Because of the rainy season in Malacca during the study, 20% of the mosquito species were damaged and could not be identified. A total of 18 houses (21%) were positive with *Aedes* mosquitoes. Therefore, a mean of 4 *Aedes* adults were trapped/sticky strip/2 months/house with the maximum 22 *Aedes* sp. were caught in one sticky strip. Observation under microscope showed *Aedes* eggs were deposited onto the sticky strip, indicating that gravid female mosquitoes were attracted to lay their eggs in the autocidal trap. Twenty two percent out of 827 mosquitoes trapped in the autocidal trap was *Culex* species. The IMR Autocidal Trap is therefore an effective mosquito trapping device.

OS1.8

IMPACT OF PREDATION ON *TOXORHYNCHITES SP.* FED ON WILD TYPE AND TRANSGENIC *AEDES AEGYPTI* (L) LARVAE: IMPLICATION OF RIDL GENE TRANSFER

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Dengue continues to cause high human morbidity and mortality compared with any other vector-borne viral diseases. To date, there has been no specific treatment and vaccine. Thus, it is evidently essential to develop new and effective methods, such as genetic control. Recently, the development of RIDL (Release of Insect carrying Dominant Lethality) mosquitoes, particularly the release of males carrying this dominant lethal gene as part of this integrated tool in vector control is being evaluated. However, prior to deployment of these sterile males, it is essential to study the biology and behavior of the closest related predator species in order to determine the possible effect of gene transfer on life span, size, longevity and fecundity of the predator, *Tx. splendens* (Thailand) and *Tx. amboinensis* (Hawaiian) on Wild Type (WT), and transgenic *Ae. aegypti* larvae bred on tetracycline and without tetracycline. The results indicated that the life cycle, wing-length and fecundity of *Toxorhynchites* species fed with transgenic and WT *Ae. aegypti* larvae remained unchanged. Further test of *Toxorhynchites* sp. larval stage 4 of F1 generation using polymerase chain reaction (PCR) showed negative results, indicating absence of lethal gene being transferred via predation. Thus, horizontal gene transfer of the lethal gene to *Toxorhynchites* larvae via ingestion is extremely unlikely.

Oral Session 2

OS2.1

DETECTION OF SCRUB TYPHUS DISEASE USING PCR TECHNIQUE IN CHIGGER AND TISSUES OF SMALL MAMMALS

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Scrub typhus has been recognized in numerous countries in Asian-Pacific area including Malaysia; the disease was first noted in Malaysia in 1915 by Dowden. This project is to detect the presence of scrub typhus in preserved and live chiggers and screened host target organs such as liver, spleen as well as blood. All samples were processed by a standard method that began with extraction of DNA, then continued with polymerase chain reaction (PCR) and followed by gel electrophoresis. A total of 465 chiggers (*Leptotrmbidium deliense*) and 7 different species of hosts (*Ratus diardii*, *Tupaia glis*, *T. minor* and *R. tiomanicus, Sundamys muelleri* and *R. whiteheadi, Leopoldamys sabanus*) were collected from 12 different locations (Bukit Sagu; Bukit Goh; Bukit Kuantan; Chengal Lempung, Balok and Tg. Lumpur-Kuantan, Pahang, Bukit Panchor and Pulau Jerjak-Penang, Ketengah Jaya and Setiu; Terengganu, Pulau Pangkor, Perak and Sungai Sedim, Kedah)' and tested. Collection sites included oil palm plantation, rubber estate, secondary forest, housing estate and coastal area. All specimens had tested negative except for a blood sample from *L.* sabanus from Sungai Sedim, Kedah.

OS2.2

POINT MUTATIONS IN DHPS AND DHFR GENES OF *PLASMODIUM FALCIPARUM* ISOLATES FROM SABAH

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Sulfadoxine and pyrimethamine (SP) is currently the first line drug for the treatment of falciparum malaria in Sabah, Malaysia. Resistant of *P. falciparum* to SP has been observed in Malaysia since 1960's. The quintuple mutations have previously been recognized to strongly predict clinical outcome of SP resistance. The objective of this study was to determine the present of point mutation in *pfdhps* and *pfdhfr* genes from 31 microscopically confirmed blood samples of individuals from malaria endemic areas in Kalabakan, Tawau. Nested mutation specific polymerase chain reaction and restriction digestion methods were used to detect the presence of mutations at 16, 51, 59, 108 and 164 codon position in *pfdhfr* gene and mutations in the 437, 540 and 581 codon sites in *pfdhps* gene. We found that all samples had point mutations in at least one codon of *pfdhfr* gene. Changes restricted to codons 16V, 108N and 164L were 16.1%, 67.7% and 80.6% respectively while mutation at codon 59R was found in all isolates. No mutations were detected at 51N and there were no changes from 108S to 108T. With regards to *pfdhps*, we found that all of the isolates had the 437G mutation. High proportions (74.2%) of the samples have mutation at 581G codon position. However all the samples showed wild-type for codon 540. Although there were no quintuple mutations found in the isolates, the high number of samples with triple mutation (59R108N/437G) may indicate that the parasite within this population could have the potential to develop into quintuple mutants in the future.

OS2.3

PCR AMPLIFICATION, CLONING AND SEQUENCING OF A GENE ENCODING AN ERYTHROCYTE INVASION PROTEIN OF *PLASMODIUM KNOWLESI*

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Plasmodium species cause malaria by invading and multiplying inside the host red blood cells. The parasite uses multiple invasion ligands which bind to specific red cell receptors. The relative efficiency by which these ligands interact with RBC receptors may be critical to the rate of increase in parasitaemia. Hyperparasitaemia is associated with severe disease in *Plasmodium knowlesi,* a zoonotic malaria, found in Southeast Asia. The aims of the study are to test the hypothesis that *Plasmodium knowlesi* invasion gene haplotypes have an association with parasitaemia at presentation and clinical outcome. A gene encoding the *Plasmodium knowlesi* normocyte binding protein xa (Pknbpxa) was chosen for this work because it is orthologous to invasion gene families encoding reticulocyte homologs of *P. falciparum* and *P. vivax.* An amplification protocol for the Pknbpxa gene was developed and a method for cloning and sequencing was optimized. The full length sequence of Pknbpxa (8,540bp) has been obtained from one field isolate of *P. knowlesi.* A reliable haplotyping assay will be developed following sequencing of other field isolates to screen for polymorphisms in the Pknbpxa gene from *knowlesi* malaria patients with known parasitaemia and disease severity.

OS2.4

OPERATIONAL RESEARCH IN SABAH TO ASSESS THE STATUS OF THE PROGRAMME FOR ELIMINATION OF LYMPHATIC FILARIASIS

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An operational research was performed in Sabah, Malaysia with the objective of determining whether the annual mass drug administration (MDA) of the National Programme for the Elimination of Lymphatic Filariasis can be stopped or should be continued. The main diagnostic tool used was a lateral flow cassette test called "panLF rapid", an IgG4-based assay using two filarial recombinant antigens, *Bm*R1 and *Bm*SXP. Day-time finger prick blood samples from 2437 individuals were sampled and tested in the field by panLF rapid, 1430 were from 7-8 year old school children and 1007 were from adults. A total of 90 children (6.3%) and 132 adults (13.1%) were found to be positive by the rapid test. Positive individuals were further sampled at night to test for presence of microfilaria (mf) by thick blood smear and real-time PCR. A total of 31/87 (35.6%) children and 29/128 (22.7%) adults were found to be mf positive. Real-time PCR was positive in 52.9% (46/87) children and 28.9% (37/128) adults. The study showed that the prevalence of brugian lymphatic filariasis in the area was still high, notably in children. Subsequently the decision was made to continue the MDA for at least two more cycles.

Oral Session 3

OS3.1

LONG-TERM BIOMONITORING FOR ZOONOTIC WATERBORNE PATHOGENS: NEW GLOBAL STRATEGIES FOR ASSESSING THE EFFECTS OF CLIMATE CHANGE

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Assessments of potential effects of climate change and other environmental dynamics on spread of zoonotic pathogens must rely on long-term biomonitoring programs that accurately sample environments for pathogens across periods adequate to detect correlation with changing environmental conditions. From 1990-2020, we developed long-term monitoring programs for the opportunistic protists, *Cryptosporidium parvum* and *Giardia lamblia*, and the emerging human-virulent microsporidia, *Enterocytozoon bieneusi* and *Encephalitozoon* spp., in major freshwater systems and agricultural regions of North America and Europe. Because these and other waterborne pathogens are prevalent throughout the world, we propose expanding such monitoring efforts to other areas, including Malaysia and elsewhere in Southeast Asia and the Indo-Pacific region, with modifications to identify local sentinel organisms. Our methods couple use of sentinel organisms for field collection with laboratory diagnosis using molecular markers. Across a range of climate conditions, we accurately detected each of these pathogens in up to 93% of samples in major rivers and smaller watersheds in both urban and agriculturally intensive areas. Sentinel organisms found to be effective include filter-feeding molluscs, coprophagous flies, and dung beetles. We found all to accumulate and retain viable pathogens for extended periods, making them available for diagnosis using staining, PCR, and/or Fluorescent In-Situ Hybridization (FISH) with immunofluorescent monoclonal antibody tags (IFA).

OS3.2

HUMAN SCHISTOSOMIASIS IN THE KINGDOM OF SAUDI ARABIA

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Schistosomiasis the most important human helminthes infection is a major source of morbidity for people in 76 countries. *Schistosoma mansoni* and *Schistosoma haematobium* are endemic in Saudi Arabia. The epidemiology of the disease, the snail intermediate hosts and the governmental successful control efforts are covered in the form of a review. In addition, the major challenges for control of schistosomiasis in the country are discussed.

OS3.3

CRYPTOSPORIDIOSIS IN A DAIRY CATTLE FARM

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Cryptosporidium sp. was detected in 3 cows from rectal pinch samples. Direct smear stained with Acid Fast and Kinyoun stain was used to detect the organism. Subsequent samplings also indicated positive for Cryptosporidiosis, whereby one of the animals died due to dehydration and severe clinical signs of diarrhoea. The farm had contaminated water supply where 2 out of the four ponds were positive for Cryptosporidium sp. whereas the municipal water supply was negative. The management of the farm was poor in terms of nutrition and cleanliness which led to Cryptosporidium sp. infection in the cattle compounded by stress factors. The mortality of the adult dairy cattle and calves was also high reaching up to 40%. The most common cause of death was leg weakness, severe dehydration and pneumonia in calves as a result of severe infections. Cryptosporidiosis is zoonotic and thus needs to be controlled to prevent outbreaks in the human population.

Oral Session 4

OS4.1

DISCOVERY OF A NEW SPECIES OF BLOWFLY FROM CRIME SCENE INVESTIGATION IN MALAYSIA

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Forensic entomology applies knowledge about the behaviour and ecology of insects associated to corpses to crime scene investigations. It is possible to calculate a minimum post-mortem interval (PMI) by determining the age of the oldest blowfly larvae feeding on a corpse. It is, thus, crucial to correctly identify the species collected from crime scene investigations. This represents the first study in Malaysia to identify blowfly species based on specimens collected during crime scene investigation. We evaluated both morphological and molecular tolls in species identification for 11 individuals of 4 different species sampled from 10 different crime scenes in Malaysia. A molecular identification method involving the sequencing 2.4 kilo basepairs 'barcode' fragment of the COI, COII and t-RNA leucine genes from 11 specimens, representating 10 different crime scenes. A phylogenetic tree is generated using a neighbour-joining technique. This study confirmed the presence of *Chrysomya megacephala, Chrysomya rufifacies, Chrysomya nigripes* and *Lucilia cuprina*. *Chrysomya megacephala* was the predominant species found. In addition, we identified a new species based upon complete genes sequencing.

OS4.2

A PRELIMINARY STUDY OF FORENSIC INSECT DIVERSITY IN A HIGH RISE BUILDING IN SENTUL TIMUR, KUALA LUMPUR

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Forensic entomology is the study of insects and other forensic arthropods associated with legal investigation. Often, the location of a cadaver may affect the diversity of forensic arthropods. The objective of this study was to determine the diversity of arthropods fauna in a high rise building. The study site was a 26th storey building in Sentul Timur, Kuala Lumpur. Fresh cow liver and meat, used as bait to attract the flies, were placed in an indoor and outdoor location on the 26th storey of the study building. The duration of the study was 21 days until no more flies were observed. The arthropods infesting the baits were collected and identified as *Megaselia scalaris* (Loew), *Chrysomya megacephala* (Fabricius), *Boettcherisca peregrina* (Robineau-Desvoidy), *Parasarcophaga dux* (Thomson), *Musca domestica* Linnaeus, ants, and spider. In addition, fly maggots were collected and mounted for identification. The maggots were those of *Megaselia scalaris,* and species of the family Sarcophagidae. The adults and larvae were collected both from indoor and outdoor. The study also showed that flies were attracted to the baits within 8.82 ± 0.42 hours in a high rise building, indicating that cadaver infestation can occur within the same day of death in a high rise building.

OS4.3

IMPLICATIONS OF MAGGOT INFESTATION IN INDUSTRY – FIRST REPORT OF INDUSTRIAL FORENSIC ENTOMOLOGY

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Forensic entomology is the application and study of insect and other arthropods related to legal matters. Forensic entomology can be divided into three subfields: urban, stored-product and medico – legal/ medico-criminal entomology. In this study we reported for the first time the involvement of insects in an industrial sector and we termed it Industrial Forensic Entomology. In this case, maggots were found breeding at the inline filter of the liquid cream yeast circulation pipeline of an established bread producer. The investigation was to determine if the fly had infested the yeast at the yeast production industry (YPI) or the infestation began at the bread producer industry (BPI), as this has legal implication. Specimens of maggot were collected and sent to us for identification and to determine if the identified maggot species could survive and develop at or below 6ºC, at which temperature the yeast was stored. The maggot specimens were identified as 3rd instar *Megaselia scalaris* (Leow). We conducted a study on the development of *M. scalaris* in the laboratory at room temperature and below 6ºC. Study at room temperature indicated that the complete life cycle of *M. scalaris* from egg to adult in liquid yeast media was 14-16 days. The eggs hatched within 12 h, while the larval and pupal period was about 60 h and 10 days, respectively. Male flies emerged before females, while the first oviposition of females was about 2 days after emergence. *Megaselia* eggs could not hatch at low temperature at 4-5ºC in another experiment, using first instar larvae only about 8% of larvae could survive for a maximum of 3 days but these larvae failed to pupate and develop into adults. These data indicated that *Megaselia* could not breed in yeast stored continuously at low temperature.

Oral Session 5

OS5.1

EVALUATION OF EFFECTIVENESS OF TWO COMMERCIAL DISINFECTANTS AGAINST HOUSE DUST MITES *DERMATOPHAGOIDES PTERONYSSINUS* AND *DERMATOPHAGOIDES FARINAE* (ACARI: PYROGLYPHIDAE) IN THE LABORATORY

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This study was conducted to determine the toxicity of two commercial disinfectants containing chloroxylenol and benzyl chlorophenol, against dust mites, *Dermatophagoides pteronyssinus* and *Dermatophagoides farinae* in the laboratory. The contact, topical, and residual activities as well as simulated assay of the two commercial disinfectants were investigated at five concentrations (2.4%, 1.2%, 0.6%, 0.3% and 0.15%). For contact and residual activities, mites were exposed to Whatman No. 1 filter paper impregnated with disinfectants solution while for topical activity, disinfectant solution were applied direct to the dust mites. For simulated test, mites were exposed to cotton fabric impregnated with disinfectant solution. Mortalities from chloroxylenol solution were better than benzyl chlorophenol for all activities. At 2.4% concentration, 24 hrs contact exposure to chloroxylenol resulted in mortality greater than 90% while mortality was more than 50% for topical exposure in both species of dust mites. 100% mortality was recorded for 24 hrs post treatment of residual exposure to 2.4% chloroxylenol in both species of dust mites but the mortalities of *D. pteronyssinus* declined to 70% by week 4. Meanwhile, 2.4% benzyl chlorophenol at 24 hrs contact and topical exposures produced higher mortalities in *D. pteronyssinus* than *D. farinae;* however the mortalities in *D. farinae* were greater than *D. pteronyssinus* for 24hrs residual exposure at that concentration and mortalities for both species declined progressively by week 4. Mortalities of *D. pteronyssinus* for simulated test of chloroxylenol were better than *D. farinae* while mortalities for both species were similar for benzyl chlorophenol.

OS5.2

ANTHELMINTIC RESISTANCE IN GOAT FARMS IN TERENGGANU

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One of the major constraints to the small ruminant industry in Malaysia is parasitic gastroenteritis. The main form of control for many years lies in anthelmintics hence the nematode parasites have developed anthelmintic resistance, reported to be widespread in Malaysia. This study was done to evaluate the present anthelmintic resistance status of goats in Terengganu. A total of 141 goats from six farms were chosen for detection of resistance using the Fecal Egg Count Reduction Test, using levamisole, ivermectin, benzimidazole and closantel. Fecal samples taken were subjected to fecal egg count and larval culture for third stage strongyle larvae identification. All farms had resistance towards benzimidazole and closantel while only two farms were still susceptible to levamisole and one farm had suspected resistance to ivermectin. There were four out of six farms that had resistance to all anthelmintics tested. The strongyles which had developed anthelmintic resistance were predominantly *Haemonchus* sp. followed by *Trichostrongylus sp.* The findings of this study showed that anthelmintic resistance in Terengganu has escalated and the need for effective immediate action in particular with regard to farmer education is very important to salvage the small ruminant industry.

OS5.3

ASSOCIATION OF HEALTH PRACTICES, ENVIRONMENT AND SANITATION WITH THE PREVALENCE OF INTESTINAL PARASITISM IN FAMILIES LIVING ALONG THE COASTAL AND DUMPSITE AREAS IN METRO MANILA, PHILIPPINES

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Parasitism remains a public health problem in the Philippines despite deworming programs by the government. This study aimed at identifying the factors that contribute to this issue. Routine fecal examination was done on members of 46 families from 2 different depressed areas in Metro Manila, Philippines. Results were then correlated with the health practices, environmental, and sanitation conditions of the families involved in the study. Residents from the dumpsite area were found to have higher prevalence of intestinal parasitism (76%) compared to coastal area dwellers (41%). While *Ascaris lumbricoides* and *Enterobius vermicularis* infections were prevalent in the dumpsite area, fecal samples of residents from the coastal area were positive mostly for monoecious flukes and even cestodes. Unsatisfactory storage of drinking water and irregular house cleaning were demonstrated as major factors for the persistence of intestinal parasitism regardless of deworming the dumpsite residents. Conversely, the coastal area dwellers lacked latrine in their homes and practiced improper garbage segregation and excreta disposal. They also admitted to serving "sun-dried" seafoods, which they would catch from the water just below or near their houses. Moreover, their unconcern about their last deworming time proved to contribute to the prevalence of parasitism in their community. Hence, constant deworming was not sufficient to reduce incidence of parasitism in such communities. It is, therefore, most important to break the transmission cycle of the parasite through proper education and monitoring of the health practices, environmental and sanitation conditions especially of the urban slum dwellers.

OS5.4

HIGH LEVEL OF SERUM LIPID DAMAGE IN BREAST CANCER PATIENTS INFECTED WITH INTESTINAL PARASITES

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Prolonged state of oxidative stress (caused by overproduction of free radicals than antioxidants) has been one of the contributory factors of cancer. Free radicals that are generated by host's immune cells to kill the invading parasites implicate parasitic infections as a possible cause of oxidative stress. The activity of free radicals namely reactive oxygen species (ROS) can cause secretion of metabolites in serum such as malondialdehyde (MDA, metabolite of lipid peroxidation), hydrogen peroxide (H_2O_2, indicates hydroxyl radical level) and AOPP (advanced oxidation protein product). Previously, we have reported that colorectal cancer patients (majority with *B. hominis* infection) exhibited high level of AOPP. This indicates that the possibility of intestinal parasitic infection in facilitating cancer growth via oxidative protein damage should not be ruled out. However such studies have not been reported in breast cancer. This study compares MDA, H_2O_2 and AOPP in subjects infected with intestinal parasites alone and breast cancer patients with and without intestinal parasitic infection. All intestinal parasite infected subjects and breast cancer patients showed high level of oxidative stress compared to the healthy individuals. The levels of H_2O_2 in breast cancer patients with infection were significantly higher compared to patients without infection. This implicates that intestinal parasitic infections in cancer are generally detrimental regardless of the cancer types. To date this is the first study to report on the effect of intestinal parasitic infection towards oxidative damage in breast cancer. Thus, cancer patients who are mainly known for immunodeficiency should be subjected for intestinal parasitic screening.

OS5.5

DAILY MOVEMENT PATTERNS OF A COMMON SPECIES OF TREE-SHREW, *TUPAIA GLIS,* SURROUNDING HOUSES OF OTOACARIASIS CASES IN KUANTAN, PAHANG, MALAYSIA

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Objective: To document daily movement patterns of 5 individuals (3 males and 2 females) of a common species of tree-shrew, *Tupaia glis* surrounding houses of otoacariasis cases. **Methods:** Each shrew was fitted with a transmitter chip radio-collar which operates between the frequencies of 154.13 MHz to 154.21 MHz. Each transmitter was then tracked with a Portable Telemetry Receiver (Sirtrack, New Zealand) fitted with a 3-element Yagi antenna. Collared shrews were located using standard methods of ground-based triangulation. Each location was taken from at least 2 directional fixes and a minimum of 3 compass bearings. Fixes were taken hourly for each collared individual from the time of emergence from nest (beginning of activity) till time of entry into the nest (end of activity) every day for 5 to 7 continuous days. Three series of radio telemetry observations were carried out. The bearings, time and positions of an observer were recorded and later plotted on a graph paper in order to derive coordinates of the collared animal. These coordinates then analyzed using Ecological Software Solutions (Biotas Version 1.03). **Results:** Daily telemetry detections demonstrated 2 individuals of different sex having nests (or a nest) in the same house. All shrews emerged from and returned to their nests between 0601 to 0659 hours and 1901 to 1959 hours, respectively. Both the time of exit from and entry into nest were the same between sexes ($P>0.05$). Their average total active period was 4.90 to 7.00 hours with a total daily travel distant of 270 m to 382 m. A male and a female shrew can move as far as 3 285 m and 4 591 m, respectively. Active movements of *T. glis* were during daytime. They regularly entered some houses in the area during day and night except for one individual which visited during daytime only. Females covered a 15.4% slightly higher daily movement range compared to males. **Conclusions:** This is the first radio telemetry study in Malaysia to demonstrate shrews as potential carriers of ticks from wild into the houses and compounds of 4 to 7 otoacariasis cases and vice versa. There are also evidences showing shrews have close contact with humans.

OS5.6

ACCUMULATION OF *ANGUILLICOLOIDES CRASSUS* IN EUROPEAN EEL IN THE UK RIVER SYSTEMS

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Like other living things, fish also suffer from diseases and parasites. Parasitic infections lead to serious consequences of fish behavior where they cause morbidity, mortality and economic losses in fish production in the world. The European eel, *Anguilla anguilla,* is an economically important species contributing to the biodiversity of UK and European inland and coastal waters. However, the recruitment of European eel reported to suffer a great losses and one contributory factor is believed to be the effect of infection with parasites. The swim-bladder nematode *Anguillicoloides crassus,* has gained much attention more than other eel parasites since its introduction into Europe in early 1980s. This is due to its relatively recent and rapid invasion of European waters and the subsequent debilitating pathology that occurs within *A. anguilla*. However, the natural host, the Pacific eel *A. japonica,* is not harmed by *A. crassus* infection. In this study, we seek to clarify the status of *A. crassus* in UK habitats. Such information is necessary as a basis for the control of spreading of this parasite and for future improving the management of European eel in UK. Data highlighting the prevalence and intensity of *A. crassus* infection in UK eel populations will be presented at the meeting.

OS5.7

PARASITOLOGY AND HEMATOLOGY OF HORSES EXPERIMENTALLY INFECTED WITH *TRYPANOSOMA EVANSI*

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Six local female horses aged between three to seven years old were used to study the dynamics of *Trypanosoma evansi* infection in horses. Four animals were injected with 10^2 parasites/ kg body weight intravenously, while the remaining two animals served as negative control. Blood samples and rectal temperature were collected on alternative days from both groups for fifty days. The infected group was salvage treated on day 31 post-infection (PI) using diminazine aceturate injection. Parasitemia was detected on day 4 PI and fluctuating throughout the infection period. In the infected group, one animal died unexpectedly on day 23 PI without showing the neurological symptoms of *surra*, while a second animal was euthanized on day 15 post-treatment due to poor body condition induced by the infection. Mean total erythrocyte counts (RBC), packed cell volume (PCV) and hemoglobin (Hb) showed marked decline in the infected group on day 16 PI onwards. Mean corpuscular volume (MCV) and mean corpuscular hemoglobin concentration (MCHC) remained normal. Thrombocyte counts in the infected animals decreased dramatically below the control group and normal range on day 8 PI onwards. A neutropenia accompanied with monocytosis was detected in the infected group on day 6 and 16 PI respectively, and fluctuated during the disease. In conclusion, the inoculum of 10^2 trypanosome/ kg body weight had established an acute disease distinguished by a normocytic, normochromic anemia and one fatal outcome 23 day PI.

Blastocystis Symposia

BS1

BLASTOCYSTIS – PAST, PRESENT AND FUTURE

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Blastocystis since its discovery in the beginnings of 1900 have travelled through time totally enmeshed in controversy and contradictions in all aspects of the organism including its phylogenetic status, biochemical, biology, immunology and most importantly the pathogenic role it was supposed to exert. The discussion traces its past, highlights major achievements in many of these fields and surface current thinking especially in terms of its pathogenic role and the possible mechanisms involved in the process.

BS2

MOLECULAR ASPECTS OF *BLASTOCYSTIS* SP.: THE ENIGMA CONTINUES

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Blastocystis sp. is one of the most common intestinal parasites of humans and animals. Despite its discovery in the early 1900s, many fundamental biological aspects of the parasite such as taxonomy, pathogenicity and modes of transmission have just recently been revealed in the last decade with the application of modern molecular tools. Phylogenetic analyses based upon small-subunit ribosomal RNA gene, cytosolic-type 70-kDa heat shock protein, translation elongation factor 2 and noncatalytic "B" subunit of vacuolar ATPase clearly demonstrated that *Blastocystis* is a stramenopile. Thus *Blastocystis* is neither a fungus nor a protozoan. *Blastocystis* is placed in a newly created Class Blastocystea in the Subphylum Opalinata, Infrakingdom Heterokonta, Subkingdom Chromobiota, Kingdom Chromista. This classification makes *Blastocystis* the first chromist known to parasitize humans. The stramenopile grouping of *Blastocystis* is rather unusual since the diverse group includes slime nets, water moulds and brown algae. *Blastocystis* is most closely related to *Proteromonas lacertae*, a flagellate of the hindgut of lizards and amphibian, although it does not posses any flagella. Based on the genetic distance between homologous genes, *Blastocystis* sp. from humans and animals can be potentially divided into 12 or more species. Nevertheless the speciation of *Blastocystis* remains a great challenge mainly due to its low host specificity. Studies on the association of a particular subtype with its pathogenic potential have produced conflicting results but subtype 3 is the most frequently reported to be associated with disease. Recent molecular studies have also provided evidence for the zoonotic and waterborne transmission of *Blastocystis* sp.

BS3

BLASTOCYSTIS HOMINIS INFECTION: COULD IT BE LINKED WITH CANCER?

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Previous evidences have shown that *Blastocystis hominis,* one of the most widespread intestinal protozoan parasites in humans, has a pathogenic role in causing intestinal inflammation. Studies have reported that parasitic infections trigger inflammatory processes to produce free radicals (namely reactive oxygen species or ROS) to kill the invading parasites. Excess of ROS can cause oxidative stress, a contributory factor of cancer. However, association of *B. hominis* with cancer is yet to be explored. Thus in present study, we aimed to investigate the effect of *B. hominis* on colorectal cancer. The study involves 3 areas: assessment of oxidative stress level in A) cancer patients with and without intestinal parasitic infection and B) *in vivo* model with *B. hominis* infection; C) *in vitro* study to evaluate the effect *B. hominis* towards the growth of colorectal cancer cells. Results showed that colorectal cancer patients (majority with *B. hominis* infection) exhibited high level of oxidative protein damage. Non-cancerous individuals with intestinal parasitic infections (majority with asymptomatic *B. hominis* infection) had high levels of oxidative damage to lipid and protein. Rats with asymptomatic *B. hominis* infection exhibited high levels of oxidative damage to lipid and protein. The pro-inflammatory cytokine levels in these rats were also elevated. These findings imply that *B. hominis* infection could cause significant oxidative burst which may lead to inflammatory processes. Moreover, *in vitro* study indicated that antigen from symptomatic isolate of *B. hominis* is more pathogenic compared to the asymptomatic isolate as it caused higher levels of inflammatory reaction and proliferation rate in colorectal cancer cells. In conclusion, the study has demonstrated that *B. hominis* can increase oxidative damage and enhance the growth of colorectal cancer cells. Hence, it is very important to include treatment procedures in patients with Blastocystosis.

BS4

BLASTOCYSTIS SP. IN WATER SOURCES: CURRENT CHALLENGES AND FUTURE DIRECTIONS

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Blastocystis sp. is a common intestinal parasite detected in many faecal surveys of humans and animals. To date, at least 16 studies have implicated contaminated water as a source of *Blastocystis* infection. Of which, two studies had successfully detected the parasite using polymerase chain reaction (PCR). The potential of *Blastocystis* sp. in causing a major outbreak must not be undermined due to its tiny size, resistance to chlorination and low infectious dose. The present paper will highlight some current challenges that we faced in studying *Blastocystis* sp. in water sources. Despite the accumulating evidence on its association with irritable bowel syndrome and urticaria, the pathogenicity of the parasite is still being debated. This has somehow hindered researchers from putting much effort in searching for the organism in water. Although the tiny and pleomorphic nature of the *Blastocystis* sp. faecal cyst have been previously described, its morphological appearance in water sources is yet to be studied. In addition, *Blastocystis* sp. has been confirmed to exhibit low host specificity, hence the cyst recovered from water sources could potentially infect humans. Since World Health Organization has in 2004 endorsed the inclusion of the detection of *Blastocystis* sp. into World Health Organization Guidelines for Drinking-water Quality (WHO GDWQ), there is an urgent need to devise an affordable, sensitive and specific method to detect and enumerate *Blastocystis* sp. cyst in water sources. There should be integrative efforts among public health officers, clinicians, laboratory scientists, policy makers and communities to cooperatively meet the challenges of this potential public health threat.

Students Oral Presentation (Postgraduates)

OP1

MOLECULAR AND MORPHOLOGICAL CHARACTERISATION OF MALARIA PARASITES IN ORANGUTANS FROM SABAH

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By using morphological methods, two malaria parasites were previously reported to occur naturally in orangutans, namely *Plasmodium pitheci* and *P. silvaticum*. Following analysis of the small subunit ribosomal (SSU r) RNA genes of *Plasmodium* in orangutans from Kalimantan, Indonesia, the authors of that study concluded that orangutans are infected with four species of *Plasmodium,* including *P. vivax* and *P. cynomolgi*. However, the phylogenetic analysis of the DNA sequences was flawed and no morphological descriptions were provided. In order to identify the different *Plasmodium* species occurring in orangutans, a molecular and morphological approach was therefore initiated. A total of 116 blood samples were collected from 40 different orangutans (27 captives and 13 semi-captives / wild) at the Sepilok Orangutan Rehabilitation Centre, Sabah. These samples were collected bi-monthly from the captive orangutans, and on occasions that semi-captive/wild orangutans were ill or injured, from March to November 2009. Screening for *Plasmodium* DNA using nested PCR assays indicated that seven of the 27 (25.9%) captive orangutans were malaria-positive at least once during the sampling period. Eight of the thirteen (61.5%) semi-captives/wild orangutans were malaria positive. The SSU rRNA and cytochrome *b* genes were amplified, cloned and sequenced. Phylogenetic analysis indicated that there are at least three, if not more, species of *Plasmodium* that infect orangutans. Thin blood films from one orangutan showed malaria parasites that appeared to be similar to *P. pitheci* parasites. However, molecular characterisation demonstrated mixed infections, thereby underscoring the importance of molecular methods for correctly identifying species of *Plasmodium*.

OP2

CYTOPATHIC EFFECT OF CLINICAL AND ENVIRONMENTAL ISOLATES OF *ACANTHAMOEBA SPP.* ON RABBIT KERATOCYTES

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Acanthamoeba keratitis (AK) is a sight-threatening infection, where patients' eyes were infected due to physical contact with this free-living amoeba from the environment. In this study, 4 clinical strains were isolated from corneal scraping of keratitis patients, while the environmental strains were isolated from aquatic and soil sources of four recreational locations in Malaysia. Identification of *Acanthamoeba* was based on Pussard and Pons classification of cyst morphology and phylogenetic analyses of the partial 18S ribosomal DNA sequences. Result revealed that *A. castellanii*, *A. culbertsoni*, *A. polyphaga* and *A. lenticulata* were detected within these samples. All clinical strains belonged to T4 genotype and both T4 and T5 genotypes were found in the environmental strains. Both axenised clinical and environmental strains were capable to lyse all the keratocytes after 24-hour co-incubation. Based on the study, these environmental isolates are most likely to be pathogenic and could be the potential risk factor of AK.

OP3

SARCOCYSTIS SPECIES IN MALAYSIA: A MOLECULAR CHARACTERIZATION USING DNA PROFILLING

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This study was carried to establish the DNA profile of *Sarcocystis* species found in wild rodents in Peninsular Malaysia. One hundred and forty six rodents belonging to 7 species trapped in the states of Johor, Selangor, Kelantan and Kedah were examined. Rodents as an intermediate host to *Sarcocystis* pose a public health. Studies have shown the prevalence rate of *Sarcocystis* in Southeast Asia to be high. Human infections with Sarcocystis spp. from rodents results in human muscular sarcocystosis, implicated with myalgia, erythematous subcutaneous nodules, fever, bronchospasm, cough, headaches, loss of appetite, weight loss and lethargy.

Hematoxylin and eosin (H&E) stained sections of the tissues from the wild rodents showed the presence of *Sarcocystis* species. In the study using light microscopy, a total of 146 thigh muscles were examined and 73 (50%) were found to be positive. Morphological observation showed that there may be 3 different species infecting these rodents. The brain sections were found not to contain any cysts. To identify the species present in these wild rodents, DNA extraction was carried out on paraffin embedded blocks of tissue using 5 prime archive pure DNA cell/tissue kit. DNA profiling was done for the identification of the different species. The results of the analysis will be reported at the conference.

OP4

MOLECULAR DETECTION OF *BARTONELLA HENSELAE* AND *B. CLARRIDGEIAE* (CAUSATIVE AGENTS OF CAT SCRATCH DISEASE) FROM ANIMAL ECTO-PARASITES IN MALAYSIA

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Bartonellosis is a newly emerging arthropod-borne infection which is caused by bacterial pathogens in the genus of *Bartonella*. *Bartonella henselae,* the causative agent of cat scratch disease, is found throughout the world in association with domestic and feral cats. However, data on human and animal infections of bartonellae (mainly *B. henselae and B. clarridgeiae*) have not been reported in Malaysia. In this study, we examined the presence of bartonellae in ectoparasites (209 fleas, 172 ticks and 177 lice) collected from cats and dogs in several locations in Malaysia. Using PCR assays, *B. henselae* and *B. clarridgeiae* DNA were detected from 25 (12%) and 40 (19.1%) fleas (*Ctenocephalides felis*), respectively. Five pooled ticks (*Rhiphicephalus sanguineus*) and four pooled lice (*Heterodoxus spiniger*) were also positive for *B. henselae.* Co-infection of *B. henselae* and *B. clarridgeiae* was noted in seven fleas. Bartonellae DNA was not detected from *Haemaphysalis* ticks and *Felicola subrostratus* lice tested in this study. Upon sequence analysis of the *pap31* gene fragment of *B. henselae*, two genogroups, i.e., Marseille and Houston-1 were detected, with genogroup Marseille (genotype Fizz) more predominantly found in 28(82.4%) of 34 *B. henselae*-positive ectoparasites.

OP5

COMPARISON OF ENTOMOFAUNA POPULATIONS ON CARCASSES PLACED ON THE GROUND AND AT HIGH RISE BUILDING IN KUALA LUMPUR, MALAYSIA

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Distribution of insect species at high elevation becomes more important, given the presence of huge numbers of high rise buildings in urban areas. Therefore, a study was conducted to investigate the distribution of forensically important entomofauna at high rise building in Kuala Lumpur, Malaysia. Two monkey carcasses were used. One was located at the top floor of Clinical Block of UKM Medical Centre (UKMMC) and another one was located at the ground level at the backyard of UKMMC as control. Both carcasses were monitored daily for 30 days. It was found that the decomposition process was slower for the carcass located at the top floor (approximately 130 feet height). Numerous entomofauna species were found on the carcass located on the ground, namely *Ch. megacephala, Ch. rufifacies, Ch. nigripes, Sarcophaga spp., Hemipyrellia sp., Hydrotea spp., Musca sorbens* and other insect species. For carcass located at the top floor, only three species of flies were found, which were *Synthesiomyia nudiseta, Sarcophaga* sp. and *Megaselia* sp. The difference in entomofauna distribution was most probably due to the ability of certain flies to reach high altitude and could survive with different types of environmental conditions. The above findings highlighted the importance of better understanding of fly behaviour and distribution in assisting forensic investigations, especially when death occurs at high rise buildings.

OP6

GENOTYPING OF *TOXOPLASMA GONDII* STRAINS ASSOCIATED WITH HUMAN TOXOPLASMOSIS: A CURRENT STATUS

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Toxoplasma gondii (*T. gondii*) is one of the most well-known protozoan parasites causing a disease called toxoplasmosis which infects many warm-blooded domestic and wild animals, including humans. Due to a complex life cycle of *T. gondii*, these combined of sexual and asexual cycles thus create an unusual population structure found in the host. Among the vast majority of *T. gondii* strains, the three main clonal lineages belong to type I, II, and III are predominately found in Europe and North America. In contrast, *T. gondii* isolates from human patients in South America represent polymorphic or divergent lineages. Unfortunately, there was very limited data on the association between *T. gondii* strains and human toxoplasmosis reported from Asia. It is postulated that infrequent sexual recombination, population and geographical origin have been influenced these differences in *T. gondii* strains. In human infections, type II strain is found in majority of cases which has thus far been reported in North America and Europe. However, the links between *Toxoplasma* genotype and severity of disease is still a matter of debate, particularly in patients with immunodeficiency. This review highlights the global distribution of *T. gondii* genotypes in associating with human toxoplasmosis, recent development on different methods of genotyping, and provides important implications on typing study in the management of human toxoplasmosis in the near future.

OP7

IMMUNE RESPONSES OF GOATS INFECTED WITH *TRYPANOSOMA EVANSI* TO INTRANASAL PNEUMONIC *MANNHEIMIA* VACCINATION

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A study was conducted to investigate the immunosuppressive effect of *Trypanosoma evansi* in goats given Intranasal Pneumonic Mannheimia (IPM) vaccination. Twenty male goats were divided equally into four groups. Groups 1 and 2 were inoculated intravenously with 10^4 trypanosomes / animal, while goats in groups 3 and 4 served as uninfected vaccinated and uninfected unvaccinated controls, respectively. Goats in group 2 were treated with diminazine aceturate two days before primary vaccination. Groups 1, 2 and 3 received intranasal spray of 1 ml of Pneumonic *Mannheimia* (IPM) vaccine on day 30 post infection (PI) and a booster dose on day 44 PI. On day 58 PI all goats were inoculated intratracheally with 4 ml of live *Mannheimia haemolytica* organisms (10^6/ml) each. Blood samples were collected weekly and analyzed for IgG levels using antibody-ELISA assay. All goats were killed on day 72 PI, lung lavage fluid was collected and analyzed for IgA levels, while lung lesions were assessed grossly. All goats became positive with *T. evansi* 4 to 6 days post infection. Group 1 remained positive throughout the experiment while Group 2 goats were negative 24 hours after treatment until the end of the experiment. All the goats survived the experiment except for one in group 3 which died before the challenge infection due to an unrelated cause. No significant difference ($P>0.05$) was found in lung IgA levels nor lung lesion scores between the groups. Although serum IgG levels between the four groups did not differ significantly, highest IgG level was detected in the vaccinated group with the lowest level in the *T. evansi*–infected group. Thus the IgG findings imply that *T. evansi* in the early stage of the infection compromised the immune response of intranasally vaccinated goats.

OP8

DEVELOPMENTAL RATE OF SCUTTLE FLY, *MEGASELIA SCALARIS* (LOEW) (DIPTERA: PHORIDAE) AT DIFFERENT LABORATORY TEMPERATURES

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This research observed the developmental data of a cosmopolitan scuttle fly *Megaselia scaris* (Loew) at selected laboratory temperature. *M. scalaris* was obtained from colony maintained in the Department of Biomedical Science Insectary, Universiti Kebangsaan Malaysia. Rearing took place in a digital growth chamber set at 27, 30 and 33ºC. Mean developmental time at 27ºC were: egg period, 15 hours (h); feeding larva period, 58.2 ± 2.5 h; postfeeding larva period, 23.0 ± 1.8 h for male and 19.3 ± 1.6 h for female; pupa period, 179.7 ± 6.9 h for male and 179.6 ± 5.8 h for female. Developmental time at 30ºC were: egg period, 13.5 h; feeding larva period, 59.5 h; postfeeding larva period, 12 h for male and 12.7 ± 2.8 h for female; pupa period, 176.1 ± 5.6 h for male and 175.3 ± 5.7 h for female. Developmental time at 33ºC were: egg period, 11.5 h; feeding larva period, 46.5 ± 2.8h; postfeeding larva period, 13.3 ± 2.6 h for male and 24 h for female; pupa period, 176.3 ± 7.8 h for male and 179.0 ± 3.5 h for female. Total developmental time of *M. scalaris* from egg stage to adult emergence at 27ºC was approximately 275.9 h (11.4 days) for male and 272.1 h (11.3 days) for female; at 30ºC, 261.1 h (10.9 days) for male and 261 h (10.9 days) for female; and at 33ºC, 247.6 h (10.3 days) for male and 261 h (10.9 days) for female.

OP9

GENETIC DIVERSITY OF *PLASMODIUM FALCIPARUM* ISOLATED FROM PENINSULAR MALAYSIA BASED ON MSP1 AND MSP2 GENES

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Malaria is still a public health problem in Malaysia. *Plasmodium falciparum* has been characterized based on their MSP genes in Southeast Asian countries. However, no much known about the population structure of *P. falciparum* in peninsular Malaysia. MSP1 (block2) and MSP2 (block3) genes of *P. falciparum* were genotyped from 36 samples collected from Pahang using nested PCR. The prevalence of RO33 and K allelic families were 38.7% and 35.5%, respectively. MAD20 allelic family had the lowest frequency (3.2%). Of the MSP2 allelic families, FC27 showed higher prevalence (12.9%) compared to 3D7 (9.7%). The complexity of *P. falciparum* infection was 1.6. It would seem that low complexity and distribution of the family alleles of MSP1 and MSP2 genes reflect the low intensity of malaria transmission in peninsular Malaysia.

OP10

BLASTOCYSTIS SP.: EVIDENCE OF ITS OCCURRENCE IN WATER SOURCES IN PENINSULAR MALAYSIA

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Blastocystis sp. is a common intestinal parasite found in faecal surveys. It affects 27 to 60% of people in developing countries. Sporadic and scanty studies have implicated its waterborne potential. Hence, it is important to mount a survey to access its occurrence in various water sources. This is essential as World Health Organization has endorsed the inclusion of *Blastocystis* sp. detection into World Health Organization Guidelines for Drinking-water Quality (WHO GDWQ). In this study, a total of 607 water samples including drinking water (308), filtered water (14), lake (37), pond (5), river (208), tap (33) and well (2) water with various volumes (0.5, 1, 5 and 10L) were collected from May 2008 to April 2010 in Peninsular Malaysia. Water samples were processed using centrifuge or flatbed membrane filtration system in order to obtain water sediment, which was subsequently subjected to *in vitro* cultivation. *Blastocystis* sp. was found in 13.8% (84/607) of the samples. From the samples detected positive for *Blastocystis* sp., 98.8% (83/84) were river water samples and 1.2% (1/84) was lake sample. The parasite was found in 39.9% (83/208) river water samples and 2.7% (1/37) lake sample but was not found in all other water samples (drinking water, filtered water, pond, tap and well water). This study suggests that river water could be the reservoir for waterborne transmission of *Blastocystis* sp. In conclusion, our study has successfully provided evidence of the occurrence of *Blastocystis* sp. in water sources. Hence, there is a need to design a systematic and affordable detection method to enumerate *Blastocystis* sp. in water sources.

OP11

RECOGNITION OF POTENTIAL ANTIGENIC PROTEINS FOR DIAGNOSIS OF AMOEBIC LIVER ABSCESS USING TWO DIFFERENT ANTIGEN PREPARATIONS

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Amoebic liver abscess (ALA) is the most common clinical manifestations of amoebiasis in human caused by an enteric protozoan, *Entamoeba histolytica*. This neglected disease has claimed about 100,000 lives and inflicted many more annually. Indirect hemeagglutination assay (IHA), Cellognost ® Amoebiasis (Dade Behring Marburg GmbH, Germany) is frequently used in diagnosis of ALA, but it is costly and not suitable to be used in mass screening of invasive amoebiasis, particularly in endemic developing nations. Thus, the objective of this study is to identify potential antigenic proteins from *E. histolytica* crude soluble antigen (CSA) and ether extract antigens (EEA) for the diagnosis of ALA by using experimentally infected hamster serum samples. Thirty Golden Syrian hamsters were each inoculated with 1 x 10^6 of *E. histolytica* trophozoites to produce ALA. Each animal was sacrificed with 3x overdose of pentobarbital and the cardiac-punctured blood sample was collected to obtain the serum. The CSA was prepared via sonication of trophozoites while the EEA was prepared by solubilizing the trophozoites using ether. Protein concentrations from both antigen preparations were then determined using Bio-Rad Assay. Subsequently, Western blot analysis on both CSA and EEA based on the hamster ALA serum samples revealed that the ~70kDa as a potentially important antigen for diagnosis of hamster ALA. In conclusion, this antigenic protein set the stage for further study in the diagnosis of human ALA.

OP12

HUMAN HYDATIDOSIS IN SUDAN: PREVALENCE AND STRAIN IDENTIFICATION

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Cystic echinococcosis (CE) is a zoonotic disease affecting mainly various species of livestock and humans. It is caused by metacestodes of dog tapeworms of the *Echinococcus granulosus* complex. Preliminary data about the prevalence of hydatidosis in different intermediate hosts in Sudan revealed that the disease occurs in all domesticated intermediate host species (camel, cattle, sheep and goats) with the highest infection rates in camels. Nevertheless, infection rates in humans are not very much clear. Moreover, new epidemiological data suggest a major influence of the locally prevailing parasite genotype/species. In this study, a previously described PCR system for species discrimination was used and the partial cox1 and nad1 genes of the obtained samples (5) were sequenced. As the origin of the patients is widely distributed over central, western and southern Sudan, the disease seems to occur sporadically in a large part of the country. All of five cysts samples were *E. canadensis* G6. It was suggested that this strain may have a lower pathogenicity to humans due to its sporadic occurrence. This is especially so, as all epidemiological conditions for autochthonous transmission of CE are given: In rural areas there are large numbers of dogs in and around villages, and infection can occur with offal from slaughterhouses or during unsupervised home slaughtering. Nevertheless, even if the parasite may have lower infectivity to humans, the infection can occasionally get established and progress to clinical CE and all samples from the patients in our study were viable and contained protoscolices.

OP13

MOLECULAR AND MORPHOLOGICAL CHARACTERISATION OF HAEMOSPORIDIAN PARASITES IN SMALL MAMMALS FROM SARAWAK

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Previous studies have shown that small mammals including bats and squirrels are natural hosts to two genera of haemosporidian parasites, *Hepatocystis* and *Plasmodium*. In Peninsular Malaysia, two *Hepatocystis* spp. and three *Plasmodium* spp. have been described in small mammals. A previous study to identify haemosporidian parasites in small mammals from Sarawak indicated that fruit bats and flying foxes were infected with *Hepatocystis* spp. The main objective of this study is to determine whether malaria parasites exist in other small mammals in Sarawak by using molecular and morphological methods. Forty-seven blood samples were collected from small mammals: 17 squirrels, 25 rats, 4 tree shrews and a mouse deer from four sampling sites in Sarawak. These samples were examined by nested PCR assay and five plantain squirrels (*Callosicurus notatus*) were positive using *Hepatocystis* and *Plasmodium*-specific primers. The small subunit ribosomal RNA (SSU rRNA) and cytochrome *b* (cyt *b*) genes were amplified, cloned and sequenced. Phylogenetic analysis based on the SSU rRNA genes showed the presence of two different clades, one closely related to *Hepatocystis* spp. while the other was closely related to *Plasmodium*. The cyt *b* gene sequences formed two monophyletic groups. Molecular data of SSU rRNA and cyt *b* gene sequences showed that *Hepatocystis* spp. and *Plasmodium* spp. tend to be host specific. Blood parasites from plantain squirrels were morphologically identical with *Hepatocystis vassali malayensis* from a plantain squirrel in Peninsular Malaysia. In conclusion, plantain squirrels from Sarawak are infected with *Hepatocystis* spp.

OP14

PHENOTYPIC AND GENOTYPIC CHARACTERIZATION OF *TRICHOMONAS VAGINALIS*

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The protozoan *Trichomonas vaginalis* causes vaginitis, urethritis and cervicitis in human and it is sexually transmitted. Nevertheless it is commonly asymptomatic in both men and women. The variable degree of pathogenicity of the parasite could possible due to its phenotypic and genotypic variations and it warrants further investigation. Hence this represents the first to establish the phenotypic and genotypic differences between the parasite isolates obtained from symptomatic and asymptomatic individuals. In this study, we obtained the parasites from 6 symptomatic patients and 4 asymptomatic individuals. Symptomatic isolates exhibited higher growth rate and peak parasite count compared to asymptomatic isolates in Hollander medium. We found that parasites in symptomatic isolates generally greater in size and tend to cluster together and this is not observed in all asymptomatic isolates. Symptomatic isolates consistently showed greater binding affinities to FITC-labelled Con A (*Canavalia ensiformis*) and acridine orange which may indicate differences in surface carbohydrate content and level of DNA activity respectively. DAPI staining exhibited multiple nuclei in a single cell of symptomatic isolates. Scanning electron microscopy revealed rougher surface in symptomatic isolates. Meanwhile transmission electron microscopy showed the abundance of perinuclear structure in hydrogenosome. We observed the multiple nucleated formations and this confirms the occurrence of multiple nuclear divisions in symptomatic isolates. Sequencing of the actin gene showed variations between these two groups of isolates. This study provides conclusive evidence on the existence of two different groups of *T. vaginalis* which differ both phenotypically and genotypically.

OP15

DETERMINATION AND PHYSIOCHEMICAL CHARACTERIZATION OF *IN VITRO* ANTIBACTERIAL ACTIVITY OF *LUCILIA CUPRINA* (WIEDEMANN) (DIPTERA: CALLIPHORIDAE) LARVAL EXTRACT AGAINST SELECTED PATHOGENIC BACTERIA

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This study was conducted to determine the *in vitro* antibacterial activity of *Lucilia cuprina* larval extract against seven selected diabetic wound pathogenic bacteria via four bioassays, namely, the turbidometric (TB) assay, colony-forming unit (CFU) assay, agar well-diffusion assay and minimum inhibitory concentration (MIC) assay as well as characterizing the physiochemical properties of *L. cuprina* larval extract via TB assay. TB assays demonstrated that *L. cuprina* larval extract was significantly potent against all bacteria tested ($p<0.001$). Additionally, CFU assay had affirmed that the larval extract was bactericidal against *Pseudomonas aeruginosa, Escherichia coli*, *Klebsiella pneumonia,* and to a lesser extent, against *Staphylococcus epidermidis* ($p<0.001$). On the other hand, agar well-diffusion assay also revealed the apparent potency of larval extract against the gram-negative bacteria, *P. aeruginosa* with formation of 19.6 ± 1.06 mm (n=10) inhibition zones. Furthermore, MIC assay had further substantiated the above results in which as little as 0.78 and 1.56 mg/ml larval extract were able to inhibit 58.57 ± 3.38% *P. aeruginosa* and 57.15 ± 3.43% *E. coli*. Besides, physiochemical characterization of the potency of *L. cuprina* larval extract via TB assays revealed that the freeze-dried or reconstituted larval extract was highly robust and able to withstand long-term storage (13 months) at -70ºC as well as demonstrated high thermal and freeze-thaw stability (n=5) without significant loss of antibacterial activity against all bacteria tested.

OP16

METRONIDAZOLE INCREASES SPIRAMYCIN PENETRATION TO BRAIN IN A MOUSE MODEL

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Background: At present, the treatment regimes of toxoplasmosis still fail to eliminate *Toxoplasma gondii* from the infected host, due to low brain penetration. Spiramycin, a macrolide antibiotic (P-glycoprotein substrate), tested effective against toxoplasmosis. Metronidazole, a nitro-imidazole antibiotic which inhibits the substrates of P450 (CYP)3a4 & P-glycoprotein. Hence, we developed a HPLC method for simultaneous analysis of spiramycin and metronidazole and to determine their interactions in plasma and brain of mouse model. LC separation done with Phenomenex C-18 (15 cm x 3.8 mm, 5 µm) column with mobile phase of acetonitrile-phosphate buffer at pH 2.5, flow rate of 1 ml/min, 29ºC and detected at 232 nm, in a gradient run. Validations were carried out based on inter- and intra-day variability, linearity, precision and accuracy. *In vivo* drug-drug interaction was performed in Balb/c mice. Twelve mice were dosed orally; four-metronidazole 500 mg/kg, four-spiramycin 400mg/kg and four-metronidazole 500 mg/kg and spiramycin 400mg/kg (30 min after metronidazole). The animals were euthanized 2h after the administration of spiramycin. Experiments were repeated by euthanizing the mice at different time points; 0.5, 1.0, 2.0, 2.5, 4.0, 6.0, 8.0, 10.0 and 12.0 hours. Brain and blood were obtained, processed and subjected to HPLC analysis. Results: Recovery was above 75%. Intra- and interday variability was within 15%. Range of linearity: 0.25–50.0 µg/ml, mean $r^2 = 0.999$. There was no matrix interference and the LLOQ was 0.25 µg/ml. In mice, the co-administration of spiramycin and metronidazole showed a 2-fold increase in brain spiramycin concentration compared to spiramycin alone. However there's no significant difference seen in the plasma spiramycin concentration. Conclusions: An effective HPLC method to simultaneously analyze metronidazole and spiramycin was developed. Metronidazole has enhanced the delivery of spiramycin into the brain, probably due to its role as P-glycoprotein inhibitor. This may render clinical benefit in the treatment of chronic cerebral toxoplasmosis.

Poster Presentation

PP1

THE EFFECTS OF TREM-1 PATHWAY INHIBITION ON PRO-INFLAMMATORY CYTOKINES RELEASE AND PARASITAEMIA DEVELOPMENT IN RODENT MALARIA

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TREM-1 functions as an immune regulator and inducer of pro-inflammatory cytokines release and it can amplify the inflammatory responses in many diseases. Since malaria infection is associated with the elevation of proinflammtory cytokines which gave rise to severe immunopathological reactions, we investigated whether modulating TREM-1 release pathway would have a positive impact on the major pro-inflammatory cytokines release during the infection and the impact on parasitaemia development. *Plasmodium beghei* infection in mice were used in this study. TREM-1 levels were measured systemically using ELISA methods. Parasitaemia were monitored by means of thin blood film stained with Leishman on microscope slide and viewed under light microscopy. TREM-1 release pathway in malarial mice was modulated using recombinant TREM-1/Fc chimera that antagonizes its action. Results showed that inhibition of TREM-1 caused significant decrease in the release of TNFα, IFNγ and IL-6 during the critical stage of the infection. The inhibition however resulted in a faster development of the parasitaemia. This suggests that TREM-1 pathway is involved in triggering the release of pro-inflammatory cytokines during malaria infection as its inhibition also resulted in the pro-inflammatory cytokines being inhibited. The increase in parasitaemia development was however a disadvantage to the earlier finding and may be due to the decrease concentration of TNFα and IFNγ that were thought to provide some inhibition on the parasite growth. Based on the current findings, further investigation is needed to evaluate TREM-1 as a potential chemotherapeutic target for malaria as the balance between the advantages and disvantages needs to be outweighed.

PP2

MODELLING THE EFFECT OF TEMPERATURE CHANGE ON THE EXTRINSIC INCUBATION PERIOD OF *PLASMODIUM*

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Development of the malaria parasite, *Plasmodium falciparum,* commonly recorded in Malaysia,is sensitive to temperature. The Intergovernmental Panel on Climate Change (IPCC) report has indicated Malaysian climate will experience an increase of 3-5ºC. Using computer models and the mid-value of 4° increase, the effect of this temperature change on the growth rate of *P. falciparum*is investigated at two environmentally different locations in Malaysia: Kuala Lumpur (KL) and Cameron Highlands (CH). A temperature model was first constructed based on sinusoidal submodelfor daytime and a decreasing exponential submodelfor the night. The model was run and the predicted temperatures weretested against Kuala Lumpur temperature and the fit was found to be good. The extrinsic incubation period (EIP) of *Plasmodium falciparum*at KL and CH was then calculated, using both the model predicted hourly temperaturewhich is variable, and the mean temperatureof the day (a fixed value). The EIP's from the computer simulations for KL, current hourly temperatures versus temperatureincreased by 4ºC were 11.88 and 10.75 days respectively, and for CH 37.50 and 17.29 days respectively. If the daily mean temperatures were used in the calculations (using the Detinova equation), the EIP's (currenthourly temperature versus a rise of 4ºC) for KLwere 11.02and 8.19days respectively, and for CH 36.23 and 17.06 days respectively. These results indicate EIP estimation using the mean daily temperature appears to be underestimated slightly. The values of R_0 (basic reproductive number, or number of cases of a disease that arise from one case of the disease introduced into a population of susceptible hosts) were also calculated. R_0 values for KL and CH are respectively 1.2X and 21X when the temperature was increased by 4ºC. In conclusion, an increase in temperature will have more significant effect in speeding up the EIP in a cooler place (eg CH) than in KL, resulting in a greater R_0, and consequently increasing the transmission intensity and malaria risk. These computer simulation studies indicate that a temperature change arising from the global climate change will likely affect the epidemiology of malaria in Malaysia.

PP3

PROTECTIVE IMMUNITY AGAINST *PLASMODIUM BERGHEI* LETHAL CHALLENGE ELICITED BY RECOMBINANT 19 KDA MEROZOITE SURFACE PROTEIN 1 (MSP1) IN ALUM

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A number of protective antigens have been identified in animal models utilizing several kinds of adjuvants, most of which are toxic and cannot be applied in humans. Furthermore, the purified antigens tend to lose immunogenecity. Therefore, an effective and safe adjuvant for human use is one of the keys for successful malaria vaccines. The merozoite surface protein 1 (MSP1) is one of the leading vaccine candidates at the erythrocytic stage. This molecule has been identified in almost all of the Plasmodium sp that infects humans, simians and rodents. In this study we have also evaluated the cross protective immunity of both the MSP1 *Plasmodium falciparum* and *P. berghei* MSP1. The rPbMSP1 formulated in alum was found to be immunogenic which induced high levels of specific anti-rPbMSP1 antibody. The IgG2a response predominated over that of IgG1 during the challenge infection in the vaccinated mice. Mice vaccinated with rPbMSP1 in alum mounted significant protective immunity against challenge infection ($P<0.01$). On day 121 after the booster, three out of ten mice immunized with rPbMSP1 in PBS survived parasite infection ($P < 0.05$). In contrast, eight out of ten mice and five out of ten survived respectively in those vaccinated with rPBMSP1 and rPFMSP1 in alum ($P < 0.01$). Hence, obvious protective effects of MSP1 in alum immunization prevented death from *P. berghei* lethal infection in mice ($P < 0.01$). There was significant cross-protection of rPfMSP1 against *P.berghei* challenge infection. In total these observations provide excellent basis for clinical assessment of protective immunity of MSP1 in human subjects. This mouse model in this study is a basis for screening vaccine candidate for the control of malaria which is estimated to be between 300 to 500 million clinical cases and 2.7 million deaths per year.

PP4

EXTENDED SURVIVORSHIP OF MOSQUITOES TREATED WITH SPACE-SPRAYED PYRETHROID FORMULATIONS

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Space spraying of pyrethroid formulations remains the main method used to control dengue vectors. Normally, mosquito mortality after space-spraying was determined 24 hours post-treatment. However, mosquito survival at extended post-treatment period and at different height needs to be re-assessed due to discrepancies in test and operational use of these formulations. In this study, mortality of *Aedes* was determined 24, 48, 72 and 96 hours at post treatment and at ground and at 1.5m height. A formulation of 1.7% cyfluthrin (AEDIS ULV15™) and 10.35% permethrin (AquaResigen™) was applied using an ULV portable generator against *Aedes* mosquito in a simulated field trial. Sucrose-fed and caged *Aedes aegypti* and *Aedes albopictus* adults aged 5-7 days were held at 1.5 m height and placed at 2 m intervals up to 14 m in a straight line at an open field together with MgO coated slides for collection of insecticide droplets for analysis. The insecticide was space-sprayed against the test mosquitoes according to standard WHO guidelines. The mortality of the mosquito was recorded in laboratory at 24. 48, 72 and 96 hours post treatment. Results showed that low mortality and recovery of mosquitoes were still occurring at 48, 72 and 96 hours post treatment. Approximately between 48 to 96 hours, 2-16% of *Ae aegypti* treated with cyfluthrin formulation whereas 1-24% of the mosquitoes treated with permethrin formulation recovered. Similarly, high percentage of *Ae albopictus* recovered especially those placed at the ground level. Hence these results indicated that not all knock down mosquitoes died at 24 hours which may recover and survive. There is thus a need to re-assess the post-treatment mortality determination.

PP5

MOLECULAR DETECTION OF *PLASMODIUM FALCIPARUM* CHLOROQUINE RESISTANCE IN YEMEN

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Chloroquine (CQ) is considered as a first-line for prevention and treatment of malaria and is widely used in Yemen. The chloroquine resistance (CQR) problem in Yemen is constantly growing since the detection of indigenous cases of *P. falciparum* CQR in 1989. This study was carried out to determine the prevalence of chloroquine resistance (CQR), based on *pfcrt* 76T mutation, in *P. falciparum* isolates from Yemen. The *pfcrt* is the *P. falciparum* chloroquine resistance transporter, which is a digestive-vacuole related transmembrane protein. Substitution of threonine (76T) for lysine (K76) at position 76 (K76T) in the *pfcrt* gene confers resistance of *P*. *falciparum* to chloroquine. The prevalence of *pfcrt* 76T mutation was high (66 of 81 isolates, i.e. 81.5%). High prevalence of *pfcrt* 76T was reported among age group > 10 years. Almost two- third of the mutation was reported in male (63.6%) as compared to female (36.4%). The prevalence in rural areas was higher than in urban areas. The resistance was significantly associated with younger age (d" 10 years), low household income and not using bednets. Non-educated individuals and not working showed protective association (OR = 0.24; 95% C1 = 0.07-0.78; P = 0.016 and OR = 0.14; 95% C1 = 0.02-1.16; P = 0.034, respectively) with resistance. By using logistic regression analyses, the age group d" 10 years and the low household income were significant with the CQR. This study revealed high prevalence of *pfcrt* 76T in the *P. falciparum* isolates, thus suggesting that this gene marker will be most predictive for chloroquine resistance in endemic areas. Surveys to determine the prevalence of *pfcrt* 76T will be useful in areas that still use CQ.

PP6

COMPARATIVE BIOEFFICACY OF TWO LONG-LASTING NETS, PERMANET AND OLYSET AFTER FIELD USE IN LAOS

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Long-lasting factory-impregnated bed nets are increasingly used in malaria control programme as a mean of personal protection against the anopheline vectors. Among these, two such nets, the PERMANET and OLYSET net are used in several malaria endemic countries. In Laos, more than 50,000 nets were distributed and used extensively in several provinces. The long-term effectiveness of these nets, however, needs to be evaluated. Fifty Permanet and 50 Olyset net were collected randomly from the Loatian households after using the bed nets for two years. The nets were sent to Institute for Medical Research (IMR), Kuala Lumpur for bioassay study. Each net sample on receipt at IMR, was stored immediately at 4ºC until used. Standard WHO tube bioassays were conducted to determine the effectiveness of these nets against *Anopheles maculatus*. The results indicated that PermaNet mosquito net showed higher bioefficacy compared to Olyset mosquito net. The adult mean mortality for PERMANET and OLYSET net was 99.17% and 81.07% respectively. There is no significant difference in the bioefficacy among the Permanet ($p>0.05$; $F= 0.67$) and among Olyset mosquito nets ($p>0.05$; $F=1.97$). However, highly significant difference was found in the bioefficacy between the Permanet and Olyset mosquito nets ($p<0.001$: $t=7.103$). These results demonstrated the long-lasting effects of these nets under field condition. However, there are many variables in the field that may affect the performance of these nets.

PP7

COMPARATIVE FIELD EFFECTIVENESS OF A CYFLUTHRIN AND PERMETHRIN SPACE-SPRAY FORMULATION AGAINST *AEDES* MOSQUITO

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A pyrethroid space spray formulation, AEDIS ULV15™ containing 1.7% cyfluthrin, currently has been utilized by some health authorities to control *Aedes* population. The objective of this study was to determine the field effectiveness of AEDIS ULV15™ compared to a 10.35% permethrin formulation (AquaResigen™) in controlling *Aedes* mosquito in a simulated field trial applied using an ULV generator (Fontan). Sucrose-fed and caged *Aedes aegypti* and *Aedes albopictus* adults aged 5-7 days were held at 1.5 m height and placed at 2 m intervals up to 14 m in a straight line at an open field together with MgO coated slides for collection of insecticide droplets for analysis. The insecticide was space-sprayed against the test mosquitoes according to standard WHO guidelines. The mosquito knockdown rate was recorded at 20, 40 and 60 minutes post-treatment. Mortality of the mosquito was recorded in laboratory 24 hours post-treatment. At 4, 6, and 8 meter distances, complete mortalities of both *Ae aegypti* and *Ae albopictus* treated with permethrin were recorded, whereas complete mortality was only observed in *Ae aegypti* treated with cyfluthrin at 6 m distance. Droplet analysis indicated presence of ULV droplets and the ratio of VMD/NMD for cyfluthrin and permethrin formulations were 0.65 and 0.75, respectively, indicating fairly uniform distribution of droplet sizes. This limited simulated field study indicated that the permethrin formulation was more effective against *Aedes* mosquito.

PP8

A NOVEL MOSQUITO FEEDING SYSTEM FOR ROUTINE BLOOD-FEEDING OF *AEDES AEGYPTI* AND *AEDES ALBOPICTUS*

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Vector-borne disease research often requires maintenance of laboratory colonies of vectors. Blood feeding of mosquitoes is thus required for the maintenance of these colonies. Due to high cost and inconvenience of using live animals as blood hosts, we developed a simple and user friendly blood feeding system for artificial feeding the mosquitoes. The system consists of collagen membrane casing and an in-house developed heating device. We carried out a parallel study between the membrane blood feeding system and the guinea pig feeding method. Eight generations of *Aedes aegypti* and three generations of *Aedes albopictus* were tested. Four parameters, namely, blood feeding rate, fecundity, survival rate and hatchability were monitored. For *Aedes aegypti*, the results showed that there is a significant difference in the feeding rate between the membrane feeding and the guinea pig feeding methods (P = 0.012). However, there were no significant difference in the fecundity (P =0.556), survival rate (P=0.715), and hatchability (P=0.932). Although, the feeding rate (85.3%) of membrane feeding method is significantly lower compared to the rate (96.2%) of guinea pig feeding, the percentage were at an acceptable level of 80% . For *Aedes albopictus,* the results showed there is no significant difference between the two feeding methods (feeding rate P=0.068, fecundity P=0.887, survival rate P=0.580 and hatchability P=0.564). Hence, we conclude that this collagen membrane blood feeding system can be used for routine colonization of laboratory strains of *Aedes aegypti* and *Aedes albopictus*.

PP9

ENTOMOLOGICAL SURVEILLANCE FOR MALARIA

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Entomological surveillance for malaria is challenging as the preferred habitats of *Anopheles* species are frequently inaccessible. Vector investigation of malaria outbreak is crucial to pinpoint the right *Anopheles* species so that appropriate vector control measures can be instituted to impede transmission. In this study, we compared the species of mosquitoes between larval and adult surveillance. Larval surveillance were performed within assessable sites from 9 am to 1pm while adult surveillance was carried out using CDC-Light Traps (LT), BG-sentinel traps augmented with CO_2, Human-Baited Net Trap (HBNT) and Human Landing Catch (HLC) from 7 pm till 12am. Here we describe two case studies: one in mainland Singapore, and the other on an off-shore island. On the mainland, larval surveys in ponds with brackish water produced only 2 species *Culex sitiens* and *Anopheles epiroticus*. However, more than 15 species were collected during adult surveillance around the breeding sites. *An. sinensis* (>20%) was the major *Anopheles* species and surprisingly no *An. epiroticus* was collected. On the off-shore island of Singapore, larval surveys yielded no *An. epiroticus* and 14% of the larvae were *An. barbirostris.* However, *An. epiroticus* was the major *Anopheles* species collected during the adult surveillance, constituting 19% of the total mosquitoes caught. HLC was the most sensitive adult surveillance technique and LT was the best mechanical trap. This study shows that entomological surveillance must incorporate larval and adult surveillance to enable a more holistic understanding of the mosquito population on site.

PP10

BIOCHEMICAL MECHANISMS OF *AEDES AEGYPTI* IN SINGAPORE

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The primary approach to control vector-borne diseases rely mainly on the application of insecticides. The prolonged usage of insecticides may cause rapid development of insecticide resistance in many insect species including mosquitoes. *Aedes aegypti* has been known to develop resistance to insecticides in Singapore. The objective of the current study is to determine resistance/susceptibility status of *Ae. aegypti* from historical and new sensitive dengue areas in Singapore. Biochemical studies of F1 mosquitoes reared from ovitrap collections were carried out using WHO microplate assays to determine the enzymes activities in individual mosquitoes. The enzymes tested were acetylcholinesterase (AchE), non-specific esterases (α- and β-esterases), glutathione S-transferases (GST) and mixed-function oxidases (MFO). There were significantly increased ($p<0.05$) levels of altered AchE in adult *Ae. aegypti* in all populations ($n=170$) but not in larval stage ($n=223$). Larvae from all populations had elevated non-specific esterases activities. No evidence of α- and β-esterases activities were found in adult mosquitoes. No significant ($p>0.05$) elevated GST activities were identified in all populations except Clementi strain (new sensitive area). Only Ang Mo Kio strain (historical sensitive area) showed elevated MFO enzyme levels (associated with pyrethroid resistance) in larval stage. The results suggest that *Ae. aegypti* is developing lowered susceptibility to organophosphates. Further investigation with bioassays and synergists' studies are needed to provide direct evidence for the mechanism involved.

PP11

USING SATELLITE IMAGERY FOR MAPPING MALARIA TRANSMISSION RISK AREA IN POS LENJANG, PAHANG

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Understanding local variability in malaria transmission risk is critically important when designing malaria vector control programme. Using a combination of field data, satellite image analysis and GIS technique we developed a map of malaria transmission risk area in Pos Lenjang. Entomological surveys which consisted of adult collection and larval survey were conducted to determine the type of mosquitoes, their characteristics and the abundance of habitats. Features like rivers, small streams, forest, vegetation areas, roads and residential area were extracted from the satellite image. Base topographical maps of the site were digitized and overlaid with entomological data. All digital data in the GIS were displayed in the WGS 1984 coordinate system. The results showed that *An. maculatus* prefer to breed in clear rock pool form on the bank of river and water falls. Map of villages with 400 m buffer zone visualizes that more than 80% of *An. maculatus* immature habitats were found within the buffer zone. Changes in breeding characteristics were also observed. In addition, adult population studies showed that a total of 1,435 adult mosquitoes were collected by human landing catching technique from 17 mapped villages. *Anopheles maculatus* Theobald (31.01%), *Armigeres flavus* Leicester (11.29%), *Armigeres annulitarsis* Leicester (11.01%), *Culex vishnui* Theobald (9.55%) and *Aedes albopictus* Skuse (7.04%) were the predominant species caught in the study area. As for larval survey studies, Anopheline and Culicine larvae were collected and mapped from 79 and 67 breeding sites respectively. Satellite imagery is a useful tool in mapping malaria risk areas and planning of an effective control programme.

PP12

COMPARATIVE DISPERSAL AND LONGEVITY OF FIELD AND LABORATORY MALE *AEDES AEGYPTI* STRAINS DETERMINED BY MARK-RELEASE-RECAPTURE EXPERIMENT

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Mark-Release-Recapture (MRR) experiments have been used for several decades to study longevity and horizontal dispersal of mosquitoes. This paper compares field and laboratory strains of male *Aedes aegypti* mosquitoes in terms of their dispersal and longevity. The study was conducted in Melaka consisting predominantly of residential single-storey terraced houses. 4-6 old males were released and BG-Sentinel® adult traps were used to recapture them over a 7-day period. Flourescent powder was used to mark the two strains with different colours. A total of 1,957 and 5,942 males were released from field and laboratory strains respectively, and similar recapture rates (0.31% vs 0.32%) were obtained. Dispersal was estimated in terms of median dispersal, mean distance travelled, and 'flight range 90' (distance from the release point within which 90% of the released mosquitoes are expected to be found). The field strain had higher values for these parameters (87m, 130m, 190m) compared to the laboratory strain (22m, 54m, 115m) indicating that the former has better dispersal capacity. Field strain also had higher daily survival probability (0.74) compared to laboratory strain (0.67), although bootstrap analysis didn't reveal any significant difference between strains. Wing measurements showed that the field strain males were bigger (although reared under same initial conditions) which could be a likely explanation for its higher dispersal capacity. These MRR experiments give us valuable information on male *Aedes aegypti*'s behaviour in its natural habitat, which can be useful in setting up Sterile Insect Technique (SIT) programmes as part of integrated vector control.

PP13

ENTOMOLOGICAL INVESTIGATIONS OF CHIKUNGUNYA INFECTIONS IN THE STATE OF KELANTAN, MALAYSIA IN 2009

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Chikungunya infection has become a public health threat in Malaysia since the 2008 nationwide outbreak. At the same time *Aedes albopictus* Skuse was identified as the chikungunya vector in the state of Johor. In 2009, several outbreaks were reported in the state of Kelantan and entomological studies were conducted in the state, in four districts, namely Jeli, Tumpat, Pasir Mas and Tanah Merah in order to identify the vector responsible for the transmission of chikungunya. CHIKV case records were obtained from the Kelantan State Health Department and the localities involved were identified. Both larval and adult mosquitoes were sampled and transported back to the laboratory. The presence of the virus was determined using reverse transcriptase PCR. A total of 1,245 mosquito larvae were collected during the larval survey and 2,019 adult mosquitoes were collected using an aspirator. From these collections, 640 mosquito pools were tested for the presence of CHIKV by RT-PCR. *Ae albopictus* was the most abundant mosquito collected, followed by *Culex* sp., *Armigeres sp.* and *Anopheles sp*. A total of 2, 814 artificial containers were inspected during the study. The House Index (HI) in Jeli was 8.33%, Tanah Merah 6.45% and Pasir Mas 8.44%, container index (CI) was 33.33%, 7.44% and 10.61%, respectively, while the Breteau Index (BI) was 8.71, 8.39 and 8.44, respectively. None of the mosquito samples were positive for the chikungunya virus; therefore the vector(s) of chikungunya virus in the present localities could not be determined.

PP14

IMMUNOGENICITY OF NEWCASTLE DISEASE VIRUS CAPSIDS DISPLAYING THE EV71 VP1 FRAGMENT IN MICE

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Enterovirus 71 (EV71) is a member of the *Picornaviridae* family. It is one of the viruses which cause hand, foot and mouth disease (HFMD). In recent years, several outbreaks of HFMD due to EV71 with severe neurological complications and significant mortality have been reported. Despite the serious threat, no effective EV71 vaccine is available. Recently, we reported an induction of strong immune response to a recombinant Newcastle disease virus (NDV) capsids displaying EV71 VP1 fragment (NPt-VP1$_{1-100}$) in rabbit. The high immunogenicity suggests that this protein serves as a good candidate for EV71 vaccine. However, since all EV71 animal models thus far are developed in mouse systems, protective efficacy of this vaccine can only be tested in mice. Therefore, to investigate mice immunogenicity to the NPt-VP1$_{1-100}$, we evaluated the type of immune responses developed by adult Balb/c mice against the protein. NPt-VP1$_{1-100}$ protein induced high levels of anti-VP1 IgG production in the mice. Purified VP1 antigen stimulated activation, proliferation and differentiation of splenocytes harvested from the immunized mice. They also produced significant levels of Th1 cytokine, IFN-γ. Taken together, NPt-VP1$_{1-100}$ protein is a potent immunogen in adult mice and our findings will provide the data needed for testing of its protective efficacy in mouse models of EV71 infections.

PP15

BLASTOCYTIS HOMINIS IN COLONIC LAVAGE SAMPLES FROM COLORECTAL CANCER PATIENTS

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Colorectal cancer (CRC) is a major cause of death worldwide. Although its incidence is higher in developed countries, it is increasing rapidly in many parts of Asia, including Malaysia. A recent study implicated Blastocystis *hominis* (*B. hominis*) in triggering CRC. *B. hominis* is commonly found in human and animal stool samples, and is spread by water-borne transmission. In this study, colonic lavage fluid from 30 CRC patients were collected and screened for *B. hominis* and other parasites. The patients were asked to complete a questionnaire comprising various aspects to evaluate their lifestyle. The samples were spun down and the sediments were cultured in Jones medium supplemented with 10% heat-inactivated horse serum. They were then further incubated at 37ºC and screened for *B. hominis* after 24 hours. DNA was also extracted from the sample for genotyping purposes. Formal-ether concentration technique was carried out on the remaining sample to screen for other parasites. All 30 samples cultured in Jones medium were negative for *B. hominis*. However, PCR amplification with specific primers from the extracted DNA showed 3 samples positive for sub-type 3 (10%), 2 samples positive for sub-type 2 (6.7%) and 1 for sub-type 4 (3.3%). Modified trichrome stain (MTS) showed 3 samples positive for *Microsporidium* sp. This study provides evidence that apart from stool samples, colonic lavage could also be used for detecting *B. hominis*.

PP16

BLASTOCYSTIS HOMINIS AND MICROSPORIDIA AS OPPORTUNISTIC INFECTIONS IN CANCER PATIENTS

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Cancer patients undergoing chemotherapy are known to have immunosuppression that could trigger latent parasitic infections in stools to emerge. However reports of such possibilities in cancer patients are still scanty. This study aimed to investigate if intestinal parasites could emerge as opportunistic infections in breast and colorectal cancer patients (n=46 and 15 respectively) by screening them throughout the chemotherapy treatment regimes for 6 months. Breast cancer patients were on FEC (5-Fluorouracil/Epirubicin/Cyclophosphamide) regime (comprising 6 chemotherapy cycles); colorectal cancer patients were either on FOLFOX (Oxaliplatin/5-Fluorouracil/Folinic acid) or Mayo (5-Fluorouracil/Folinic acid) regime (comprising 12 and 6 cycles respectively). Three urinary oxidative indices were measured to study the treatment effect towards free radical damage. Based on the questionnaires given the patients' lifestyle, diet intake and home dwellings were unchanged throughout the chemotherapy regime. Stool examinations of the cancer patients showed negative for any intestinal parasitic infections prior to the chemotherapy. However, the patients were positive for *Blastocystis hominis* and microsporidia infections during the intermediate chemotherapy cycles (cycle 2 - 4 out of 6 cycles and cycle 5 - 9 out of 12 cycles). This correlated with the increase of patients' oxidative indices level during the intermediate cycles suggesting that oxidative damage which is known to cause immunosuppression may result in opportunistic infections. Therefore, cancer patients undergoing chemotherapy should be screened repeatedly for intestinal parasites namely *B. hominis* and microsporidia. This is because the infection by these parasites may intensify the free radical mediated damage which could reduce the efficacy of chemotherapy treatments.

PP17

HIGH FREQUENCY OF MIXED SUBTYPE INFECTIONS OF *BLASTOCYSTIS* SP. IN AN ABORIGINE COMMUNITY AT PAHANG, MALAYSIA

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Blastocystis sp. is one of the most common intestinal parasites of human. This represents the first study to determine the genetic diversity of *Blastocystis* sp. among a community of aborigine people in Malaysia. A total of 58 out of 151 individuals (38.4%) were found positive for *Blastocystis* sp. by *in vitro* cultivation. *Blastocystis* sp. isolates obtained were genotyped by PCR using seven pairs of known sequenced-tagged site (STS) primers. Out of the 58 isolates, 41 were identified as one of the known subtypes and mixed subtype infections were found in 15 (25.9%). Subtype 1 was most frequently found, followed by subtype 3 and 5. The occurrence of high frequency of mixed subtype infections in the community may indicate active transmission of *Blastocystis* sp. and hence the modes of the transmission warrant further investigation.

PP18

RECOVERY OF *BLASTOCYSTIS* SP. CYSTS: FLATBED MEMBRANE FILTRATION SYSTEM VERSUS CENTRIFUGATION

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Blastocystis sp., an intestinal parasite, has recently been implicated as a waterborne parasite. However, there is a lack of protocol describing its recovery from water sources. Therefore, the main aim of this study was to evaluate *Blastocystis* sp. cysts recovery using two methods, namely, flatbed membrane filtration system and centrifugation. In flatbed membrane filtration system, water samples seeded with a range of *Blastocystis* sp. cysts (2.2- 10.0 X 10^5 cysts) in 1L distilled water in a polyethylene beaker was filtered at 250ml/min using flatbed membrane filtration system. Cysts were recovered by scrapping the surface of membrane filter using 10ml phosphate buffered saline (PBS) as the eluting buffer followed by centrifugation at 1,400xg for 10 min. In centrifugation method, water samples seeded with a range of *Blastocystis* sp. cysts (1.4- 2.8 X 10^5 cysts) in 1L distilled water in a polyethylene beaker was centrifuged at 1,400xg for 10 min to obtain cysts. All recovered cysts from two methods were enumerated by trypan blue dye exclusion counts using a haemocytometer. Overall, recovery range for flatbed membrane filtration was 63.0% – 82.0% while centrifugation was 54.5% – 63.6% with mean recovery as 71.1±5.9% and 59.8±6.4%, respectively. Based on cost benefit analysis on both the methods, we recommend that it is more cost effective to process small volume of water samples ($\leq$ 1L) using centrifugation while it is advisable to use flatbed membrane filtration for larger volume of water samples ($\geq$ 5L).

PP19

BLASTOCYSTIS HOMINIS IN COLONIC LAVAGE SAMPELS FROM IRRITABLE BOWEL SYNDROME PATIENTS

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Blastocystis hominis (*B. hominis*) is one the most common intestinal parasites found in the intestinal tract of humans and animals. Irritable bowel syndrome (IBS) is associated with changes in bowel habits along with abdominal pain due to functional gastrointestinal disorder. The aim of this study is to screen for *B. hominis* in colonic lavage collected from 30 confirmed IBS patients based on Rome criteria III. The samples were collected from Endoscopic Unit, University Malaya Medical Centre. The samples were spun down and the sediments were cultured in Jones medium supplemented with 10% heat-inactivated horse serum. They were then further incubated at 37ºC and screened for B. *hominis* after 24 hours. DNA was also extracted from the sample for genotyping purposes. Formal-ether concentration technique was carried out on the remaining sample to screen for other parasites. All 30 samples were negative for *B. hominis* using direct microscopy and *in vitro* culture method. 5 IBS patient samples were positive for *B. hominis.* Out of 5 patients, 3 were *Blastocystis* sp. subtype 3 (6.7%) and 2 were *Blastocystis* sp. subtype 2 (6.7%) and 0 (0%) for subtype 4. This finding shows that there is a need to screen for more colonic lavage samples from IBS patients to detect *B. hominis*.

PP20

INFLUENCE OF PRESERVATIVE ON STAINING TECHNIQUES FOR *BLASTOCYSTIS SPP.*

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The choice of preservatives, when collecting stools are important, when staining is considered of faecal smears. The influence on staining of *Blastocystis* was assessed on parasites from stools spiked with *Blastocystis* and preserved using 10% formalin, 70% alcohol and polyvinyl alcohol (PVA) respectively. For each preservative fecal smears were made in triplicates and stained respectively with Fields', Giemsa and Trichome stains. A human isolate of *Blastocystis* grown at 37ºC were used to spike human stools. These spiked stools were kept at room temperature and 4ºC respectively to assess if temperature can influence staining contrasts. Staining characteristics included morphology, clarity of nuclear and cytoplasmic details, overall colour contrast and the ease to differentiate and detect *Blastocysti*s from faecal debris. The results showed that staining contrasts and clarity from stools persevered in 70% alcohol were comparable with that of smears made from 10% formalin. Giemsa and Fields' stains showed similar contrasts, however Fields' stain as previously reported, had shorter staining time. Storage at 4ºC has been shown not to interfere with staining contrasts from both 10% formalin and 70% alcohol preservative. The study recommends that the 70% alcohol can be used as a preservative and since the staining contrasts are comparable to that preserved in 10% formalin, it is suggested that stools be collected in 70% alcohol as the preservative confers the advantage of exploiting the samples for future molecular studies.

PP21

DRUG RESISTANCE OF BLASTOCYSTIS HOMINIS: WHAT COULD THE MECHANISM BE?

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Blastocyctis hominis is an intestinal parasite that may cause abdominal pains and diarrhea. Infections by *B. hominis* are usually treated with nitroimidazole drug which is metronidazole. However, there are cases reported where *B. hominis* are resistant towards the drug. To date, research on the gene responsible for the drug resistance in *B. hominis* has not been explored. Understanding the underlying mechanism of this drug resistance may help in the treatment of infected patients. Reports have shown that intestinal bacteria and protozoan parasites namely *Helicobacter pylori*, *Giardia lamblia*, *Entamoeba histolytica* are treated with metronidazole. However, there have been reports on resistance towards metronidazole in these microorganisms. Resistance of metronidazole in *H. pylori*, *G. lamblia* and *E. histolytica* have been suggested to be triggered by the factors such as down regulation of hydrogenosome or mitrochondrion like organelles (MLO), aerobic and anaerobic environment, prolonged exposure to drug treatment, expression of specific genes, and mutation of specific genes. It has also been reported that mutations in certain nitroreductase gene could be responsible to confer resistance in *H. pylori*. Besides this, metronidazole resistance activity in *G. lamblia* and *E. histolytica* are due to oxygen-insensitive nitroreductase (ntr) and nitroimidazole reductase (NIMs) recombinant gene, and different level of NADH and NAD(P)H oxidase activity. Investigation on resistance of *B.hominis* towards metronidazole is still lacking. All the above mentioned evidences indicate that, there are possibilities for drug resistance in *B.hominis* to be similar with the mechanism found in *H. pylori* and *E. histolytica*. This will be further discussed in the present study.

PP22

APOPTOSIS IN *BLASTOCYSTIS HOMINIS*

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Apoptosis, a form of programmed cell death (PCD) in unicellular parasites have been previously reported. Previous report showed human intestinal protozoan parasite *Blastocystis hominis* upon exposure to metronidazole, have displayed morphological and biochemical features of PCD. The rate of apoptosis in *B. hominis* in drug treated organisms however has not been established. This present study demonstrates the rate of apoptosis of the *B. hominis* at different drug concentrations. Culture tubes containing *B. hominis* were treated with 0.0001 and 1.0 mg/ml metronidazole respectively and monitored for a period of 96 hr before introducing the respective viable parasites into drug-free fresh growth medium. The results showed that the apoptosis rate was higher in *Blastocystis* treated with 0.0001mg/ml in contrast with 1.0mg/ml. However at the 48th hour of culture, the apoptosis rates in culture tubes containing both the concentrations were reduced respectively. When the treated parasites from both concentrations when harvested from 96 th hr of culture were introduced into fresh drug-free medium, the number of apoptotic cells in both concentrations of drug increased respectively. In conclusion, drug treated *B. hominis* when re-cultured in fresh medium showed higher rates of apoptosis. Whether these drugs treated cells have gained resistance or have further changes at the biochemical level remains uncertain. The study further implies the need to review the choice of drugs against *Blastocystis* as drug treated organisms have been shown to influence viability and rate of apoptosis.

PP23

ELUCIDATION OF BIOCHEMICAL PROPERTIES IN TROPHOZOITES AND 'PSEUDOCYSTS' OF *TRICHOMONAS VAGINALIS* FROM ASYMPTOMATIC AND SYMPTOMATIC ISOLATES

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This present study examines the different biochemical properties found in trophozoites and 'pseudocysts' of *Trichomonas vaginalis* in asymptomatic and symptomatic isolates. Modified Fields'stain, acridine orange and DAPI staining were used to examine the distribution and intensity of nuclear material. Nucleus in trophozoites from symptomatic isolates showed lesser staining intensity when stained with both acridine orange and DAPI. The wall of trophozoites in symptomatic isolates stained less intensely with FITC-ConA when compared to asymptomatic isolates suggesting a pathogenic role for these lifecycle stages. However nucleus, in 'pseudocyst' from symptomatic isolates showed brighter blue and green fluorescence when stained with DAPI and acridine orange respectively when compared to 'pseudocysts' in asymptomatic isolates. DNA distribution and intensity also showed strong variation between these forms. These differences could be correlated to the ultrastructual description. The study confirms that phenotypic differences exist at the biochemical level between parasites from symptomatic and asymptomatic patients.

PP24

PREVALENCE AND GENOTYPIC IDENTIFICATION OF *TRICHOMONAS VAGINALIS* FROM MALAYSIAN SAMPLES

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Trichomonas vaginalis is a trichomonad species found in genitourinary tract of human which causes trichomoniasis. Sexual transmission was considered as its mode of transmission. In the present study, a total of 695 vaginal secretion samples from patients who came for routine Pap smear and sexually active women with complaints of vaginal discharge were examined to detect *T. vaginalis* infection. 9% (n=467) of patients were asymptomatic and 32.81% (n=228) were symptomatic. 11 positive cases (1.58%) of *Trichomonas vaginalis* were found and out of that 6 patients had cervical intraepithelial neoplasia (CIN3) and 4 cases were asymptomatic cases. The prevalence rate of Trichomoniasis in our study population is 1.58%. The 6 symptomatic isolates and 4 asymptomatic isolates were genotyped using nested PCR method. Nested PCR amplified actin gene of *T. vaginalis*. Nested PCR offers a sensitive and specific method for molecular typing of *T. vaginalis*. Further confirmation of sequencing was obtained to show the genotypic differences between symptomatic and asymptomatic isolates. Results indicated that there were genetic differences between symptomatic and asymptomatic isolates of *T. vaginalis*. The present study suggested that genotypic differences revealed the pathogenic variations potential infect human.

PP25

SURFACE DIFFERENCES IN TROPHOZOITES AND 'PSEUDOCYSTS' OF *TRICHOMONAS VAGINALIS* FROM ASYMPTOMATIC AND SYMPTOMATIC ISOLATES

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We obtained the flagellated protozoan *Trichomonas vaginalis,* which causes trichomoniasis from vaginal swabs of symptomatic and asymptomatic female patients at a local clinic. Scanning electron microscopy provided an opportunity to study the surfaces of three-dimensional images of trophozoites and 'pseudocysts' in asymptomatic and symptomatic isolates. The trophozoites of asymptomatic isolates showed a smooth surface with few fine micropores as compared to the trophozoites from symptomatic isolates which showed rough surface with numerous deep micropores. Numerous amoeboid forms with many rough crater-like depressions were seen in trophozoites from symptomatic isolates. These forms were found attached together implying that their surfaces were sticky. 'Pseudocyst' from asymptomatic isolates showed a less smooth surface as compared to the trophozites of the same without any obvious noticeable micropores as compared to the 'pseudocyst' from symptomatic which showed rough surface, less micropores and attached to another implying that the surface is sticky. 'Pseudocyst' from asymptomatic isolates did not show any flagella, had smooth surface, with lesser surface crater-like depression as compared to `pseudocysts' from symptomatic isolates which showed more surface crater-like depressions. Therefore, our results imply that phenotypic differences at the surface level indicate that there were differences between trophozoites and 'pseudocysts' of *T. vaginalis* in both asymptomatic and symptomatic isolates.

PP26

ULTRASTRUCTURAL DIFFERENCES IN TROPHOZOITES AND 'PSEUDOCYSTS' OF *TRICHOMONAS VAGINALIS* IN ASYMPTOMATIC AND SYMPTOMATIC ISOLATES

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We have used transmission electron microscopy to describe ultrastructural differences of trophozoites and 'pseudocysts' of *T. vaginalis* from asymptomatic and symptomatic isolates. We analyzed the morphology and sizes of nucleus, hydrogenosomes, vacuoles, cell membranes and flagella of three isolates each of symptomatic and asymptomatic *T. vaginalis* isolates. The nucleus of trophozoites in symptomatic isolates showed large chromatin masses as compared to asymptomatic isolates. Symptomatic isolates also showed more hydrogenosomes within a single peripheral vesicle, more vacuoles with residues of digested particles and more budding-like formation. However there were no distinguishing characteristics seen in the flagella from both isolates. The 'pseudocyst' from symptomatic isolates showed similar characteristics with that of the trophozoites except that the membrane showed higher invagination and folding as compared to asymptomatic isolates. The hydrogenosomes were more rounded in symptomatic isolates. Both isolates showed more vacuoles with residues digested particles. Flagella were not seen in `pseudocysts' from both symptomatic and asymptomatic isolates. The study confirms that there are phenotypic differences at the ultrastructural levels for both trophozoites and 'pseudocyst' obtained from asymptomatic and symptomatic isolates.

PP27

STUDIES TO ASSESS THE EFFECTS OF *TRICHOMONAS VAGINALIS* ON HUMAN VAGINAL EPITHELIAL CELL AND CERVICAL CANCER CELL

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Trichomonas vaginalis has been associated with cervical cancer. Therefore, the present study investigated the differences between the effects of asymptomatic and symptomatic solubilised antigen of *T. vaginalis* on the cell viability and proliferation of peripheral blood mononuclear cell (PBMCs), human vaginal epithelial cell (HVEC) and cervical cancer CaSki cell (CaSki). We found that *T. vaginalis* antigen from both asymptomatic and symptomatic isolates caused inhibition of PBMCs indicating that the soluble antigens possessed the capability to suppress immune cell activity. On the other hand, *T. vaginalis* antigen from-both the isolates induced the HVEC proliferation. This implicate that *T. vaginalis* may own the ability to modify the normal growth of vaginal epithelial cells to become hyper proliferative, which is the early step in carcinogenesis. Besides this, CaSki cells exposed to *T. vaginalis* antigen showed a very mild proliferative activity (<10%) leads to a speculation that it may, to a certain extent exacerbate the cervical cancer cell growth. However this will be further confirmed and discussed by investigating the expressions of tumor promoting genes.

PP28

MOLECULAR CHARACTERIZATION OF *GIARDIA DUODENALIS* ISOLATES FROM IRANIAN PATIENTS (FRARS PROVINCE)

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Giardiasis is a widespread intestinal disease caused by *Giardia duodenalis* in a wide range of mammalian hosts, including human. Molecular analyses have divided *G. duodenalis* into two groups of assemblages (A and B) which are commonly found in both humans and animals. The objective of this study was to determine the molecular characterization of *G. duodenalis* isolates from Iranian (Frars Province) patients by PCR which amplified the SSU-rDNA (~ 292 bp). Human fecal samples (n = 1000) were collected from September 2009 to August 2010 from health centre and hospital in Shiraz, South of Iran. Microscopic confirmation of *G. duodenalis* cysts and trophozoites was performed. Sucrose gradient of positive stool samples were performed and stored at 4ºC for DNA extraction. DNA isolation was performed with 2% Triton X100 and then incubated in water bath at 75ºC for 1hour. Proteinase K and lysis buffer were added to the homogenate and then incubated at 37ºC overnight. Phenol-chloroform-isoamylalcohol extraction procedure was then performed, and the DNA was kept at -20ºC for PCR analysis. The results indicate, 107 (10.7%) were positive for *G. duodenalis* based on microscopy and PCR identified 44 (41%) samples as positive for *G. duodenalis* based on SSU-rDNA amplification. Further genotyping study need to be done to identify the assemblage groups of these findings.

PP29

HUMAN WATERBORNE PROTOZOAN PARASITES: A LESSON LEARNED

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Waterborne protozoan parasitic infections are the most frequently cause of morbidity in healthy (immunocompetent) populations and may cause life-threatening diseases in immunocompromised and immunodeficiency persons. The protozoan parasites are *Acanthamoeba* spp., *Balantidium coli*, *Blastocystis hominis*, *Cryptosporidium* spp. *Cyclospora cayetanensis*, *Entamoeba histolytica*, *Giardia lamblia*, *Isospora belli*, *Naegleria fowleri*, the microsporidia, and *Toxoplasma gondii*. These protozoan infections remain common in both developing and developed countries, while, their transmission is either via contact with recreational and surface water or consumption of contaminated drinking water. Their potential for producing large numbers of transmissive and infective stages in feces of infected peoples or animals constitutes persistent threats to both public and veterinary health concerns. So far, more than 300 water-associated human outbreaks of protozoan parasitic diseases have been well documented worldwide. The clinical scenarios from these outbreaks caused by these pathogenic parasites varied from gastrointestinal, ocular or even fatal neurological involvements. In recent years, there has been the increasing trend for the role that water can play in the transmission of these pathogenic parasites to human. This review addresses the global epidemiological surveillances of waterborne parasites, possible important mechanisms of transmission, advanced development on detection methods of waterborne parasites for clinical laboratory purposes, the potential impacts of parasites causing waterborne outbreaks diseases in human, and provides some insights into public health policy making in safeguarding water quality.

PP30

OPTIMIZATION OF THE AXENISATION AND CULTIVATION MEDIA TO OBTAIN PROLIFERATIVE *ACANTHAMOEBA* TROPHOZOITES

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Axenisation of *Acanthamoeba* spp. is aimed to obtain pure culture of trophozoites in order to study its active form properties, especially when involving *in vivo* test and *in vitro* cell culture. Pure PYG medium (0.75% peptone, 0.75% yeast extract and 1.5% glucose) is a common medium used for axenisation and cultivation of *Acanthamoeba* trophozoites. However, this study showed that both clinical and environmental isolates could only survive in pure PYG medium for 2 days after excystation. Optimal axenisation medium (4% peptone, 4% yeast extract and 2% glucose) supplemented with 20% fetal bovine serum (FBS) produced proliferative trophozoites. Stable axenised trophozoites were eventually changed to cultivation medium (4% peptone, 4% yeast extract and 2% glucose) with 10% FBS and pure PYG medium. Growth rates of both axenised clinical and environmental isolates between cultivation medium with 10% FBS and 20% FBS were most likely to be the same. Only environmental isolates could slowly adapt to pure PYG medium, while clinical isolates tend to encyst or die when cultured in pure PYG medium. As a conclusion, cultivation medium with 10% FBS is more suitable to maintain axenised *Acanthamoeba* trophozoites.

PP31

MININUM CYSTICIDAL CONCENTRATION (MCC) OF CHLORHEXIDINE AND GENTAMICIN AGAINSTS ENVIRONMENTAL AND CORNEAL ISOLATES OF *ACANTHAMOEBA* SPP.: AN IN VITRO STUDY

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This study was conducted to determine the efficacy and the minimum cysticidal concentration (MCC) of gentamicin sulphate and chlorhexidine digluconate, drugs commonly used in the treatment of infectious keratitis against *Acanthamoeba* spp. A total of six isolates of *Acanthamoeba* (HUKM21, HSB1, HUKM24, KRTG7, KRTG9 and KRTG10) were used. Doubling dilution of gentamicin starting from 40000µg/ml µg/ml and 200µg/ml of chlorhexidine were performed in a microtiter plate using page amoebic saline (PAS) to determine the MCC. After exposing *Acanthamoeba* cysts to antimicrobial agents for 24 hours, the cysts were washed free of drugs and cultured cultured onto non-nutrient agar overlaid with *Escherichia coli*. The growth of trophozoites was observed and recorded daily for 14 days. Chlorhexidine successfully exhibit its cysticidal effects at therapeutic dose, however, it is not so for gentamicin. The MCC for gentamicin sulphate range from 10000-20000 µg/ml whereas the MCC for chlorhexidine varied from 6.25µg/ml to 50µg/ml, much lower than the recommended therapeutic dose. The MCC also differ according to the isolates used. Gentamicin sulphate has the highest MCC and they exceed the recommended therapeutic dose for the treatment of keratitis. Based on this study, chlorhexidine digluconate is the best antimicrobial agent against *Acanthamoeba* isolates used, however, further investigations using more clinical isolates is needed in order to reaffirm the result.

PP32

COMPARISON OF *ENTAMOEBA HISTOLYTICA* PROTEIN PROFILES FROM TWO DIFFERENT PREPARATIONS

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Entamoeba histolytica is an enteric protozoan that causes intestinal amoebiasis, which may manifests into the fatal amoebic liver abscess (ALA) if left untreated. Previous studies reported that membrane-bound proteins of the parasite could be antigenic and play important role in diagnosis. However, some other amoeba species might share similar membrane-bound proteins. Thus, to increase the specificity of diagnosis, membrane-bound proteins can be removed by ether. The aim of this study is to compare the protein profiles of crude soluble antigen (CSA) and ether extract antigen (EEA) of *E. histolytica*. Firstly, 10 x 10^6 trophozoites were used to prepare either CSA or EEA. CSA was done by sonication technique while EEA was prepared by adding ether to 1X PBS suspended trophozoites and the supernatant was collected after removing the organic phase. Protein concentrations were determined and both CSA and EEA protein profiles were compared by running 12% SDS-PAGE. Several protein bands such as ~40kDa and ~32kDa not found in EEA protein profile were probably located in the plasma membrane. It is interesting to note that both the antigen preparation techniques showed a few prominent protein bands such as ~100kDa, ~45kDa and ~38kDa. Future study will focus on the antigenicities of these proteins.

PP33

PREVALENCE OF TOXOPLASMA GONDII ANTIBODIES IN WOMEN IN TRIPOLI - LIBYA

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This study carried out to determine the sero-prevalence of *Toxoplasma gondii* antibodies in women. A total of 240 samples of sera form the Obstetric qyna out patient clinic. The sero-positive were 131 out of 240 women (54.58 %). Among the age group 19-28 year the sero-positive 55 (48.25%) out of 114, comparing to the age group 29-38 year and age group 39-48 year were 62 (60.19%) out 103, 14 (60.87%) out of 23 respectively, but statisticaaly no significance according to age. Also found that the women whom are seropositive and had no history of contact with cats were(54.58%), while women whom are seropositive and have history of contact with cats were (57.4%), statistical no significance difference between seropositive, factor contact with cat, and no difference according their residence at different part of Tripoli-Libya.

PP34

DIPSTICK IMMUNOASSAY FOR DETECTION OF IMMUNOGLOBULIN G (IGG) AND IGM ANTIBODIES OF HUMAN TOXOPLASMOSIS

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Toxoplasma gondii infection is widespread in humans, although its prevalence varies widely from place to place. Most infections in humans are asymptomaticbut the parasite can produce devastating disease. In pregnancy,infection can result in congenital infection with severe sequelaeor late-onset eye disease, and it is a frequent cause of encephalitisin severely immunosuppressed patients with AIDS. A dipstick dye immunoassay was developed to detect immunoglobulinG (IgG) or IgM antibodies of toxoplasmosis infection in humans. The assays employ peroxidase conjugatedto sheep anti-human IgG and rabbit anti-human IgM as the visualizingagents and recombinant surface antigen of Toxoplasma gondii (r SAG1) a soluble antigen of tachyzoites of *Toxoplasma gondii* as the detective antigen. The antigen was transblotted on a nitrocellulose membrane. The assays are rapid (the whole test can be completed within15 min), simple, and cheap, and they don't require any equipment. They are sensitive and specific for the detection of anti-*Toxoplasma*IgG or IgM antibodies and generally agree closely with the resultsfrom the enzyme-linked immunosorbent assay. The assays are especiallysuitable for field applications.

PP35

APPLICATION OF MONOCLONAL ANTIBODY FOR THE DETECTION OF *ALEUROGLYPHUS OVATUS* IN DUST SAMPLES

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Aleuroglyphus ovatus is a common pest of stored products and is commonly found in store houses and barn dust. *A. ovatus* may contaminate the processed food such as flour and cereals also and is reported as one of the important causes for the development of occupational allergic diseases in agriculture and baking industry. In this study, monoclonal antibody (Ao3B8) against *A. ovatus* was produced using hybridoma technology. Low cross-reactivities of this antibody against different species of bacteria, fungi, cockroach, fly and tick were detected. Sandwich ELISA was developed using this antibody for the detection of *A. ovatus* in dust samples (20) randomly collected from different locations of a university. The lowest detection limit of this assay was 0.001 µg of *A. ovatus*. *A. ovatus* was mainly found in the dust collected from an animal holding facility and some secluded areas of the laboratories. In conclusion, this monoclonal antibody can be used for the detection of *A. ovatus* in environmental dust samples.

PP36

APPLICATION AND IMPORTANCE OF REAL-TIME CONTINUOUS MONITORING SYSTEM IN THE ASSESSMENT AND MANAGEMENT OFENVIRONMENTAL POLLUTANTS

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Environmental monitoring at industrial set ups is crucial as it ensure public safety and prevents workers from exposure to hazardous pollutants. At the present study, two methods were conducted to assess the indoor environmental parameters. One being gas chromatography testing on air sample collected by an air sampler on site by a NIOSH certified assessor. The other method is by employing an online monitoring system built on SCADA platform to collect real-time data. A winery in the Klang Valley was selected for the study. As fermentation is on-going in the production room, the emission of carbon dioxide and volatile organic compounds were captured and analysed. Seven types of volatile organic compounds were detected by gas chromatography, ranged from 0.068 mg/m3 to 2.895 mg/m3. On the other hand, real-time monitoring system recorded total volatile organic compounds ranging from 0.03ppm to 28.29ppm. We found that standard assessment program provides a general view on chemicals being emitted in the production floor and minimizes assessment cost, while real-time continuous monitoring system is more efficient in picturing uncertainty thus offering better reliability in pollution control. Volatile organic compounds and chemical gases usually present dynamically in the ambient. An environmental monitoring framework at implementation stage has been developed. This system is capable in achieving a cost effective long-term monitoring program, with the flexibility to counter on-course any variations in the surveillance environment. The system will further offer a dynamic system to be utilized in environmental impact studies and risk assessment, as well as decision making in the short-run, policymaking on the long-run. The tested system has been incorporated into a wide area network, thus offering the potential of better predictive ability and greater warning lead-time for alarming conditions than that of separated, stand-alone surveillance modalities.

PP37

GENERATION AND CHARACTERISATION OF THE PORIN cDNA SEQUENCE FROM *EIMERIA TENELLA*

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Eimeria tenella is an apicomplexan parasite that causes the economically important disease known as coccidiosis in chickens. The spread of drug-resistance strains requires the development of new drug targets, and this process can be facilitated by understanding the function of novel molecules in the parasite. Recent studies have shown that the porin protein is essential in eukaryotic organisms. Hence, this study was carried out to generate and characterise the porin cDNA sequence in *E. tenella*. Plasmid DNA that contained the *E. tenella* porin gene (*Etporin*) cDNA was subjected to DNA sequencing using the primer walking strategy and sequences generated were quality- and vector-clipped using Phred and VectorTrim respectively. Assembly of the sequences using Bioedit resulted in a contig of 1368bp in size. Analysis with ORF Finder shows that the most probable open reading frame is 879bp in length and codes for 292 amino acids. Blastx analysis against the GenBank database shows that Etporin is 47% similar to the putative porin sequence of *Toxoplasma gondii*, while a search against the Conserved Domain Database (CDD) shows that Etporin contains the Porin3 superfamily domain. In addition, ClustalW alignment with porin sequences from various eukaryotic organisms shows that the conserved 'VKXKX' and 'GLK'/ 'STK' motifs are present in Etporin. Structure analysis predicts that Etporin is composed of 19 β-strands and adopts a β-barrel architecture that is common to all porin proteins. Taken together, the results of this study indicate that *Etporin* codes for the porin protein in *E. tenella*.

PP38

IN SILICO IDENTIFICATION AND CHARACTERISATION OF THE PUTATIVE GLYCOGEN SYNTHASE KINASE-3 (GSK-3) GENE FROM *Eimeria tenella*

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Eimeria tenella is the most pathogenic of the intracellular protozoan parasite *Eimeria* spp. that causes coccidiosis in chickens. The economic impact of coccidiosis to the poultry industry and concerns relating to drug-resistance of the parasite towards current chemotherapeutics strengthen the need for novel drug targets. Glycogen synthase kinase-3 (GSK-3), a multifunctional serine/threonine protein kinase involved in the regulation of diverse cellular processes, represents a suitable candidate. In this study, the *in silico* identification and characterisation of the putative *E. tenella* GSK-3 (*EtGSK-3*) gene was carried out. Expressed sequence tags (ESTs) corresponding to GSK-3 were compiled and mapped to the *E. tenella* genome sequence. The structure of *EtGSK-3* was predicted using TWINSCAN and refined with RNA-seq data. The resulting *EtGSK-3* gene model is 3119bp in length with an open reading frame (ORF) of 1239bp that codes for 417 amino acids. Blastx analysis of the predicted ORF revealed 84% similarity to *Toxoplasma gondii* protein kinase 3 and 80% similarity to *Plasmodium falciparum* GSK-3. ClustalW alignment with GSK-3 sequences of other eukaryotes showed that EtGSK-3 contained the 11 conserved subdomains essential for protein kinase activity. Results of this study indicate that *EtGSK-3* codes for the GSK-3 protein in *E. tenella*.

PP39

SARCOCYSTOSIS AMONG WILD CAPTIVE AND ZOO ANIMALS IN MALAYSIA

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Sarcocystis sp. infection was investigated in 20 necropsied captive wild mammals and 20 birds in two petting zoos in Malaysia.The gross post mortem lesions in mammals showed marbling of the liver with uniform congestion of the intestine and for birds there was atrophy of the sternal muscles with haemorrhage and oedema of the lungs in two birds. Naked eye examination was used for detection of macroscopic sarcocysts, and muscle squash for microscopic type.Only microscopically visible cysts were detected in eight animals and species identification was not possible. Histological examination of the sections of infected skeletal muscles showed more than 5 sarcocysts in each specimen. No leukocytic infiltration was seen in affected organs. The shapes of the cysts were elongated, circular and the mean size reached 254 x 24.5 µm and the thickness of the wall up to 2.5µm.Two stages were recognized in the cysts, the peripheral metrocytes and large numbers of crescent shaped merozoites. Out of 40 animals examined, 3 mammals and 5 birds were positive (20%). The infection rate was 15% and 25% in mammals and birds respectively. Regarding the organs, the infection rate was 50% in the skeletal muscles followed by tongue and heart (37.5%), diaphragm (25%), and esophagus (12.5%). Further ultra-structural studies are required to identify the species of Sarcocystis that infect captive wild animals and their possible role in zoonosis.

PP40

MACROPARASITIC DISTRIBUTION AND BIODIVERSITY OF THE WILD RODENT POPULATIONS FROM COASTAL AND ISLANDS OF PENINSULAR MALAYSIA

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A survey of wild rodent population of coastal and island of Peninsular Malaysia was carried out from the months of May to August to determine their diversity and distribution of ectoparasites and endoparasites. A total of 190 rodents were captured comprising of 4 areas: Kuantan (54.2%), Malacca (20.5%), representing coastal and Penang (13.2%) and Carey Island (12.1%) representing island sites. The most dominant species in Kuantan were *Rattus rattus diardii* (62.1%), followed by *Rattus norvegicus* (34.0%), *Rattus exulans* (2.9%) and *Rattus tiomanicus* (1.0%) while in Carey Island, only two species were captured; *Rattus rattus diardii* (56.6%) and *Rattus tiomanicus* (43.5%). All rodents in Penang and Malacca captured were *Rattus norvegicus* (100%). The population showed higher number of females (56.8%) compared to males (43.2%) from all sites. The ectoparasites recovered fell under 3 broad groups, namely lice (*Polyplax spinulosa*), mites (*Laelaps nuttali* and *Laelaps echidninus*) and flea (*Xenopsylla cheopis*) while endoparasites recovered were Cestodes (*Taenia taeniaformis, Rodentolepis nana* and *Hymenolepis diminuta*) and Nematodes (*Nippostrongylus brasiliensis, Angiostrongylus malaysiensis, and Capillaria hepatica*). Two main factors were investigated to determine infestation in the rodent population, i.e. age-related and sex. The rat populations from both habitats were observed to harbor more than one group of parasite. Of all ectoparasites recovered, *Xenopsylla cheopis* is a known vector of murine typus and plague, posing a potential health risk to humans.

PP41

MACROPARASITE COMMUNITIES FROM STRAY CATS IN URBAN CITIES OF PENINSULAR MALAYSIA

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The occurrence of macroparasites was studied from 543 stray cats in four urban cities from the west (Kuala Lumpur), east (Kuantan), north (Georgetown) and south (Malacca) of Peninsular Malaysia during January 2009 to August 2010. Five ectoparasite species were recovered namely, *Ctenocephalides felis, Felicola subrostrata*, *Haemaphysalis bispinosa, Heterodoxus spiniger* and *Lynxacarus sp.* with an overall prevalence of 46.2% *Haemaphysalis sp.* was found in all cities except for Kuantan whereas *Lynxacarus sp.* was only found in Kuala Lumpur and Georgetown. Two cats from Georgetown were infested with the dog louse, *Heterodoxus spiniger* and this represented the first host record of this species in Malaysia. Up to nine species of helminths were recovered, with overall high prevalences of infections of 83.0% in Kuantan followed by 75.1% in Kuala Lumpur 71.6% in Georgetown and 68.0% in Malacca. The nine helminths comprised six nematode species (*Toxocara malaysiensis, Toxocara cati, Ancylostoma braziliensis, Ancylostoma ceylanicum, Strongyloides sp., Physaloptera praeputialis*) two cestode species (*Taenia taeniaeformis, Dipylidium caninum)* and one trematode species (*Platynosomum fastosum)*. Most helminth parasites were present in all study sites except for the sole presence of *Strongyloides sp.* and the absence of *Physaloptera praeputialis* in Kuala Lumpur. Levels of infection and infestation were also shown to be influenced by host age and gender and the extent of parasite species richness in these four urban cities is discussed.

PP42

THE DOG LOUSE *HETERODOXUS SPINIGER* FROM STRAY CATS IN PENANG, MALAYSIA

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A louse species, *Heterodoxus spiniger*, commonly found on dogs, is recorded for the first time in cats from Peninsular Malaysia. A total 102 stray cats were examined from Georgetown, Penang in association with the Society for the Prevention of Cruelty to Animal (SPCA).Two cats were infested including a juvenile male and female, which were both found in close contact with each other prior to capture. The number of lice ranged from up to 5 and 14 in male and female cats respectively. Other ectoparasites recovered included the common cat flea, *Ctenocephalides felis,* although infestations with lice and fleas did not appear to adversely affect the health of the stray cats.

PP43

ESTABLISHMENT OF A MOLECULAR TOOL FOR BLOOD MEAL IDENTIFICATION IN MALAYSIA

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Objectives: (a) To establish a Polymerase Chain Reaction (PCR) technique based on mitochondria DNA (mtDNA) cyt b gene, for blood meal identification; (b) To compile data for mitochondria DNA (mtDNA) cyt b gene sequence of some vertebrate animals in Malaysia; and (c) To deposit them in international databases. **Materials and Methods:** The PCR technique was established based on published information and validated using blood sample of four laboratory animals (guinea pig, rabbit, SD rat and Balb/c mice) of which their whole gene sequences are available in GenBank. PCR was next performed to compile gene sequences of nine different species of wild rodents. The species of rodents were *Rattus (rattus) tanezumi, Rattus tiomanicus, Leopoldamys sabanus, Tupaia glis, Tupaia minor, Niviventor cremoriventor, Sundamys muelleri, Rattus rajah* and *Maxomys whiteheadi*. These rodents were caught in 8 different localities in Peninsular Malaysia. The primers used for PCR are complementary to the conserved region of the *cyt b* gene of vertebrate's mtDNA. They are derived from the primers L14841 and H15149 described by Kocher *et al* (1989). A total of 88 blood samples were analyzed and 31 PCR products were sequenced. The sequences obtained were then compared using a BLAST program to identify sequences with the most similarities. **Results:** Seven new gene sequences have been deposited in GenBank database since September 2010 with accession number HQ166262, HQ166263, HQ180173, HQ288326, HQ288327, HQ656820 and HQ656821.

PP44

DETECTION OF *BRUGIA MALAYI* AND *WUCHERERIA BANCROFTI* IN MOSQUITOES BY DUPLEX POLYMERASE CHAIN REACTION

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Lymphatic filariasis still remains endemic in several states of Malaysia even though the control and elimination programme for lymphatic filariasis was introduced since 1960. This study was conducted to determine the possibility of local transmission of microfilariae parasites in field-collected mosquitoes using the duplex polymerase chain reaction method in order to comply with the Global Elimination of Lymphatic Filariasis by the year 2013. Adult mosquitoes from the endemic states of Johore, Kedah, Kelantan, Pahang, Perak, Sabah, Sarawak, and Terengganu were collected by using the bare leg catch (BLC) method from 7pm to 12pm and CDC light trap from 7pm to 6am commencing from the month of February to October, 2010. A total of 232 pools of mosquitoes were obtained from a total collection of 3501 mosquitoes comprising 23 species from six genera. DNA extractions were performed by using Qiagen QIAamp DNA Mini Kit followed by DNA amplification and gel electrophoresis. The PCR results indicated that no microfilariae parasites were detected in the mosquito. Based on these results, local transmission of filarial worms was not detected.

PP45

POLYPARASITISM AND BURDEN OF INFECTION BY SOIL TRANSMITTED HELMINTHS AMONG ABORIGINAL SCHOOL CHILDREN IN SATAK, RAUB, PAHANG, MALAYSIA

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A survey was conducted to determine the current prevalence, polyparasitism rate and burden of soil transmitted helminthiases (STH) among aboriginal school children in Satak, Raub district, Pahang state. Malaysia. Two hundred and forty six (246) school children (119 males and 127 females) participated in this survey. The result shows that, 93.5% of the children were infected with atleast one helminth parasite species. *Trichuris trichiura* is the most prevalent, afflicting 83.7% of the subjects, it is followed by *Ascaris lumbricoides* with 46.3% and the least is hookworm with 5.0%. Of the infected subjects, 42.3% were co-infected with atleast two helminthes, 51.2% had single infections while 6.5% were un-infected. According to sex, 95% of all the males and 92.1% of the females were positive for atleast one parasite. Age wise, 95.7% of the sampled children e”10years and 91.6% of the children <10years, were positive for helminthes. However, differences in the level of infection according to sex and age groups were not significant (P>0.05). Worm burden analysis shows that, 14.1% of the infections by *A. lumbricoides* and *T.trichiura* were heavy, 39.9% were moderate and 46%were light. All hookworm infections were light. The survey confirmed that, STH infections are still a matter of public health concern among the Malaysian aborigines. Polyparasitism and burden of infections among the subjects could be due to the exposure to related risk factors. Efforts to improve their quality of life should include improvement in sanitary facilities, proper disposal of human faeces, supply of portable water, health education and introduction of school based helminth control programmes.

PP46

BIODIVERSITY OF GEOHELMINTH EGGS FROM URBAN AND SUBURBAN AREAS IN PENINSULAR MALAYSIA

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Soil contamination with geohelminth eggs is a potential source of infection to human thus, poses a threat to the public especially to children. Parasites commonly found in soil include *Ascaris* spp., *Toxocara* spp., *Trichuris* spp and *Ancylostoma* spp. Many reports have highlighted the geohelminth impact on human worldwide in relation to diversity of parasite infection and prevalence, however, very little is known of the status here in Malaysia. This study was conducted to determine the distribution and biodiversity of soil-transmitted helminthiasis in 3 localities i.e. west (Kuala Lumpur), northern (Georgetown) and southern (Malacca) states of Peninsular Malaysia, in particular the contamination of sandpits surrounding children's playgrounds. To date, a total of 200 soil samples were taken from the sandpits of 40 playgrounds between October 2009 and August 2010. This study employed the centrifugal floatation technique with the use of saturated NaCl (SGI.25) to determine egg counts (E.P.G). Among the sites studied, all 40 playgrounds were contaminated with STH eggs namely; *Toxocara* spp. *Ascaris* spp., *Ancylostoma* spp. and *Trichuris* spp. In fact, the prevalence of STH eggs from sandpit of 40 playgrounds (200 samples) in 3 localities examined areas was 100% respectively. Prevalence of *Toxocara* spp. (856.4 ± 1.0546) was observed to be highest followed with *Ascaris* spp. (740.8 ± 2.5483), *Ancylostoma* spp. (388.4 ± 1.2066) and *Trichuris* spp. (195.4 ± 0.2256). The worst contaminated playground sites were in Penang (E.P.G level for *Toxocara* spp. ranged from: 214.8-856.4; *Ascaris* spp.; 260.0-740.8; *Trichuris* spp.; 49.6-195.4; *Ancylostoma* spp.; 149.2-388.4).

PP47

DERMATITIS CAUSED BY *PAEDERUS FUSCIPES* CURTIS, 1840 (COLEOPTERA: STAPHILINIDAE) IN THE STUDENT HOSTELS IN SELANGOR, MALAYSIA

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We report a series of dermatitis cases caused by the staphilinid beetles, *Paederus fuscipes* Curtis among university's students who stay in the residential colleges in Puncak Alam, Selangor, Malaysia from January to December 2010. There were 12 hostels within the campus which hosted around 6,000 students. A total of 360 cases (6.0%) were recorded in the hostel's Health Center throughout the year and majority of the patients were came from the hostel which is located near to an oil palm plantation. The age of students were ranged from 18-20 and all of them showed erythematous, edema, vesicular papules, dermatitis linearis, painful blisters, burning sensation, pruritus (when sweating), prolonged pigmentation and peeling skin after accidental crushing of the beetles. The common sites of involvement were face, neck, shoulder and arms while other parts of body such as periorbital region, chest, abdomen and legs were rarely seen. Most students noticed the symptoms in the early morning after wake up. The patients were treated with fucidin cream and the symptoms resolved after 5 days. These beetles are nocturnally active and enter the room whenever the light source is available. The unintentional crushing of these beetles during sleep causes the release of its hemolymph (pederin) which is the culprit for the dermatitis. Installation of window mesh, insecticide fogging, setting up physical traps and increase the public awareness may decrease the incidence of paederus dermatitis. Several factors attributed to this endemic dermatitis will be discussed.

PP48

EFFECT OF BEEF LIVER, MEAT AND MIXED NUTRIENT AGAR DIETS ON THE DEVELOPMENT OF SCUTTLE FLY, *MEGASELIA SCALARIS* (LOEW) (DIPTERA: PHORIDAE)

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This research investigated the effect of different types of diets on the development of cosmopolitan scuttle fly, *Megaselia scalaris* (Loew) (Diptera: Phoridae). Diets used in this study were fresh beef liver, beef meat, beef liver agar and beef meat agar. Larvae were cultured in beef meat recorded the largest mean length, 4.21 ± 2.02 mm, followed by beef liver agar (3.93 ± 1.82 mm), beef liver (3.82 ± 1.98 mm) and beef meat agar (3.81 ± 1.77 mm). Highest mean weight was recorded in beef liver and its agar form, 3.50 ± 1.20 mg and 3.50 ± 0.90 mg, followed by beef meat 3.40 ± 1.20 mg and its agar form (3.10 ± 1.30 mg). Maximum mean length for *M. scalaris* pupa was recorded in beef liver agar (3.47 ± 0.80 mm), followed by beef meat agar (3.38 ± 0.95 mm), beef liver (3.30 ± 1.02 mm) and beef meat (3.29 ± 0.87 mm). Highest mean weight for pupa was recorded in beef liver and beef meat agar, 3.50 ± 1.10 mg and 3.50 ± 1.30 mg respectively, followed by beef meat (3.10 ± 1.40 mg) and beef liver (2.70 ± 1.40 mg). Nutrient agar recorded the lowest value of mean larval length (3.20 ± 1.12 mm), pupa length (2.87 ± 0.32 mm), larval weight (1.00 ± 0.70 mg) and pupa weight (1.80 ± 0.10 mg). Beef liver agar was also found to be an efficient alternative form of diet for culturing *M. scalaris* larvae in laboratory because it gave optimum larval growth, odorless, clean and had a consistent food texture.

PP49

DIVERSITY AND SUCCESSIONAL PATTERNS OF INSECTS ON DECAYING ANIMAL CARCASSES IN A SECONDARY FOREST AT UNIVERSITI KEBANGSAAN MALAYSIA, BANGI, SELANGOR

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A study on diversity and successional patterns of insect fauna on decaying animal carcasses was conducted from 27th September to 28th October 2010 in a secondary forest at Universiti Kebangsaan Malaysia, Bangi, Selangor. Collections of insects were made on nine animal carcasses which consisted of three laboratory rats (Sprague Dawley, mean weight 0.508 kg), three rabbits (New Zealand White, mean weight 2.538 kg) and three monkeys (*Macaque fascicularis,* mean weight 5.750 kg). A total of 31088 individuals which comprised of three orders and twenty-two families were collected from all carcasses. Insects belong to Formicidae family were the most abundant taxa which comprised of more than 80% of total collected insects in all carcasses and they colonized carcasses from fresh to dry stage. Among Dipteran, Calliphoridae was the most abundant insect family collected on monkey carcasses while Sepsidae was the most abundant on rat and rabbit carcasses. The number of insect taxa collected was lower on rat carcasses compared to that of rabbit and monkey carcasses which were obvious in the first week of decomposition. Analysis on the successional pattern of insect revealed that some taxa have a clear visitation period while the others especially Coleopteran did not show a clear succesional pattern and many gaps existed along the colonization period. For future succession study, replication of animal and repetition of experiment is crucial to produce a clearer insect successional pattern.

PP50

THE OCCURRENCE OF ARTHROPODS IN PROCESSED RICE PRODUCTS IN MALAYSIA

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Objective: To determine distribution of arthropods in processed rice products such as rice flour and rice cereal-based infant food. **Methods:** Random samples of rice flour and rice cereal-based infant food purchased from commercial outlets were examined for the presence of arthropods using a modified Berlese Tullgren Funnel Method. Mites were mounted prior to identification and weevils were directly identified. **Results:** For non-expired products, infestation was found in 6.7% of rice flour and none was found in rice cereal-based infant food samples. The arthropods found in the flour samples were *Cheyletus* spp., *Suidasia pontifica*, *Tarsonemus* spp., *Tyrophagus putrescentiae*, *Sitophilus granarius* and *Sitophilus oryzae*. Others which cannot be identified were Oribatid and Prostigmatid mites. The most common mites in rice flour were *Tarsonemus* spp. (69.1%), followed by *S. pontifica* (18.2%). For expired products, only one sample of rice cereal-based infant food was infested and the infestation was by mites of the family Tydeidae. **Conclusions:** This study demonstrates the presence of 4 allergenic species of *S. pontifica, T. putrescentiae, S. granarius* and *S. oryzae* in rice flour. These arthropods can contribute to the incidence of anaphylaxis upon consumption by atopic individuals. There was no infestation of arthropods in rice cereal-based infant food surveyed except for an expired product in a moderate rusty tin container.

PP51

CLINICAL SIGNIFICANCE OF NONSPORULATING MOLDS CULTURED FROM CLINICAL SPECIMENS

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It is not uncommon to culture only non-sporulating molds from clinical specimens. In the absence of spores, these molds could not be identified by cellular morphology and diagnostic labs report these molds as 'non-sporulating molds' to the clinicians. Clinical significance of these molds is unknown. In the current work, 20 non-sporulating molds grew from 8 dermatological specimens (skin, hair and nails) and 12 systemic specimens (blood cultures and other body fluids) were identified using polymerase-chain-reaction (PCR) methods. DNA extraction was performed using commercial DNA extraction kits. The internal transcribed spacer region of the ribosomal DNA was amplified using ITS1-ITS4 primers. The purified PCR products were sequenced and the sequences were analysed with BLAST program. Using this method, non-sporulating molds from nail specimens were identified as *Phoma* species and *Fomitopsis pinicola* while *Xylaria feejeensis*, *Phoma* species and *Dicyma olivacea* were molds isolated from skin specimens. Non-sporulating molds associated with diseased nails were identified as *Microsporum canis* and *Phoma* species. A dermatiacous fungi, *Bipolaris* species and *Aspergillus niger* were identified from a PD fluid and CSF specimens, respectively. Various environmental fungi grew in blood cultures and were identified as *Pseudozyma parantartica*, *Schizophylum commune*, *Xylaria feejeensis*, *Fomitopsis ostreiformis*, *Eutypella* species, *Penicillium* species and *Coprinellus* species. It can be concluded that the non-sporulating molds are mostly clinically insignificant saprophytic fungi. However, established pathogen such as *M. canis,* emerging fungal pathogen such as *S. commune* and opportunistic pathogenic fungi such as *P. parantartica* and *Phoma* species were also among the 'non-sporulating molds'.

PP52

A CASE OF RARE TREMATODIASIS IN A LOCAL RESIDENT

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The patient in our case report was a 27 year old female who presented with complaints of excessive menstrual bleeding attributed to uterine fibromyoma. Her blood picture showed a microcytic hypochromic anemia and an ultrasound of the liver showed normal liver echogenicity with smooth outline with no significant abnormality. Elective laparotomy myomectomy was made and she was subjected to a full blood work-up prior to the surgery including a stool microscopic examination. Some ova showed the characteristic ova morphology of *Fasciola hepatica* or *Fasciolopsis buski*. However, a definite diagnosis cannot be obtained solely on egg morphology and an inconclusive clinical history. Further test with ELISA fascioliasis was negative. This patient was treated with praziquantel, 40 mg/kg body weight. Subsequent examination of fecal samples showed absence of eggs. Epidemiology of foodborne trematode infection is greatly dependent upon a suitable ecology for the intermediate snail host to breed, and close proximity between fresh water and human habitation. Water pollution, deforestation, climate change and aquaculture may be factors for declining prevalence. This is a rare case report that warrants further epidemiological survey of the village of the infected person. Perhaps trematode infections in Malaysia are not truly rare because some villages are still devoid of major changes in their flora and fauna.

PP53

HIGH LEVEL OF SERUM LIPID DAMAGE IN BREAST CANCER PATIENTS INFECTED WITH INTESTINAL PARASITES

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Prolonged state of oxidative stress (caused by overproduction of free radicals than antioxidants) has been one of the contributory factors of cancer. Free radicals that are generated by host's immune cells to kill the invading parasites implicate parasitic infections as a possible cause of oxidative stress. The activity of free radicals namely reactive oxygen species (ROS) can cause secretion of metabolites in serum such as malondialdehyde (MDA, metabolite of lipid peroxidation), hydrogen peroxide (H_2O_2, indicates hydroxyl radical level) and AOPP (advanced oxidation protein product). Previously, we have reported that colorectal cancer patients (majority with *B. hominis* infection) exhibited high level of AOPP. This indicates that the possibility of intestinal parasitic infection in facilitating cancer growth via oxidative protein damage should not be ruled out. However such studies have not been reported in breast cancer. This study compares MDA, H_2O_2 and AOPP in subjects infected with intestinal parasites alone and breast cancer patients with and without intestinal parasitic infection. All intestinal parasite infected subjects and breast cancer patients showed high level of oxidative stress compared to the healthy individuals. The levels of H_2O_2 in breast cancer patients with infection were significantly higher compared to patients without infection. This implicates that intestinal parasitic infections in cancer are generally detrimental regardless of the cancer types. To date this is the first study to report on the effect of intestinal parasitic infection towards oxidative damage in breast cancer. Thus, cancer patients who are mainly known for immunodeficiency should be subjected for intestinal parasitic screening.

PP54

LARVICIDAL ACTIVITY OF *OCIMUM TENUIFLORUM* AND ITS MAJOR CHEMICAL CONSTITUENTS

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Larvicidal bioassay of the essential oil of Ocimum tenuiflorum was carried out with two mosquito vectors, i.e., *Aedes aegypti* and *Culex quinquefasciatus* as the test organisms. Results indicated that the late third instar larvae of *Cx. quinquefasciatus* (LC_{50} 31.34 ppm) were more susceptible to the essential oil when compared to *Ae. aegypti* (LC_{50} 44.32 ppm). The essential oil of Ocimum tenuiflorum obtained by hydrodistillation of the fresh aerial parts was analysed by a combination of capillary GC and GC-MS. The most abundant component of the essential oil was methyl eugenol (68.7%). Other compounds that were present in appreciable amounts were β-caryophyllene (11.6%), α-cubebene (5.6%), methyl isoeugenol (3.8%), eugenol (2.1%) and endo-borneol (1.7%). We suggest that the existence of these compounds may contribute in the larvicidal activities shown.

PP55

LARVICIDAL EFFECT OF ESSENTIAL OILS OF *CITRUS HYSTRIX* AND *CITRUS AURANTIFOLIA* AGAINST *AEDES AEGYPTI* AND *CULEX QUENQUEFASCIATUS*

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Citrus hystrix and *Citrus aurantifolia* of Rutaceae Family were collected from Teluk Intan, Perak and Sabak Bernam, Selangor, respectively. Both plant species then were hydrodistilled to obtain their essential oils. The larvicidal bioassay was according to World Health Organization (WHO) guidelines with slight modification. Late third instar larvae of *Aedes aegypti* and *Culex quenquefasciatus* were chose as the test organisms and the results were observed after 24-h period to determine their median lethal concentrations (LC_{50}). The result showed that *Citrus hystrix* essential oil gave median lethal concentration (LC_{50}) value of 35.90 ppm and 77.67 ppm, against *Ae. aegypti* and *Cx quinquefasciatus*, respectively. *C. aurantifolia* essential oil gave median lethal concentration (LC_{50}) value of 17.67 ppm and 12.11 ppm against *Ae. aegypti* and *Cx quinquefasciatus*, respectively. From the results, it showed that *C. aurantifolia* demonstrated higher larvicidal activity than *C. hystrix* for both mosquito species. The essential oil of both plant species were analysed by a combination of capillary GC and GC-MS leading to the identification of their major chemical compounds.

PP56

COMPARATIVE ANALYSIS OF SHORT TANDEM REPEATS IN THE GENOME OF *EIMERIA MAXIMA* AND *EIMERIA TENELLA*

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Microsatellites are short tandem repeats (STRs) that are well known as useful molecular markers for genome mapping studies due to their high abundance in the genome. STR densities have been shown to vary among different taxa and genomic regions. In this study, we compared genome-wide distribution of STRs in the protozoan parasites *Eimeria maxima* and *E. tenella*. Sequences for both of these genomes, which were estimated to be 42Mb and 52Mb in size respectively, were retrieved from publicly accessed databases. Tandem Repeats Finder (TRF) was used to identify all possible STRs in these two genomes, which were then further processed by Tandem Repeats Analysis Program (TRAP). *E. maxima* was found to have a higher average relative density of STRs with 102398.59 compared to *E. tenella* with 95343.43. The distribution of different repeat type classes showed that both genomes are rich in trinucleotide repeats consisting ~51% of the total STR density in *E. maxima* and ~52% in *E. tenella*. From all of the trinucleotide repeat types, AGC is found to be the most abundant in both genomes where it represents ~94% and ~99% of the total trinucleotide in *E. maxima* and *E. tenella*, respectively. The second highest density of repeat class in *E. maxima* is tetranucleotide with the most abundant repeat type AAAT (~65%), while heptanucleotide has the second highest density of repeat class in *E. tenella* with AAACCCT as the most abundant repeat type. These highly abundant repeat patterns may indicate their functional and evolutionary importance in these two genomes.

PP57

SEQUENCING OF FULL-LENGTH CDNA CLONES FROM *EIMERIA MAXIMA* SPOROZOITES USING THE NEXT GENERATION SEQUENCING TECHNOLOGY

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Chicken coccidiosis is a serious disease that causes huge economic losses to the poultry industry worldwide. *Eimeria maxima* is recognised as one of the seven *Eimeria* spp., obligate intracellular parasites from the Apicomplexa phylum, which are responsible for this disease. The major method of control of coccidiosis has been chemotherapy. However, due to the widespread of drug resistance, new targets for intervention are needed. This will require a more in-depth knowledge of the biology of this parasite. Sequencing of full-length cDNA clones may contribute to this effort. In this study, approximately 20 million reads were generated from full-length cDNA clones of *E. maxima* sporozoites using the Solexa sequencing technology. The assembly of these reads was performed using the Velvet program. Different hash lengths were tested and the hash length of 51 was found to give the most optimum assembly resulting in 3404 contigs. Blastx analysis showed that 33.23% of the contigs had significant similarity (E-value $\leq 10^{-5}$) to sequences available in the GenBank non-redundant database. Most of the significant hits (85.27%) matched with sequences from apicomplexan parasites especially *Toxoplasma gondii* and other *Eimeria* spp., implying that these sequences are conserved and play important roles in the phylum. Further analysis can be carried out on the remaining contigs with no significant match as they may represent novel sequences exclusive to *E. maxima*.

PP58

DAILY FEEDING OF FRESH NEEM LEAVES (*AZADIRACHTA INDICA*) FOR WORM CONTROL IN SHEEP

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This study was conducted to evaluate the anthelmintic effect of Neem (*Azadirachta indica*) on nematode parasites of sheep. Twelve Santa Ines cross bred sheep from a government farm were randomly selected and equally divided into control ($n = 6$) and treated groups ($n =6$). Faecal egg counts (FEC) using the modified McMaster technique and the FAMACHA score for assessing clinical anaemia were carried out daily and recorded for 6 weeks. At the end of the study all the animals were slaughtered and the total worm count (TWC) was done. The results of FEC showed that there was no significant difference between the control and treated group ($p = 0.081$). However, worm burden estimations showed that the number of parasites was significantly higher in the control group compared to the treated group ($p < 0.05$). This result indicated that feeding Neem had an effect on worm numbers in sheep, but was not reflected in their faecal egg counts. Further work is needed to reconfirm the effect of Neem on helminth infections of sheep.

PP59

PRELIMINARY TRIAL OF MODIFIED LARVAL MOTILITY ASSAY AS AN ALTERNATIVE ANTHELMINTIC BIOASSAY

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A variety of plants have been traditionally used by local farmers to treat helminth infection in ruminants. Previous studies had described a range of *in vitro* tests that can be conducted to evaluate the anthelmintic efficacy of any potential plants. More anthelmintic efficacy bioassays should be conducted on any potential plants especially local species to give more alternatives to the local farmers. In this study, established larval motility assay was modified based on the principle of egg hatch assay and larval migration test. Experimental plant, *T. catappa* was used to determine the anthelmintic potential against three different targeted species namely *H. contortus, T. colubriformis* and *C. curticei* to prove the effectiveness of this modification. Species differentiation and identification were first conducted followed by the *in vitro* study. Larvae was distributed at a concentration of 50 L3 (n=±50) per well in 96-multiwells plates before being incubated with diluted crude aqueous extract of *T. catappa* at a ratio of 1:1 at 20ºC for 3 hours and 5 hours respectively. After 3 hours of incubation, reduction percentages for *T. colubriformis, C. curticei* and *H. contortus* were 70%, 63% and 73% respectively while at 5 hours of incubation, reduction percentages for each species were 77%, 67% and 80% respectively. The control showed no reduction in terms of motility and survivality of the larvae with standard deviation (SD) at 5-10%. These findings shows that with this modification bioassay, the anthelmintic potential of *T. catappa* was successfully evaluated and more trials should be conducted in future.

PP60

STUDY OF FILARIAL PARASITES IN DOGS AND CATS AND THEIR INFECTIONS IN MAN IN SELANGOR

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This study focuses on the detection and prevalence of infection of filarial parasites in dogs, cats and humans in Selangor. Two study areas were chosen as sites for blood sample collection; Kampung Sungai Bumbun, an Orang Asli village in Pulau Carey and the SPCA Selangor animal shelter in Ampang Jaya. Microscopic examination of the animal blood samples detected 3 different species of microfilariae which are; *Brugia pahangi, Dirofilaria immitis* and *Dirofilaria repens*. The rate of filarial infection was determined as 14.3% (1 out of 7) and 28.6% (6 out of 21) in cats and dogs respectively. The rate of filarial infection was also much lower in the SPCA where only 6.3% (1 out of 16) animals were infected, compared to Pulau Carey which showed an infection rate of 50% (6 out of 12). The overall prevalence of these filarial parasite infections in the study areas was 25% (7 out of 28). No microfilariae were detected upon microscopy of the human blood samples, but testing using a *BRUGIArapid t*est kit showed a positive result in 1 out of 16 human samples tested (6.25%). PCR confirmed the species as *B. pahangi.* From this study, it was demonstrated that the prevalence of filarial parasites in animals is still high in rural areas such as the Orang Asli village in Pulau Carey. The finding of *B. pahangi* infection in a human subject also provides further evidence to prove that the natural infection of humans with *B. pahangi* (unreported to date) can occur.

PP61

SPECIES COMPOSITION OF MOSQUITO IN MALARIOUS AREA IN KINTA DISTRICT

Noor Aslinda Ummi Awang Besar[1], Mohd Nawi Bin Sulaiman[1], Junaidi Bin Ibrahim[1] and Mahani Yusof[2]

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The adult population and species composition of mosquitoes collected in malarious area in Kinta District were described. A total of 562 mosquitoes representing 4 genera and 10 species were collected using human landing catch (Bare Leg Catch), outdoor during 2009 and 2010. *Anopheles maculatus* was the most common species (57%) followed by *Anopheles barbirostris* (23%), Culex sp. and others in very small percentage. An. maculatus was collected most often in March 2010 and present throughout the year. Over 2009 and 2010, there are no malaria outbreak in Kinta District. In 2009, 22 malaria cases were recorded and only 5 localities are from malaria prone areas. Malaria cases were decrease in 2010, only 15 malaria cases were reported. The identification of vector species and knowledge of their ecology and behaviour is essential for epidemiologic studies, the design and implementation of vector control strategies.

PP62

PRELIMINARY SCREENING OF AQUEOUS EXTRACT OF *FICUS RELIGIOSA*'S STEM BARK AGAINST *AEDES* (STEGOMYIA) *AEGYPTI* LARVAE

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Ficus religiosa which is the subject of the present study has been used for centuries by traditional practitioners in India to treat various diseases. Each part of the tree is believed to posses medicinal values. Hence, it was decided to investigate the larvicidal activity of aqueous extract of *Ficus religiosa*'s stem bark against laboratory strain *Aedes aegypti* larvae. Bioassay was conducted under laboratory condition at the selected doses of 500, 750, 1000, 2500, 5000, 7500, 10000, 12500 and 15000 ppm to determine the LC_{50} and LC_{90} value at 24, 48 and 72 hours post treatment. The findings indicate that high concentration of *Ficus religiosa* stem bark aqueous extract is needed to suppress 50% of the larval population of *Aedes aegypti*. Furthermore, it was also noted that with the exception of control group, no larvae from the treated groups developed into the pupal stage during the test.

PP63

PREVALENCE OF *BLASTOCYSTIS HOMINIS* AMONG RURAL PRIMARY SCHOOLCHILDREN IN PAHANG, MALAYSIA

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A cross-sectional study among rural Malay and Aboriginal children from four primary schools in Lipis and Raub districts of Pahang state, Malaysia, was carried out to determine the prevalence and potential risk factors associated with *Blastocystis hominis* infection. Stool samples were collected from 300 schoolchildren aged 6 – 12 years (150 males and 150 females) and examined for the presence of *B. hominis* by using direct smear observation after *in-vitro* cultivation in Jones' medium. The overall prevalence of *B. hominis* was found to be as high as 25.6%. Outputs of the univariate and multivariate analyses showed that low levels of mothers' education (OR=3.29; 95%CI=1.55, 6.98; P<0.01) and absence of piped water supply (OR=2.83; 95%CI=1.58, 5.04; P<0.001) were the significant risk factors of *B. hominis* infection. There was no significant difference in the prevalence of this parasite among the subjects according to age, sex, race, family size, family income, parental employment status, living with animals, and presence of gastrointestinal symptoms. In conclusion, *B. hominis* is prevalent among rural children and the important factors that determine the infection were the sources of drinking water and mothers' educational level. Interventions of clean water supply and health education especially to mothers are required.

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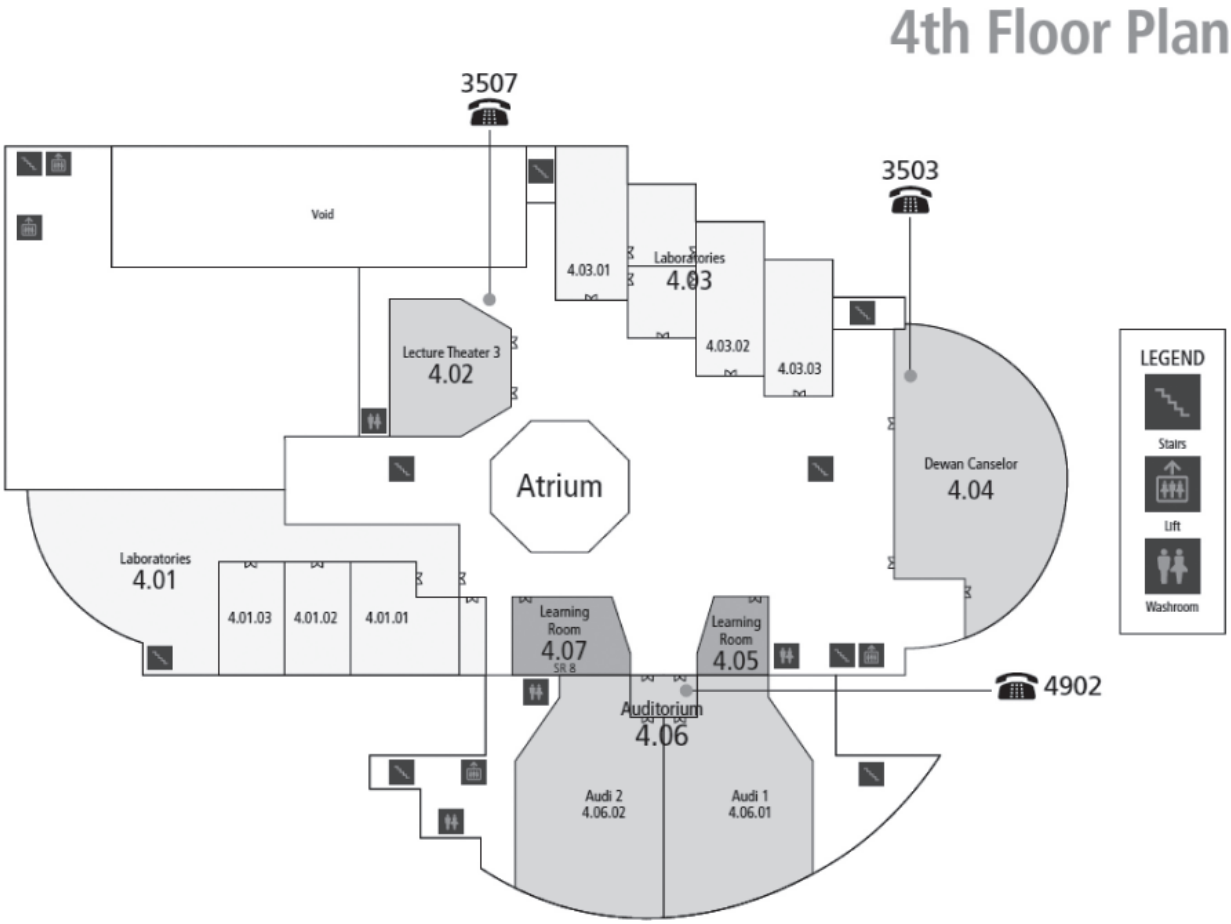

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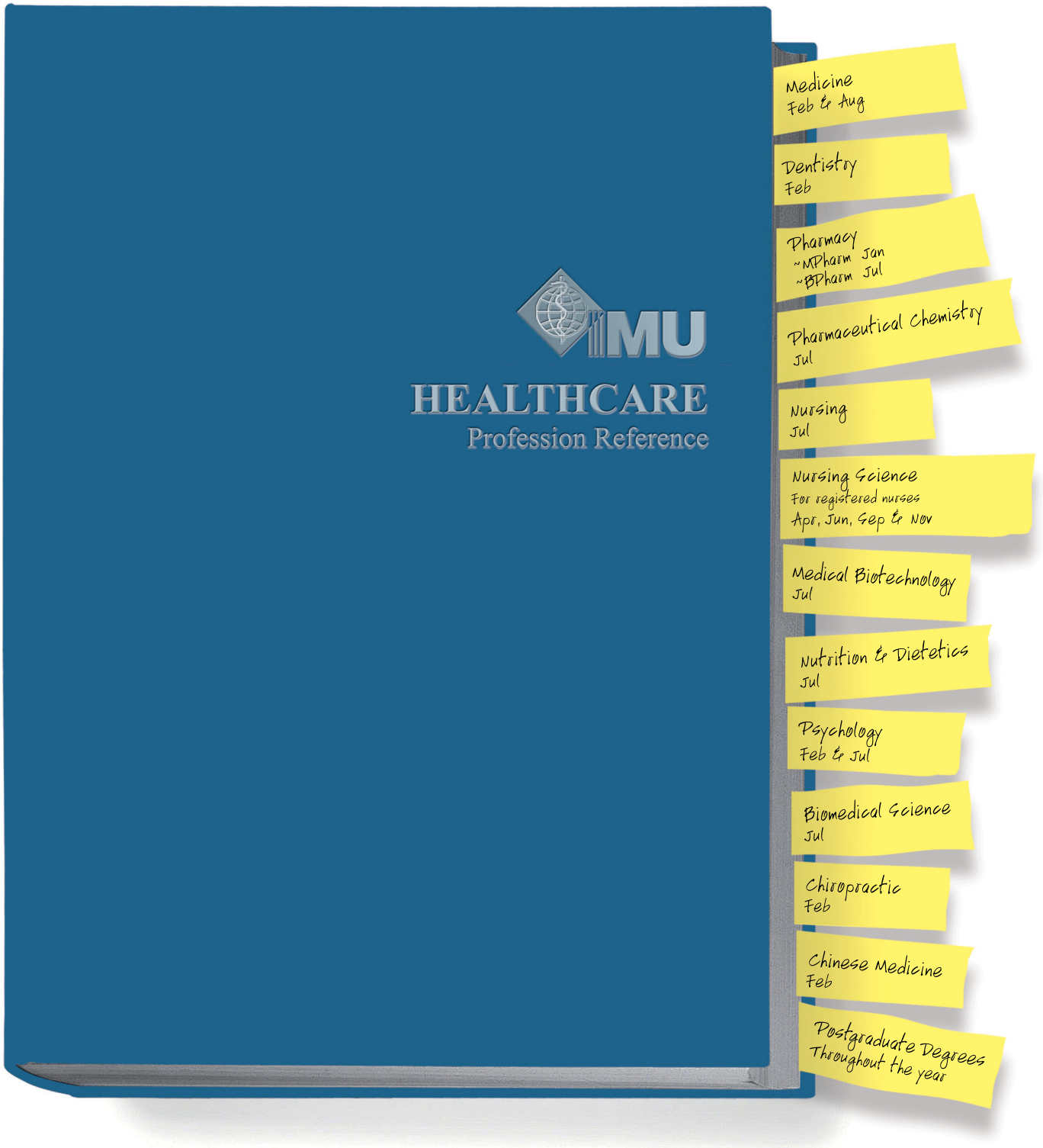

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