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## SEAOHUN 2018 INTERNATIONAL CONFERENCE

**One Health Academic Challenges:  
Preparing Today's Workforce  
to Combat Tomorrow's Infectious Diseases**  
**12 - 15 November 2018**  
*Hanoi Medical University, Hanoi, Vietnam*

# PROGRAM BOOK

Dear Friends and Colleagues,

It is my great pleasure to welcome you to SEAOHUN 2018 International Conference "One Health Academic Challenges: Preparing today's workforce to combat tomorrow's infectious diseases" which will be held at Hanoi Medical University, Hanoi, Vietnam on November 12-15, 2018.

To provide the state-of-art knowledge, expertise as well as to share experiences in training and research on One Health related issues, Hanoi Medical University will be co-organizing the SEAOHUN 2018 International Conference. The conference will provide opportunities for all distinguished guests and participants to exchange the latest information, ideas, field practices and achievements in One Health approaches, including but not limited to approaches to One Health, risk communication, One Health policy and research, infectious diseases, Antimicrobial Resistance (AMR), etc. Outstanding investigators and experts in the areas of One Health will be sharing their expertise in insightful talks and/or forums.

The conference venue is Hanoi Medical University, the oldest and the leading medical university in Vietnam, established in 1902. The hosting of the Conference is led by Institute for Preventive Medicine and Public Health, Hanoi Medical University in collaboration with Southeast Asia One Health University Network (SEAOHUN) and the One Health Workforce (OHW) project with the support of the U.S. Agency for International Development (USAID).

Your participation and contribution will enhance the success of the SEAOHUN 2018 International Conference and our collaboration in addressing One Health challenges in the human, the animal and the plant. You are most welcome to join this scientific event. To attend and/or present at the conference, please study the guidelines to the abstract preparation and registration.

Thank you very much!

Yours sincerely,



Nguyen Duc Hinh

President, Hanoi Medical University

## Organizing and scientific committee



**Assoc. Prof. NGUYEN DUC HINH**

Head of Organizing Committee

President of Hanoi Medical University



**Prof. TA THANH VAN**

Vice head of Organizing Committee

Vice President of Hanoi Medical University



**Prof. LE THI HUONG**

Chairperson of SEAOHUN

Dean of School for Preventive Medicine and Public Health



**Assoc. Prof. LE MINH GIANG**

Head of Science Management and Technology,

Hanoi Medical University



**Dr. VIPAT KURUCHITTHAM,**

Executive Director of Southeast Asia One Health  
University Network (SEAOHUN), Thailand



**Assoc. Prof. TRINH DINH THAU**

Dean Faculty of Veterinary Medicine,

Vietnam National University of Agriculture



**Dr. PHAM DUC PHUC**

Coordinator

Vietnam One Health University Network (VOHUN)



**Dr. SELENA ABDUL AZIZ**

Lecturer

Faculty of Veterinary Medicine, Universiti Putra Malaysia

**Prof. MOHD RIZAL ABDUL MANAF**

Head of Department of Community Health

Faculty of Veterinary Medicine, Universiti Putra Malaysia



**Mahidol University**  
*Wisdom of the Land*

**Assist. Prof. Dr JONGDEE TO-IM**

Lecturer/ Advisor for Student Affairs

Faculty of Environment and Resource Studies, Mahidol University



**CMU**  
Chiang Mai University

University of Excellence  
Where Nature Nurtures  
Beautiful Intelligence

**Dr. WARANGKHANA CHAISOWWONG**

Lecturer

Faculty of Veterinary Medicine, Chiang Mai University

# CONFERENCE AGENDA

## SEAOHUN 2018 INTERNATIONAL CONFERENCE

12 – 15 November 2018

Hanoi Medical University, Vietnam

"One Health Academic Challenges:

Preparing today's workforce to combat tomorrow's infectious diseases"

### DAY 1: Monday, 12 November 2018

#### PRE-CONFERENCE WORKSHOPS

**08:30 – 09:00**

Registration

**09:00 – 17:00**

W 1 – The Participatory One Health Disease Detection (PODD) system empowering communities in early outbreak detection and rapid respond

W 2 – Showcase of students' One Health activities and a panel discussion on career paths in One Health

### DAY 2: Tuesday, 13 November 2018

#### MAIN CONFERENCE

**07:30 – 08:30**

Registration

**08:30 – 08:40**

**Welcome remarks** by Assoc. Prof. Le Minh Giang (Chair of Scientific Committee)

**08:40 – 09:15**

**Opening session** by Chairperson of SEAOHUN, President of HMU, USAID/VN Mission Director, and Vice Minister of Health (TBC)

**09:15 – 10:00**

**Keynote on Global One Health Workforce: Challenges and Opportunities** by **Dr. Dennis Carroll**, Director, Emerging Threats Program, Bureau for Global Health U.S. Agency for International Development (USAID)

**10:00 – 10:30**

BREAK

**10:30 – 11:00**

**Plenary I – One Health in Communicable Disease Control in Vietnam** by **Prof. Vu Sinh Nam**, Senior Advisor in Vector Borne Diseases Surveillance and Control, National Institute of Hygiene and Epidemiology.

**11:00 – 11:30**

**Plenary II – Healthy Animals, Healthy Human, Healthy World** by **Dr. Satoko Otsu**, Team Lead of WHO Health Emergency, WHO Vietnam.

**11:30 – 12:00**

**Plenary III – Health Security**  
**The World Bank Group support for the Health, Security in East Asia and Pacific Region** by **Dr. Sutayut Osornprasop**, Senior Human Development Specialist in the Health, Nutrition, Population Global Practice of the World Bank.

***Health Security Financing Assessment : Findings from a pilot study in Vietnam*** by **Dr. Nguyen Khanh Phuong**, Head of Health Economic Department, Health Strategy and Policy Institute, Ministry of Health, Vietnam.

**12:00 – 13:30**

LUNCH / Poster Presentation [pages 70 - 91]

**13.30 – 15:30**

***Panel discussion: One Health Workforce Development: Experiences from One Health University Networks in Southeast Asia and Africa moderated*** by **Marilyn Crane**, Senior International Higher Education Advisor for the Emerging Threats Division, USAID

Panelists:

- **Prof. Wayan Tunas Artama**, Liaison Officer of Indonesia One Health University Network (INDOHUN), Indonesia
- **Prof. Mohd Hair Bejo**, Chairperson of Malaysia One Health University Network (MyOHUN), Malaysia
- **Asst. Prof. Dr. Saengduen Moonsom**, Coordinator of Thailand One Health University Network (THOHUN), Thailand
- **Dr. Phuc Pham Duc**, Coordinator of Vietnam One Health University Network (VOHUN), Vietnam
- **Dr. Vipat Kuruchittham**, Executive Director of Southeast Asia One Health University Network (SEAOHUN), Thailand
- **Prof. Japhet Killewo**, One Health Central and Eastern Africa (OHCEA) Focal Person, Muhimbili University of Health and Allied Sciences, Tanzania
- **Dr. Irene Naigaga**, OHCEA Regional Program Manager, OHCEA Secretariat, Uganda
- **Ms. Agnes K. Nalugooti Yawe**, Head, Grants and Resource Mobilization/Partnerships, OHCEA Secretariat, Uganda

**15:30 – 16:00**

BREAK

**16:00 – 16:30**

***Plenary IV – Challenges and Evolving Methods to detect and Respond to Outbreaks*** by **Prof. Jeff Bender**, Director USAID One Health Workforce Project, University of Minnesota

**16:30 – 17:00**

Poster Presentation [pages 70 - 91]

**18:00 – 20:00**

Welcome reception and networking

DAY 3: Wednesday, 14 November 2018

<b>08:00 – 08:30</b>	Registration
<b>08:30 – 10:00</b>	<p>Parallel Session 1 - One Health policy <i>[pages 19 - 25]</i>                      Moderator: <b>Prof. Suwat Chariyalertsak</b>, Chiang Mai University, Thailand</p> <p>Parallel Session 2 - Infectious diseases (I) <i>[pages 26 - 30]</i>                      Moderator: <b>Prof. Wayan Artama</b>, Gadjah Mada University, Indonesia</p>
<b>10:00 – 10:30</b>	BREAK
<b>10:30 – 12:00</b>	<p>Parallel Session 3 - One Health Education and Training <i>[pages 31 - 40]</i>                      Moderator: <b>Prof. Le Thi Huong</b>, Hanoi Medical University, Vietnam</p> <p>Parallel Session 4 - Infectious diseases (II) <i>[pages 41 - 46]</i>                      Moderator: <b>Prof. Saul Tzipori</b>, Tufts University, USA</p>
<b>12:00 – 13:00</b>	LUNCH / Poster Presentation
<b>13:00 – 14:30</b>	<p>Parallel Session 5 – Antimicrobial Resistance (AMR) <i>[pages 47 - 53]</i>                      Moderator: <b>Assoc. Prof. Zunita Zakaria</b>, Universiti Putra Malaysia, Malaysia</p> <p>Parallel Session 6 - Infectious diseases (III) <i>[pages 54 - 59]</i>                      Moderator: <b>Prof. Stan Fenwick</b>, Tufts University, USA</p>
<b>14:30 – 15:00</b>	BREAK
<b>15:00 – 16:30</b>	<p>Parallel Session 7 - Food safety <i>[pages 60 - 64]</i>                      Moderator: <b>Prof. Japhet Killewo</b>, University of Health and Allied Sciences, Tanzania</p> <p>Parallel Session 8 - Infectious diseases (IV) <i>[pages 65 - 69]</i>                      Moderator: <b>Dr. Sudarat Damrongwatanapokin</b>, USAID Regional Development Mission Asia, Thailand</p>

DAY 4: Thursday, 15 November 2018

<b>07:30 – 20:00</b>	Field Trip to Halong Bay (Optional)
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## SPEAKERS



LE THI HUONG, MD, PHD

Dean of school for Preventive Medicine and Public Health

My initial training was medicine at Hanoi Medical University. After the initial training, I pursued my PhD training in Nutrition, food technology and biotechnology from Wageningen University of the Netherlands. Since then, I have accumulated a wealth of experiences in conducting research on HIV/AIDS, environmental health, nutritional science, community health, primary healthcare, climate change and communicable and non-communicable diseases. Over the past 20 years, I have developed strong expertise not only in the field of nutrition, but also in the field of public health and preventive medicine as well. As a professor at Hanoi Medical University, the Dean of the Institute of Preventive Medicine and Public Health (IPMPH), Hanoi Medical University and the Head of Nutrition and Food Safety, IPMPH, I am the team leader of many studies in health sector and trainer of some critical nutrition education programs in Vietnam. I have mentored more than 40 students, including Vietnamese and international students to acquire Master and PhD trainings. Moreover, I also have experiences in project management as the coordinator of the nation-wide project funded by the Netherlands titled "Strengthening Teaching and Research Capacity of Preventive Medicine in Vietnam"; the chair of the SEAOHUN(the South-East Asia One Health University Network) and the executive board member of the Vietnam-Australia friendship association.



**LERTRAK SRIKITJAKARN**

Dean's Consultant in International Relations  
Affairs Division of Veterinary Public Health  
Faculty of Veterinary Medicine  
Chiang Mai University

**THE PARTICIPATORY ONE HEALTH DISEASE DETECTION (PODD) SYSTEM:  
EMPOWERING COMMUNITIES IN OUTBREAK EARLY DETECTION AND RAPID RESPOND**

In 1979, Lertrak Srikitjakarn graduated DVM from Faculty of Veterinary Medicine, Chulalongkorn University, Thailand. After graduation, he started work as a veterinarian with Department Livestock Development, then 8 years as a field veterinary investigator in Epidemiology section of Thai-German, Regional Veterinary Diagnostic Centre in northeastern Thailand. In 1986 he completed Dr.med.vet study from Free University Berlin, Germany. In 1995 he started his profession as a lecturer of Division of Veterinary Public Health after joined the Faculty of Veterinary Medicine, Chiang Mai University and also Acting Associate Dean of Planning and Research. In 2003 he was a founder director of Veterinary Public Health Centre for Asia Pacific. His research interests are zoonoses control and VPH system. He was dean of Faculty of Veterinary Medicine, Chiang Mai University from 2006 – 2014 and Chairman of South East Asia One Health University Network (SEAOHUN) from 2016-2017. Currently he is Dean's consultant in International Relations Affairs of Faculty of Veterinary Medicine, Chiang Mai University as well as the Principal Investigator of PODD Project at Chiang Mai University funded by SKOLL Global Threats Fund (Ending Pandemics) USA from 2014 – present.

**Dr. DENNIS CARROLL**

Director, Emerging Threats Program, Bureau for Global  
Health U.S. Agency for International Development

## GLOBAL ONE HEALTH WORKFORCE: CHALLENGES AND OPPORTUNITIES

Dr Dennis Carroll currently serves as the Director of the U.S. Agency for International Development's (USAID) Emerging Threats Division. He is responsible for providing strategic and operational leadership for the Agency's programs addressing new and emerging disease threats in more than 30 countries across Africa and Asia.

Dr Carroll was initially detailed to USAID from the U.S. Centers for Disease Control and Prevention as a senior public health advisor in 1991. In 1995 he was named the Agency's Senior Infectious Diseases advisor, responsible for overseeing the Agency's programs in malaria, tuberculosis, antimicrobial resistance, disease surveillance, as well as neglected and emerging infectious diseases. In this capacity Dr. Carroll was directly involved in the development and introduction of a range of new technologies for disease prevention and control. He was responsible for the initial design and development of the President's Malaria Initiative (PMI). Dr. Carroll officially left CDC and joined USAID in 2005 when he assumed responsibility for leading the USAID response to the spread of avian influenza. He provided overall strategic leadership for the Agency's response to the West Africa Ebola epidemic

Dr Carroll has a doctorate in biomedical research with a special focus in tropical infectious diseases from the University of Massachusetts at Amherst. He was a Research Scientist at Cold Spring Harbor Laboratory where he studied the molecular mechanics of viral infection. Dr. Carroll has received awards from both CDC and USAID, including the 2006 USAID Science and Technology Award for his work on malaria, including the design of PMI, and avian influenza, the 2008 Administrator's Management Innovation Award for his management of the Agency's Avian and Pandemic Influenza program, and in 2015 USAID's Distinguished Service Award.

**VU SINH NAM, PROFESSOR, PH.D.**

Epidemiologist, Senior Public Health Specialist,  
National Institute of Hygiene and Epidemiology

**ONE HEALTH IN COMMUNICABLE DISEASE CONTROL IN VIETNAM**

Professor, Dr. Vu Sinh Nam is Former Deputy Director General, The General Department of Preventive Medicine, Ministry of Health. He is working at the Department of Training and Research Management; Senior Scientific Advisor of the Department of Medical Entomology and zoology, National Institute of Hygiene and Epidemiology; member of the Steering Committee of National Dengue Control Program, as well as member of the National Advisory Committee on Vector borne Diseases Control, Ministry of Health of Vietnam. He is also member of the Advisory Committee on Health Research, WHO-WPR, 2001-2004 and taking part in several wellknown scientific societies in Vietnam such as Vietnamese Society for Entomology, Vietnamese Association of Preventive Medicine, American Mosquito Control Association (1991-1992, 2002), American Society of Tropical Medicine and Hygiene (2002), The World Association of Copepodologists.

Over 40 years of research experiences on infectious diseases, he has focused on exploring the new epidemiological factors and effective interventions in prevention and control of diseases. Main contributions from his researches are the Dengue vector bio-ecology, vector surveillance and control, the community based dengue surveillance and control, and the use successfully of new biological agent (Mesocyclops) through community participation in dengue prevention and control in Vietnam.

He holds a Bachelor of Science degree in biology at Hanoi University (1975), and Diploma in Medical Entomology at Pasteur Institute of Paris (1992), PhD in Epidemiology at the National Institute of Hygiene and Epidemiology of Vietnam (1995). Prof. Vu also is supervisor, Mentor for Medical doctors, Master's students both National and International undertaking infectious disease researches.

**Dr. SATOKO OTSU**

Team Lead, WHO Health Emergency Program  
WHO Representative Office in Viet Nam

## HEALTHY ANIMALS, HEALTHY HUMAN, HEALTHY WORLD

In 2001 December, Dr Satoko Otsu joined the first time an international Red Cross operation to provide medical support to Afghan refugee camps in Pakistan and worked for nine months as health delegate of International Federation of Red Cross and Red Crescent. This experience changed the direction of her career towards global health. Since then, while continuing her medical practice with the Japanese Red Cross (JRC) Wakayama Medical Center, she undertook many deployments to emergency response and preparedness operations such as in Zimbabwe, Sri Lanka, Indonesia, and Kenya as project manager or team lead of the Japanese Red Cross Emergency Response Unit (ERU).

In 2007 Dr Otsu first joined WHO Western Pacific Regional Office where she worked in communicable disease preparedness and response including the response to pandemic influenza (H1N1) 2009. She was appointed Director of the newly launched Infectious Disease Department at the JRC Wakayama Medical Center in 2011, and continued involving in the Red Cross international medical operations, such as Typhoon Haiyan in the Philippines, cholera outbreaks in Sierra Leone, and HIV/AIDS support in southern African countries. Since 2016, she is Team Lead for the WHO Health Emergencies Program in Viet Nam.

Dr. Otsu is a certified consultant of infectious diseases and internal medicine. She also holds a Master of Public Health from Johns Hopkins Bloomberg School of Public Health, and a Diploma of Tropical Medicine and Hygiene from the London School of Tropical Medicine and Hygiene.

## Dr. SUTAYUT OSORNPRASOP

Senior Human Development Specialist in the Health, Nutrition,  
Population Global Practice, World Bank



### THE WORLD BANK GROUP'S SUPPORT FOR SUSTAINABLE FINANCING AND RESILIENT SYSTEMS FOR HEALTH SECURITY IN EAST ASIA AND PACIFIC REGION

Sutayut Osornprasop (Ph.D.) is Senior Human Development Specialist in the Health, Nutrition, Population Global Practice of the World Bank. Based in Bangkok, Sutayut is the Health Cluster Leader for Thailand and have been leading World Bank projects and analytic work to promote multi-sectoral collaboration and social determinants for improved health and nutrition outcomes across the East Asia and the Pacific region. A social scientist by training, he is widely known for his leadership in promoting innovative HIV prevention interventions, promoting multi-sectoral actions to address double burden of malnutrition and the rise of non-communicable diseases and obesity in the East Asia and Pacific region, and supporting sustainable financing and resilient systems for health security and pandemic preparedness. His leadership and contribution to the post-disaster damage and losses assessment of the health sector following Thailand's devastating floods in 2011 is well recognized. He also contributed to the damage and losses assessment of the health sector following Cyclone Nargis in Myanmar in 2008. He has worked on health financing and co-authored public expenditure reviews of the health sector in Thailand and Myanmar. He has also contributed to the efforts to support Palestine on the Universal Health Coverage agenda.



**Dr. NGUYEN KHANH PHUONG**

Head of Health Economic Department, Health  
Strategy and Policy Institute, Ministry of Health

**HEALTH SECURITY FINANCING ASSESSMENT : FINDINGS FROM A PILOT STUDY IN  
VIETNAM**

Dr. Nguyen Khanh PHUONG is currently head of the Health Economic Department under the Health Strategy and Policy Institute, Ministry of Health. She has served in the institute for nearly 20 years and devoted her entire career to the healthcare sector in Vietnam.

Dr. Phuong is viewed as a leading health economist with more than 20 years of experience in health financing, health economic and health system reform in Vietnam. She also has a strong background on policy evaluation and monitoring, research proposal design and development, provider payment methods, hospital services cost, health technology assessment and project evaluation.

Dr. Phuong graduated from Hanoi College of Pharmacy in 1994 and earned a master of science on Health Economics in Chulalongkorn University in Bangkok, Thailand in 1997. She earned a PhD degree on Public Health in National Institute for Hygiene and Epidemiology in 2011

## MARILYN CRANE

Senior International Higher Education Advisor for the  
Emerging Threats Division, U.A. Agency for  
International Development (USAID)



### ONE HEALTH WORKFORCE DEVELOPMENT: EXPERIENCES FROM ONE HEALTH UNIVERSITY NETWORKS IN SOUTHEAST ASIA AND AFRICA

As senior international higher education advisor for the Emerging Threats Division at the Bureau for Global Health, Marilyn Crane came to the U.S. Agency for International Development (USAID) with more than fifteen years of leadership in non-profit organizations, including 13 years of experience managing international higher education development programs. She currently is responsible for providing management oversight for USAID's One Health Workforce project, which is active in 14 countries in Africa and Asia.

Prior to joining USAID in May 2016, Marilyn served as senior program specialist at Higher Education for Development (HED), where she managed higher education partnership programs between colleges and universities in the United States and North Africa, sub-Saharan Africa, the Middle East, Armenia, and Haiti focused on women's leadership and empowerment, public health, civic education, small- and medium-enterprise development, entrepreneurship, and workforce development. Before HED, Marilyn worked at the International Women's Forum as associate director of programs and the Aspen Institute's International Peace, Security, & Prosperity Program as program coordinator.

Marilyn earned her bachelor's degree in international studies, with a correlate in French, from Vassar College and studied economics and political science at L'Institut d'Etudes Politiques de Paris. She also holds master's degree in public administration with a concentration in public policy analysis from American University.



**PROF. WAYAN TUNAS ARTAMA**

Liaison Officer of Indonesia One Health University Network (INDOHUN), and Coordinator of One Health Collaborating Center-UGM



**PROF. MOHD HAIR BEJO**

Chairperson of Malaysia One Health University Network (MyOHUN)



**ASST. PROF. Dr. SAENGDUEN MOONSOM**

Coordinator of Thailand One Health University Network (THOHUN)



Dr. PHUC PHAM DUC

Coordinator of Vietnam One Health University Network (VOHUN)



Dr. VIPAT KURUCHITTHAM

Executive Director of Southeast Asia One Health  
University Network (SEAOHUN), Thailand

Professor JAPHET KILLEWO

OHCEA Focal Person for Muhimbili University of Health and  
Allied Sciences, Tanzania





**Dr. IRENE NAIGAGA**

Regional Program Manager for One Health Central and Eastern Africa (OHCEA), Uganda

**Ms. AGNES K. NALUGOOTI YAWE**

Head, Grants and Resource Mobilization/Partnerships,  
One Health Central and Eastern Africa, Uganda





## Dr. JEFF BENDER

Director, USAID One Health Workforce Project,  
University of Minnesota

### CHALLENGES AND EVOLVING METHODS TO DETECT AND RESPOND TO OUTBREAKS

Dr. Jeff Bender is a Professor in the School of Public Health and an adjunct professor in the College of Veterinary Medicine. He is currently the Director for the USAID funded One Health Workforce Project, a workforce development program focused on preventing, detecting, and responding to emerging pandemic threats. In addition, he is a Co-Director for the NIOSH funded Upper Midwest Agriculture Safety and Health Center (UMASH), a Center focused on improving the health of agriculture workers and their families. His primary teaching and research interests include infection prevention, disease surveillance, emerging zoonotic diseases, occupational safety, food safety and antimicrobial resistance.

## FACTORS THAT ENABLE EFFECTIVE ONE HEALTH COLLABORATIONS - A SCOPING REVIEW OF THE LITERATURE

Kaylee Myhre Errecaborde, Katelyn Wuebbolt Macy, Amy Pekol, Sol Perez, Mary Katherine O'Brien, Ian Allen, Francesca Contadini, Julia Yeri Lee, Elizabeth Mumford, Jeff B. Bender and Katharine Pelican

University of Minnesota College of Veterinary Medicine

Advocates of One Health recognize that global health challenges require multidisciplinary collaborative approaches. While past publications have looked at interdisciplinary competency training for collaboration, few have identified the factors and conditions that enable operational One Health.

Through a scoping review of the literature, a multidisciplinary team of researchers analyzed peer-reviewed publications describing One Health collaborations around specific health events. The researchers identified 12 factors that support successful One Health collaborations and a coordinated response to health events across three levels: individual factors (I. education & training and II. prior experience & existing relationships), organizational factors (III. organizational structures, IV. culture, V. human resources and, VI. communication), and network factors (VII. network structures, VIII. relationships, IX. leadership, X. management, XI. available & accessible resources, and XII. political environment). The researchers also identified the stage of collaboration during which these factors were most critical, further organizing them into starting condition or process-based factors.

The research team found that publications on One Health collaborations do not uniformly report on successes or challenges of collaboration and rarely identify outputs or outcomes of the collaborative process; this research thus identifies a gap in the scholarship regarding a common language and framework for uniform reporting, implementation, and evaluations of One Health collaborations.

In this paper, the researchers suggest important next steps, including the proposal of a format for standardized reporting on successes and challenges of One Health work to support collective and iterative improvement of One Health processes. This One Health reporting framework will serve as a basis for further scholarship to validate and further refine the factors identified in this paper, to ultimately support the development of evaluation metrics for factors deemed important to a One Health response.

## STRENGTHENING ONE HEALTH CAPACITY FOR ONE HEALTH IN VIET NAM - PHASE 2 (SCOH2)

Dao Thu Trang, David Payne and Le Thanh Hai

Vietnam One Health Partnership for Zoonoses (OHP)  
Ministry of Agriculture and Rural Development (MARD)

### Background

The One Health Strategic Plan for Zoonotic Diseases for 2016 – 2020 (OHSP) was approved by MARD according to Decision No. 5273/QĐ-BNN-HTQT dated December 19, 2016 with the consensus of the MOH and related partners. The OHSP outlines how zoonotic diseases in Viet Nam will be addressed, weaving together the various activities and programs that are in place or are expected. It is aligned with international and regional initiatives relevant to One Health, such as: IHR (2005), APSED III and JEE; OIE PVS and World Bank HSFAT; The Global Health Security Agenda (GHSa); international and regional plans for specific zoonotic diseases and health issues (e.g. AMR, rabies). This plan not only emphasizes the need for on-going building of One Health capacities but also demonstrates how and why One Health approaches will be conducted for specific diseases or groups of diseases in Viet Nam and the expected gains over the next 5 years. The plan takes into account key regional and international activities and provides estimates of likely costs of activities and sources of funds.

### Description

In early 2018, the OHP Secretariat mobilized two senior national consultants to support the Health and Agriculture Sectors to work with key government agencies, these consultants have prepared a draft OHSP Progress Report for 2016-2017 and Implementation Plan for 2018-2020 for each sector. The plans identify proposed activities as well as areas for collaboration with the other sector and other key stakeholders. With lessons learned from the Progress Report for 2016 – 2017, the plans also identify key gaps to be addressed in each sector and provide a basis to identify areas where course corrections or further investments are needed, as a basis for detailed planning, budgeting and resource mobilization on specific areas. The OHP Secretariat, with technical inputs from USAID EPT/Preparedness and Response, has also worked with national and international stakeholders to develop a monitoring and evaluation plan for the OHSP.

This presentation will indicate the process of how to involve various sectors to cooperate and collaborate in advocacy for One Health practices while provide a model for consideration by other countries.

### Lessons learned

The progress review of overall OHSP implementation to the end of 2017 reveals a number of key achievements as well as lessons and identification of areas where further policy discussions, national efforts and international technical and financial assistance may be required to meet the targets of the OHSP.

### Conclusions/ Next Steps

The OHP Secretariat is continuing to support overall monitoring of OHSP progress and lessons learned. The annual One Health Forum in 2019 will be a key point for national and international partners to take stock of further progress and to identify key directions until and beyond the end of the current OSHP.

PS1-02

**ONE HEALTH POLICY****ESTABLISHING A ONE HEALTH LABORATORY NETWORK (OHLN)**

PS1-03

Anis Karuniawati, Wiku Adisasmito, Felicia Nutter, Saul Tzipori and Agus Heri Setiawan

Faculty of Public Health, University of Indonesia

Indonesia One Health University Network

**Background**

Emerging infectious diseases are a significant and growing threats with the potential of causing high health, socioeconomic, and tourism impact. To minimize these impact, major challenge must be overcome in the national laboratory capacity for rapid and accurate etiological identification and early detection. Given these concern, Indonesia One Health University Network (INDOHUN) in collaborating with Tufts University established the One Health Laboratory Network (OHLN) in 2017. This project focus on linking university laboratories, targeting specifically zoonotic diseases to enhance rapid detection, secure handling and storage, and contribute to the development of strategies for control Under Government of Indonesia (GOI) regulations and systems.

**Description**

During 2017, INDOHUN established a linkage of potential university; microbiology and parasitology laboratory in one platform called One Health Laboratory Network. Thirty-four laboratories under INDOHUN faculty members were assessed using specific questionnaire. Those laboratories that fulfill the OHLN member criteria then further assessed using Food and Agricultural Organization Laboratory Mapping Tool (FAO LMT), and directly become the OHLN first year member. Several workshops were conducted in order to consolidate the members and enhance the future program, which are identifying the laboratory current capacity, gap and resource analysis, developing strategic plan, identification national and international of biorisk and laboratory quality assurance guideline, and conducting in-service training on Good Clinical Laboratory Practice (GCLP) and basic biorisk management to the laboratory member personnel. Workshop was also conducted with GoI to introduce the network and to identify the potential collaboration between OHLN and GoI both human and animal laboratories in the next project phase.

**Lessons learned**

The network has been established in the system supported by memorandum of understanding and cooperation agreement with university and faculty member. The implementation of bio-risk management and GCLP has also been promoted and advocated. Lack of internal laboratory system management, infrastructure and facility, and national policy on bio-risk management and quality assurance become the major challenges during the implementation of the project.

**Conclusion**

In general, the university laboratories play important roles to strengthen the national security capacity through early identification and detection of zoonotic disease and (re)-emerging infectious diseases, including the pathogens that are potentially used as biological weapon. Improvements are greatly needed on national policy system on biorisk management implementation, laboratory member performance, and partnership/networking. Network among university and government laboratories should be established to overcome the global threat with effective solution to tackle EID, Zoonosis, and AMR issues.

# ONE HEALTH SURVEILLANCE SYSTEM RESPONSE, AN INVESTIGATION OF A HYPOTHETICAL EVENT: A RESISTANT PATHOGEN IS FOUND IN A PERSON DURING A FOODBORNE DISEASE OUTBREAK, VIETNAM

Marisa E V Mitchell<sup>1,3</sup>, Robyn Alders<sup>2</sup>, Hung Viet-Nguyen<sup>3</sup>, Fred Unger<sup>3</sup> and Jenny-Ann Toribio<sup>4</sup>

1. Faculty of Arts and Social Sciences, The University of Sydney, Sydney, Australia
2. Sydney School of Veterinary Science and Charles Perkins Centre, School of Life and Environmental Sciences, The University of Sydney, Sydney, Australia
3. International Livestock Research Institute (ILRI), Hanoi, Vietnam
4. Sydney School of Veterinary Science, The University of Sydney, Sydney, Australia

## Background

It is estimated that by 2050, the global consequences of antimicrobial resistance (AMR) will result in up to 10 million human deaths annually [1]. Antibacterial Resistance (ABR), deemed an emerging health crisis, is a significant concern due to the threat it poses to treating diseases and to complicating medical procedures. The World Health Organization (WHO) 2013 AMR Global Surveillance Report highlighted the need for a multi-sectoral approach to address the gaps in surveillance and data sharing related to the emergence of ABR in foodborne bacteria [2]. A One Health surveillance system for ABR has been strongly advocated for by the international community [2]. Similarly, the Vietnamese Government has recognised the multi-faceted risk ABR poses to public health and the country's sustainable development. The inter-ministerial strategy to combat ABR, developed by the Government in 2013, focuses on prioritising a surveillance system for ABR and targets food-producing animals, retail food, community and hospital settings [3]. However, the implementation of policies that require inter-sectoral collaboration can be challenging [4]. Multi-sectoral participation in the development of priority setting is most successful when trust, transparency, equal representation and consensus is found in all relevant sectors [5]. This study aims to use a One Health approach to: (1) assess the technical and logistical capacity of the surveillance system to respond to antibiotic resistance found within the pork value chain in Vietnam; and (2) identify potential intervention options for strengthening cross-sectoral surveillance for antibiotic resistance.

The study is based on a hypothetical scenario where an antibiotic resistant pathogen is discovered in a person in Vietnam. It aims to elucidate the challenges and/or opportunities of the One Health surveillance system in Vietnam.

## Lessons learned

The network has been established in the system supported by memorandum of understanding and cooperation agreement with university and faculty member. The implementation of bio-risk management and GCLP has also been promoted and advocated. Lack of internal laboratory system management, infrastructure and facility, and national policy on bio-risk management and quality assurance become the major challenges during the implementation of the project.

## Conclusion

In general, the university laboratories play important roles to strengthen the national security



capacity through early identification and detection of zoonotic disease and (re)-emerging infectious diseases, including the pathogens that are potentially used as biological weapon. Improvements are greatly needed on national policy system on biorisk management implementation, laboratory member performance, and partnership/networking. Network among university and government laboratories should be established to overcome the global threat with effective solution to tackle EID, Zoonosis, and AMR issues.

PS1-04

## NEGLECTED TROPICAL DISEASES AMONG MIGRANT WORKERS: A MALAYSIAN CASE STUDY

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Since 1970s, Malaysia experienced an economic bloom that has led to high demand for workforce imported from neighboring countries from the South East Asia nations (Indonesia, Cambodia, Vietnam, the Philippines and Myanmar) and South Asian countries (Nepal, India and Bangladesh). Ongoing urbanization and cross-border migration of workers into large cities for employment has contributed to the development and growth of urban slums. These deprived areas are conducive for the transmission of intestinal pathogens. Prior to entering the country for employment, workers are screened for communicable diseases however, screening for parasitic infections is often neglected and this may pose risk of transmission due to poor hygiene and sanitation practices. Neglected Tropical Diseases (NTD) are a group of infectious diseases which primarily affect the poorest sectors of society, especially the rural poor and the urban poor populations. In view of this, a total of 483 bloods and 388 faecal samples were screened for parasitic infections from migrant workers between September 2014 and August 2015, employed in five sectors; construction, manufacturing, agriculture and plantations, food services and domestic services. A total of three nematode species were identified with high prevalence of *Ascaris lumbricoides* (43.3%) followed by hookworm (13.1%) and *Trichuris trichura* (9.5%). Positive hookworm samples were subjected to molecular analysis. PCR amplicons successfully obtained 9.0% *Necator americanus* and 2.1% *Ancylostoma* spp. All *Ancylostoma* spp. samples were confirmed *Ancylostoma duodenale* and this is the first record of *A. duodenale* in Malaysia. The overall seroprevalence of *S. stercoralis* using the ELISA commercial kit for immunoglobulin G (IgG) was 35.8%. Seroprevalence using the rSs1a-ELISA was 13.0%. Subsequent testing by a nested PCR against DNA from stool samples showed successful DNA amplification from three male samples (0.8%) having *S. stercoralis* infection.

A total of 135 serum samples were also tested for antibodies to Cystic Echinococcus (CE), which is not endemic in Malaysia. Serum samples were screened for CE by adopting two commercial IgG ELISA kits and a prototype IgG4 lateral flow dipstick test. Among the three tests, concordant results were observed among 38 samples and discordant results among 97 samples. Statistical analysis showed fair agreement among them and this study highlights the presence of CE infections among migrant workers. Information gathered from this study is crucial for public health officials when offering diagnosis and treatment for these workers. Key findings from these studies highlight the need for refinements of the current health policies for foreign workers entering Malaysia to include the implementation of mass drug administration and health awareness programs aimed at increasing personal hygiene and sanitation, knowledge in disease transmission and healthy behaviors in controlling parasitic infections.

## INFECTIOUS DISEASE (I)

## SURVEILLANCE FOR FIVE VIRAL FAMILIES OF PUBLIC HEALTH IMPORTANCE AND INVESTIGATION OF HUMAN BEHAVIORS AT WILDLIFE/HUMAN INTERFACES IN VIETNAM WITH HIGH RISK FOR ZOO NOTIC DISEASE SPILLOVER

Nguyen Thi Thanh Nga<sup>1</sup>, Amanda E. Fine<sup>1</sup>, Nguyen Van Long<sup>1</sup>, Sarah Olson<sup>1</sup>, Hoang Bich Thuy<sup>1</sup>, Cong Hong Hanh<sup>1</sup>, Tran Minh Phuc<sup>1</sup>, Dang Duc Anh<sup>2</sup>, Vu Sinh Nam<sup>2</sup>, Vu Trong Duoc<sup>2</sup>, Nguyen Duc Thinh<sup>2</sup>, Bui Huy Hoang<sup>3</sup>, Nguyen Thanh Phuong<sup>3</sup>, Vo Van Hung<sup>3</sup>, Le Tin Vinh Quang<sup>3</sup>, Nguyen Thi Diep<sup>3</sup>, Nguyen Thi Lan<sup>4</sup>, Nguyen Thi Hoa<sup>4</sup>, Leilani Francisco<sup>5</sup>, Karen Saylor<sup>6</sup>, Tracey Goldstein<sup>7</sup>, Alexandre Tremeau-Bravard<sup>7</sup> and Jonna Mazet<sup>7</sup>

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5. Eco Health Alliance
6. Metabiota, University of California, Davis

### Background

A global assessment recently identified Viet Nam as a “hot spot” for new emerging infectious diseases as a result of human activities that have increased human-animal (both domestic and wildlife) interactions. Although Viet Nam has developed a successful system for identifying and responding to outbreaks of endemic diseases, national assessments identified the need to build additional capacity to detect and investigate potential emerging zoonotic diseases of animal origin. The PREDICT project is empowering One Health partners and strengthening surveillance and diagnostic capacities to provide a better understanding of disease spillover in at-risk human populations. PREDICT is part of the Emerging Pandemic Threats Program funded by the United States Agency for International Development (USAID).

### Methods

In Viet Nam, PREDICT is triangulating surveillance for viruses of pandemic potential in wildlife, domestic animals, and humans at key concurrent surveillance sites in Ha Noi (wildlife trade interface) and Dong Nai Province (wildlife farming interface). Samples collected through both syndromic and community sampling are associated with concurrent wildlife and domestic animal sampling either in the catchment area of the hospital/clinic or surrounding the target community. Once consented, study participants provide biological samples and complete a questionnaire designed to characterize factors associated with zoonotic disease risk. In addition, focus groups and ethnographic interviews are being conducted to obtain qualitative accounts of human behaviors and perceptions to support the development of effective public health interventions.

### Results

As of July 06, 2018, a total of 585 people were interviewed and sampled, through community surveillance of people with occupational exposure to wildlife (327 people), and through syndromic surveillance of people with fevers of unknown origin in hospitals (258 people) that serve communities at the PREDICT-2 concurrent surveillance sites. In addition, 7,290 animal

samples have been collected from 2,512 individuals from different taxa, including rodents, non-human primates, carnivores, pangolins and bats in collaboration with NIHE, DAH, RAHO6, RAHO7, and VNUA. Partner laboratories are screening human and wildlife samples for five priority viral families by consensus PCR assays that are confirmed by cloning and sequencing. We will share results approved for public release by the government at the time of the presentation.

PS2-01

**Conclusions**

As a One Health focused project, PREDICT is equipping Viet Nam with the knowledge, capacity and skill set to respond to new emerging pandemic threats.

## INSTILLING GOOD KNOWLEDGE, ATTITUDE AND PRACTICES AMONG THE INDIGENOUS PEOPLE OF MALAYSIA CONCERNING DOG ASSOCIATED ZONOTIC INFECTIONS

PS2-04

Abdul Rashid Khan, Lau Seng Fong, Siti Fatimah Kader Maideen, Intan Nur Fatiha Shafie, Puteri Azariah Megat Abd Rani, Nur Indah Ahmad, Farina Mustaffa Kamal, Mokrish Ajat and Sharina Omar

### Background

The Jahai, an aboriginal people of peninsular Malaysia, have commonly used dogs for hunting. But recently they have begun to move away from traditional hunter-gatherer lifestyle, leaving dogs which were commonly used for hunting to wander around the villages as strays and to multiply in numbers. These dogs now pose risks of dog associated zoonotic infections to the marginalized and socio economically deprived indigenous community.

### Objective

The objective of this interventional study was to instil good knowledge, attitude and practices of the Jahai community concerning dog associated zoonotic infections using a One Health concept.

### Methods

this non-experimental pre and post-test intervention study was conducted among Jahai villagers aged 12 years and above living in a village located in the Belum forest in Malaysia. The respondents were chosen using a convenient sampling method in consideration the population would fluctuate either because some villagers were still nomadic or because most of the villagers would be out either hunting or foraging for food in the forests usually for several days. The first part of the study commenced in April 2017 with the preliminary data collection followed by four episodes of health education and promotion relating to dog associated infections. The intervention involved two teams which included medical, veterinary and allied health students. The health intervention materials were jointly developed by the medical and veterinary professionals using One Health concept. Data was analysed using PASW version 18. The proportion of each answer was compared using a chi square test for statistical significance. The pre and post mean knowledge, attitudes and practices scores were analysed using t test. A probability value of  $P < 0.05$  was considered to be significant.

### Results

There were 177 participants pre intervention and 182 post intervention. In general most aspects of knowledge, attitude and practice improved post intervention. The knowledge on the possibility of infections spreading from pet dogs ( $X^2=4.293$ ,  $p=0.038$ ) and the practice of washing hands before eating ( $X^2=14.984$ ,  $p < 0.001$ ) improved significantly. The mean scores of the participants knowledge ( $t=-9.875$ ,  $p < 0.001$ ) and attitude ( $t=-4.100$ ,  $p < 0.001$ ) improved significantly post intervention. There was a slight increase in the mean score for practice after intervention, but it was not statistically significant.

However, although in general most aspects of knowledge improved post education, a significant proportion still believed that dog associated infections are spread by smell, aura and looking at a dog, and that the route of infection is through spirits. Also, significant proportion believed

that traditional rituals and prayers can prevent dog associated infections and dreams, intuition and shaman can help detect infections.

## Conclusion

This study showed the effectiveness of a multidisciplinary team using One Health concept to successfully improve knowledge, attitude and practices related to dog associated infections. A sustained and committed interventions promoting health should be custom made for indigenous communities, and sanitation and hygienic practices reinforced at every opportunity.

PS2-04

## AWARENESS AND RISK BEHAVIORS AMONG ETHNIC MINORITY COMMUNITY IN MOUNTAINOUS AREA, THUA THIEN HUE PROVINCE TOWARDS ZOO NOTIC DISEASE

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### Background

Human activities and their impacts on the environment have increased likelihood for exposure and transmission of pathogens between livestock, wildlife and humans. Besides, the global climate change has greatly influenced animals, resulting in an increasing risk of transmitting zoonotic diseases, especially in mountainous and rural areas. Objects: To explore awareness and risk behaviors of residents in Nham commune, A Luoi district in zoonosis transmission. To determine the associated factors related to the risk behaviors of the residents.

### Methods

A sectional-cross study was conducted among 230 residents whose age is from 18 - 85 were living in Nham commune, A Luoi district adjacent to the Vietnam – Laos border. All participants were interviewed directly with a questionnaire included the following categories: zoonosis awareness, socio-economic position, demographics, livestock management and behaviors related to wildlife.

### Results

40% of respondents have heard about zoonotic disease. The majority of subjects raise free-range livestock. (83,4%), especially on poultry and cow. Nearly 26% consumed culled sick and dead animals. In term of wildlife-related behaviors, over 30% of villagers slept in the forest and more than 50% consumed bushmeat. Based on multivariable logistic regression analysis, there were relationships between risk behaviors related to zoonotic disease and information approach, livestock management, number of cattle and age of subjects. Factors That affect wildlife-related risk behaviors consist of gender, zoonosis awareness, literacy and wealth index.

### Conclusion

Behaviors of human-wildlife contact and zoonosis were quite common which highlight the necessity for interventions in zoonotic disease control.

**ONE HEALTH EDUCATION  
AND TRAINING**

PS3-01

**STRENGTHENING AND EXPANDING VIETNAM ONE HEALTH  
WORKFORCE: INTEGRATING APPLIED BIORISK MANAGEMENT  
(BRM) CONCEPTS INTO VOHUN ACADEMIC CURRICULUM**

Iris Shurdhi

Sandia National Laboratories (SNL)

Sandia National Laboratories (SNL) has conducted BRM training needs assessments in Vietnam and has identified deficiencies at several levels across the human and animal health sectors. One of the important sectors identified was the academic sector. Vietnam is a relatively high-risk region for emerging infectious diseases (EIDs), including zoonotic diseases arising from the interaction of humans, livestock, wild animals and ecosystems. Animal farming, poultry production, and slaughterhouse activities present increased risk of biohazard exposure when BRM practices are not up to international standards. Research and diagnostic laboratories in both the human and animal sectors store, and have personnel who work with, extremely dangerous pathogens (EDPs), providing both biosecurity and biosafety risks to employees and surrounding communities. Preventing and/or effectively responding to the next outbreak in Vietnam will require an educated workforce trained in the One Health approach to address the critical need to manage diseases that cross human, animal, and environmental health sectors. Vietnam has recognized this need and has an active network of academic institutions who champion a One Health Curriculum (VOHUN).

The biological risk management approach is one of the most important mechanisms to protect human and animal populations from pathogen exposures resulting from either inadvertent or intentional release. Adoption of such an approach provides guidance to practitioners on policies, practices and procedures used to minimize the risks of disease transmission and intentional or inadvertent release of biological materials from laboratories and animal facilities. Thus, BRM is fundamental to the Global Health Security Agenda (GHSA) and is an important subject for individuals and institutions engaged in the fields of Public Health and Veterinary Medicine.

The great success of this engagement is evidenced by the fact that faculty from Nong Lam University – Ho Chi Minh City (NLU) developed a new mandatory 2-hour credit course in BRM for their Veterinary Public Health MA degree. NLU is the lead academic institution in Southern Vietnam to incorporate BRM concepts that support human, animal, or environmental health. Also, faculty members from two other universities, Hanoi University of Public Health (HUPH) and Vietnam National University (VNU), have developed BRM teaching modules for their institutions and we are hoping that through VOHUN more universities will incorporate BRM concepts into public health and veterinary degrees.

Formal inclusion of BRM in higher education curricula serves to address Global Health Security recommendations as students enter the workforce better prepared to work with EDPs in the



field and in laboratories, or prepare for outbreaks should they take such jobs in the government sector. Long term sustainability of targeting higher education for introducing and updating BRM concepts would not only be diachronic because it will be repeated year after year to different cohorts of students, but also synchronic as it would reach many students with a range of potential work careers, with a multiplier effect on single resource units invested.

PS3-01

**ONE HEALTH EDUCATION  
AND TRAINING**

PS3-02

**INCORPORATING ONE HEALTH ASPECTS INTO OCCUPATIONAL  
SAFETY AND HEALTH TRAINING AT A MALAYSIAN ZOO:  
DEVELOPMENT OF EMERGENCY RESPONSE PLAN**Zainal Abidin E<sup>1</sup>, Syed Ismail SN<sup>1</sup>, Karuppiah K<sup>1</sup>, Ismail NH<sup>2</sup>, Rasdi I<sup>1</sup> and Praveena SM<sup>1</sup>

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**Background**

Emergency Response Plan (ERP) is essential in any organisation. In the field of Occupational Safety and Health (OSH), zoo is unique because hazards are different from other workplaces such as manufacturing industry; workers work closely with wildlife animals and zoo has significant public access. Potential emergencies are not restricted to physical but to biological hazards as well; which is incorporated in One Health concept.

**Description**

The present project involves developing tailor-made ERP in a large Malaysian zoo. In this project, tailor-made ERP which considers all potential emergencies involving structured risk assessment of available hazards was developed together by the team of trainers and workers at the zoo. The development of the systematic ERP involved training of basic OSH methods were linked to the One Health concept and the Incident Command Structure (ICS) model. The team of trainers assisted by 58 undergraduate students in the Department of Environmental and Occupational Health trained representative employees of the zoo which consisted of zookeepers, veterinary doctor, nurses and other technical staffs in a series of sessions. The teams assessed risks from all hazards prior to developing response plans from the identified potential emergencies. One potential emergency was simulated to ensure hands-on experience were obtained.

**Lessons learned**

Workers in the zoo had only been involved in ERP related to animal escape prevention. Considering the lack of workers' OSH exposure, ERP was developed in stages. Initially, workers were taught hazards and risks concepts via table-top exercises and practical sessions (walk-through survey) followed by presentations. All hazards were considered including emphasis on zoonosis. Next, responsibilities were delegated to workers according to ICS hierarchy by management. Five potential emergencies were identified; infectious zoonotic disease emergency, natural disaster emergency, animal attack emergency, fire emergency and terrorist/bomb attack emergency. ERP for each emergency were drafted and documented based on existing references. Management selected fire emergency for simulation. Simulation was planned and performed to identify weaknesses for correction. Simulation included internal and external agencies (fire brigade and ambulance services) in addition to the presence of

visitors at the zoo. In post-mortem discussion, the authorised agency found several crucial weaknesses which can be given immediate attention by the management. The simulation was among the first drill performed in more than 5 years. It is expected that the trained workers will be able to simulate and improve all ERP drafted on continual basis.

## Conclusions

ERP training is essential to protect zoo workers exposed to workplace risks including diseases linked with wildlife animals. Current OSH training modules rarely consider One Health concept and are not focused on zoo workers. Integrating One Health into OSH training for this group of workers is needed. There is the need to ensure workers fully realize potential zoonotic diseases in addition to other potential emergencies via regular training however it may not be fully feasible due to management constrictions. Carefully-developed ERP is needed to protect workers, visitors and all stakeholders in this field and is part and parcel of the Malaysian OSH law.

PS3-02

## ONE HEALTH EDUCATION AND TRAINING

### GLOBAL RESPONSIBLE USE OF FLUOROQUINOLONES IN VETERINARY MEDICINE

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PS3-03

#### Background

The availability of effective antimicrobial drugs in veterinary medicine such as fluoroquinolones, safeguard animal health and well-being, and subsequently provide healthy animal products for human nutrition. Reducing the availability of therapeutic medicines to the veterinarian will have a significant detrimental impact on animal health and well-being, and it may increase the risk of pathogen transmission to humans, thereby ultimately impairing public health. Every use of antibacterial products, both in human and animals, presents the possibility of selection of resistant bacteria.

#### Description

To minimize the risk of resistance selection during veterinary therapeutic use and to safeguard the future utility of fluoroquinolones in veterinary medicine, Bayer is committed to promote the prudent use of enrofloxacin in animals: "Principles for the Responsible Use of Fluoroquinolones in Veterinary Medicine", were published in 1998 (revised 2014). According to these principles, administration on prescription-only and under veterinary supervision, and we are committed to susceptibility monitoring. Only authorised fluoroquinolones should be used in accordance with the terms of their marketing authorisations. The application as performance enhancer/growth promoter, in aquaculture, as in-feed medication, for viral or trivial bacterial infections or for routine prophylaxis is not permitted.

Bayer Animal Health is part of various extensive monitoring programs performed across Europe started in 1992, for major target animal pathogens and zoonotic bacteria. Since then, more than 28.000 bacterial isolates sampled from food producing animals covering major indications been analysed and stored.

#### Lessons learned

Between 2007 and 2018, 1,449 porcine and 224 bovine pathogens were collected from animals with respiratory disease and Minimum Inhibitory Concentrations (MICs) of enrofloxacin were determined by worldwide-accepted standards. The most common species isolated from pigs were *Pasteurella multocida* (n=386), *Streptococcus suis* (n=376), *Bordetella bronchiseptica* (n=261), *Actinobacillus pleuropneumoniae* n=179) and *Haemophilus parasuis* (n=113), from cattle mainly *P. multocida* (n=100) and *Mannheimia haemolytica* (n=59) were isolated. Enrofloxacin resistance was absent for *M. haemolytica*, *P. multocida* as well as *A. pleuropneumoniae* and very low for the other main species (<2.0%) isolated from pigs. Antimicrobial susceptibility monitoring programs are essential to study changes in the susceptibility of antimicrobial patterns over time. These activities contribute considerably to national and regional (here EU-wide data collection) monitoring programs and are an important component of product stewardship.

## Conclusions

This survey demonstrates a very high susceptibility of respiratory pathogens obtained from pigs and cattle to enrofloxacin. The data are published regularly and are consistent with the results of national authority programs. With data of such programs, endorsement of professional education and information campaigns for veterinarians and end user (all personnel involved in medication of animals) ensures the rational use of antimicrobials.

Given the global nature on antimicrobial resistance, collaboration among the major stakeholders as well as with international organisations is strongly encouraged in order to tackle the development of resistance.

PS3-03

## KNOWLEDGE AND PRACTICES REGARDING DENGUE PREVENTION OF PEOPLE LIVING IN HANOI IN 2017

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3. Military Institute of Preventive Medicine

### Background

According to World Health Organization (2017), 120 countries have been infected by dengue fever since 1970 [1]. There are about 400 million infection cases and more than 20,000 dengue related-death annually, which creates a significant burden for all countries [2]. Similarly, in Vietnam, dengue fever has been spread nationwide. In the northern part, Hanoi was one of the hotspots with thousands of cases every year. In 2017, the biggest dengue outbreak in the history of Hanoi occurred with more than 17,000 infections. This study aimed to investigate the knowledge, attitudes and practices regarding dengue prevention of people living in Hanoi in order to provide evidence to develop relevant prevention interventions.

### Methods

This study used cross-sectional design. Two steps of sampling were conducted. In the first step, we selected the study sites. Firstly, stratification sampling by geography and epidemiological characteristics was used to select 2 urban districts, 2 sub-urban districts and 2 rural districts in Hanoi. Secondly, we randomly selected 5 communes of each districts. In the second step, we selected the households for each commune. We used the household list given by the communal health stations, then randomly select 25 households. The face-to-face interviews using structured questionnaire were conducted with 626 households in total. Data collected were entered and analyzed using STATA 12.0 to calculate the frequency and percentage and further data analysis.

### Results

Regarding knowledge of household members on dengue fever, we surveyed nine items, including: clinical symptoms, transmission route, knowledge of main living of *Aedes aegypti* mosquitoes, strong uptime of mosquitoes, knowledge of egg laying place, preventive measures, killing mosquitoes methods, killing mosquito larva methods. Findings showed that the percentage of people with correct knowledge on dengue fever is still low in all areas including urban, semi-urban and rural (23,1 %, 21,8%, 11,7% respectively). Despite that, their practice was relatively well with 92.8% of people using bed net, 85.8% of those using different types of killing mosquito larva correct methods, 48,7% cleaning water container everyday. There was not significant difference among three areas. However, the practice of waste management was still low with 75.9% having no method to manage waste, 41.9% just throw away water plastic bottle, can without categorizing or managing.

## Conclusion

The correct knowledge of people on dengue prevention and control is still limited in all areas over Hanoi. However, from respondents' answers, people had a relatively good practice on dengue prevention and control regardless of limited knowledge. Nonetheless, it is necessary to do further study and analysis, particularly participatory observation and qualitative interviews to examine the actual practice.

PS3-04

## THE “JAHAI” AND BUSH MEAT CONSUMPTION: A SNAPSHOT OF THE SITUATION AMONG INDIGENOUS IN BELUM FOREST, MALAYSIA

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### Background

Orang Asli is the Indigenous people living in Peninsular Malaysia. They are classified into three main groups, Negrito, Senoi and Proto-Malays; of which Jahai is one sub-ethnic group of Negrito. The Jahai living in the Belum forest are nomadic or semi-nomadic and most of them are hunters. They consume bush meat as primary source of protein. Eating raw contaminated meat and improper handling of contaminated meat or carcasses increases the risk of contracting zoonotic diseases. This community-based project aimed to implement a health promotion program, besides assessing the knowledge and practices of the Jahai on the consumption and handling of bush meat.

### Methods

Prior to the program, ethical approval was obtained from Joint Penang Ethics Committee (JPEC) and Department of Orang Asli Development (JAKOA). A training for all the research assistants was done prior to the implementation of the program. The program was conducted among Jahai adults aged 18 years and above in Belum forest. Due to the arrangement of the settlements of Orang Asli is scattered along the lake, the participants were approached at the respective houses. The participants were interviewed on the knowledge and practices in regards of bush meat and hygiene using a self-developed questionnaire. After the assessment, by using colourful illustration posters, the community was taught on how to identify healthy and sick animals; types of diseases that they are at risk of contracting; sign and symptoms of infection, mode of transmission and the prevention methods. Importance of proper hand hygiene was also emphasized. Data was analyzed using SPSS Version 21.0.

### Result

A total of 102 out of 150 adults participated in the program, giving a response rate of 68%. Majority of the participants were males (60%), married (82%) and were currently working (50%). Majority of the participants (81%) ate bush meat regularly but had had poor knowledge (74.3%) in regards of disease transmissions. The most common bush meats that they eat were monkeys (77.1%), porcupines (62.7%) and squirrels (46.9%). Only about 11% of the participants used personal protective equipment when handling the carcasses. Gender and occupation were associated with bush meat consumption. There was significant association between knowledge on disease transmission and the consumption of bush meat. No significant associations were observed between practice of hand hygiene, hunting & handling of carcasses and the consumption of bush meat.



## Conclusion

While majority of the Jahai eats bush meat for living, yet most of them were still lacking in knowledge on disease transmission which might put them at risk of infection. Effective educational program on the dangers of zoonotic infections and measures to prevent these infections are crucial and to be emphasized among this high risk group of people.

PS3-05

## INFECTIOUS DISEASE (II)

**DETERMINANTS OF COMPLIANCE TO MASS DRUG ADMINISTRATION (MDA) FOR LYMPHATIC FILARIASIS IN ENDEMIC DISTRICT OF INDONESIA**

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PS4-01

**Background**

Kuningan is one of the district in West Java Province, Indonesia which is a filariasis endemic area with a total of 48 cases in 2016. The implementation of Mass Drug Administration (MDA) in Kuningan (2015) showed the percentage of community taking drug of filariasis prevention, from the total population was 76.83% (government target > 86%). Cilimus Subdistrict became filariasis endemic area in Kuningan with 2 cases of filariasis found there. Meanwhile, the percentage of community in Cilimus who taking drug from the total population was 72.39% (< government target). The purpose of this study was to analyze the determinant factors of compliance to mass drug administration for lymphatic filariasis.

**Methods**

This research was an analytical study with cross sectional design. The study was conducted in May-June 2018. A sample of 103 population who lived in Bandorasawetan and Linggajati Villages, Cilimus Subdistrict, Kuningan District were taken using simple random sampling technique. Independent variables consist of education level, knowledge, attitude, socialization, family support and getting drugs measured using a questionnaire. The compliance to mass drug administration (MDA) for lymphatic filariasis as dependent variable was also measured using a questionnaire. Data analysis consisted of univariate, bivariate and multivariate analysis. Bivariate analysis using chi square and multivariate using multiple logistic regression.

**Results**

The results of the research showed that the variables of knowledge ( $p = 0.000$ ; OR = 25.50; CI = 3.255-199.747), attitude ( $p = 0.010$ ; OR = 4.836; CI = 1.484-15.76), socialization of the filariasis drugs ( $p = 0.000$ ; OR = 11.529; CI = 3.649-36.428), family support ( $p = 0.032$ ; OR = 3.226; CI = 1.163-8.945), receiving filariasis drugs ( $p = 0.000$ ) influencing compliance to mass drug administration (MDA) for lymphatic filariasis. Education level variables did not have a significant relationship with compliance to mass drug administration (MDA) for lymphatic filariasis ( $p = 0.447$ ). The results of multivariate analysis showed that the variables that most influenced compliance to mass drug administration, were knowledge and socialization of filariasis drugs.

**Conclusion**

The variables that influence the compliance to mass drug administration for lymphatic filariasis were knowledge, attitude, socialization of family support and getting filariasis prevention drugs.

## RISK FACTORS OF FILARIASIS : A CASE-CONTROL STUDY IN BANYUASIN

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PS4-02

Filariasis becomes a public health problem in the world in accordance with the resolution of the World Health Assembly (WHA) in 1997. The world Filariasis elimination program initiated by the declaration of the WHO in 2000. In Indonesia, until 2014 there was more than 14 thousand people suffer from chronic clinical filariasis (elephantiasis) spread in all provinces. The District of Banyuasin is the most endemic area of filariasis in South Sumatra province. The objective of this study to identify potential risk factors for filariasis in Banyuasin.

This study used case control design with a total sample of 102 individuals consist of 34 cases and 68 controls. Cases were patients with filariasis obtained based on secondary data from Department of Health in Banyuasin district. Controls were selected from a neighboring cases that do not suffer from filariasis. Total control group drawn from the comparison of the number of cases is 1: 2. Bivariate and multivariate logistic regression was used to identify potential risk factors for filariasis.

In total of 102 respondents interviewed, of which 34 respondents were suffered of filariasis. Multivariate analysis showed that the risk of Filariasis in Banyuasin was higher in groups of respondents who have lower education [OR = 2.641 (95% CI 0.366 to 19.064)], respondents who raised reservoirs at home [OR = 2.997 (95% CI 1.217 to 7.381)], respondents who have bushes in their house [OR = 1.736 (95% CI 0.531 to 5.675)], people who do not use of wire netting in their house [OR = 1.009 (95% CI 0.264 to 3.852)], people who do not using mosquito repellent [OR = 1.471 (95% CI 0.386 to 5.610)], and the group of respondents who do not use the bed nets [OR = 1.124 (95% CI 0.464 to 2.721)].

It is recommended to intervene in the form of counseling to the community that contains information on preventing mosquito bites by preventing night out, wearing mosquito net, and etc, in addition frequent visit of health officer to monitor the disease of filariasis. Communities can promote community service to get a clean environment.

## VARIATIONS OF PROPORTIONS OF PLASMODIUM KNOWLESI SUBPOPULATIONS IN AN AREA WITH HIGH ZOONOTIC MALARIA TRANSMISSION IN MALAYSIAN BORNEO

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PS4-03

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*Plasmodium knowlesi* is the major cause of malaria in Malaysian Borneo. A population genetic survey on this zoonotic parasite from human clinical isolates using a microsatellite toolkit indicated an admixture of two highly divergent subpopulations in Malaysian Borneo, associated with forest dwelling long-tailed macaques (Cluster 1) and pig-tailed macaques (Cluster 2). Human-animal-environment interactions potentially affect the distribution of *P. knowlesi* infections, and this would result in changes in the frequency of each *P. knowlesi* subpopulation. To determine any variations in the proportion of *P. knowlesi* subpopulations in clinical isolates from Sarawak, Malaysian Borneo, we developed simple genotyping PCR assays to distinguish the two subpopulations and applied these on clinical isolates over different time windows. Genotypic analyses of 1062 *P. knowlesi* infections from patients at Kapit division, Sarawak revealed remarkable variations in the frequency between the two subpopulations. Cluster 1 accounted for approximately two thirds of the total infections, indicating that majority of human *P. knowlesi* infections were transmitted from long-tailed macaques. One-third of *P. knowlesi* infections were associated with pig-tailed macaques (Cluster 2) while only a small proportion (< 0.1%) had parasites from both macaque hosts. Over the four time periods of 2000 – 2002 (n = 110), 2006 – 2008 (n=177), 2013 – 2016 (n = 479) and 2016 – 2017 (n = 296), the proportion of Cluster 1 and Cluster 2 subpopulations showed similar patterns of distribution (2/3 infections of Cluster 1). Across the different months from 2000 - 2017, the proportion of *P. knowlesi* subpopulation cases showed remarkable heterogeneity despite Cluster 1 being the predominant subpopulation overall. Continued monitoring of the frequency of the two subpopulations together with environmental alterations are necessary to determine whether there are changes in the epidemiology of *knowlesi* malaria.

## ONE HEALTH CONCEPT ON THE IN-VIVO ANTIPARASITIC ACTIVITY AND TOXICITY EVALUATION OF Elettaria cardamomum TOWARDS THE GROWTH AND SURVIVAL OF ZOONOTIC HAEMOFLAGELLATE, TRYPANOSOMA EVANSI

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### Background

One Health (OH) concept summarized an idea that human health and animal health are interdependent and bound to the health of ecosystem and environment in which they exist. The concept of One Health (OH) emphasizes on how the involvement of multidisciplinary careers can be jointly approached to ensure the safety and health of humans and animals, and to maintain the environmental sustainability. Realizing that *Trypanosoma evansi* is now has been potentially transinfected to human, this study demonstrated how the manipulation of natural spice, *Elettaria cardamomum* (cardamom) seeds, promisingly can solve the endemicity of vector-borne zoonotic manifestation of atypical human trypanosomiasis (AHT) or Surra disease.

### Methods

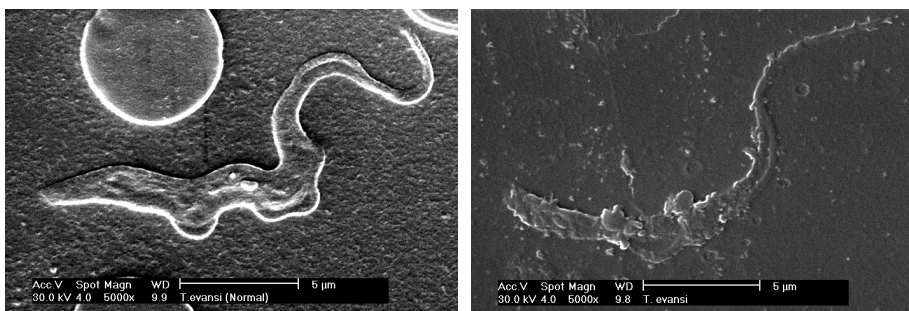
The effectiveness of *E. cardamomum* seeds on the growth and survival of the haemoflagellate protozoa *Trypanosoma evansi* was compared with Berenil (C18H22N8O3). Groups of male ICR mice (6 – 8 weeks old, 20 – 25g body weight) were intraperitoneally (i.p) administered with the parasite at  $5.0 \times 10^3$  *T. evansi*/mouse and orally given pre-, concurrent- and post-infection treatments with 10 µg/mL of *E. cardamomum*-dH<sub>2</sub>O extract at 0.1 mL/mouse. Using Giemsa stained blood smear and examined under light and scanning electron microscopes (SEM), the morphological changes of parasite cells were assessed. Toxicity level of blood enzymes and selected vital organs and survival rate of the mice were also investigated.

### Results

The morphological changes of *T. evansi* cells were evidenced. The cell became crescent-shaped and the undulating membrane was destroyed where both posterior and anterior ends were tapered before the flagellum disintegrated in which lead to death of the cells. A positive correlation ( $p \leq 0.05$ ,  $n = 6$ ) were recorded between the mice survival time and the ability to inhibit the parasites growth in pre-infection treatment group. Besides, the mice in this group was also recorded the longest pre-patent ( $31.37 \pm 2.1$  days) and survival ( $237.14 \pm 3.8$  days) period. The results for biochemical tests were significantly situated in the normal ranged level as well as no abnormalities found on the selected vital organs.

## Conclusions

This study positively indicated that *E. cardamomum* could be utilized for the preservation and welfare of human beings, animals and environment, as well as for sustainability of the natural planted herbs. It is suggested that the scientists and practitioners from many disciplines needs to initiate to work collaboratively to synthesize and develop the novel solutions towards *E. cardamomum* against AHT and Surra disease that problematize to the policy makers, veterinarian and medical practitioner nowadays.



PS4-04

Notable morphology changes of *T. evansi* in the mice from pre-infection treatment group treated with 0.1 mL of 10 µg/mL of *E. cardamomum*-dH<sub>2</sub>O extract which was taken on day 40<sup>th</sup> (A) and day 230<sup>th</sup> (B) post-infection as observed under x5000 magnification of scanning electron microscope (SEM).

## EPIDEMIOLOGICAL FACTORS AND CLINICAL MANIFESTATIONS OF STREPTOCOCCUS SUI MENINGITIS PATIENTS TREATED AT HOSPITAL FOR TROPICAL DISEASES – HOCHIMINH CITY - VIETNAM

PS4-05

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### Background

Streptococcus suis infection is an emerging zoonotic disease in Asia. It can seriously threaten human health and also have a major negative impact on pig industry.

### Objective

To investigate the epidemiological factors and clinical symptoms of *S. suis* meningitis.

### Method

Cases series study

### Results

72 cases of meningitis by *S.suis* type 2: 18.1% is farmers and 33.3% had regular contact with pigs and pork. 18% of reported cases have skin injury. Patients hospitalized throughout the year. Clinically: 98.6% with fever, headache - 93.1%, perceptual disorders - 63.9%; nausea and vomiting - 58.3%, body aches - 27.8%, diarrhea - 9.7% and decrease or loss of hearing - 38.9%.

### Conclusion

Collaboration between Veterinarians and Medical doctors for the control of *Streptococcus suis* infection outbreak.

## ANTIMICROBIAL RESISTANCE

### STRATEGIES TO PREVENT AND CONTROL METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS INFECTIONS IN A TERTIARY HOSPITAL

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PS5-01

#### Background

Methicillin-resistant *Staphylococcus aureus* (MRSA) infection is a major global health care concern, emerging as one of the predominant healthcare-associated infections (HCAI) with significant morbidity, mortality and higher cost of care. Our institution implemented infection prevention and control strategies for the identification, management and control of MRSA in order to reduce the risk of transmission of MRSA. On top, this program is aimed to ensure that strategies are put in place to minimize the risk of patients acquiring an MRSA HCAI.

#### Description

MRSA surveillance program was part of the Infection Control Unit activity at our 850 bed tertiary teaching hospital. The infection control nurse (ICN) daily visited the Microbiology Laboratory to collect MRSA data into the MRSA line listing. All positive MRSA culture results upon validation were placed in a designated box. The ICN would visit all affected MRSA patients to ensure adherence to recommended precautions where patients were placed in the isolation room or otherwise cohort in the open cubicle; emphasizing on the 5-moments of hand hygiene; contact precautions; cleaning and disinfection of equipment and the environment; and visitor policies. The ICN ward round would also determine whether patients had active MRSA infection or colonization. MRSA infected patients were treated with anti-MRSA agent in particular vancomycin. Decolonization MRSA colonizers was advocated with daily chlorhexidine baths plus intranasal mupirocin for 5 days. Staff education regarding MRSA was reinforced. Active surveillance test for MRSA screening in ICU and NICU upon admission and weekly was also conducted. Outcome measures of MRSA HCAI rates and total MRSA (infection plus colonization) rates were monitored and reported to relevant stakeholders and Ministry of Health, Malaysia. Data analysis was based on excluding duplicate MRSA isolates from the same patient.

#### Lesson learned:

The total MRSA rates were 0.98/1000 patient-days increased to 1.48/1000 patient-days in year 2013 to 2017 (Figure 1). However, a declining trend with significant reduction of MRSA HCAI rates ( $p=0.005$ ) were observed with 0.17/1000 patient-days, 0.15/1000 patient-days, 0.10/1000 patient-days, 0.08/1000 patient-days and 0.06/1000 patient-days for the respective years of 2013 to 2017 (Figure 1). Additionally, our MRSA HCAI rates were also far below the national



MRSA HCAI rates, 0.06/1000 patient-days versus 0.18/1000 patient-days in 2017. Selective active surveillance test for MRSA screening resulted in increased detection of MRSA colonized patients. However, proactive implementation of recommended practices with vigilance adherence to hand hygiene compliance, isolation and contact precautions, decolonization of MRSA carriers, cleaning and disinfection policy, contributed to the significant reduction of MRSA HCAI.

### Conclusions

Implementation of multifaceted approaches is crucial in the success of preventing and controlling further spread of MRSA as decreasing MRSA HCAI rates were observed throughout the five years' period. However, the impact of antimicrobial stewardship program on MRSA HCAI need consideration for future endeavor.

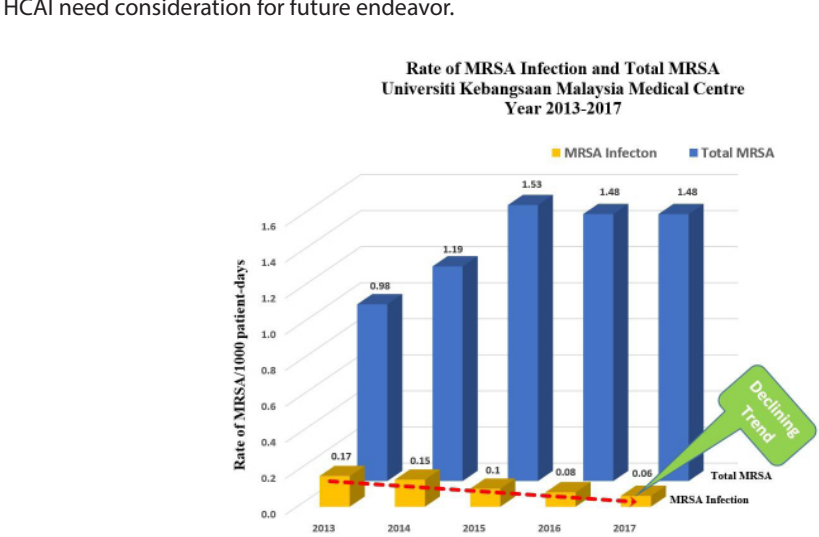


Figure 1: Rate of MRSA Infection and Total MRSA/1000 patient-days

## ANTIMICROBIAL RESISTANCE

## QUANTIFICATION AND CHARACTERIZATION OF ESBL/AMPC-PRODUCING

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PS5-02

## Background

Extended-spectrum  $\beta$ -lactamase (ESBL) and AmpC  $\beta$ -lactamase (AmpC) producing Enterobacteriaceae have been isolated from human, companion animals, livestock farms and food of animal origin. Due to increasing treatment difficulties in cases of human and animal bacterial infections, and the evidences of transmission between animals and humans, ESBL/AmpC-producing Enterobacteriaceae have become an emerging public health concern. To date, information of ESBL/AmpC-producing Enterobacteriaceae in seafood is still scarce. The aims of this study were to investigate the prevalence and the quantitative load, with further characterization of ESBL/AmpC-producing Enterobacteriaceae in retail seafood in Germany.

## Methods

Seafood samples ( $n = 160$ ) were collected from supermarkets and seafood shops in Berlin, Germany between December 2015 and August 2016, including shrimp and bivalves. All samples were screened for the presence of ESBL/AmpC-producing Enterobacteriaceae with MacConkey agar supplemented with 1mg/L cefotaxime. Species identification was carried out using MALDI-TOF analysis. ESBL/AmpC production was confirmed by the disc diffusion method; characterization of ESBL/AmpC  $\beta$ -lactamase genes was done by real-time PCR as well as multiplex PCR followed by DNA sequencing. Spread plating method was used for quantification of ESBL/AmpC-producing Enterobacteriaceae.

## Results

Overall, ESBL/AmpC-producing Enterobacteriaceae in seafood were detected in 21.3% (95% CI: 14.8% - 27.7%) The prevalence of ESBL/AmpC-producing Enterobacteriaceae in shrimp was slightly higher than in bivalves (22.5% versus 20%), however the difference was not statistically significant. The quantitative analysis revealed that most of the positive samples (91.2%) contained an ESBL/AmpC-producing Enterobacteriaceae load of  $< 100$  CFU/g, while 8.8% contained counts of 100 to 1000 CFU/g. Among Enterobacteriaceae isolates ( $n = 45$ ), 62.2% of isolates harbored a single  $\beta$ -lactamase gene ( $bla_{CTX-M}$ ,  $bla_{SHV}$ ,  $bla_{TEM}$ ,  $bla_{ACC}$ ,  $bla_{CMY}$ ,  $bla_{DHA}$ ,  $bla_{MIR}$  or  $bla_{ACT}$ ), 17.8% of isolates contained two genes ( $bla_{CTX-M} + bla_{TEM}$ ,  $bla_{SHV} + bla_{TEM}$ ,  $bla_{SHV} + bla_{ACC}$  and  $bla_{SHV} + bla_{DHA}$ ) and 6.7% of isolates possessed a combination of three genes ( $bla_{CTX-M} + bla_{SHV} + bla_{DHA}$ ). However, 13.3% of isolates showed the phenotype of ESBL/AmpC but had negative results for the detection of  $\beta$ -lactamase encoding genes.

## Conclusion

This is the first report addressing the prevalence of ESBL/AmpC-producing Enterobacteriaceae in retail seafood. Though the quantitative contamination levels were low, a high prevalence of ESBL/AmpC-producing Enterobacteriaceae was found and highlights the potential public health hazard of seafood containing ESBL/AmpC-producing Enterobacteriaceae.

PS5-02

## ANTIMICROBIAL RESISTANCE

**PREVALENCE OF MRSA IN GOAT AND SHEEP MILK IN TERENGGANU MALAYSIA**

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PS5-03

Recently, the emergence of antimicrobial resistant bacteria or superbug has been a concern worldwide. One of the bacteria that have been well known to develop resistance toward multiple antibiotics is Methicillin Resistant *Staphylococcus aureus* (MRSA). MRSA that was initially detected in human derived from the hospital. However, recent studies have shown that Livestock Associated MRSA (LA-MRSA) has been isolated from domestic food animals and their handlers. It is well understood that the subsequent transmission LA-MRSA among humans and animals can be bi-directional with close contact being the common transmission pathway. Few studies had been carried in various countries indicating that MRSA can be found in milk. However, there is still lack of data on the prevalence of MRSA derived from animal products, particularly raw milk from small ruminant in Malaysia. The aim of this study is to investigate the prevalence rate of MRSA in the goat and sheep milk from selected farms located in Terengganu. The data collected will provide useful information on the current status of MRSA prevalence in Terengganu. A total of 396 (182 goat and 16 sheep) udder milks samples were collected aseptically from 23 farms within Terengganu. *Staphylococcus aureus* in milk were isolated using mannitol salt agar, Gram staining and standard biochemical tests. The identity of the bacteria isolated was further confirmed using end-point PCR where specific designed primers were used to detect the presence of *nuc* gene of *S. aureus* at 278 bp. *MecA* gene primers (533 bp) were used to investigate the prevalence of MRSA among the *S. aureus* isolates. The susceptibility of the *S. aureus* isolates toward various antimicrobial agents was performed using Muller Hinton Antibiotic Susceptibility Test. Results have shown that 41 samples have positive findings for *S. aureus* and 2 of the *S. aureus* isolates were MRSA. The *S. aureus* isolates show different degree of resistances towards the various antibiotics. *S. aureus* isolates were found to have higher tendency to be resistance toward Oxacilin (14.6%) and Penicillin (32.0%). Besides, 7.3% of isolates also showed resistances towards Tetracycline and Vancomycin. In conclusion, 2 MRSA isolates have been detected presence in goat milk samples from Terengganu suggesting the emergence of LA-MRSA in small ruminant. Antibiotic Susceptibility test also revealed that *S. aureus* and MRSA isolates shown resistant toward multiple antibiotics. More comprehensive studies should be done to study the prevalence status, transmission pathway and genetic composition of LA-MRSA in Malaysia. In addition, collaboration among government agencies, drugs development companies, researches and local farmers must done to prevent major outbreak of LA-MRSA infection.

## ANTIMICROBIAL RESISTANCE

### OCCURRENCE AND ANTIBIOTIC RESISTANCE OF *LISTERIA MONOCYTOGENES* ISOLATED FROM FRESH WATER FISH IN EAST COAST MALAYSIA

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PS5-04

#### Background

*L. monocytogenes* has sporadically been the limelight in food safety and public health issues for its ability to cause listeriosis and tolerance towards diverse environmental stresses. Despite the increased incidence of antibiotic resistant *L. monocytogenes* from food industry, surveillance data on *L. monocytogenes* contamination in fish is still lacking. Here we report occurrence and antibiotic resistance of *L. monocytogenes* from fresh water fish.

#### Methods

In this study, a total of 70 fresh water fish samples were randomly collected from wet markets in East Coast Malaysia to investigate the occurrence of *L. monocytogenes*. Fillets, gills and intestine were dissected from each fish and were analysed according to ISO-11290-1 method with slight modification. Presumptive positive *Listeria* colonies identified via biochemical tests were then confirmed using multiplex polymerase chain reaction and subjected to antimicrobial susceptibility tests via disk diffusion method.

#### Results

A total of 9 presumptive positive *Listeria* colonies were identified. Subsequent confirmation via multiplex PCR revealed that 3 samples of catfish (4.29%) were contaminated with *L. monocytogenes*. Antimicrobial susceptibility tests revealed that all isolates were sensitive to all tested antibiotics except one isolates was found to be resistant towards tetracycline.

#### Conclusion

This is the first report of isolation and identification of *L. monocytogenes* from fresh water fish in East Coast of Peninsular Malaysia. Further molecular characterization of these isolates are currently on-going. Nevertheless, this preliminary report highlighted that fresh water fish are potential sources of listeriosis and contamination of fresh water fish with antibiotic resistant *L. monocytogenes* could be a public health concern.

## ANTIMICROBIAL RESISTANCE

**NASAL CARRIAGE OF MULTI-DRUG RESISTANT STAPHYLOCOCCUS AUREUS ISOLATED FROM PRECLINICAL AND CLINICAL MEDICAL STUDENTS IN A MALAYSIAN UNIVERSITY**

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PS5-05

**Introduction**

Prevalence of multi-drug resistant *Staphylococcus aureus* (MRSA) strains in healthcare (HA-MRSA) and community (CA-MRSA) incurred costly morbidity and mortality.

**Objectives**

This study assessed the prevalence and antibiotic sensitivity profile of SA and MRSA isolates from medical students.

**Results**

A cross-sectional study of nasal swabs from 60 medical students yielded 93% positive SA. In this study, erythromycin, fusidic acid, gentamicin, penicillin, vancomycin and methicillin were used. The most significant antibiotic sensitivity against SA was fusidic acid ( $p$ -value=0.0042). The SA and MRSA isolates from clinical students were more resistant than those of preclinical students against erythromycin (44%; 15%), fusidic acid (33.3%; 10%), penicillin (85%; 86.9%), vancomycin (11.1%; -) and methicillin (19.4%; 15%) respectively while the isolates from preclinical students were more resistant than those of clinical students against gentamicin (5%; -). Conclusions: In this study, gender, age and duration of clinical exposure had no significant bearing on the prevalence of nasal SA and MRSA respectively. No MRSA infections were detected in preclinical (15%) and clinical (19%) students positive for MRSA, suggesting that these students may be carriers of CA-MRSA. A larger study will be implemented to provide baseline data for monitoring CA-MRSA infections, genotyping and constructing of phylogenetic tree.

## INFECTIOUS DISEASE (III)

## 10 YEARS STUDY ON FELINE SPOROTRICHOSIS DIAGNOSED AT THE UNIVERSITY VETERINARY HOSPITAL OF UNIVERSITY PUTRA MALAYSIA AND THE ZONOTIC IMPLICATIONS

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### Background

Sporotrichosis is a chronic, granulomatous cutaneous mycosis commonly reported in domestic cats and people which is caused by dimorphic fungi *Sporothrix schenckii*. It has the potential to infect skin, respiratory system, lymphatics and systemically including brain. It is ubiquitous in the environment, which naturally found in soil, plants and sphagnum moss. Intact male cats that roam outdoors and involved in traumatic injuries include fights and bites causing puncture wounds, which then offer an advantageous route for *S. schenckii* to enter the body. *S. schenckii* is a zoonotic agent which can infect between different animal species, and between animals and humans. Cats are popular pets in Malaysia. The objectives of this study were to retrospectively determine the prevalence, clinical characteristics, treatment outcomes and prognostic factors of cats diagnosed with sporotrichosis at the University Veterinary Hospital (UVH) of Universiti Putra Malaysia and its zoonotic implications to owners.

### Methods

Medical records of cats with wounds and those specifically diagnosed with sporotrichosis on cytology were retrospectively evaluated from archives of UVH between 2008 and 2017. Data were extracted, reviewed and analysed to describe the percentages and frequencies followed by Chi Square analyses where applicable. Cox Regression analysis was performed to evaluate the risk factors for poor clinical outcome in cats that received anti-fungal therapy with  $p < 0.05$  considered statistically significant. Kaplan-Meier curves were drawn using censored survival data.

### Results

A total of 870 cats were diagnosed with sporotrichosis within the past 10 years where 718 records were able to be retrieved for further analysis. The median age was 2 years with intact male (75%), Domestic Shorthaired breed (87%), free roamers (81%) and cats from multi-cat household (93%) were overrepresented. Ulcerated (poor healing wounds) were the predominant lesion (64%) with common distribution sites, include fore limbs (18%), nose (16%), hind limbs (15%) and ears (12%). A total of 95% cats that were on oral itraconazole anti-fungal therapy (10mg/kg daily) achieved a median clinical cure of 8 weeks. Among the cats treated with itraconazole where duration of follow up was available (32%), presence of respiratory signs was inversely associated with survival outcome ( $p = 0.162$ ). The presence of other concurrent clinical signs during the treatment period resulted in a poorer clinical outcome ( $p = 0.012$ ) and cats treated with antifungal concurrent with antibiotics had significantly better clinical outcome ( $p = 0.014$ ). On Cox regression analysis, presence of other clinical signs and cats treated with antifungal concurrent with antibiotics, were found as independent prognosticators. Among 138 households with cats infected with sporotrichosis, 14 owners were infected with this disease (10.1%) with non-healing wounds on the hands and legs.

**Conclusions**

Feline sporotrichosis is a highly prevalent disease among cats where presence of concurrent illnesses in the affected cats resulted in poorer outcome while the addition of antibiotics concurrent with antifungal therapy can facilitate healing in cats with this disease. Zoonotic transmission is evident in cat owners, and hence ongoing awareness program is required to educate public on this disease recognition, risk factors and early treatment; while more emphasis on stray cat management is necessary.

PS6-01



## MOLECULAR IDENTIFICATION AND ANTIFUNGAL SUSCEPTIBILITY OF *SPOROTHRIX SCHENCKII* ISOLATED FROM CATS AND HUMANS IN MALAYSIA

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PS6-02

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Sporotrichosis is a fungal infection caused by *Sporothrix schenckii* species complex that requires prolonged antifungal treatment. *S. schenckii* sensu stricto clinical clade D has been reported to be the causative agent for feline sporotrichosis in Malaysia while cat scratches and bites are the predominant factors for human infections in the region. In cats, the infection may result in non - healing ulcerated wounds, if not treated at an early stage, while in humans, the lymphocutaneous form of the disease occurs in immunocompetent individuals. The aims of this study were to determine the distribution of the fungal species causing infections in cats and humans by molecular characterisation and to evaluate the in vitro antifungal susceptibility of fungal isolates. Ten *S. schenckii* isolates from humans and six isolates from cats identified by morphological methods were molecularly identified based on the calmodulin gene sequence as it provides the highest level of discrimination in *S. schenckii*. The isolates were tested for their susceptibility to the recommended antifungal drug for sporotrichosis, itraconazole and a newer azole, ravuconazole using the M38A broth microdilution method. The calmodulin gene sequence was identical in all human and cat isolates and belonged to *S. schenckii* sensu stricto. The 750 bp gene sequences were also identical to feline isolates from a previous Malaysian study. Phylogenetic analysis revealed that the Malaysian isolates grouped with worldwide *S. schenckii* sensu stricto strains, classified as clade D (based on ITS) and AFLP type E. Antifungal susceptibility testing revealed the MIC of itraconazole  $\leq 2$  which is within the recently established epidemiological cutoff value for *Sporothrix* (2 ug/mL). Therefore, all isolates were sensitive to itraconazole. Ravuconazole was also active against all isolates tested, with MIC  $\leq 1$ . This first report on molecular identity and susceptibility of human *S. schenckii* isolates in Malaysia in comparison to feline isolates has revealed a genotypically conserved *S. schenckii* sensu stricto species causing sporotrichosis in both humans and cats and is suggestive of a clonal strain in the country. In vivo monitoring of therapeutic outcomes and continued surveillance of antifungal susceptibility is required to determine treatment efficacy in cats and humans. Besides this, greater awareness of this disease among clinicians and pet owners can help to prevent transmission of sporotrichosis in humans and reduce disease severity in cats.

## INFECTIOUS DISEASE (III)

**LOOP-MEDIATED ISOTHERMAL AMPLIFICATION (LAMP): A ROBUST TOOL TO DETECT LEPTOSPIRAL DNA FROM VARIOUS SAMPLE TYPES**

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**Background**

Leptospirosis is an emerging infectious disease caused by bacteria of the genus *Leptospira*. It is a zoonotic disease affecting both humans and animals worldwide. Transmission of leptospirosis usually occur through direct contact with animal or rat urine, or environmental water and soil contaminated with *Leptospira*. Early and rapid detection is crucial to control the spread of this disease and molecular detection is the most popular alternative. In this study, we used a robust detection technique, LAMP targeting *secY* gene to detect the presence of *Leptospiral* DNA in clinical specimens, rat kidneys and soil samples collected at the outbreak areas. The detection efficiency was compared with PCR, another well-established molecular detection method.

PS6-03

**Methods**

LAMP targeting the *Leptospira secY* gene was developed and tested against DNA samples isolated from clinical specimens, rat kidneys and soil samples. Blood and urine from suspected leptospirosis patients were collected upon admission to the hospital while the rat kidneys and soil samples were obtained from sampling at few outbreak areas in Selangor. DNA extraction was performed using commercially available extraction kit except for soil samples where direct boiling method was used. All isolated DNA samples were subjected to a LAMP assay which was performed for 30 minutes 65°C. Following this, PCR was carried out on samples that were detected to be positive by LAMP by using the outermost LAMP primer pair (F3 and B3) and then sequenced for conformation.

**Results**

*Leptospiral* DNA was detected from 28 of 69 blood samples using LAMP and of these, only 26 samples were positive by PCR. On the other hand, 16 and 14 were positive by LAMP and PCR respectively on 34 urine samples tested. Other than clinical samples, LAMP showed higher detection rate of *leptospiral* DNA on rat kidney, whereby 31 were positive compared to 19 positive by PCR from total of 88 rat kidneys tested. An obvious difference was observed when none of *Leptospiral* DNA was detected from soil samples using PCR whereas LAMP detected 11 positive soil samples of 35 samples tested. The presence of *secY* gene in the various samples was confirmed by sequencing on selected PCR positive samples.

**Discussion and Conclusion**

The developed LAMP system targeting *secY* gene showed higher detection rate compared to PCR in all types of samples tested especially soil. Soil contains humic acid (1) which may inhibit the PCR reaction. LAMP has been shown to be more robust and sensitive compared to PCR (2,3), therefore the higher detection rate by LAMP is anticipated. Hence, LAMP can be considered as an alternative rapid diagnosis method of leptospirosis for different type of specimens considering its robustness and sensitivity as demonstrated in this study.

## BRUCELLOSIS OUTBREAK IN JOHOR MALAYSIA: THE CULPRIT REVEALED

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PS6-04

### Background

Brucellosis places significant burdens on the human healthcare system. An outbreak of brucellosis has been reported in the state of Johor, Malaysia in 2015 associated with drinking non-pasteurized goat's milk.

### Methods

An epidemiological investigation was conducted together with Department of Veterinary Service to find the source and control the outbreak. This descriptive study was carried out and serologic investigations were done. Review of the investigation reports based on interviews of patients, contacts and owners of the animal husbandry premises inclusive of environmental investigation to the suspected animal farms were conducted.

### Results

Fourteen cases of brucellosis were identified as epidemiologically related in two districts of Johor and all the patients had history of drinking unpasteurized raw goat's milk. Ten cases had positive culture results and two contacts were also positive of Brucellosis. Goat's blood and milk sampling from seven farms revealed that 44% of all the serological tests on goats' serum were positive, however none of the milk sample showed positive milk ring test. The investigation found that the source of the milk was originated from a single farm. This brucellosis outbreak was caused by *Brucella Melitensis*, acquired by consuming unpasteurized goat's milk from the farm. For control measures adequate public health interventions have been carried out including active case detection among contacts and health promotion to the public and the district goat farm owners.

### Conclusions

Preventive measures were implemented and manage to contain the outbreak despite facing several limitations. Managing this type of outbreak requires an interdisciplinary collaboration or One Health approach that consists of the development of an infrastructure for disease surveillance and reporting in both veterinary and public health departments, various campaigns for control in livestock and health promotion programs.

## INFECTIOUS DISEASE (III)

**LEPTOSPIRA INFECTION IN TRADITIONAL LIVESTOCK AND MORE INTENSIVE SCHEME VILLAGES**

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**Background**

Leptospirosis, a zoonotic disease, is addressed by the World Health Organization (WHO) as a worldwide public health issue because of its potential seriousness with estimation of annually 1.03 million cases and 58,900 deaths due to leptospirosis worldwide. About 5-10% of leptospirosis may develop severe infection requiring hospitalization and critical care depending on the infecting serovar, level of leptospiraemia, host genetic factors and host immune response. According to Health Statistic Yearbook 2014 issued by Vietnam Ministry of Health, total of 26 leptospirosis cases were reported nationwide. However, the real situation of *Leptospira* infection seems to be underreported according to reflection of individual research projects in Vietnam. With the support from ECOMORE project, the study aims at investigating the health risk of intensive livestock, of which Leptospirosis in both human and animal is considered to be one of the focuses.

PS6-05

**Methods**

Two cross-sectional surveys were conducted within 6 months apart from January to December 2015 in 2 villages in Duy Tien district, Ha Nam province; Thuong village in Tien Ngoai Commune represents the intensive production zone and Quan Nha village in Yen Bac commune the traditional production zone. In each survey, single venous blood samples were collected from study subjects in addition with sociodemographic and occupation data. Additionally, blood sample from pig of household were taken also. All samples were tested for ELISA and MAT to investigate antibody and serogroup of *Leptospira*.

**Results**

The result showed noticeable circulation of *Leptospira* among studied population, both human and animal, particularly in pig. The prevalence indicated nearly 13% of studied human population who have been historically infected with *Leptospira*, while almost 6% of them recently infected. Among households provided pig samples, more than 11% of them were positive with *Leptospira*. Even though the results were not showed statistically difference between two studied sites, the risks of those who are involved in working in rice field, forestry, and fishery are statistically higher than those, who are not. Additionally, the infection possibility is cumulatively increased by age.

**Conclusions**

The risk of leptospirosis is potentially high for rural populations, especially those in close contact with animals. Identification of environmental, climate and landscape, socio-economic and occupational factors associated with leptospirosis will allow to recommend a strategy to raise awareness of populations at risk, to strengthen local capacity for diagnosis and treatment of the disease and to support authorities to be prepared for the increased risk of leptospirosis.

The second phase of ECOMORE project starting now aims at establishing the epidemiologic status of Leptospirosis in Vietnam and at identifying the main risk factors of transmission in various occupational, socio-economic, landscape and climatic environments.

## A PRELIMINARY STUDY OF UMAI DELIGHTS IN BINTULU, BORNEO SARAWAK

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Umai is a popular traditional Melanau dish from Sarawak, prepared using chunks of raw fish marinated with calamansi juice and seasoned with onion, ginger, and chilies. The acidity of the citrus juice is commonly believed to eliminate bacteria and slightly cook the fish. The most effective ways of killing the parasites are either freezing or heat inactivation. The aim of the study was to investigate umai preparation process in Bintulu and food safety awareness. Hundred questionnaires were distributed into two groups of umai makers; professional and non-professional. Results showed that there was a significant difference ( $p = 0.0025$ ) for selection of fish between Spanish mackerel (*Scomberomorus* sp.) and empirang (*Setipinna* sp.) between the groups. It was shown that 12% of the professional group and 8% of the non-professional group agreed on freezing the raw fish chunks before processing them into umai. Majority of the respondents in both groups had checked the freshness of the fish by observing of the gills' condition. Both groups showed that marinating raw fish in calamansi juice for approximately 30 minutes ensures that the umai dish is safe to be consumed. Findings of this study revealed that the level of understanding and food safety awareness for professional group was low at 41.7% whereas for the non-professional group it was higher at 58.3%. Thus, a further investigation is needed to detect parasites in fish particularly fish for making umai and the microbial population present in umai dish.

PS7-01

## PREVALENCE OF TOXOPLASMA GONDII IN MEAT FROM CATTLE, GOATS AND SHEEP FROM WET MARKETS IN KLANG VALLEY AND ABATTOIRS IN SELANGOR, MALAYSIA

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PS7-02

Toxoplasmosis is recognized globally as a disease capable of infecting all warm-blooded animals and causing major health concerns to human especially to unborn foetus and immunosuppressed individuals. Consumption of undercooked meat or meat products is highly associated with toxoplasmosis as well as drinking unpasteurized milk or accidental ingestion of oocysts from the environment. In Malaysia, the seroprevalence of *Toxoplasma gondii* (*T. gondii*) among healthy people ranges from 14 to 30%, indicating that this disease is common nationally. However, studies on *T. gondii* in meat have been reported only in poultry, wild boar and exotic animals but none in ruminants. The goal of this study was to determine the prevalence of *T. gondii* in meat from cattle, goat and sheep from wet markets in Klang Valley and abattoirs in Selangor, Malaysia. A total of 192 meat samples were bought from 55 stalls at various wet market in Klang Valley, Malaysia. Meanwhile a total of 200 meat samples were collected from two government abattoirs located in Selangor. All meat samples collected were kept at -20°C until further analysis. All meat juices from samples were subjected to a commercially available test kit for the presence of IgG antibodies against *T. gondii*. Furthermore, 184 meat samples from goat and sheep were subjected to conventional nested PCR (B1 genes) for the detection of *T. gondii* DNA. Result from the wet market samples revealed seroprevalence of *T. gondii* antibodies of 5.6% (6/108, 95% confidence interval [CI]: 2.1-11.7%), 68.6% (24/35, 95% CI: 50.7-83.1%) and 34.7% (17/49, 95% CI: 21.7-49.6%) in meat of cattle, goat and sheep respectively. From the abattoir meat samples, antibodies against *T. gondii* were detected in 13% (13/100, 95% CI: 7.1-21.2%) in cattle, 42.5% (17/40, CI: 27.0-59.1%) in goats and 33.3% (21/60, CI: 22.9-45.2%) in sheep. Hence from a total of 392 samples, *T. gondii* antibodies was detected in 25% of the meat samples with overall seroprevalence of 9.1% (19/208, 95% CI: 5.6-13.9%) in cattle; 54.7% (41/75, 95% CI: 42.7-66.2%) in goats and 34.9% (38/109, CI: 26-44.6%) in sheep. No *T. gondii* DNA was detected in any of the goat and sheep meat samples. Results from this study showed an alarming increment of *T. gondii* seroprevalence when compared to previous studies suggestive of highly contaminated environment. Though seropositive may indicate that the animal was exposed to the antigen but it may not necessarily harbour viable pathogen. Nevertheless, the public especially pregnant women and immunosuppressed individuals should be educated and made aware on the risk of consuming undercooked meat. Further studies at the farm level should be conducted to determine the risk factors involved causing the higher seroprevalence of *T. gondii* in ruminant livestock in Selangor, Malaysia.

## THE IMPACT OF SOIL POLLUTION ASSOCIATED WITH BAUXITE MINING ACTIVITY ON FOOD SAFETY AND HEALTH RISK IN MALAYSIA

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Malaysia faces a big challenge of environmental impact amid from its rapid development and food safety and security is not exception under pressure from the effect of this. To identify the contamination characteristic of heavy metals in soils on the bauxite mining area and how this could possibly impact the food safety in the country, soil pollution assessment was employed to evaluate the pollution levels using several pollution indices such as pollution index (PLI), geo-accumulation index (I<sub>geo</sub>) and enrichment factor (EF). The exposure risk posed to human health via food (biological samples) and water consumption was quantified with the risk assessment model developed by the US Environmental Protection Agency.

The results showed that soils in the mining area were contaminated by heavy metals at varying degree. The exposure risk level of soil metals were not acceptable as the overall non-carcinogenic risk was high in the stockpile area (HI = 10.7) and mining sites (HI = 4.51). Chromium (Cr) has been identified as the priority control metals as it is the main contaminant with the potential to cause cancer through ingestion and inhalation. Children and adult females were the vulnerable populations for the carcinogenic risk. The soil metals were mainly sources from the mine waste or residues, dust and aerosol emission from the mining operations, and a crustal mineral from the extraction, transportation and resuspension of soil particles from mining activity. These results provide basic information of the impact of mining activity and its contribution to human health. It also can be used in developing pollution prevention and control measure in Malaysia.

## THE PREVALENCE OF PARASITES IN FRESH VEGETABLES AT THE MARKETS OF BAC LIEU CITY - VIETNAM

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### Background

Fresh vegetables are a popular food and very good for health. It is easy to buy them from market to super market. However, it is difficult to identify in practice.

### Objective

To Identify the prevalence of parasites in fresh vegetables at the markets of Bac Lieu city – South of Vietnam.

PS7-04

Subjects and methods

Identifying the prevalence of parasites in fresh vegetables at the markets of Bac Lieu city.

### Results

The prevalence of parasites in fresh vegetables is 80%. The prevalence of parasites in fresh vegetables is 73%, larvae of nematode and *Ascaris lumbricoides* eggs are the most prevalent of parasites (44% and 43%). The prevalence of protozoa in fresh vegetables is 54%, mainly *Balantidium coli* cysts with 41%. Remarkably, fresh vegetables have a high parasite infection prevalence and they are nearly equal, contamination is highest in lettuce and basil (85%), followed by heartleaf (80%) and the least contaminated is mustard green (70%).

### Conclusion

The prevalence of parasites in fresh vegetables is 80%. It is necessary to control parasites on fresh vegetables, it is suggested that the use of fertilizers of human source in agriculture should be avoided, must use the hygienic water for irrigation. Traders must use hygienic water to spray on vegetables. Consumers must wash their vegetables with saline under strong running water.



## EFFECT OF HIGH HYDROSTATIC PRESSURE ON INACTIVATION OF VIBRIO SPP.

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PS7-05

*Vibrio* (V.) spp. naturally occur in marine and estuarine environment. Among different bacterial pathogens detectable in seafood, *Vibrio* spp. have been considered as the most common cause of foodborne diseases associated with the consumption of raw or undercooked seafood, particularly shellfish. Therefore, the application of post-harvest processing is necessary to lower the risk of pathogenic contamination, including *Vibrio* spp. in seafood. Among those, high hydrostatic pressure (HHP) has been applied to inactivate spoilage and pathogenic microorganisms in a variety of food products such as fruit juices, meat, meat products and shellfish. This study was conducted to determine the effect of HHP on the inactivation of *Vibrio* spp. in both culture suspension and mussel homogenates.

**Methods:** Four *Vibrio* strains including *V. alginolyticus* (ATCC 17749), *V. cholerae* (NCTC 4711), *V. parahaemolyticus* (RIMD 2210633) and *V. vulnificus* (V57/10) were used in this study. HHP of pure cultures and mussel homogenates inoculated with *Vibrio* spp. were carried out at pressure levels of 250, 350 and 450 MPa for 1 and 3 min at 25°C. Drop plating method was used to determine the number of *Vibrio* spp. before and after HHP treatment.

**Results:** The reduction levels were significant different among the four *Vibrio* spp. tested in both pure culture and mussel homogenates, and *V. vulnificus* was the most susceptible species to HHP.

**Conclusion:** The efficacy of HHP inactivating *Vibrio* spp. was observed in both pure culture and mussel homogenates. Pressure treatment at 350-450 MPa for  $\geq 1$  min for both *V. alginolyticus* and *V. cholerae*, 250 MPa for  $\geq 3$  min or 350-450 MPa for  $\geq 1$  min for *V. vulnificus*, and 350 MPa for  $\geq 3$  min or 450 MPa for  $\geq 1$  min for *V. parahaemolyticus* should be applied to achieve a  $> 5$ -log reduction in mussel homogenates.

## INFECTIOUS DISEASE (IV)

**KNOWLEDGE AND AWARENESS OF MERS COV TRANSMISSION AND INFECTION AMONG INDIVIDUAL PLANNING FOR HAJJ**CR. Low <sup>1</sup>, AJ Luqman <sup>1</sup>, NA Mohamed <sup>2</sup> and TZMT Jamaluddin <sup>3</sup>

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Middle East Respiratory Syndrome - Coronavirus (MERS-CoV) is a virus, endemic in the Middle-East and frequently causes febrile respiratory illness to individuals who have travelled to countries in or near the Arabian peninsula or be in contact with a traveler from this region. With the high numbers of Malaysian pilgrims and visitors to Saudi Arabia every year, increases the risk of MERS-CoV transmission to the Malaysian population. The index case in Malaysia emerged in 2014 a middle-aged man who had just returned from Umrah. This study aims to determine the knowledge, attitude and preventive practices towards MERS-CoV among Malaysian Hajj pilgrims. Furthermore, this study also ventures to determine the associated factors such as sociodemographic factors, co-morbidity and history of travel to Saudi Arabia that will affect the level of knowledge, attitude and preventive practices towards MERS-CoV among them. A cross-sectional study was conducted during a Hajj preparatory course at Universiti Sains Islam Malaysia from 7th May to 10th August 2018. A total of 138 Malaysian Hajj pilgrims were included in this study. Data representing knowledge, attitude and practices were collected using a structured self-administered questionnaire. The mean age of the participants was  $47.79 \pm 13.105$  years, ranged from 19 to 75. More than half of them were males ( $n=64$ , 55.2%) and have heard of MERS-CoV before ( $n=76$ , 65.5%). About half of the participants ( $n=57$ , 49.1%) depended on television as a source of knowledge about MERS-CoV. In general, majority of them had poor knowledge of MERS-CoV transmission and infection ( $n=112$ , 96.6%) with an overall mean knowledge score of  $3.71 \pm 2.19$ . 80.2% ( $n=93$ ) of them had positive attitude. The overall mean attitude score was  $41.95 \pm 8.854$ . The overall mean practice score was  $37.54 \pm 7.366$  with slightly more than half of the studied population are found to have poor practice. The significant predictors of good knowledge were female and with high blood pressure. The significant predictors for positive attitude were low socioeconomic status and lesser number of times of travel to Saudi Arabia. In conclusion, our study showed that there is a knowledge gap and poor practices among Hajj pilgrims towards MERS-CoV infection although they reported positive attitude. Continued and strengthened educational programs are needed to improve their knowledge and hygienic practices that will be in the interest of global public health.

PS8-01

## INFECTIOUS DISEASE (IV)

# JAPANESE ENCEPHALITIS IN RURAL DISTRICT IN SARAWAK; HUMAN-ANIMAL INTERFACE

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## Background

Japanese encephalitis (JE) is endemic in Sarawak. Despite having a state level immunization for children, cases still occurred especially in certain rural areas including the district which was selected in this study. The study aim to describe the epidemiology of JE cases and to detect the interface between human cases, host and vector related to this disease. This research was funded by MyOHUN seed funding award 2016.

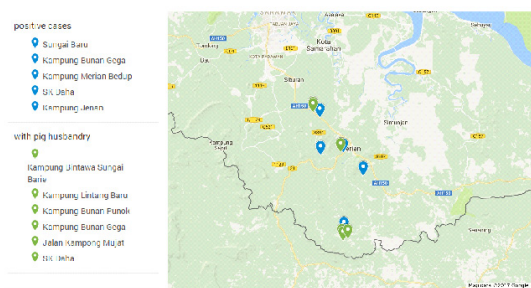
## Methods

This was a cross sectional study, conducted from October 2016 to September 2017. After NMRR approval from Malaysia Ministry of Health, case notes review were done on all confirmed JE cases admitted in Sarawak General Hospital from 2010-2015. Important data such as age, address, date onset, clinical complication and sequelae were collected. Based on the location of cases, mapping of affected area was done, followed by mosquito trapping using BG-sentinel traps for vector density (JEV using RT-PCR). Environmental assessment for the presence of potential host was conducted. The location of cases were mapped with the presence of host and mosquitoes.

## Results

A total of nine confirmed cases were reviewed. The age group range from 10 months to 23 years old. Six of them were student. The outcomes of the cases were two deaths, three discharges with severe neurological deficit and four discharges well. Mapping of the cases showed close relationship with traditional pig husbandry. Vector trapping showed the presence of adult Culex mosquitoes with the density of 10-14 mosquitoes per 14 hours.

Conclusions: There are shift in the age to older age group of patient with JE in Sarawak. The complications among the admission cases were still profound. Positive interface demonstrated among cases, pig husbandry and Culex mosquitoes. However, seroprevalence among pig was not able to do in view of rabies outbreak in the same areas. This initial findings are important implications for future research in seroprevalence among the pig in Sarawak.



Graph 1: Mapping of infected areas with pig husbandry

## INFECTIOUS DISEASE (IV)

## CANINE INFLUENZA VIRUSES: ONE-HEALTH PERSPECTIVES

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**Background**

Influenza viruses have continuously evolved into multiple mutant strains from several regions, resulting in aggravated endemic or epidemic outbreak conditions. In the 2000s, several outbreaks of inter-species transmission were reported, such as, the avian H3N2 influenza virus that crossed the host barrier to dogs. And recently, the H5 lineage of highly pathogenic avian influenza (HPAI) virus has spread in Asia. There is some concern regarding the potential transmission of HPAI viruses into dogs.

**Methods**

Isolated 23 CIV reassortants from a naturally co-infected dog, and analyzed the reassortment patterns. And Dogs were experimentally infected with HPAI clade 1.1.2 (H5N1), 2.3.2.1c (H5N1), and 2.3.4.4 (H5N6).

PS8-03

**Results**

The M gene of pdm H1N1 and the HA gene of H3N2 CIV were predominant in reassortants. Notably, the H3N2 CIV with the matrix gene of the pdm H1N1 virus showed more efficient transmission in ferrets than the classic H3N2 CIV. And we have found that dogs are susceptible to HPAI clade 1.1.2 (H5N1), 2.3.2.1c (H5N1), and 2.3.4.4 (H5N6) showing clinical signs.

**Conclusions**

Our findings emphasized the necessity of intensive monitoring for influenza infection in companion animals for investigating the potential for the emergence of novel human influenza strains.

## HUMAN, SWINE AND FRUIT BATS ANTIBODIES AGAINST PTEROPINE ORTHOREOVIRUS IN PENINSULAR MALAYSIA

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### Background

The first Pteropine Orthoreovirus (PRV), previously named Nelson Bay virus, was isolated from fruit bat in Australia in 1970. Pteropine Orthoreovirus infection in human was isolated a decade ago in Malaysia and subsequently imported to Hong Kong, and Japan from Bali. Additional PRV isolates were also isolated from different species of bats. However, seroprevalence of PRV in human was very limited. Seroprevalence of 4.4% in Central Vietnam was reported. No seroprevalence of PRV in any animal population have yet to be reported. Here we aims to demonstrate serological evidence of PRV infection in human, swine and fruit bats samples collected in Peninsular Malaysia

### Methods

Human sera was collected at 2012 at Rembau, Malaysia. Swine sera were collected from farms located at north, central and south of Peninsular Malaysia in 2018. Fruit bats (*Pteropus vampyrus*) was collected at Pulau Tioman, Malaysia in 2018. Sera microneutralization was performed against four strains of PRV namely, Melaka virus, Pulau virus, Kampar virus and Sikamat virus in Vero cells. Cells were observed up to 5 days for syncytia formation. End point titration that have neutralizing effect on the respective viruses were recorded.

### Results

Seroprevalance of 19% (N=200), 20% (N= 85) and 95% (N=15) were observed among human, swine and fruit bats samples, respectively. Cross neutralization against two or more Pteropine Orthoreovirus strains were observed among human and swine sera while fruits bats generally had antibodies against all four Pteropine Orthoreovirus strains.

### Conclusions

The data showed the presence of Pteropine Orthoreovirus infection in human and animal population with indication of high split over events of PRV from bats to humans and swine.

## KNOWLEDGE, SELF-REPORTED PRACTICE AND ASSOCIATED FACTORS TOWARDS PREVENTION OF SURGICAL SITE INFECTION AMONG HEALTH WORKERS WORKING IN 19.8 GENERAL HOSPITAL, HANOI, VIETNAM, 2017

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2. Hanoi Medical University
3. 19.8 General Hospital.

### Background

Surgical site infection (SSI) is a significant clinical problem that affects the quality of health care outcomes globally, particular in developing countries. SSI is also the leading cause of death and disability among surgical patients in Vietnam and all over the world. Despite the availability of some studies in the world, evidences regarding prevention of SSIs and associated factors are very limited in Vietnam. Moreover, identifying existing knowledge and practices of SSI control among healthcare workers is the first step in developing successful infection control programmes. Hence, our study aims to assess and compare knowledge and self-reported practice and associated factors toward SSI prevention targeting different occupational groups (doctors and nurses) in 19.8 General hospital in 2017.

PS8-05

### Methods

A cross-sectional study was conducted on all of the health workers who works in 10 surgical departments (N=197) in 19.8 hospital. A questionnaire consisting of a section on knowledge and another on self-reported practice, was used for data collection. For analysis, total knowledge score ranged from 0-27 (with cutpoint was 50%) and total practice score range from 0-24 (with cutpoint was 80%). Using Chi-square test ( $\chi^2$ ) and calculate the odds ratio (OR) to test differences in scores among personal characteristics.

### Results

The majority of health workers did not have good knowledge about SSI prevention (75.59%); however, 52.8% of participants had good knowledge on pre-operative knowledge while 90.4% of them did not have good knowledge on post-operative knowledge. Knowledge regarding SSI prevention in the doctor group were likely to be better than in the nurse one (OR=1.53,  $p=0.19$ ). Four items of health workers' knowledge that had the lowest percentage of correct answers including Pre-operative hair removal methods (1%), The appropriate time to shower or bathe with an uncovered incision after surgery (6.1%), The time to assess SSI diagnosis (4.6%), SSI classification (9.1%). Moreover, there was a statistically significant relationship between good knowledge of health workers and service experience, working experience in surgical ward and how many times participating in infection control training program ( $p<0.05$ ).

## APPLICATION OF E-LEARNING ON PREVENTION OF PETS ORIGIN ZOO NOTIC DISEASES AMONG ONE HEALTH FUTURE LEADERS IN KELANTAN, MALAYSIA

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In Malaysia, subjects on zoonotic diseases have never been exposed to the primary schoolchildren. It is because these diseases have never been a real threat to the public in the past 30 years. However, with the trending of more than 45% people owning pets worldwide and in Malaysia, it is timely now for the public to be well informed about these zoonotic diseases originating from their pets and raise their knowledge and awareness on what kind of diseases the owners' risks due to the exposure. This study aimed to carry out the health education program to improve knowledge on zoonotic diseases which will be translated into the practice of prevention among the schoolchildren in selected schools in Kelantan, Malaysia. The schools were chosen as they were within the 25km radius of a previous H5N1 outbreak. Two primary schools had been selected upon the consent from the headmasters. Prior to the program, questionnaires specially designed for pre and post of this study were distributed to gauge the knowledge of the students. The health education module which had been developed was meant to be delivered in via multiple ways/methods. The nature of interactivity and discovery in learning bears a beneficial boost to the monotony of passive learning. The results showed that the knowledge of the students boosted for both schools. The program managed to raise awareness among the schoolchildren although not as high as expected which was due to language barrier. On a lighter note, a module of teaching zoonotic diseases to schoolchildren had been developed for continuous teaching and imparting the knowledge. It is also beneficial to the committee members and among the facilitators as the One Health Workforce; to be able to practice One Health concept and core competencies in this program.

### Search Methods

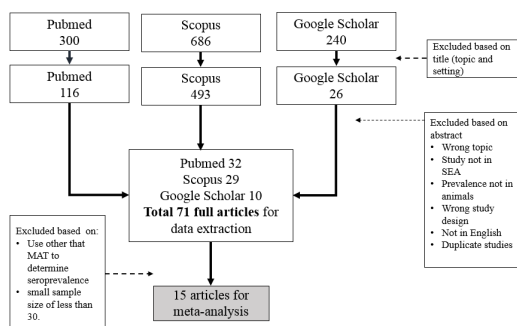


Figure 1 Search Method

## ASSESSMENT OF ZONOTIC DISEASES AWARENESS AMONG PRIMARY SCHOOL STUDENTS OF SEKOLAH KEBANGSAAN AGAMA, MAJLIS ISLAM SARAWAK IN BINTULU, SARAWAK

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### Background

Zoonotic diseases are becoming a common cause of human illness and up to a certain case, it may be fatal. One of the earliest review on zoonotic diseases in Malaysia was reported in the early 1980's and ever since then, many research has been conducted to understand better these zoonotic diseases. In recent years, cases of humans infected with leptospirosis and brucellosis are on the rise in Malaysia. This may due to lack of understanding on prevention and proper hygiene. Many are not aware of the term zoonotic diseases and the concept of one health. Quite a number of cases of leptospirosis infection were found among school students. Upon investigation, they were found to have visited waterfalls or lakes which were positive with leptospira. Visits to petting zoos and handling of stray animals may even lead to the exposure of other form of zoonoses if no proper hygiene were taken. Hence, this project was design to assess the awareness of school students in the rural area of Bintulu, Sarawak. Previous studies on the awareness of zoonotic diseases in various countries showed that many of the respondents were not aware of the term zoonotic diseases. This study was conducted to assess the awareness of zoonotic diseases among school student in the rural part of Bintulu, Sarawak. This project was implemented by using modules created to educate students to understand better on the transmission and prevention of zoonotic diseases.

PO-03

### Description

Program was conducted for 3 days in UPM Campus Bintulu Sarawak and the school (Sekolah Kebangsaan Majlis Islam Sarawak). A total 15 volunteers comprised of UPM staffs and postgraduates students were trained before the program. Training module covers topics from One Health concept to running of modules for the program. A total of 39 students aged 11 to 12 years old comprising both male and female participants were involved in this program for 2 days. The same participants were assessed for both days.

### Lessons learned

A total of 39 respondents participated in this assessment. From 47 questions, there were 17 questions that had significant difference ( $P < 0.05$ ) in awareness level score between before and after the program was conducted. All the 17 questions mean rank differences exhibited that the students had small increase in level of awareness among the student after program completed. One of the main reasons for high level of awareness may due to the recent rabies outbreak that took place within one month before the program.



**Conclusions**

This study reveals that majority of the primary school students in the school have high level of awareness on the zoonotic diseases even before the awareness program was initiated. Compared to previous study conducted in Sekolah Kebangsaan Seri Selangor in 2016, this study shows that public awareness in zoonotic diseases increase parallel to outbreak occurrence in Malaysia. Rabies outbreak in Sarawak during that period triggers the public authorities and government to execute outbreak manual which emphasized the public and indirectly to the students around Malaysia of the hazard of zoonotic disease specifically on rabies.

## A REVIEW OF HOSPITAL WASTEWATER: IS IT A SPOT OF ANTIMICROBIAL RESISTANCE?

Bui Thi Minh Hanh, Le Thi Hoan, Chu Van Thang

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### Background

Hospital wastewater is seen as a contaminated source of natural aquatic ecosystem due to containing polluted ingredients. It also poses potential risk of spreading antibiotics and antibiotic resistant bacteria. This study reviewed researches implemented in the past ten years to provide an overview of characteristics and risk factors of hospital wastewater worldwide.

### Methods

Searching was conducted on IWAP (journal of water and health), JSTOR, PubMed, Elsevier, ACS Publications (journal of environmental science and technology) and Google Scholar. The searching process utilized three strategies including six keywords (hospital, waste-water, characteristic, risk, antibiotic, resistance), then a flexible combination of keywords and synonyms aiming to reach high quality papers, and searching in references of previous found documents to ensure all related papers to be reviewed. Eligible articles were screened, reviewed on characteristics and risk factors of hospital waste-water. Data on present, mean concentration of polluted ingredients or evaluations, evidences of threats from hospital wastewater to the environment and human health was extracted.

PO-05

### Results

Thirty-five eligible publications from 18 different countries between 2008 and 2018 were chosen including 58% studies conducted in Asiatic countries (Iran, SriLanka, Indonesia, Vietnam, Iraq, Pakistan, India, China, UEA), 30% in European countries (Turkey, Italia, Luxembourg, Denmark, Switzerland, Spain), 8% in America (USA, Haiti) and 4% in Africa (Nigeria).

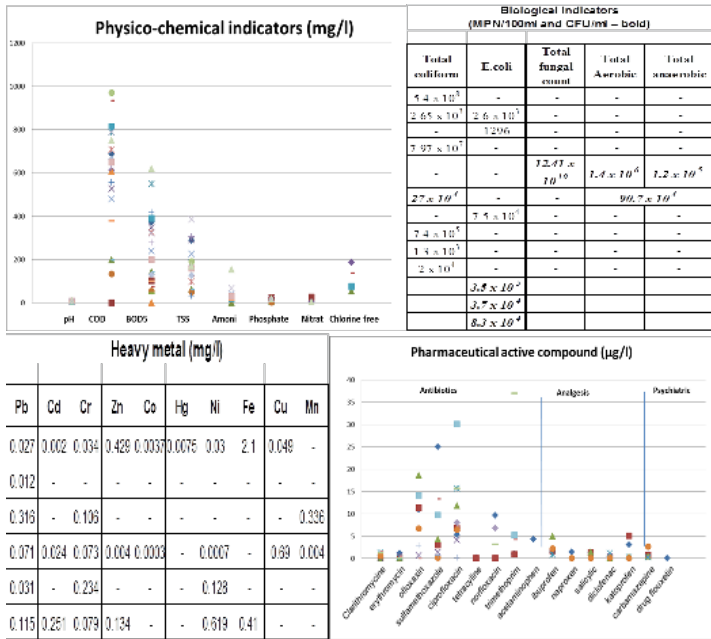
Characteristics of hospital wastewater were collected and divided into four groups of physic-chemistry, biology, heavy metal and pharmacy. The characteristics of hospital wastewater are diverse, with appearance of concerned indicators including pH, COD, BOD5, TSS in physic-chemical group; Total coliform and E.coli in biological group; Pb and Cr in heavy metal group; Antibiotics, analgesis and psychiatric drugs in pharmaceutical group (Figure 1).

Risk factors of medical effluent were classified into 3 categories including chemical risk physical risks and biological risks. The first category - chemical risks - was heavy metal, disinfectants, chemical solvents and pharmaceutical compounds (antibiotics). The second category - physical hazard - related to radioactive substances such as I131 radioisotope, phosphorus-32, strontium-89, and yttrium-90. The third category - biological risks - was a range of pathogen microorganisms (bacteria, protozoa, helminthes and viruses) with occurrence of antibiotic resistance bacteria/genes. While potential damage of risk factors was estimated using different models and equations (Risk Quotient, Danger Quotient, Beta - Poison Model or Daphnia Magna bioassay Indicator), a consistent risk factors emerging through reviewing all publications was the appearance of pharmaceutical active compounds (antibiotics) and the occurrence of antibiotic resistance bacteria in hospital wastewater.

Conclusions

A variety of ingredients were found in hospital waste-water with the present of polluted substances which cause harm to environment and human health. The most concern of risk factor in medical wastewater was micro-pollutants with a wide range of found antibiotics and antibiotic resistance genes/bacteria. Enhancing efficiency of wastewater treatment plants and developing novel techniques to detect, measure antibiotic/antibiotic resistance genes and explore their correlation in medical wastewater are urgently need to control and prevent Antimicrobial Resistance.

Figure 1: The occurrence and mean value of ingredients in hospital wastewater



## A PRELIMINARY STUDY ON MOLECULAR CHARACTERISATION OF TOXOPLASMA GONDII ISOLATED FROM CAT FAECES IN SERDANG, SELANGOR, MALAYSIA

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PO-08

### Background

Owning a cat as pet animals and treated them as part of family members have become a trend in developed society worldwide. In Malaysia, awareness of the zoonotic disease transmission among the cat owner is still low. Apart from the pet animals, we still have a problem of having stray cats which freely live outside with poor nutrition and health status.

### Methods

An epidemiological study of a zoonotic protozoan parasite *Toxoplasma gondii* in cat faeces in Serdang, Selangor Malaysia was carried out using both microscopic and molecular detection techniques. A total of 200 faecal samples were collected. This comprised of 100 faecal samples from pet cats at the University Veterinary Hospital, Universiti Putra Malaysia and 100 faecal samples from stray cats around Serdang area. Microscopic examination using floatation techniques was performed by concentrated Sheathers' sucrose solution. The molecular detection was carried out using conventional polymerase chain reaction (PCR) targeting the specific B1 gene and 529 repetitive genes which are specific to *Toxoplasma gondii*.

### Results

Overall, the microscopic technique revealed 7 (3.5 %) faecal sample were positive with 2 (2 %) and 5 (5 %) for pet and stray cat respectively. Seventeen (8.5%) out of 200 samples were confirmed to be positive with 4 (4%) and 13 (13 %) for pet and stray cat respectively.

### Conclusions

This is the first report of molecular detection of *Toxoplasma gondii* parasite from cat faecal sample in Malaysia. This indicates that the soil environment is highly contaminated and serve as a pool for infection which pose a threat to human health. The subsequent analysis will be carried out to determine the genotyping of the isolated *T.gondii* on the diversity and virulence of each strain.

## POTENTIAL OF MALAYSIAN HERBS IN A TREATMENT OF ZOONOTIC INFECTIONS: THE TOXOPLASMA GONDII PARASITE

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### Background

Toxoplasmosis is a parasitic disease of zoonotic importance that is gaining relevance throughout the world. Human acquires the infection through either environmentally oocyst-contaminated food, vegetable, water, fruits or soil or through tissue cyst in muscles and brains of food animal and in the placenta. Considering the biology and parasitic life style of *T. gondii*, the setbacks that characterized the use of current chemotherapeutic agents may pave way for the development of drug resistance. We therefore in this study, evaluate the potentials of natural herbs that are commonly grown in our environment on the intracellular replication of *T. gondii*.

### Methods

We used the maceration procedure to obtain the ethanolic extract of *Tinospora crispa* and *Andrographis paniculata* followed by phytochemical screening using standard procedures. We conducted a MTT assay to determine the cytotoxicity and anti-parasitic effect of the crude extracts. We assessed the parasite Infection index (cell invasion) and intracellular replication at 24 h and 48 h periods after treatment at 24 h post-infection using microscopy. Results: Phytochemical screening revealed the presence of alkaloid, phytosterols and phytophenols. The MTT assay revealed that both plants and clindamycin are safe to host cells with IC<sub>50</sub> of 142.4, 179±1.5 and 116±2.3 µg/ml for *A. paniculata*, *T. crispa*, and clindamycin respectively. Extracts also showed good anti-parasitic activities against *T. gondii* with IC<sub>50</sub> (*A. paniculata* = 4.36 µg/ml, *T. crispa* = 6.31 µg/ml in comparison with clindamycin (8.33±1.04 µg/mL). Assessment of infection index and intracellular proliferation after 24 h showed that both plants caused a reduction in both parameters. Ethanolic extract of *A. paniculata* and *T. crispa* were nucleotide level. As the results, three cell lines were confirmed to biallelic modification and used for SCNT to generate MyD88 knockout pigs.

### Conclusions

In this study, we successfully established in vitro model to offer useful resources toward human disease. And we expect that MyD88 knockout pigs could be used to inoculation test of dengue virus for verification of virus infection and suggest a potential animal model of dengue fever disease.

This work was supported by grants from Korean IPET (Institute of Planning and Evaluation for Technology in food, agriculture and forestry, #116085-3).

PO-09

## ESTABLISHMENT OF PORCINE MYD88 KNOCKOUT CELL LINE AS IN VITRO MODEL FOR RESEARCH OF HUMAN INFECTIOUS DISEASE

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2. College of Pharmacy, Korea University, Sejong, Republic of Korea

### Background

Dengue fever is a tropical endemic human disease mediated by mosquitoes and is spreading worldwide due to active transportation and climate changes. Although development of novel vaccines for dengue fever has been increased, developed vaccine remains controversial issues of vaccine efficacy due to the insufficient understanding of immune responses in animal models. Recently, pigs are suggested to be an ideal animal species as research model for human disease because of similar characteristics with humans. Moreover, recent gene engineered technology allow production of suitable animal model toward specific human disease. Transgenic pigs that elicit incomplete immune response being vulnerable to infection of Dengue virus could be an alternative animal model of Dengue fever disease. Due to the TLR2/MyD88 pathway in host cells can drive immune responses during primary Dengue virus infection, the MyD88 knockout pigs could have more susceptibility against Dengue virus. These pigs can be used suitable animal model for understanding of dengue virus pathogenesis and vaccine effectiveness.

PO-12

### Methods

First, porcine MyD88 targeting CRISPR/Cas9 vector was designed to induce a double-strand break on the porcine MyD88 gene. We have transfected this CRISPR/Cas9 vector into porcine fetal fibroblasts by eletroporation. After then, the transfected cells were sorted by MACS cell sorter to enrich genetically modified cells. As a result of serial culture, we obtained biallelic mutated cell lines. Genotype and expression pattern to identify cells carrying modified MyD88 gene was confirmed by T7E1 assay, genome sequencing and FACS analysis. To produce modified transgenic animals for in vivo model, established cells were used as donor cells for somatic cell nuclear transfer.

### Results

Specific sgRNA targeting MyD88 was inserted into porcine cells. And then, 24 single-cell derived colonies were analyzed by T7E1 assay to confirm the genetic modifications; 19 colonies were confirmed to have modified MyD88 sequence, and these colonies were further analyzed to identify exact modification of MyD88 at the able to cause 40.15% and 35.99 % reduction of infection index as compared to clindamycin 21.59%. They also caused a reduction in intracellular replication of 72.05 % and 68.64 % for *A. paniculata* and *T. crispa* respectively as compared to clindamycin 48.84 %. Assessment after 48 h of treatment showed a reduction in infection index by *A. paniculata* (69.6 %), *T. crispa* (65.6 %) as compared to clindamycin (54.6 %) and reduction of intracellular replication by *A. paniculata* (92.4 %), *T. crispa* (91.3 %) as compared to clindamycin (84.5 %). We computed all values in relation to negative control.

### Conclusions

Our study showed that the ethanolic extracts of both plants contain promising drug candidates effective against *T. gondii* and safe to the host cells and can possibly be use in future to develop potent anti-Toxoplasma compounds.

## POSTER

## VECTOR-BORNE DISEASES OVERVIEW THROUGHOUT THE 2014 MAJOR FLOODING EVENT IN KELANTAN, MALAYSIA

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2. United Nations University-International Institute for Global Health, Kuala Lumpur, Malaysia.
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4. Kelantan State Health Department, Kota Bharu, Kelantan, Malaysia.

### Background

Dengue and malaria are two common vector-borne diseases that cause severe morbidity and mortality among those affected by floods. This study assesses the occurrence of dengue and malaria, their spatial distribution and associated factors throughout the 2014 major flooding event in Kelantan, Malaysia.

### Methods

We conducted an observational study involving incident dengue and malaria cases, from the three months pre, during, and three months post-flood periods. Geographical information system was used to determine spatial distributions of disease cases while influencing climatic factors were also analysed.

### Results

A total of 2722 dengue and 46 malaria cases were notified within the 3 study periods. Surprisingly, almost 76% of dengue cases occurred in the pre-flooding period as compared to only 8% during and 16% in the post-flooding period. For malaria, no case was recorded during the flooding with 19 and 27 cases occurring in the pre and post-flooding periods, respectively, with *Plasmodium vivax* dominating before flooding as compared to *P. falciparum* in the post flooding period. Average nearest neighborhood analysis indicated that dengue cases were more clustered in the pre-flood period as compared to the post-flood period, with observed mean distance between cases of 351.8 meters and 909.3 meters, respectively (both at  $p < 0.01$ ). Kernel density revealed that dengue cases were highly concentrated in the urbanized and densely populated areas of Northern Kelantan throughout all periods. Significantly, dengue incidences were positively associated with river water levels but inversely associated with humidity, rainfall and maximum temperature.

### Conclusions

The occurrence of dengue and malaria throughout flooding was associated with several different factors. Understanding spatial distribution and associated factors of these vector-borne diseases can help improve future disease surveillance and management during and following floods.

PO-13

## SEROLOGICAL SURVEY OF BARTONELLA INFECTION IN RURAL MALAYSIAN POPULATIONS AND MOLECULAR DETECTION OF BARTONELLA ORGANISMS IN ANIMALS AND ARTHROPOD SAMPLES

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### Background

*Bartonella* spp. are small, vector-borne, Gram-negative bacterial pathogens which are responsible for a number of human diseases including trench fever and cat scratch fever. It has been reported that animals with substantial exposure to *Bartonella* spp. may serve as a reservoir in nature.

PO-15

### Methods

This study was aimed to determine the seroprevalence of *Bartonella* spp. among rural and urban healthy individuals in Peninsular Malaysia, using an indirect immunofluorescence assay. The potential carriage of *Bartonellae* in animals and arthropod samples was also determined by using polymerase chain reaction assays and sequence analysis of the amplified citrate synthase gene fragments.

### Results

IgG antibodies against *Bartonella* spp. were detected from approximately 20% of rural populations investigated in this study. Higher seropositivity against *Bartonella* spp. was noted amongst the rural populations, as compared to the urban blood donors. *Bartonella henselae*, *Bartonella clarridgeiae* and uncharacterized *Bartonella* spp. were detected from fleas collected in this study. *Bartonella* spp. closely related to *Bartonella phoceensis*, *Bartonella queenslandensis*, *B. henselae* and *Bartonella bovis* were detected from animals, while *Bartonella tribocorum* was detected in ticks.

### Conclusion

This study provides serological evidence on *Bartonella* infection in rural Malaysian populations and molecular evidence on the presence of various *Bartonella* spp. in animals and arthropods samples. Raising awareness for prevention and control of *Bartonella* infection is important especially in people at high risk.



## PERCEPTIONS AND RISKY BEHAVIORS IN RELATION TO LEPTOSPIROSIS AMONG HOUSEHOLDS IN CHIKORKOR AND LAW MOO TEN VILLAGE OF KHON KAEN PROVINCE, THAILAND

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3. Faculty of Veterinary medicine, Khon Kaen University, Thailand

### Background

Leptospirosis is a zoonotic disease which has wide range of animal species reservoirs, both wildlife and domestic animals, which serve as sources of infection for human. The disease is worldwide distribution, especially in countries located in tropical climate zone such as Thailand. The objective of this study was to investigate the perceptions and behavioral risks regarding to Leptospirosis infection.

### Methods

The cross-sectional descriptive study using questionnaires was performed by 107 and 120 households in Chikorkor and Lawa Moo Ten villages, respectively.

### Result

Participants' perception regarding leptospirosis was high level in both villages, some false perceptions held by the respondents were found, especially in the reservoirs of *Leptospira* spp. Animal husbandry was the risk factor of Chikorkor and Lawa Moo Ten villages with odd ratios of 8.18 (1.73-76) and 16.3 (5.6-48.6), respectively. Besides, working time on field with barefoot was a risk factor in Lawa Moo Ten with odds ratio of 2.6 (1.1-7.1). In addition, a correlation between perception and behavior was found in Lawa Moo Ten village,  $p < 0.05$ . If perceptions has 0 point, so baseline score for risk behaviors in Lawa Moo Ten villages are 7.2.

### Conclusion

Although both villages had a similar demographic information, some characteristics led to differences in prevalence of leptospirosis infection as animal husbandry and time working on field with barefoot. The study found significant association between perception and risk behaviors in Lawa Moo Ten village. Appropriate perceptions and preventative behaviors education regarding leptospirosis play important roles in preventing the disease.

## PREVALENCE OF LEPTOSPIRAL INFECTION IN ANIMAL RESERVOIRS OF SOUTH-EAST ASIA

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### Background

Leptospirosis is a zoonotic disease responsible for high morbidity worldwide. It is transmitted to humans through animal urine. Rats are the main vector of human leptospirosis in urban settings. This systematic review is intended to identify other possible animal reservoirs of *Leptospira* spp. within human surroundings, which may improve the prevention and control of the disease.

PO-18

### Methods

A systematic search was performed for the relevant title, abstract and keywords in PubMed, Scopus and Google Scholar in March 2018 based on the PICO strategy; which returned 1226 studies. Screening of abstracts had shortlisted 71 studies and data extraction was conducted for 15 studies which had been accepted after review of the full text. Only studies done in South-East Asia were considered (Figure 1).

### Results

The articles were analysed from the viewpoint of the study settings and the prevalence of *Leptospira* spp. in types of animal; with the animals being grouped into five major groups, based on taxonomy and likelihood of human contact. Using the random effects model, it was found that all animal groups have statistically significant value of pooled prevalences, with a range between 8.17% (95% CI: 4.80% - 12.39%) for sheep and goats, to as high as 27.28% (95% CI: 1.24% - 69.69%) for carnivores. The prevalence for other animal groups are 17.95% (95% CI: 7.77% - 31.18%) for rodents, 19.24% (95% CI: 10.65% - 29.65%) for pigs, and 24.90% (95% CI: 15.45% - 35.71%) for ruminants.

**Conclusion** Although rodents are traditionally incriminated for leptospires transmission, meta-analysis showed that other groups of animals, particularly carnivores, pigs, and large ruminants are just as culpable. These other groups of animals may also play vital in human leptospirosis.

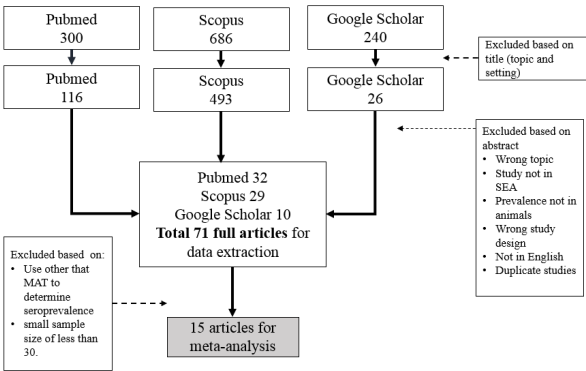


Figure 1 Search Method

## HOST CELL MIMIC POLYMERSOMES FOR RAPID DETECTION OF HIGHLY PATHOGENIC INFLUENZA VIRUS VIA A VIRAL FUSION AND CELL ENTRY MECHANISM

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### Background

Highly pathogenic avian influenza virus (HPAIV) infections have occurred continuously and crossed the species barrier to humans, leading to fatalities. A polymerase chain reaction based molecular test is currently the most sensitive diagnostic tool for HPAIV; however, the results must be analyzed in centralized diagnosis systems by a trained individual. This requirement leads to delays in quarantine and isolation. To control the spread of HPAIV, rapid and accurate diagnostics suitable for field testing are needed, and the tests must facilitate a differential diagnosis between HPAIV and low pathogenic avian influenza virus (LPAIV), which undergo cleavage specifically by trypsin- or furin-like proteases, respectively.

PO-19

### Methods

The inactive form of hemagglutinin (HA0) can be cleaved by proteases to generate HA1 and HA2, thus exposing the fusion peptide of the conserved cleavage sequence of the stalk domain. We recognized that LPAIV contains a monobasic cleavage site that can be cleaved by trypsin-like serine proteases, whereas HPAIV typically possesses a polybasic cleavage site that can be activated not only by trypsin-like serine proteases but also by furin-like proteases. To utilize between LPAIV and HPAIV in the enzyme activities at the cleavage sites, we fabricated a cell-mimetic polymersome (called "FluSome") containing fluorescence resonance energy transfer (FRET) pair fluorophores that can be fused with the virus membrane.

### Results

Upon fusion, FRET FluSome changes its fluorescence emission from orange (565 nm) to green (504 nm), which enables visual identification of HPAIV or LPAIV.

### Conclusions

Therefore, FluSome is a novel and time-saving diagnostic tool improving the sensitivity comparable to RT-PCR, and this facilitates early preventative procedures for controlling HPAIV outbreaks, which currently depends on time-consuming RT-PCR and genomic sequencing to confirm HPAIV.

## CANINE INFLUENZA VIRUSES: INSERTION-RESPONSIVE MICRONEEDLES FOR RAPID INTRADERMAL DELIVERY OF CANINE INFLUENZA VACCINE

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**Background:** Currently licensed CIV vaccines are mainly based on whole inactivated CIV of H3N8 or H3N2 strains and administered subcutaneously or intramuscularly using hypodermic needles. The use of needles, however, raises concerns about the risk of needlestick injuries during the course of veterinary practice, and often causes bleeding or non-painful lump formation at the site of injection. In addition to safety concerns, current vaccine administration routes have limited antigen targeting ability due to a relatively small population of dendritic cells (DCs) in subcutaneous fat and muscle tissue, leading to low vaccine efficacy and poor immune responses.

**Methods:** a novel tip-separable microneedle system named insertion-responsive microneedles (IRMNs) are composed of dissolvable hyaluronic acid (HA) tips and biocompatible polycaprolactone (PCL) bases, the tip of which is instantly separated from the base during microneedle insertion and retraction. Vaccine antigens derived from canine influenza virus (A/canine/VC378/2012; H3N2) were successfully coated on HA tips by rapidly freezing the tips prior to coating.

**Results:** Immunization in Guinea pigs showed that hemagglutination inhibition (HI) antibodies induced by IRMNs were two times higher than those induced by intramuscular (IM) injections. When challenged with influenza A/canine/Korea/01/2007 (H3N2) wild-type virus 2 weeks after the second vaccination, viral shedding was completely eliminated at 8 days post infection in both IRMNs and IM injection groups.

**Conclusions:** Our results suggest that IRMNs have great potential for rapid and convenient vaccination, which will be particularly attractive for animal vaccinations

PO-21

## EFFECTIVENESS OF RABIES CONTROL AND PREVENTION IN HUMANS APPLYING ONE HEALTH APPROACH IN SON LA PROVINCE, 2014-2015

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The Prevention Medicine Center of Son La province

### Background

Rabies is an acute viral infection of the central nervous system caused by the rabies virus, from the family Rhabdoviridae and in the genus Lyssavirus, which is infected from animals to human. The WHO estimates that 55,000-70,000 people die every year due to rabies (> 90% in Africa and Asia). In Son La province, rabies was an outbreak from 2011. During 2011-2013, 41 people died due to this disease. This study Effectiveness of Rabies Control and Prevention Applying One Health Approach in Son La Province, 2014-2015 was conducted to evaluate the effectiveness of rabies Control and Prevention applying the One Health approach in three communes of Mai Son district, 2014 – 2015.

PO-22

### Methods

Community based controlled intervention. Three intervention communes of Mai Son district and three controlled communes of Song Ma district were selected, 2014-2015.

Subjects: Household keepers,  $\geq 15$  years old and representatives of Committees. Method: Sample size:  $n1 = n2 = 396$ . Data collection tools: HH Questionnaire; Form for Survey of rabies control and prevention and secondary data. Data analysis: Data was collected and entered into EPIDATA 3.1 software; analyzed by STATA 10.0 software; mapped using Arc GIS 9.3 software.

### Results

The rate of people with good knowledge Prevention and Control of Rabies (PCR) increased in both groups. The effective index (EI) of the intervention group was 21.1%. Before-after index (BAI) of the control group was 5.6% and Intervention effectiveness (IE) between 2 groups was 15.5%. The rate of exposed people vaccinated with PRC in the intervention group had EI = 47.6%, and in the control group had the BAI= 3.1%. The IE between 2 groups was 44.5%. After two years, quality of PCR at all the three intervention communes increased from Medium to Fair and Good. In the 3 control communes, the scores increased but remained at an average level. At the three intervention communes, the EI of financial mobilization was 168.8% ( $p < 0.05$ ). The three control communes, before-after index was 32.5%, The IE between two groups was 136.3%.

### Conclusions

After two years (2014-2015), the IE increased the proportion of people with good knowledge about PCR between the two groups of 15.5%. The EI practiced properly by going post-exposure vaccination was 44.5% between the two groups. The rate of post-exposure prophylaxis per 100,000 people in the intervention group increased 1.6-1.1 in the control group. The vaccination coverage rate in dogs between the two groups was 8.6%. The quality of the PCR activities of the steering committees in the 3 communes intervened from the average to a good level. The IE of financial mobilization of 3 intervention communes compared with 3 control communes was 136.3%.

## AWARENESS OF BATS-BORNE INFECTIONS AND PREVALENCE OF PTEROPINE OTHOREOVIRUS AMONGST TIOMAN ISLAND'S INHABITANTS

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### Background

Pteropine orthoreovirus, an emerging zoonotic respiratory virus, reported to cause respiratory tract infections among human beings in Southeast Asia. This study aimed to determine the awareness on bats-borne infections and seroprevalence of Pteropine orthoreovirus (PRV) among villagers staying near bat roosts in Tioman Island.

### Methods

This cross-sectional study utilized a questionnaire by face-to-face interviews to assess respondents' knowledge, attitude and practice on bats-borne infections. For serological study, serum microneutralization was performed with 2-fold dilution against 100TCID<sub>50</sub> (50% tissue culture infective dose) of four strains of PRV namely, Melaka virus, Pulau virus, Kampar virus and Sikamat virus in Vero cells. Cells were observed up to 7 days for syncytia formation. End point titration that have neutralizing effect on the respective viruses were recorded.

### Results

We found that the mean score (N= 300) for knowledge, attitude and practice were poor, average and good respectively. PRV seroprevalance was 15.5% (N=155).

### Conclusions

Poor knowledge regarding bats-borne infections is worrying since the population is at risk of getting infections due to high exposure to bats. More effort is needed to facilitate any preparation to deal with possible health impacts of bats-borne infections in the future. Education, particularly, should include balancing bats conservation and prevention of bats-borne infection among residents.

PO-23

## DEVELOPMENT OF GENETIC MARKERS AND SCREENING FOR VIRUSES IN INSECTIVOROUS BATS AT THE KINABATANGAN-SEGAMA VALLEY AND THER ISOLATED AREAS OF SABAH, NORTHERN BORNEO

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### Background

The lower Kinabatangan-Segama valley comprises of eleven forest fragments (predominantly secondary forest) and surrounded by oil palm plantations. We aim to explore the impact of forest conversion and fragmentation on bat population structures, using two insectivorous bats; the Whiskered Myotis (*Myotis muricola*) and the Fawn Roundleaf Bat (*Hipposideros cervinus*) as a model, and to identify the type, dominance and prevalence of zoonotic viruses in the various bat species at Kinabatangan-Segama and other isolated areas of Sabah.

PO-24

### Method

Ongoing fieldwork has been conducted at four sampling sites at the Lower Kinabatangan-Segama Valley, Pulau Banggi and Pulau Balambangan where genetic samples have been taken from the wing flap tissues of insectivorous bats for DNA isolation. We have performed shotgun sequencing using the long-read PacBio RSII sequencer to isolate and develop microsatellite markers for genetic diversity and population structure studies. The identification of viruses was based on the consensus PCR primers assay targeting viral families.

### Results

The 6kb shotgun library resulted in a total of 117,009 and 125,740 circular consensus reads for *Myotis muricola* and *Hipposideros cervinus*, respectively. The resulting igh-quality Circular Consensus (CCS) reads were mined for four types of microsatellites i.e. di-, tri, tetra- and penta-nucleotide repeats. We have developed specific primers for the microsatellite regions which were used to capture polymorphisms in the two bat species. Ongoing documentation of the viruses carried by the bats will be reported here. In addition, we also found 91 cases of ectoparasites from bats (out of 251 sampled) from Pulau Banggi and Pulau Balambangan, some which are carriers of viruses and bacteria.

### Conclusion

We are concerned about human encroachment into wildlife territory as land-use changes is reported to be a major driver of emerging infectious diseases. The results from this study will be used to establish conservation strategies for bat conservation plan in the lower Kinabatangan-Segama valley and to discover associations between host-virus migrations in Sabah.



## CLINICAL APPLICATIONS OF THE MELD SCORE IN ASSESSING THE SEVERITY OF PATIENTS WITH CIRRHOSIS DUE TO HEPATITIS B, HEPATITIS C IN THE GASTRO-HEPATOLOGY DEPARTMENT, BACH MAI HOSPITAL IN 2016

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### Background

Cirrhosis is a common disease with high mortality rate. Alcohol and hepatitis B, C is the main causes leading to such disease. There are many scoring systems for assessing the severity of patients with cirrhosis. The MELD scoring system was established in 2000, to predict mortality and allocate organs for liver transplantation. In the world, there are a few research in assessing the prognosis of cirrhotic patients with various causes. Some has shown that cirrhosis due to viral hepatitis has poorer prognosis than alcohol-derived cause, meanwhile others have pointed it out that the prognosis is irrelevant to causes. Overall, the prognosis of virus-related cirrhotic patients haven't been clarified yet; and it is important to assess the difference between prognosis in alcohol- and virus-related hepatitis for a better health care.

### Methods

Location and date: Gastro-hepatology Department, Bach Mai Hospital from 2016 Jan 01 to 2016 Dec 31

### Study design

Retrospective study, observational cross-sectional study, medical charts.

### Study population

All cirrhotic patients in Gastro-hepatology Department, Bach Mai hospital.

### Data collection

From a single form according to study aims

### Methods of analysis used

Using common statistic analysis with the SPSS 16.0 software.

### Results

In 1897 patients with cirrhosis, major risk factors are alcohol (58,88%); hepatitis B (19,5%); hepatitis C (1,53%). The mean MELD score in virus-related group ( $17,23 \pm 9,43$ ) is statistically higher than alcohol-related group ( $15,61 \pm 7,29$ ).

### Conclusions

Cirrhosis due to hepatitis B and hepatitis C has poorer prognosis than alcohol-related cirrhosis.

PO-25

## HEALTHCARE ASSOCIATED INFECTIONS STATUS AND ANTIBIOTIC TREATMENT COSTS IN HOSPITALIZED PATIENTS AT INTENSIVE CARE UNIT, HOSPITAL E FROM APRIL TO JUNE 2018

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### Background

Observational studies aimed at determining the incidence of Healthcare Associated Infections (HAI) and identifying some factors associated with HAI and describing the costs of antibiotic treatment in patients hospitalized in Intensive Care Unit (ICU) from April to June 2018.

### Methods

A longitudinal follow-up study was performed on 137 patients admitted from April 1, 2018 to June 30, 2018 with time in hospital more than 24 hours. The research collected information on personal information: age, sex, hospital admission, onset and associated illnesses; Information on treatment process: heart rate, temperature, blood pressure, respiratory rate, clinical symptoms of respiratory tract, white blood cell number, x-ray; Information on invasive procedures on the patient: Intubation ventilation, tracheostomy, non-invasive ventilation, central venous catheters, insertion of catheter, start date if the invasive device is withdrawn; Microbiological tests: types of microorganisms detected; Information on antibiotic treatment: name of antibiotic, dose, route of use, start date, end date of use, unit price antibiotics are used. The data collected were entered into epiData software 3.0 and analyzed using the spss software to calculate the incidence of HAI rate and each type of infection, the incidence of HAI over 1000 days of treatment, number of pneumonia / 1000 days of mechanical ventilation, number of septicemia / 1000 days of intravenous catheterization, number of urinary tract infections / 1,000 days of urinary catheter entry; Single and multivariate analysis of a number of factors related to HAI, including age, sex, time in hospital, interventional procedures; antibiotic treatment costs for patients.

PO-27

### Results

Incidence of HAI in ICU was 18.25%, incidence was 15.66 / 1000 days of treatment, 25.61 pneumonia / 1000 intubation days; 6.25 septicemia / 1000 intravenous catheters, 1.44 urinary tract infections / 1,000 days of urinary catheter entry. Some factors related to HAI were age over 60, under 18, time in hospital over 12 days, ventilator administration, open tracheal ventilation, ventilatorless ventilation, central venous line were the risk factors for hospital infection. Patients with HAI had antibiotic treatment costs 3 times higher than those without HAI.

### Conclusions

The results of the study show that high rates of HAI in ICU so that the interventions to reduce HAI should focus on this intervention, especially those patients aged over 60, under 18, long time in hospital, patients have implemented invasive procedures, the study also pointed out the burden of hospital infections caused increased antibiotic treatment costs and the amount of antibiotics to use is increased antibiotic resistance. Therefore, good control of infection reduces the cost of treatment and time in hospital as well as antibiotic resistance.

## ONE HEALTH PROBLEM BASED LEARNING (OHPBL): AN APPROACH TO INCULCATE 'SYSTEMS THINKING' AMONG THE FUTURE ONE HEALTH WORKFORCE

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### Background

The current teaching pedagogies emphasize explicit instructions with individual goal-oriented-assignments and norm-referenced grading. The main issue in the teaching and learning process is the gap between active field-work and the passive classroom experience. Students rarely given the opportunity to solve real-life problems through contextual learning. To address this, professional courses in institutes of higher education are inclining towards a student-centered approach to teaching and learning.

One health (OH) embodies the optimal health of people, animal and environment. OH workforce members deal with uncertainty and tackle real-life problems in the field. The problems are complex and often with incomplete data. As OH is an integrated effort, the workforce must be effective members of a coherent team that possess strong communication and problem solving skills.

Meaningful education should build on prior knowledge of students and positively link classroom experience to real-life scenarios. We have introduced the OH concept to students from different disciplines via Problem Based Learning (OHPBL). We believe that the OHPBL can instill a sense of importance for OH, foster collaboration and promote teamwork among future OH workforce from different expertise.

### Methods

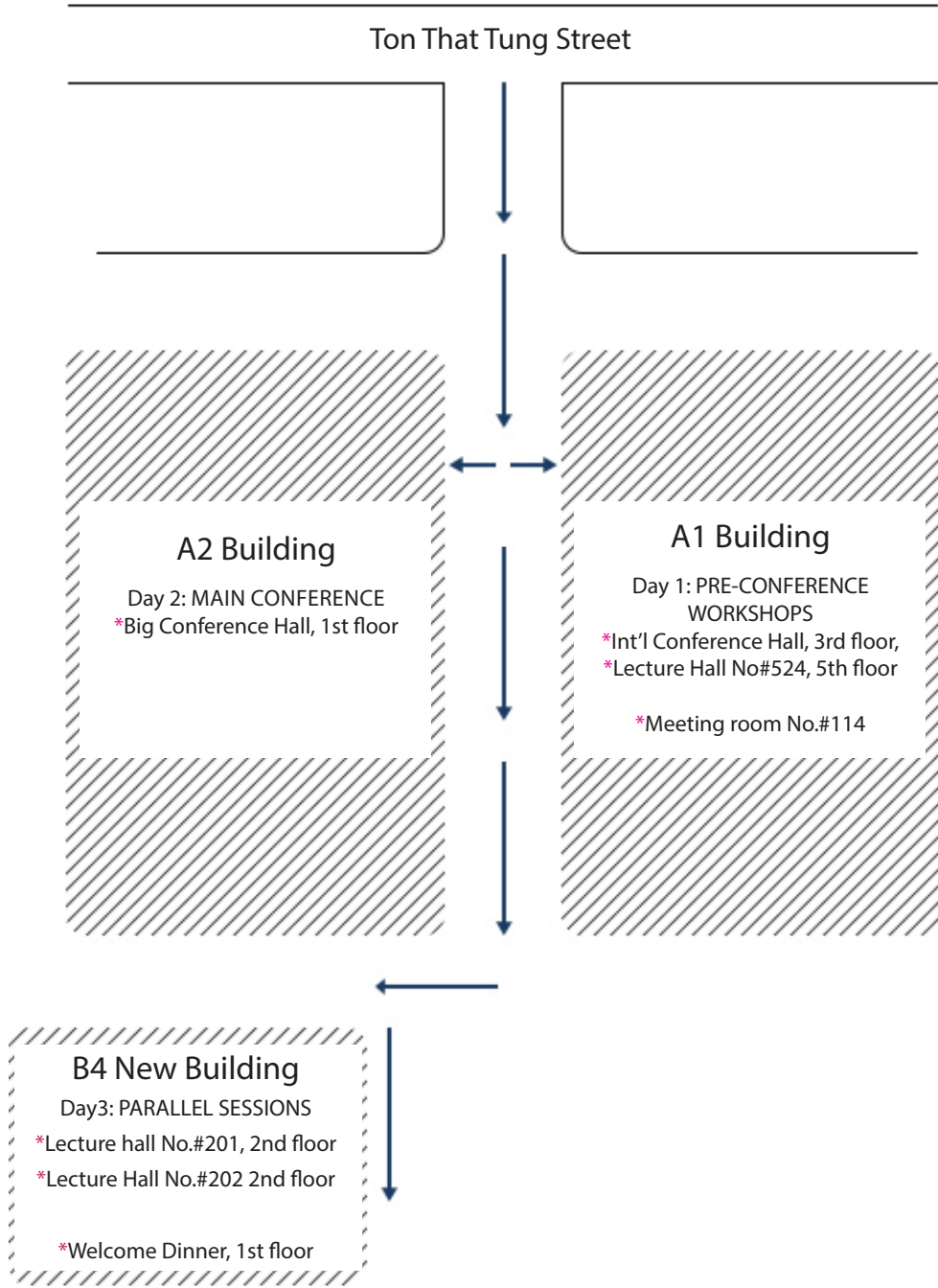
The participants in this study were 49 students attending at Universiti Malaysia Sarawak (UNIMAS), Kota Samarahan, Sarawak, Malaysia (70 % Female, 30 % Male). The respondents were recruited from 6 different faculties at UNIMAS. The students were divided to 6-integrated-groups. Groups 1 & 4, 2 & 5 and 3 & 6 were given the same OHPBL case. All together 3 different OHPBL cases were used. Each group was facilitated by a trained PBL facilitator. The triggers were given in the morning followed by self-directed-learning slots for research on the generated learning needs. In the afternoon the students discussed the new found knowledge with the guidance of the respective PBL facilitators. At the end of the OHPBL workshop, students' perspective were obtained through a questionnaire regarding OHPBL case evaluation featuring a 4-point Likert-type scale ranging from 1 = "strongly disagree" to 4 = "strongly agree".

### Results

Thirty items on OHPBL case evaluation was assessed by students which include wide range of issues such as, the PBL-module, trigger, soft-skill aspect, integration, PBL-mechanism, policy (national & international), OH concept, learning objectives, clinical aspects, cultural aspects and content of discussion. The respondents' response to all of the items showed a Mean-score (4-point Likert-type scale) > 3.5 except for 5 items. Interestingly 3/5 items were regarding PBL trigger and the Mean-score ranged from 2.918 to 3.408.

**Conclusion**

PBL was able to introduce the OH concept in an impactful manner and instill soft skills. One of the major OH core competency domains is 'Systems Thinking'. Systems thinking emphasizes working across boundaries, creating external awareness and giving students the skills to identify the problem and its impact on the broader system. We have described here how PBL is able to increase conceptual understanding of complex OH issues via systems thinking among future OH workforce. We believe that our effort will add value to the One Health paradigm shift among current learners.



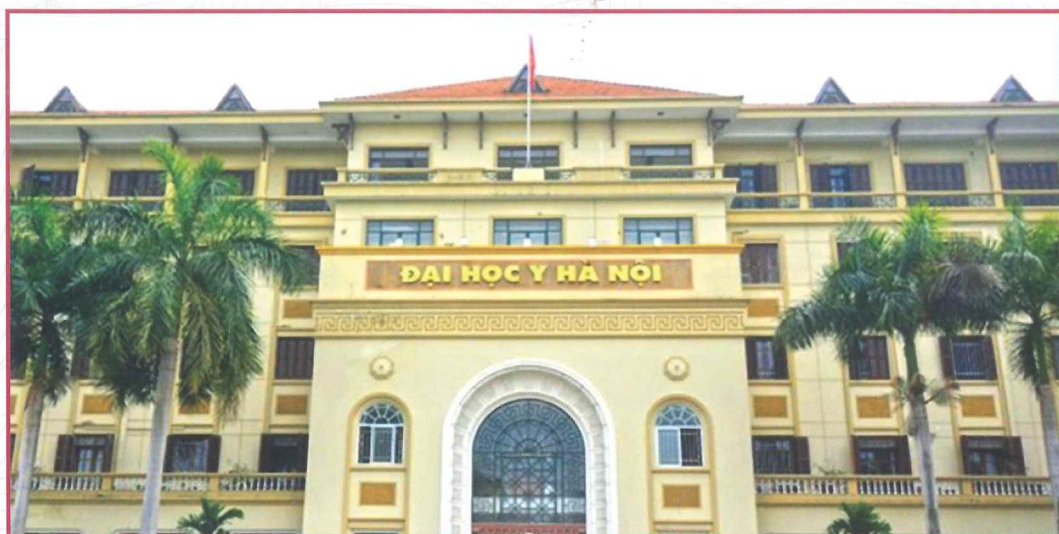


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