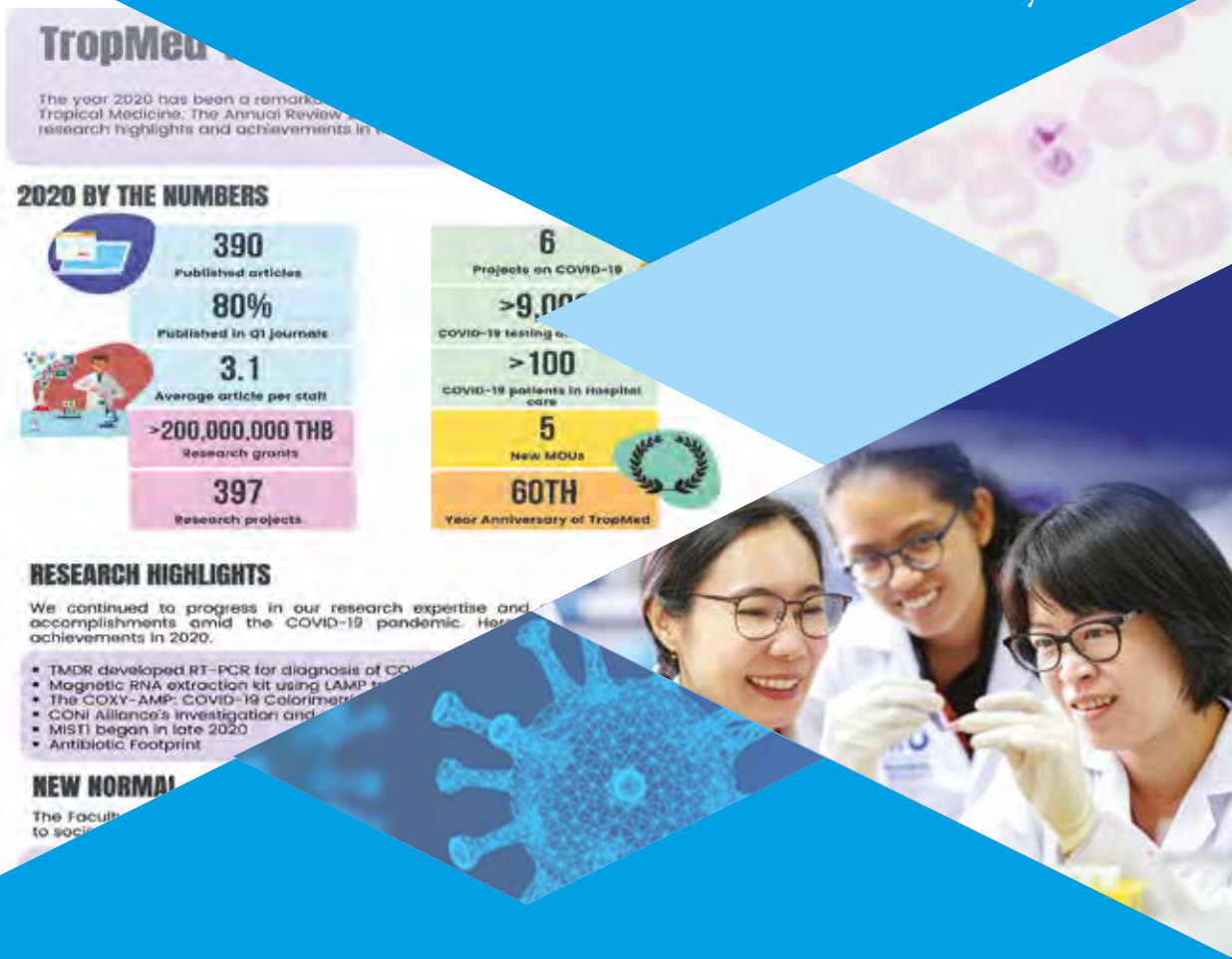
TROPMED

Annual Review 2021

Faculty of Tropical Medicine
Mahidol University



Contents

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Dean's Foreword

The year 2020 was a difficult yet remarkable year, not only for the Faculty of Tropical Medicine, but for the whole world. The novel coronavirus (COVID-19) pandemic began in early 2020. While we were faced with new and unprecedented challenges, we found new opportunities and solutions, as well.

While we made every effort to maintain normal services and to avoid disruption due to the pandemic, where advisable and practicable, staff were at times encouraged to work from home or work broken shifts to minimize the risk of infection.

Despite the challenges, our perseverance as a Faculty remained steadfast and evident. I am therefore very proud to share some of our major achievements in the past year.

We published 396 articles in international and peer-reviewed journals; 80% of these journals are ranked in Q1, the highest quartile. Our average article per staff is 3.1, one of the highest publication rates per staff among all the faculties in Mahidol University.

The World Health Organization (WHO) designated our Faculty as a WHO Collaborating Center (WHOCC) for Training, Case Management and Research for Malaria from April 2020-2024. The Faculty will expand its academic and research activities to support the WHO Collaborating Center.

In research, the focus of funding for infectious-disease research understandably shifted quite dramatically to COVID-19, so the funding opportunities for research into other infectious diseases reduced globally. Existing and planned research that involved field work, such as malaria research and clinical trials, was greatly restricted due to the necessity for quarantine and isolation, social distancing, hygiene measures, and local and overseas travel limitations.

We were able to adapt to the sudden shift of research focus on COVID-19. Many of the studies that we published covered COVID-19. We received grants worth over 200 million Baht from national and international funding agencies to conduct studies on COVID-19. We are also involved in major COVID-19 projects in Thailand.

For example, the Tropical Medicine Diagnostic Reference Laboratory (TMDR) helped develop a real-time PCR for the diagnosis of COVID-19. TMDR was among the first 33 laboratories in Thailand certified by the Department of Medical Sciences to conduct diagnostic testing for SARS-CoV-2.

In a major collaboration with the National Science and Technology Development Agency (NSTDA), we developed a Magnetic RNA extraction kit that can extract RNA of SARS-CoV-2 from patient samples. The extraction kit has been shown to be as efficient as imported extraction kits, but much cheaper, and it can be manufactured locally. The COXY-AMP: COVID-19 Colorimetric Detection Kit is a new test kit for detecting SARS-CoV-2 using a loop-mediated isothermal amplification (LAMP) technique, which is cheaper and faster than current RT-PCR methods. These two inventions will help the country reduce imports of medical supplies and support the active case finding strategy and large-scale testing.

The Hospital for Tropical Diseases has a vital role in the country's fight against COVID-19. We set up new facilities in the hospital for COVID-19, such as field acute respiratory clinic for screening, and cohort wards to take care of COVID-19 patients. We transformed the Hospital into a SMART hospital, wherein appointments, registrations, and payments can be done online through a website. We utilized a medical robot to assist medical personnel take care of COVID-19 patients and experienced no shortages of protective equipment or medications.

I consider the results of our work on COVID-19 as examples of recent public-health improvements in Thailand.

One of the Bangkok School of Tropical Medicine's (BSTM) significant challenges last year was the transformation of all teaching activities to online classrooms, web conferences, and virtual laboratories. Fortunately, because of our intelligent investment in IT and education technology infrastructure, such as the "TROPMED Studio", we were able to address these challenges. The School was also able to establish an e-learning management system for students.

Another highlight of 2020 was the 60th Anniversary of the Faculty of Tropical Medicine. While we were not able to celebrate the anniversary as planned due to COVID-19 restrictions, we published a commemorative book to honor the 60th Anniversary of the Faculty. The book encompasses the significant research of the Faculty over the past 60 years and features messages and testimonials from collaborators and TropMed alumni around the world who have been part of the Faculty's rich history.

In December 2020, we held the Joint international Tropical Medicine Meeting (JITMM Virtual 2020) on a virtual streaming platform. We were the first Faculty in Mahidol University to organize a fully virtual international scientific conference. JITMM Virtual 2020 was a success and an affirmation of our capability to adapt and innovate strategies according to the situation.

Looking forward, the rollout of COVID-19 vaccination nationwide and globally should eventually allow return to a "new normal". We hope that activities that were suspended, disrupted or delayed will be able to resume, such as research field work, physical classes, international conferences, visiting lectureships, student exchanges, and unrestricted travel, and that the risks, isolation, and stresses endured by us all will be much alleviated.

To conclude, I would like to express my sincere gratitude to all staff of the Faculty--professors, doctors, scientists, nurses, and support staff. Thank you very much for all your hard work and dedication during these trying times. The successes of the Faculty in 2020, which are detailed in this Annual Review, would not have been possible without your invaluable contributions.

I sincerely look forward to working with you all throughout the coming years!

Towards a thriving and healthy future,

W. Phumratanaprapin

Assoc. Prof. Weerapong Phumratanaprapin
Dean
Faculty of Tropical Medicine, Mahidol University

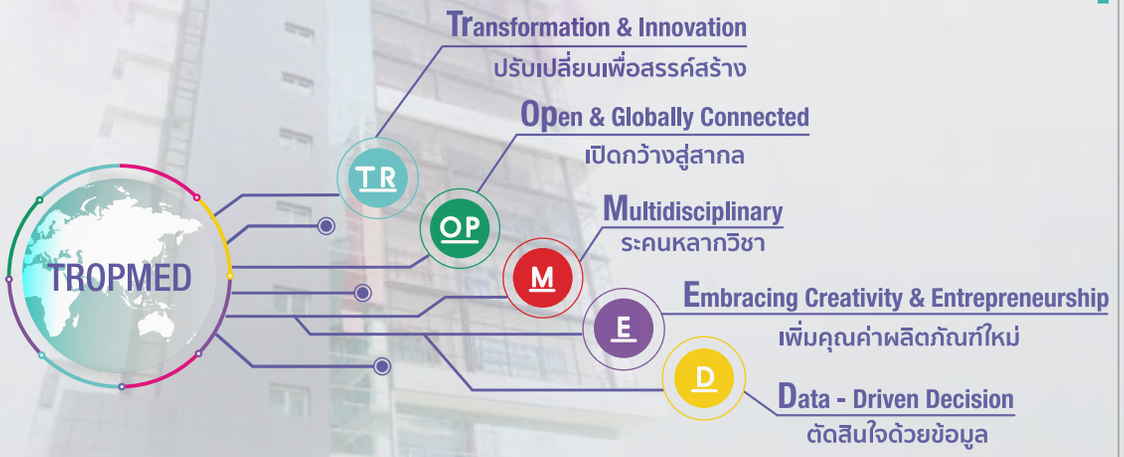
Strategic Plan (2018 - 2022)

VISION / To be the World Class Tropical Medicine Research Institute

MISSION / To Strive for Excellence in Research, Education and Health Services in Tropical Medicine

Faculty of Tropical Medicine, Mahidol University

TropMed Core Values



Administrative Board

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VISION:

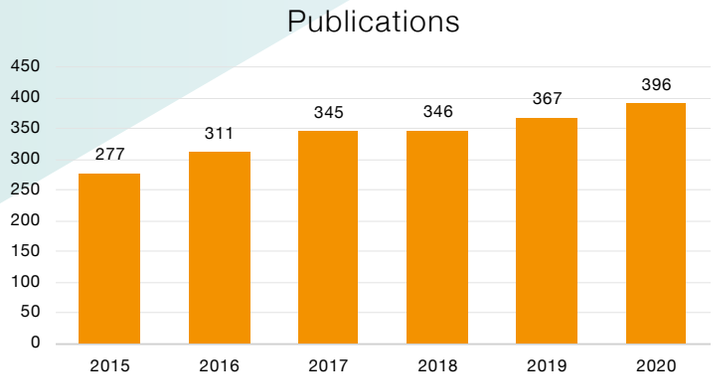
To be a World-class Tropical Medicine Research Institute

MISSION:

To strive for excellence in Research, Education and Health Services in Tropical Medicine

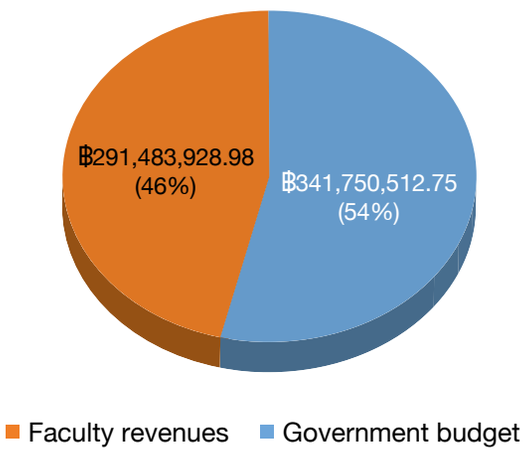
Statistical Summary

Research



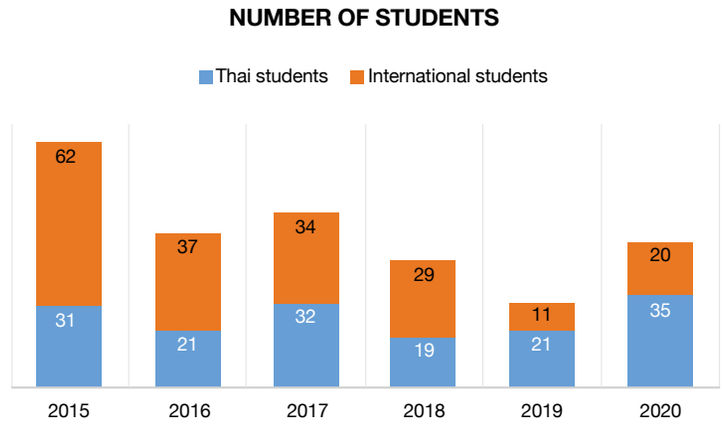
Average article per staff
3.1

Finances

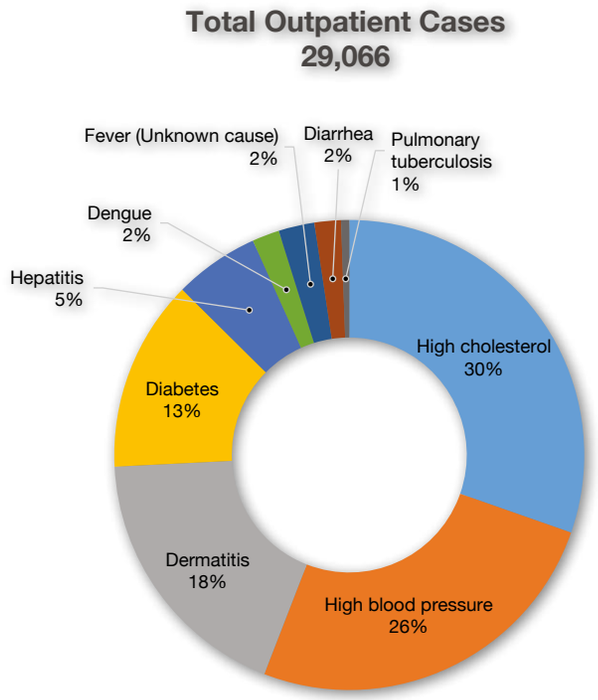


Total Income
฿633,234,441.73

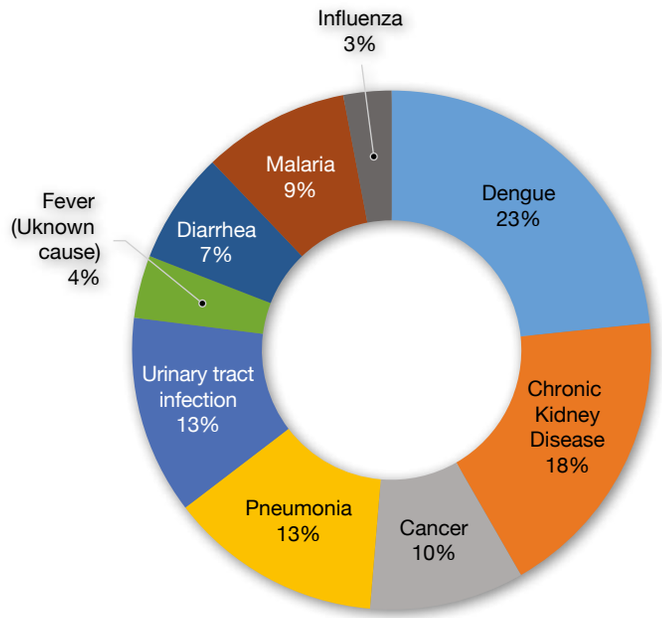
Bangkok School of Tropical Medicine



Hospital for Tropical Diseases

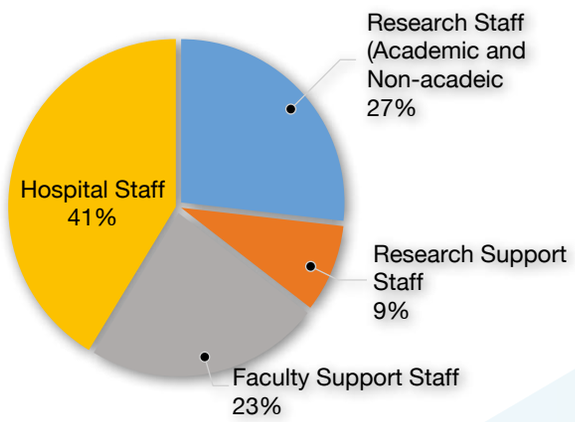


Total Inpatient Cases
29,066

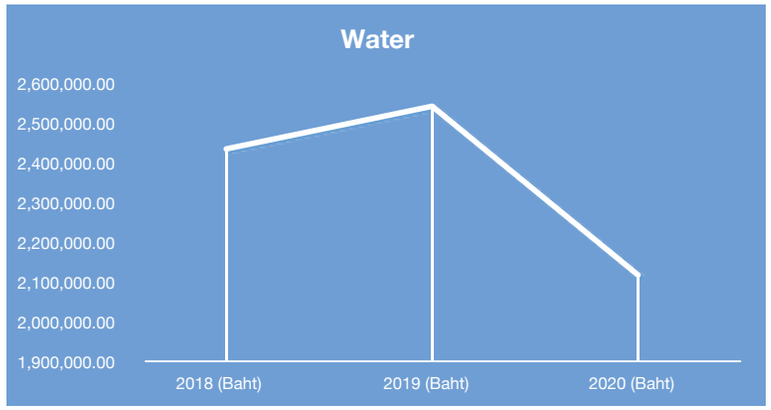


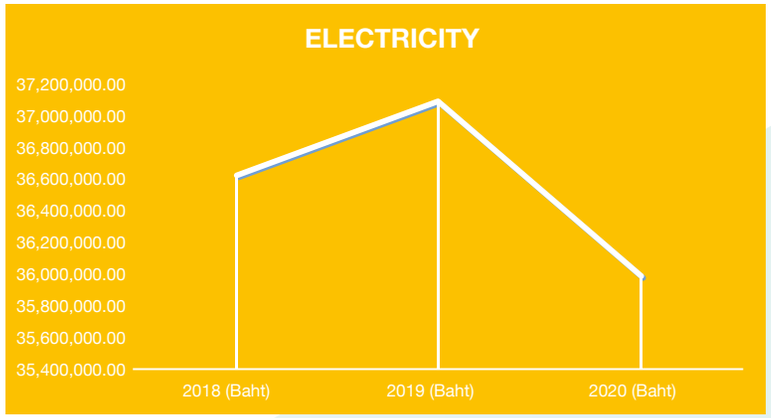
Human Resources

Total staff
806



Infrastructure and Energy Use Reduction





The Faculty of Tropical Medicine, Mahidol University entered the Thailand Energy Awards for year 2021.

TropMed Year in Review

The year 2020 has been a remarkable year for the Faculty of Tropical Medicine. The Annual Review 2021 features our research highlights and achievements in the past year.

Mahidol University
Faculty of Tropical Medicine

2020 BY THE NUMBERS

396
Published articles

80%
Published in Q1 journals

3.1
Average article per staff

>200,000,000 THB
Research grants

397
Research projects

6
Projects on COVID-19

>9,000
COVID-19 testing and screening

>100
COVID-19 patients in Hospital care

5
New MOUs

60TH
Year Anniversary of TropMed

RESEARCH HIGHLIGHTS

We continued to progress in our research expertise and services and achieve new accomplishments amid the COVID-19 pandemic. Here are some of our research achievements in 2020.

- TMDR developed RT-PCR for diagnosis of COVID-19
- Magnetic RNA extraction kit using LAMP technique
- The COXY-AMP: COVID-19 Colorimetric Detection Kit using LAMP technique
- CONI Alliance's investigation and genomic surveillance of COVID-19 in Thailand
- MISTI began in late 2020
- Antibiotic Footprint

NEW NORMAL

The Faculty transformed many of its services and training to online platforms to respond to social gatherings limitations and travel restrictions.

- Held the first-ever fully virtual scientific conference, JITMM Virtual 2020
- BSTM developed an online learning management system (www.tm-online.org)
- The Faculty was assigned to host an online training course: WHO Collaborating Centre for Case Management, Training, and Research on Malaria, from 2020 to 2024.

"When the Faculty opened in 1960, there were just five departments. But with increased specialization this number is now eleven. Covering a broad range of Tropical Medicine areas, the departments conduct research, teach students from the Bangkok School of Tropical Medicine and provide services to both the academic and healthcare communities.

The following pages feature the research highlights of each department, including their work and achievements in 2020."

Departments

Department of Clinical Tropical Medicine

Prof. Punnee Pitisuttithum
Head

Facts and Figures

27	14	63	2	฿34.94M	29	19	21
Academic staff	Support staff	Journal publication	Honors and Awards	Grants received	Funders	Ongoing research projects	Collaborators

2020 Highlights

The Department of Clinical Tropical Medicine (CTM) is strongly committed to high-quality clinical research that can be translated. Our work focuses mainly on infectious diseases in the tropics, including treatment and prevention, especially drugs, vaccines, and biologicals for emerging and reemerging infectious diseases. CTM is a major contributor to international scientific publications on tropical diseases, e.g. malaria, melioidosis, rickettsial infections, and HIV vaccines. Many of our clinical trial results have been implemented as treatment and immunization guidelines against tropical diseases nationally and internationally. The CTM Vaccine Trial Centre recently became a pioneering research hub, testing COVID-19 vaccines manufactured in Thailand.

In 2020, CTM celebrated its 60th Anniversary. A *Kalanukrom* (a chronology book), collecting stories and achievement in various aspects of CTM, was published to commemorate the special occasion.

Research publications

- Publication highlights in 2020 included research articles related to HIV vaccines, malaria control, and drug-resistant bacteria, published in reputable peer-reviewed journals. Prof. Punnee Pitisuttithum and the RV306 study group conducted an HIV vaccine study in Thailand showing that longer intervals between the primary vaccination series and late boost improved immune responses. The study was published in *The Lancet HIV*, entitled "Late boosting of the RV144 regimen with AIDSVAX B/E and ALVAC-HIV in HIV-uninfected Thai volunteers: a double-blind, randomized controlled trial".

RV306 study group

Asst. Prof. Borimas Hanboonkunupakarn, Prof. Sasithon Pukrittayakamee, and researchers from MORU and AFRIMS published the results of a drug-drug study on ivermectin in the *Clinical Pharmacology and Therapeutics* journal. The findings of the study demonstrated that ivermectin concentrations and the drug's mosquito-lethal effects were increased when ivermectin was coadministered with dihydroartemisinin-piperaquine. The title of the article is "Safety, pharmacokinetics, and mosquito-lethal effects of ivermectin in combination with dihydroartemisinin-piperaquine and primaquine in healthy adult Thai subjects".

Dr. Janjira Thaipadungpanit and collaborators from MORU and the University of Oxford, UK, published the study "The spread of chloramphenicol-resistant *Neisseria meningitidis* in Southeast Asia" in *International Journal of Infectious Diseases*. The authors found that the spreading of chloramphenicol-resistant *Neisseria meningitidis* in Southeast Asia was wider than previously expected. The findings of the study can inform other researchers and policy-makers involved in the research and surveillance of drug-resistant bacteria in Southeast Asia.

Research projects

Prof. Punnee Pitisuttithum led several clinical trials in 2020, e.g, 9vHPV vaccine, DTaP vaccine, and influenza vaccine.

The ongoing phase III international, multi-center, randomized, double-blind, placebo-controlled clinical trial aims to study the efficacy, immunogenicity, and safety of the 9vHPV vaccine, a multivalent L1 virus-like particle vaccine, in the prevention of oral persistent infection with HPV Types 16, 18, 31, 33, 45, 52, or 58 in adult males, 20 to 45 years of age.

With the support of MSD (Thailand) Ltd., the trial aims to evaluate whether a 3-dose regimen of the 9vHPV vaccine will reduce the incidence of HPV 16/18/31/33/45/52/58-related oral persistent infection 6 months (± 1-month window) or longer compared with placebo in males aged 20 to 45 years.

In collaboration with the Vaccine Trial Centre (VTC) and BioNet-Asia Co., Ltd., Thailand, the Department is running a phase II/III randomized, observer-blind, active-controlled study to compare the non-inferior immunogenicity of a combined Diphtheria-Tetanus-recombinant acellular pertussis (DTaP)

vaccine to a licensed DTaP based vaccine (non-recombinant), when administered to healthy toddlers aged 15-36 months.

The goal of the study is to assess non-inferior immunogenicity of one dose of recombinant DTaP as compared to TetraximTM based on ELISA anti-PT antibodies at 28 days post-vaccination. The study is ongoing and is funded by the National Science and Technology Development Agency (NSTDA)

A phase III double blinded, randomized, controlled, non-inferiority trial is being conducted to evaluate the immunogenicity and safety of Tri Fluvac, in healthy Thai subjects aged 65 years and above. Tri Fluvac is a seasonal trivalent inactivated split virion influenza vaccine manufactured by the Government Pharmaceutical Organization (GPO), Thailand.

The study evaluates the immunological non-inferiority seroconversion rate (using HI assay) and Geometric Mean Titre (GMT) of Tri Fluvac to active comparator vaccine for each of three vaccine antigens, four weeks post-immunization.

Together with Thammasat University, Khon Kaen University, and Praram 9 Hospital, Thailand, Dr. Wiwat Chancharoenthana is studying the integration of a genomics approach for the diagnostic and prognostic determination of allograft rejection in kidney transplant recipients. They aim to determine the genetic susceptibility loci in acute renal allograft rejection in the Thai population. The Health Systems Research Institute, Thailand, is supporting the study.

The goal of Dr. Janjira Thaipadungpanit's project, "New horizon for the diagnosis of tuberculosis and MDR-TB", is to diagnose MDR-TB rapidly from clinical sputum using next-generation sequencing. The project, which is supported by the National Research Council of Thailand (NRCT) is expected to be completed in March 2021.

Prof. Kesinee Chotivanich is part of a major project on ivermectin and its metabolites and malaria parasites. In collaboration with Prof. Joel Tarning and Prof. Arjen Dondorp, the project aims to study the effects of ivermectin and its metabolites on *P. falciparum*. The project is funded by the Bill and Melinda Gates Foundation and is near completion.

The project of Dr. Thundon Ngamprasertchai, "Incidence rate of latent tuberculosis using interferon gamma release assay among travelers visiting Thai Travel Clinic to high-endemic countries for tuberculosis", which started in 2018, intends to determine the incidence rate of latent tuberculosis among travelers in Thailand. However, due to the COVID-19 pandemic, the project is temporarily suspended. The Faculty of Medicine, Siriraj Hospital, Mahidol University, Thailand is the collaborator for this project.

Dr. Thundon Ngamprasertchai is conducting a prospective cohort study of infection-related complications and prognosis among elderly colonized with antibiotic-resistant Gram-negative bacteria in a long-term care unit. The project aims to predict the survival rate of the elderly living in a long term care unit. Dr. Thundon is working with the Faculty of Medicine, Siriraj Hospital, a long-term care unit, and a member of the private sector.

In collaboration with the University of Oxford, UK, Asst. Prof. Borimas Hanboonkunupakarn received funding from the Bill and Melinda Gates Foundation to conduct an open-label study to evaluate the pharmacokinetic properties and mosquito-lethal effects of ivermectin metabolites in healthy adult subjects. The ongoing study aims to evaluate the mosquito-killing effect of ivermectin and its metabolites and the difference of this mosquito-killing effect when the mosquitoes directly feed on ivermectin-treated participants compared with the effect when mosquitoes feed artificially on venous blood collected from participants.

Awards

Prof. Punnee Pitisuttithum was awarded the Sri Mahidol Kondee (Lecturer) from the Alumni Association of Mahidol University, in 2020. In 2019, she was named among Highly Cited Researchers (Cross-Field) in 2019 by Clarivate Analytics. She also received the prestigious Dushdi Mala Medal from King Rama X.

In 2020, Prof. Kesinee Chotivanich was appointed member of the Health Sciences Program in Pathology by the Bureau of Science, Office of the Royal Society, Thailand.

In 2019, Prof. Polrat Wilairatana received the National Outstanding Researcher Award from the National Research Council.

Asst. Prof. Weerapong Phumratanaprapin received the National Research Council Awards: Innovation Award 2018 Honorable Award, "Model for chest drainage practice training" from the National Research Council of Thailand in 2019.

Assoc. Prof. Watcharapong Piyaphanee received the Outstanding Preventive Medicine (Travel Medicine and Tourism) award 2018 from the Association of Preventive Medicine of Thailand, in 2019.

In 2019, Assoc. Prof. Jittima Dhitavat was named Outstanding Lecturer for the year 2018 by the Faculty of Tropical Medicine Senate.

Asst. Prof. Chayasin Mansaguan received the Young Investigator Award 2019 2nd Runner Up from the Heart Association of Thailand under the Royal Patronage of H.M. the King.

Asst. Prof. Prakaykaew Charunwatthana received the Thesis Advisor Award from the Faculty of Tropical Medicine, Mahidol University, in 2019.

Academic promotion

In 2020, Dr. Watcharapong Piyaphanee and Dr. Jittima Dhitavat were promoted to Associate Professor while Dr. Chayasin Mansanguan was promoted to Assistant Professor.

In 2019, Dr. Kittiyod Poovorawan and Dr. Supat Chamnanchanunt were promoted Associate Professor. Dr. Chatporn Kittitrakul, Dr. Prakaykaew Charunwatthana, and Dr. Natthida Sriboonvorakul became Assistant Professor.

Dr. Tanaya Siripoon joined the Department as Lecturer.

Scientific conference

Departmental researchers participated in the 69th American Society of Tropical Medicine and Hygiene (ASTMH) Annual Meeting 2020, held virtually on 15-19 November 2020.

The Department researchers gave oral presentations at JITMM Virtual 2020, held 15-16 December 2020.

Department of Helminthology

Assoc. Prof. Paron Dekumyoy
Head

Facts and Figures

7	8	27	2	฿3.17M	8	15	10
Academic staff	Support staff	Journal publication	Honors and Awards	Grants received	Funders	Ongoing research projects	Collaborators

2020 Highlights

Research publications

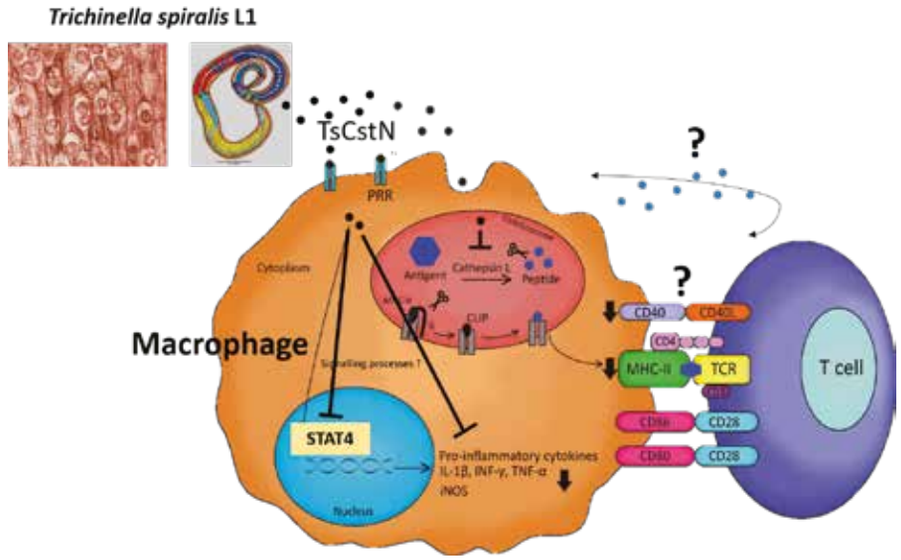
Assoc. Prof. Thaenkham, and student Ms. Abigail Hui En Chan, evaluated the suitability of using mitochondrial *12S* and *16S* ribosomal RNA (rRNA) genes for nematode (roundworm) molecular systematics by comparing them with other commonly used genetic markers. They found that *12S* rRNA supported more monophyletic nematodes (clades I, IV, and V) than *16S* rRNA (clades I and V only). However, neither rRNA genes supported clade III; clade II was not included in the study. The study suggests that *12S* rRNA is more suitable for nematode molecular systematics and the two rRNA genes are potential genetic markers for DNA barcoding.

This study, published in *Parasites and Vectors*, can benefit students and researchers in parasitology who are interested in nematode molecular systematics and DNA taxonomy.

Trichinella spiralis produces regulatory effects during infection through immunomodulatory molecule release that can suppress host inflammation and may be used for the treatment of unrelated inflammatory diseases.

Assoc. Prof. Poom Adisakwattana and PhD student Porntida Kobpornchai identified an immunomodulatory molecule derived from *T. spiralis* and characterized it as a novel *T. spiralis* cystatin (TsCstN), which inhibits inflammation mediated by LPS-treated macrophages. They found that TsCstN exhibits immunomodulatory properties on mouse bone marrow-derived macrophages (mBMDMs) and can suppress inflammation. The findings of this study provide more information on how TsCstN modulates immune response, which might be useful for the development of an alternative treatment against inflammatory diseases.

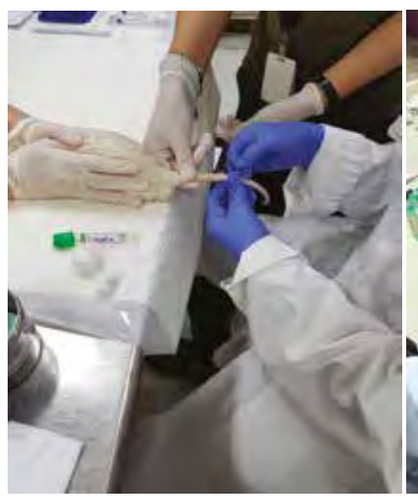
This study, entitled "A novel cystatin derived from *Trichinella spiralis* suppresses macrophage-mediated inflammatory responses" was published in *PLoS Neglected Tropical Diseases*.



Research projects

Assoc. Prof. Urusa Thaenkham heads a 1-year study of pharmacokinetics and efficacy testing of *Stemona collinsiae* root extract to determine dose and duration for treatment of *Gnathostoma spinigerum* -infected rats. This project was awarded 1.6 million Baht from The Agricultural Research Development Agency, Thailand.

Assoc. Prof. Urusa and researchers from the Faculty of Pharmacy, Mahidol University and Drug Discovery and Development Center, Thammasat University, and the Faculty of Tropical Medicine, Mahidol University, aim to develop *Stemona collinsiae, a* Thai medical herb as an anthelminthic drug for gnathostomiasis. Ongoing research focuses on pharmacokinetics to optimize dosage for evaluation of the compound's efficacy with infected rats, which will provide necessary information for further clinical phases.



Assoc. Prof. Poom Adisakwattana received 2.5 million Baht (Mahidol Frontier Research Discovery Grant) from Mahidol University for his project "Characterization of biomolecules from *Trichinella spiralis* regulating immune responses and cell development of striated muscle cells for alternative treatment against non-communicable diseases", February 2021 to January 2024.

In the future, immunomodulatory molecules derived from *Trichinella spiralis* may be developed into a novel therapy against inflammation and immune disorders, which may replace, or combine with, steroid drugs to reduce adverse effects. Moreover, the future outcomes of the project may lead to patent and manufacturing production in the pharmaceutical industry. Currently, some molecules are being tested in animal models and human immune cells.

For this project, Dr. Poom is collaborating with researchers from Queen's University Belfast, Northern Ireland, United Kingdom, Bernhard Nocht Institute for Tropical Medicine (BNITM), Hamburg, Germany, and the Faculty of Tropical Medicine, Mahidol University.

As is already known, chronic opisthorchiasis can cause cholangiocarcinoma in patients. The Department conducted research into the detection of *Opisthorchis* infection in humans and its infective stage in fish intermediate hosts in communities in Muang District, Sakhon Nakhon Province. The Department examined patients at the Ban Chiang Khruea Pho Chai Promoting Hospital, Chiang Khruea Sub-district. This project is part of a cholangiocarcinoma survey for Her Royal Highness Princess Maha Chakri Sirindhorn's project and the Health Service of the Department of Helminthology.

Awards and academic promotion

Assoc. Prof. Dorn Watthanakulpanich received the Outstanding Lecturer Award 2018 by Senior Council of Mahidol University in 2019 and the Mahidol University Award 2019 (Teaching) in 2020.

Taipei Medical University

The Visiting Associate Professorship is presented to
Associate Professor Paron Dekumyoy
From Nov 1, 2020 to Oct 31, 2023

Chien-Huang Lin

Chien-Huang Lin, Ph.D
President

Employment Number : 10945015
11/01/2020

Assoc. Prof. Paron Dekumyoy was appointed Visiting Associate Professor at Taipei Medical University, Taiwan, from November 2020 to October 2023.

Dr. Kittipong Chaisiri was promoted to Assistant Professor and Dr. Tippayarat Yoonuan and Dr. Wallop Pakdee were promoted to senior scientist (Professional level) in 2020.

Scientific conferences and other activities

Assoc. Prof. Urusa Thaenkham chaired the Free paper: Parasitic infections session of the Joint International Tropical Medicine Meeting in 2020 (JITMM Virtual 2020), held 15-16 December 2020. She was also an invited speaker at TICA International Seminar: Innovative Animal Health, held on 1 December 2020 at the Faculty of Veterinary Technology, Kasetsart University, Thailand.

Asst. Prof. Kittipong Chaisiri was invited to present an oral presentation about the outcome of the research project entitled "Screening of parasites and pathogens carried by urban small mammals: an ecological observation in public parks and citified area of Bangkok Metropolitan" at the TICA International Seminar: Innovative Animal Health, held 1 December 2020 at the Faculty of Veterinary Technology, Kasetsart University, Thailand.

Students from Mahidol University International College visited and attended the posters and research presentation of the Department of Helminthology at the "Open House Faculty of Tropical Medicine" held on March 6, 2020 at the Faculty of Tropical Medicine, Mahidol University.

Department of Medical Entomology

Assoc. Prof. Jiraporn Ruangsittichai
Head

Facts and Figures

7	13	15	฿4.94M	16	20	21
Academic staff	Support staff	Journal publication	Grants received	Funders	Ongoing research projects	Collaborators

Staff and students of the Department of Medical Entomology

2020 Highlights

Research publications

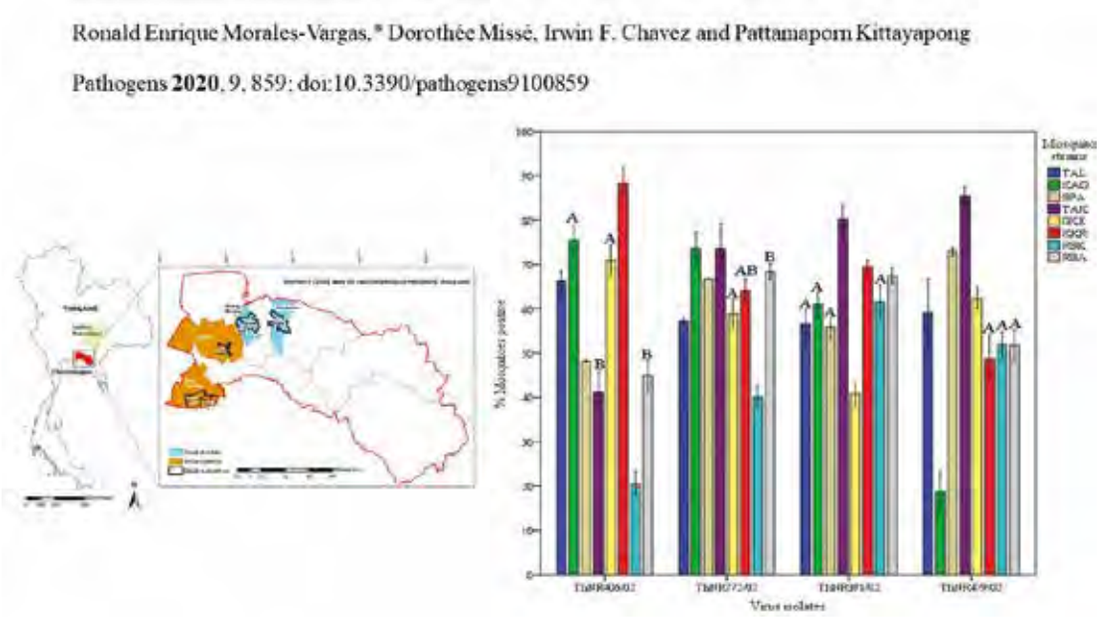
Asst. Prof. Suchada Sumruayphol, Asst. Prof. Patchara Sriwichai and other researchers in the Department studied the species distribution and dynamic trends of *Anopheles* species in malaria hotspot villages along the Thai-Myanmar border. Using molecular techniques, such as cox1 DNA barcoding and multiplex PCR, the researchers identified 3 member species of the Maculatus group in Thailand--*An. maculatus*, *An. sawadwongporni*, and *An. pseudowilmori*.

These mosquitoes of the Maculatus group were most abundant in the wet season and had a preferred distribution in villages at higher elevations.

This study provides information that can be used to guide the planning and implementation of mosquito control measures to minimize malaria transmission. The study entitled "Seasonal dynamics and molecular differentiation of three natural *Anopheles* species (Diptera: Culicidae) of the Maculatus group (Neocellia series) in malaria hotspot villages of Thailand" was published in *Parasites and Vectors*.

Staff and students of the Department of Medical Entomology

Asst. Prof. Ronald Enrique Morales-Vargas RE and collaborators studied *Aedes aegypti* vector competence for dengue-2 viruses isolated from patients with different disease severity, dengue fever (DF) and dengue shock syndrome (DSS). They found that dengue virus circulation was likely to vary according to combinations between virus strains and the origins of mosquito strains, and this may have epidemiologic implications for the incidence of flu-like classic DF and DSS.



Ronald Enrique Morales-Vargas,* Dorothée Missé, Irwin F. Chavez and Pattamaporn Kittayapong

Pathogens **2020**, 9, 859; doi:10.3390/pathogens9100859

This study, published in Pathogens, will be informative for the scientific community of the vector-borne infectious diseases, policy-makers at national and international levels, and research-grant agencies.

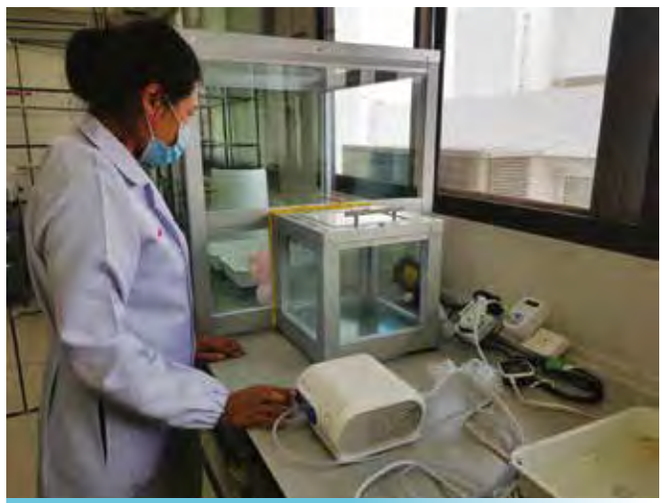
Assoc. Prof. Jiraporn Ruangsittichai, Asst. Prof. Patchara Sriwichai, and Ms. Ai-rada Pintong published an article entitled "Insecticidal and histopathological effects of *Ageratum conyzoides* weed extracts against dengue vector, *Aedes aegypti*" in the journal *Insects*. This research studied the efficiency of *Ageratum conyzoides* extracts against *Ae. aegypti*, lethal effects, chemical constituents, and components of essential oils of the plant, and indicated morphological changes in adult female mosquitoes following treatment with the plant extract and essential oils. The authors found that the essential oils from leaf-purple (LP) plants exhibited the most effective adulticidal activity and high severity scores among the histopathological changes. The chemical constituents of the essential oils provided insecticidal data on the plant.


Ageratum conyzoides


Essential oil extracted from A. conyzoides

The plant extracts of *A. conyzoides* could be used as a biological insecticide for vector control and be developed as a novel prototype of alternative bio-insecticide products.

This study provides fundamental knowledge to other researchers wanting to develop a natural insecticidal product. Moreover, the study can benefit the general public and policy makers as an alternative plant-based bio-insecticide product which is not harmful and is very useful for vector control.


Dr. Thipruethai Phanitchat

Research projects

Dr. Thipruethai Phanitchat was awarded a total of 300,000 Baht (New Research Grant) by Mahidol University for her projects "Existence of insect growth regulator (pyriproxyfen) from different water source effecting to development of *Aedes aegypti*" and "Impact of particle pollution on *Aedes aegypti*." Pyriproxyfen is a juvenile hormone used against a range of arthropods. The study focused on the effectiveness and existence of pyriproxyfen in different water conditions.

Particle pollution might affect the development and survivorship of *Aedes aegypti*. Previous statistical data reported a relationship between rising PM 2.5 concentration in the environment to decreases in dengue fever. The objective of this study was to determine the effects of particular types of pollution on the development and survivorship of *Aedes aegypti*.

Asst. Prof. Rutcharin Potiwat received 300,000 Baht grant from the Faculty of Tropical Medicine to conduct a 2-year (2019-2021) project entitled "The ability of *Aedes scutellaris* mosquito to support horizontal transmission of dengue virus in endemic area". She is collaborating with Chulalongkorn University and Kasetsart University, Thailand and Prof. Jean-Pierre Dujardin of the Institut de Recherche pour le Développement (IRD), UMR INTERTRYP IRD-CIRAD, University of Montpellier, France.


Dr. Rutcharin (far left) and surveillance team.

Dr. Rutcharin published a review article in *Pathogens* based on this project, entitled "Current arboviral threats and their potential vectors in Thailand".

The National Research Council of Thailand (NRCT) awarded Asst. Prof. Suchada Sumruayphol a 600,000-Baht grant for her project "Biodiversity analysis of *Leptotrombidium* chigger mites scrub typhus vector, DNA barcoding in Thailand". Scrub typhus is a vector-borne disease transmitted by the larval stage of the *Trombiculid* mite, called a "chigger mite". This study aims to sequence new and partial fragments of the COI gene from chigger mites, which have been, or have not yet been, submitted to Genbank.


Chigger mites under 400X magnification by Dr. Suchada

Dr. Suchada is collaborating with Dr. Rawadee Kumlert of the Ministry of Public Health, Thailand, and other researchers in the Faculty of Tropical Medicine. They are currently preparing a manuscript for journal publication.

Academic promotion

Dr. Jiraporn Ruangsittichai was promoted to Associate Professor in 2020.


R&D researchers and staff of Kincho Company Japan visited the Department of Medical Entomology for innovative research collaboration on natural products.

Department of Microbiology and Immunology

Assoc. Prof. Pornsawan Leaungwutiwong
Head

Facts and Figures

11	16	39	฿17.13M	15	35	54
Academic staff	Support staff	Journal publication	Grants received	Funders	Ongoing research projects	Collaborators

2020 Highlights

Research publications

Dr. Taniya Kaewarpai and Assoc. Prof. Narisara Chantratita published the results of a longitudinal study conducted in Udon Thani Hospital and Mukdahan Hospital, Thailand, in January 2015 to December 2018, involving melioidosis patients. The study aimed to identify plasma cytokine responses in melioidosis and analyze their association with mortality. They found that IFN-γ, IL-6, IL-8, IL-10, IL-17A, IL-23 and TNF-α were associated with adverse outcomes from melioidosis, while specific pro- and anti-inflammatory and T helper type 17 cytokines were associated with survival from melioidosis, at enrolment and over time.

The study, entitled "Longitudinal profiling of plasma cytokines in melioidosis and their association with mortality: a prospective cohort study" was published in *Clinical Microbiology and Infection*.

Dr. Tanes Sangsri, Dr. Natnaree Saiprom, Assoc. Prof. Narisara Chantratita and collaborators from Mahidol University, Thailand and University of Sheffield, United Kingdom, investigated the role of tetraspanins in *B. pseudomallei* infection *in vitro* (A549 and J774A.1 cells) using monoclonal antibodies (MAbs) and recombinant large extracellular loop (EC2). The authors confirmed that tetraspanins CD9 enhanced *B. pseudomallei* internalization in A549 cells and that CD81 inhibited MNGC formation in J774.A1 cells. They suggest that tetraspanins may be the potential therapeutic targets for melioidosis.

The information obtained from the study can benefit melioidosis researchers, physicians, doctors, and technicians involved in studying the pathogenesis of melioidosis. The authors published the study in *Scientific Reports*.

A study entitled "Genomic loss in environmental and isogenic morphotype isolates of *Burkholderia pseudomallei* is associated with intracellular survival and plaque-forming efficiency" was published in *PLoS Neglected Tropical Diseases* by Ms. Natnaree Saiprom, Assoc. Prof. Narisara Chantratita and other researchers in the Department.

As the authors summarized, "the study used a plaque-formation screening, as a surrogate for bacterial virulence, to identify a plaque-defective environmental isolate of *B. pseudomallei* that is impaired in intracellular replication, actin polymerization and MNGC formation in infected cells. Whole genome sequencing and PCR indicated that this phenotype was attributable to a large genomic loss. A similar event was detected in a K96243 isogenic morphotype *in vitro* under a laboratory stress condition. In contrast, all isolates from clinical samples induced high plaque-forming efficiency. The data suggest that further studies are required to identify the distribution of less virulent strains in the environment and the correlation with human melioidosis."

Research projects

Assoc. Prof. Narisara Chantratita and Co-investigator, Prof. Eoin West from the University of Washington, USA were awarded 408,000 USD/per year grant by the National Institute of Allergy and Infectious Diseases (NIAID), National Institutes of Health (NIH) for their ongoing project "Determinants of outcome and recurrent infections in melioidosis".

The goal of this project is to gain a deeper understanding of the human host response in melioidosis in order to identify new therapeutic targets and improve outcomes, and to establish a melioidosis research platform that can be leveraged for future studies.

The team is collaborating with Mahidol-Oxford Tropical Medicine Research Unit, the University of British Columbia, Canada, Khon Kaen University, and nine hospitals in northeast Thailand.

Another of Assoc. Prof. Narisara Chantratita's projects, "Optimization of melioidosis and glanders vaccine formulations", was completed in September 2020. Knowledge derived from this project will provide a basis for future research to develop effective vaccines for the treatment of melioidosis.

Dr. Narisara worked with Prof. Paul Brett and Prof. Mary Burtnick of the University of Nevada, Reno, USA for this project. They were awarded 116,339 USD grant /year by The Defense Threat Reduction Agency (DTRA)

COVID-19

Assoc. Prof. Pornsawan Leaungwutiwong is part of a major collaboration between Mahidol University, the National Omics Center (NOC), National Center for Genetic Engineering and Biotechnology, and the National Science and Technology Development Agency (BIOTEC-NSTDA), for the development of COVID-19 XO-AMP colorimetric detection kit. The kit uses a loop-mediated isothermal amplification (LAMP) technique to detect SARS-CoV-2 RNA. The kit is easy to use and provides immediate results (75 minutes) compared to RT-PCR. It is also cheaper than imported test kits. With its simplicity, accuracy, affordability, and accessibility, it is expected that the COVID-19 XO-AMP colorimetric detection kit can be used routinely for COVID-19 testing programs in Thailand.

The COVID-19 XO-AMP colorimetric detection kit indicates the result by color change

In July 2020, the researchers filed a petty patent for the diagnostic kit entitled, "Primer set and methodology for SARS-CoV-2 detection using LAMP technique".

Assoc. Prof. Pornsawan described her work on the project during the Corporate Innovation Summit 2020 (CIS2020) Virtual Conference organized by the Institute for Technology and Innovation Management (iNT), Mahidol University, 15-17 September 2020. She also featured the COVID-19 XO-AMP colorimetric detection kit in the Mahidol Channel, which can be viewed on Facebook and YouTube.

Assoc. Prof. Pornsawan Leaungwutiwong spoke in various online meetings. She was a speaker for the topic "One Health approaches to investigating spillover" in the Special One Health COVID-19 Response Update Sessions, held 17-18 June 2020. She talked about the fundamentals of infection prevention and control for COVID-19 at the Public Health Measures and Adaptation of Thailand for Emergence of COVID-19 Virtual Conference, 27 July 2020.

Assoc. Prof. Pornsawan Leaungwutiwong, Asst. Prof. Akanitt Jittmittraphap and other researchers in the Department were involved in COVID-19 related studies of the Department of Clinical Tropical Medicine. They published two articles in the *American Journal of Tropical Medicine and Hygiene* entitled, "Temporal change of SARS-CoV-2 in clinical specimens of COVID-19 pneumonia patients" and "Case report: COVID-19 presenting as acute undifferentiated febrile illness—a tropical world threat"

Academic promotion

Dr. Nathamon Kosoltanapiwat was promoted to Associate Professor and Dr. Akanitt Jittmittraphap was promoted to Assistant Professor. Ms. Suporn Paksanont and Ms. Watcharamat Muangkaew were promoted to Specialist. Meanwhile, Dr. Thitinan Kitisin joined the Department as a new academic staff-member.

Department of Molecular Tropical Medicine and Genetics

Prof. Mallika Imwong
Head

Facts and Figures

12	6	53	1	฿18.4M	10	15	12
Academic staff	Support staff	Journal publication	Honors and Awards	Grants received	Funders	Ongoing research projects	Collaborators

2020 Highlights

Research publications

Prof. Mallika Imwong, Assoc. Prof. Usa Boonyuen, Asst. Prof. Naowarat Saralamba, and Ms. Yupawadee Pimpat published their study entitled "Genetic analysis of the orthologous crt and mdr1 genes in *Plasmodium malariae* from Thailand and Myanmar" in *Malaria Journal*. The study characterized polymorphisms of the *P. malariae* homologous genes, chloroquine resistant transporter and multidrug resistant 1, associated with chloroquine and mefloquine resistance in *Plasmodium falciparum.*

The main finding of the study was that pmcrt and pmmdr1 polymorphisms are unlikely to affect protein function, and no amplification of pmmdr1 was observed. If the orthologous resistance genes in *P. malariae* are indeed associated with anti-malarial drug resistance in this *Plasmodium species*, the findings suggest limited chloroquine and mefloquine drug pressure on the *P. malariae* populations in Thailand and Myanmar. This study is beneficial for researchers in the field of malaria epidemiology and control.

Assoc. Prof. Piengchan Sonthayanon, Assoc. Prof. Onrapak Reamtong, and Mr. Suthee Mangmee demonstrated that the matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) -based method they developed can detect non-typhoidal *Salmonella* (NTS) from broiler samples in a Thai slaughtering and processing factory with high accuracy and cost-effectiveness. It can detect and identify all levels of *Salmonella*, from species to serovars, with large sample numbers at once.

The study suggests that the MALDI-TOF MS -based method will be beneficial for the food industry because of its potential to fulfill HACCP programs where large batches of food products and food production environments are routinely tested. The study can also inform policy-makers responsible for food product imports and exports, and researchers working on disease epidemiology and surveillance.

The study was published in *Food Control*, entitled "MALDI-TOF mass spectrometry typing for predominant serovars of non-typhoidal *Salmonella* in a Thai broiler industry".

COVID-19

Asst. Prof. Wang Nguitragool was part of the Faculty of Tropical Medicine team that collaborated with Dr. Wansikaa Kiatpathomchai of the National Center for Genetic Engineering and Biotechnology, Thailand, to develop a quick and affordable COVID-19 detection kit based on reverse transcription loop-mediated isothermal amplification (RT-LAMP) technique. The kits enable the detection of viral RNA with the naked eye through a simple color-change reaction. Being fast, specific, and sensitive, this new diagnostic kit passed the stringent criteria of the Thai FDA and is now approved for clinical use.

Dr. Matthew Phanchana was involved in the development of a COVID-19 detection kit based on theRT-LAMP technique led by a Mahidol-based startup company, Zenostic Co. Ltd. The team published a study entitled "Colorimetric reverse transcription loop-mediated isothermal amplification (RT-LAMP) as a visual diagnostic platform for the detection of the emerging coronavirus SARS-CoV-2" in the journal *Analyst*.

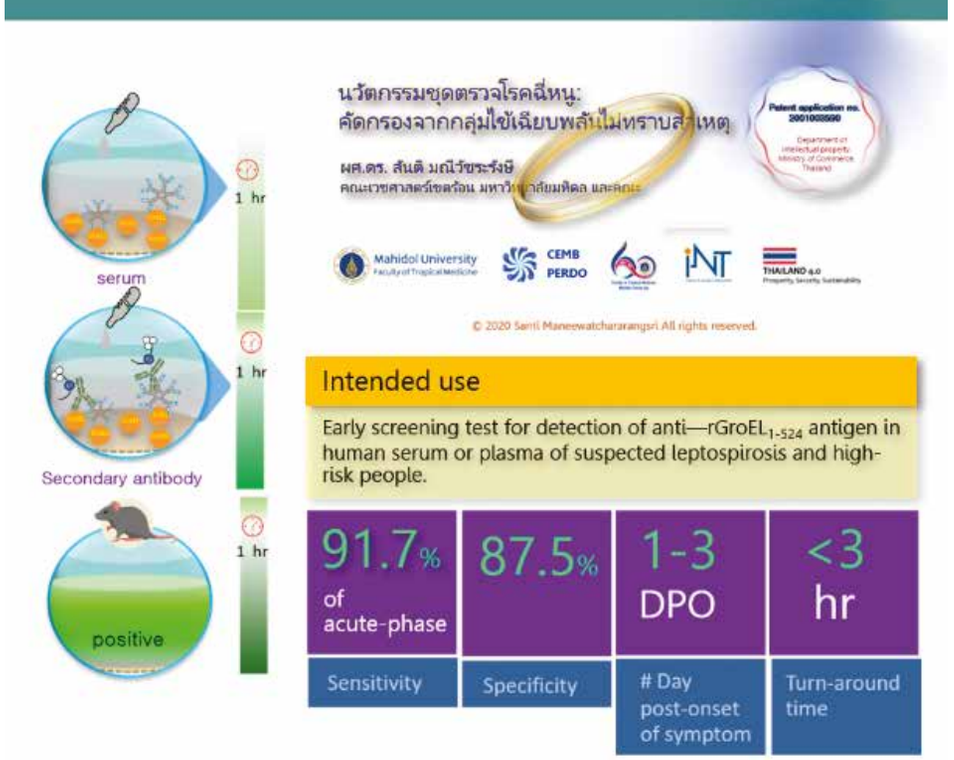
The authors demonstrated that the diagnostic performance of the colorimetric RT-LAMP assay had 95.74% sensitivity, 99.95% specificity, and 99.86 overall accuracy, as tested in 2,120 clinical samples collected in Thailand. The results suggested that this colorimetric RT-LAMP can be used as a diagnostic platform for COVID-19 screening. The kits have been approved by the Thai FDA for clinical use.

Awards and academic promotion

Asst. Prof. Santi Maneewatchararangsri received an Outstanding Research Presentation Award for his diagnostic innovation entitled "recombinant antigen-based IgM-ELISA for leptospirosis diagnosis: screening from acute undifferentiated febrile illness patients" from the Annual Conference of the Council of University Faculty Senate of Thailand, and recently from Mahidol Quality Fair 2020, 24 November 2020, held in the Prince Mahidol Hall.

In 2020, patent application was submitted to the Department of Intellectual Property, Ministry of Commerce, Thailand (Patent application no. 2001003590) for the diagnostic invention "Prototype of recombinant antigen-based IgM-ELISA assay for screening of suspected leptospirosis among risk group and clinically related acute undifferentiated febrile illnesses patients".

Dr. Onrapak Reamtong and Dr. Piengchan Sonthayanon were promoted to Associate Professor in 2020.



Department of Protozoology

Assoc. Prof. Aongart Mahittikorn
Head

Facts and Figures

6	8	6	฿1.54M	6	5	6
Academic staff	Support staff	Journal publication	Grants received	Funders	Ongoing research projects	Collaborators

Staff and students of the Department of Protozoology

2020 Highlights

Research publications

Assoc. Prof. Porntip Petmitr and Mr. Nattaporn Pinthong explored the characteristics of *Plasmodium falciparum* DNA-3-methyladenine glycosylase (*Pf*MAG) and its potential as an anti-malarial candidate. The results showed that *Pf*MAG characteristics are different from those of the human enzyme and should provide insights into identifying specifically targeting compounds that could be developed into a novel anti-malarial drug.

This study is useful to malaria researchers and pharmaceutical companies as it provides basic data and insights into *Pf*MAG, which could help develop antimalarials against the potential parasite target. The study, entitled "Molecular characterization of *Plasmodium falciparum* DNA-3 methyladenine glycosylase", was published in *Malaria Journal.*

Assoc. Prof. Supaluk Popruk and Ms. Kanthinich Thima and researchers from the Departments of Medical Entomology and Tropical Pathology, assessed the efficacy of *Ageratum conyzoides* extracts against *Giardia duodenalis*, a protozoan parasite that causes giardiasis in humans. They found that the crude extracts of *Ageratum conyzoides* induced changes in the flagella and ventral discs of *Giardia duodenalis* trophozoites, which play important roles in attachment to the surface of mucosal cells. The crude extracts of *Ageratum conyzoides* may be a source of anti-*Giardia* drugs, especially because of its low toxicity to mammalian cells compared with synthetic chemical drugs.

This study, published in *BMC Complementary Medicine and Therapies*, may be useful to researchers or pharmaceutical companies wanting to develop new drugs against Giardia.

Assoc. Prof. Supaluk Popruk and researchers at Chulalongkorn University and Bang Pa-in Hospital, Thailand, published their study entitled "Prevalence and subtype distribution of *Blastocystis* infection in patients with diabetes mellitus in Thailand" in the *International Journal of Environmental Research and Public Health.* The researchers confirmed that *Blastocystis infection* is more prevalent in older Thai patients with diabetes than those without.

This is the first study of *Blastocystis* infection in people with diabetes. It can be a useful source of information for researchers, the general public, and health policy-makers regarding diabetes and parasitic infections.

Leaves and flowers of Ageratum conyzoides

Online workshop and virtual conference

The Department of Protozoology is developing an online course, TMPZ503: Medical Protozoology. for TropMed's online learning program (tm-online.org). The Department also hosted an online workshop called "Laboratory diagnosis of intestinal parasites" to help educate people virtually during the COVID-19 pandemic when face-to-face classes are limited.

Assoc. Prof. Aongart Mahittikorn and Assoc. Prof. Supaluk Popruk chaired a free paper session on zoonosis at the Joint International Tropical Medicine Meeting (JITMM Virtual 2020) held 15-16 December 2020.

Academic promotion

Dr. Supaluk Popruk was promoted to Associate Professor in 2020.

Department of Social and Environmental Medicine

Assoc. Prof. Pongrama Ramasoota
Head

Facts and Figures

8	12	18	4	฿14.2M	19	20	35
Academic staff	Support staff	Journal publication	Honors and Awards	Grants received	Funders	Ongoing research projects	Collaborators

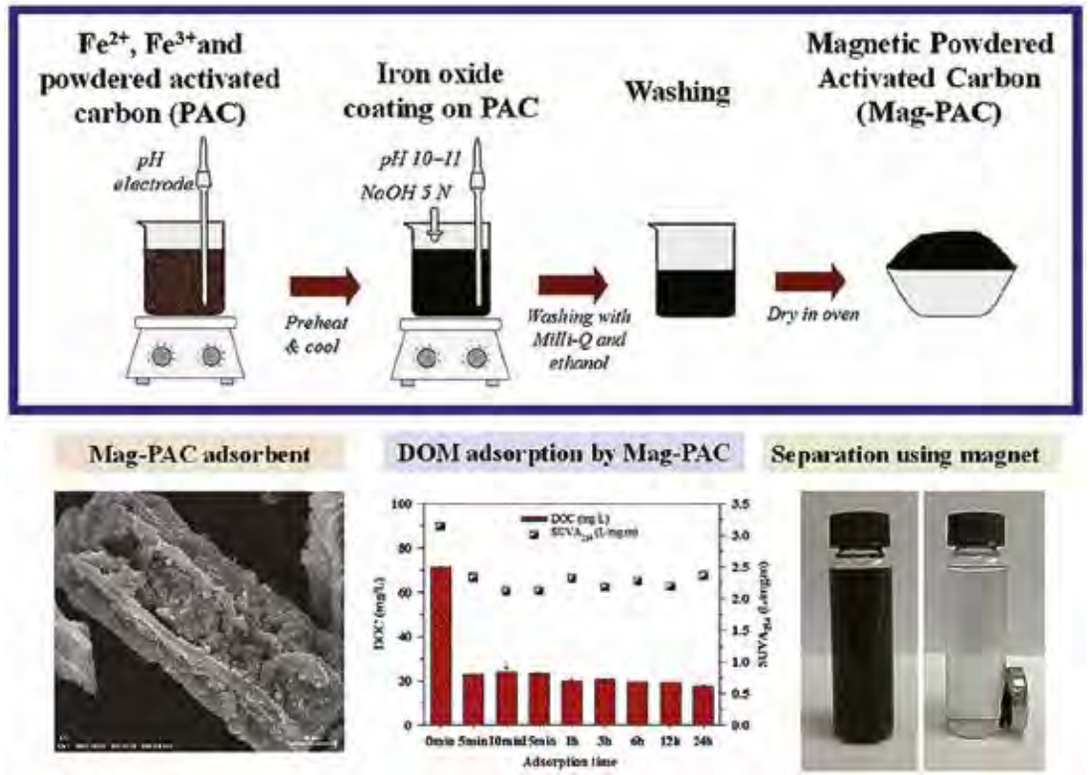
2020 Highlights

Research publications

Asst. Prof. Athit Phetrak, Ms. Sirirat Sangkarak, and collaborators from the Environmental Research and Training Center (ERTC), Chulalongkorn University, and the Faculty of Public Health, Mahidol University, assessed the capability of magnetic powdered activated carbon (Mag-PAC) as an adsorbent for removing dissolved organic matter (DOM) from membrane reactor (MBR) effluent. They confirmed that Mag-PAC's adsorption of DOM from effluent MBR was fast and efficient, especially for humic acid- and fulvic acid-like compounds and aromatic DOM with molecular weights (MWs) between 2610 Da and 3030 Da. The study suggests that Mag-PAC adsorbent can be beneficial in a post-treatment system for effluent MBR.

This study entitled "Performance of dissolved organic matter removal from membrane bioreactor effluent by magnetic powdered activated carbon" was published in the *Journal of Environmental Management*.

A study entitled "Recent advances in *Schistosoma mekongi* ecology, transcriptomics and proteomics of relevance to snail control" by Asst. Prof. Yanin Limpanont and researchers from the Department of Molecular Tropical Medicine and Genetics and the Department of Helminthology was published in *Acta Tropica*. The authors presented renewed interest in *S. mekongi* research and contributed promising data that will be utilized to generate effective control and prevention strategies.



The study will be inform other researchers and students interested in neglected tropical diseases, such as schistosomiasis.

Asst. Prof. Athit Phetrak and collaborators from Arizona State University published their study "Low energy electrochemical oxidation efficiently oxidizes a common textile dye used in Thailand" in the *Journal of Electroanalytical Chemistry*. The study demonstrated that electrochemical oxidation (ECO) efficiently decolorizes and mineralizes dyebath effluents using low levels of electrical energy. The authors suggest that ECO is an alternative to traditional solutions for treating textile manufacturing waste streams.

Research projects

Assoc. Prof. Pongrama Ramasoota and team received a 1.5 million Baht grant from the Japan Science Promotion Society (JSPS) and National Research Council of Thailand (NRCT) to develop DNA expressed neutralizing human monoclonal antibody against 4 serotypes of dengue virus without causing antibody-dependent enhancement (ADE). Dr. Pongrama and his team are collaborating with Prof. Eji Konishi and Asst. Prof. Atsushi Yamanaka of the Research Institute for Microbial Diseases at Osaka University, Japan.

The Health System Research Institute (HSRI), Thailand, awarded Assoc. Prof. Pannamthip Pitaksajjakul 1.3 million Baht to develop therapeutic human monoclonal antibody against the Nonstructural protein 1 (NS1) of dengue virus that will be used for reducing viral replication after the viremic phase and to reduce severe manifestations of dengue post-viremia. Dr. Pannamthip's team includes Dr. Pongrama Ramasoota, Dr. Surachet Benjathummarak, and Ms. Wilarut Puangmanee. They are collaborating with Prof. Yee Shin Lin of National Chen Kung University, Taiwan for this project.

COVID-19

Assoc. Prof. Kraichat Tantrakarnapa analyzed the COVID-19 situation in Thailand and used a Susceptible Exposed Infectious and Recovered (SEIR) model to determine approaches to prevention. The study showed that the movement of people, both Thais and tourists, played a significant role in the spread of COVID-19 in Thailand. Enforcing a state of emergency and regulating social distancing were found to be key factors in reducing the transmission rate of the disease. This study, entitled "Challenging the spread of COVID-19 in Thailand" was published in *One Health*.

The Department of Social and Environmental Medicine is collaborating with Prof. Yong Poovorawan of Chulalongkorn University, Dr. Anan Jongkaewwattana of BIOTEC National Science Technology Development Agency (NSTDA), and Prof. Yoshiharu Matsuura of the Research Institute for Microbial disease (RIMD), Japan, to develop therapeutic neutralizing human monoclonal antibodies against the SARS-CoV-2 virus using phage display technology. They received 4.7 million Baht from NSTDA to conduct the project. Currently, the human antibody library is undergoing construction using peripheral blood mononuclear cells (pBMC) from people who have recovered from COVID infections.

Awards and academic promotion

Assoc. Prof. Pongrama Ramasoota received numerous awards in 2019 and 2020, such as the "Mahidol University award on Invention and Innovation 2019" from Princess Maha Chakri Sirindhorn, "Thailand Outstanding Researcher 2020" from the National Research Council of Thailand, and "Outstanding Alumni 2020" from Kasetsart University. Dr. Pongrama and his team also received an award for their prototype safety guidelines for chemical-related laboratories according to ESPReL Standards

during Mahidol University's SafetyDay: Safety Culture #3, held in the Prince Mahidol Hall on 26 April 2019.

Dr. Suwalee Worakhunpiset and Dr. Pannamthip Pitaksajjakul were promoted to Associate Professor in 2019 and 2020, respectively. Dr. Athit Phetrak was appointed Assistant Professor and Ms. Ratchaneekorn Mingkhwan was promoted to senior scientist (Professional level) in 2020. Meanwhile, Ms. Nattaporn Keangkhu joined the Department as a Scientist.

Department of Tropical Hygiene

Assoc. Prof.
Saranath Lawpoolsri Niyom
Head

Facts and Figures

10	16	54	3	฿9.14M	6	15	10
Academic staff	Support staff	Journal publication	Honors and Awards	Grants received	Funders	Ongoing research projects	Collaborators

2020 Highlights

Research publications

Assoc. Prof. Saranath Lawpoolsri Niyom with her Ph.D. student, Dr. Chamnan Pinna, and Thai collaborators published their work "Evaluation of immunization services for children of migrant workers along Thailand-Myanmar border: compliance with Global Vaccine Action Plan (2011-2020)" in the journal *Vaccines*.

In this cross-sectional mixed methods study, the authors found the vaccination coverage of the Thai government's Expanded Program on Immunization (EPI) from 2014-2017 increased among migrant children living along the Thai-Myanmar border after the implementation of a mobile vaccination service. The related stakeholders, such as parents of children and vaccine providers and policymakers, are satisfied with the EPI services. However, it was noted that increased workload and communication barriers influenced the stakeholders' satisfaction toward the program. The study can inform public health workers and policy-makers who are interested in health promotion for migrants, including NGOs working with migrants and out-of-reach populations, and researchers interested in vaccination services.

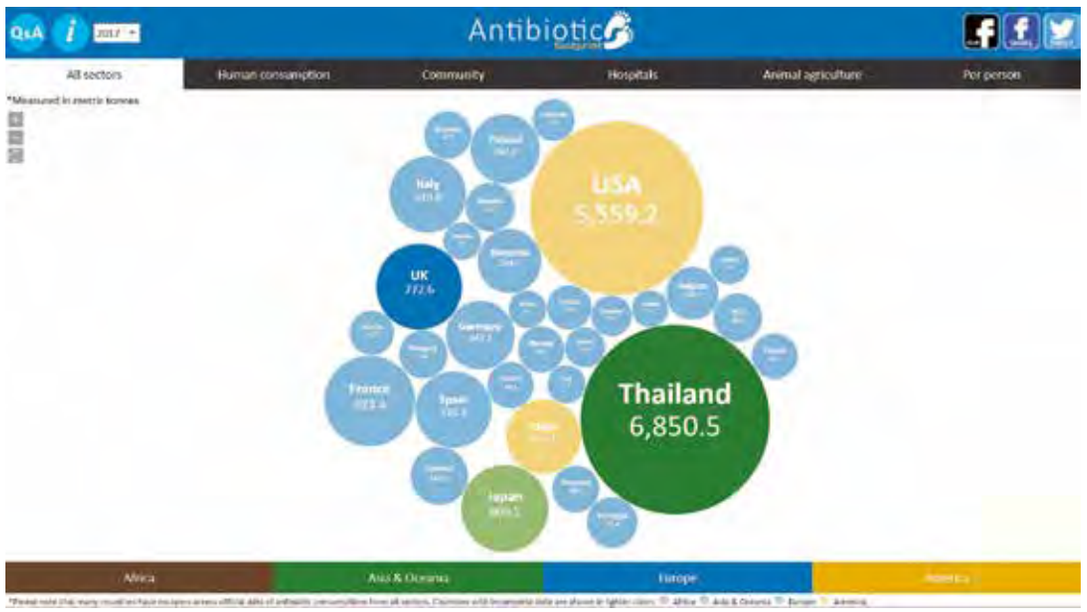
Assoc. Prof. Wirichada Pan-ngum with her PhD. Student, Dr. Wiriya Mahikul and team studied the contact mixing patterns and population movement among migrant workers from Cambodia, Lao PDR, and Myanmar in an urban setting in Thailand. The authors found significant differences among contact mixing patterns due to the type of work migrant workers were engaged in. Migrant workers from Cambodia and Myanmar had more similar contact mixing patterns to each other than workers from Laos. The findings of this study can help public-health practitioners gain a better understanding of contact mixing patterns and population movements among migrant workers in an urban setting. This information will be useful for simulations of disease epidemics and for researchers interested in infectious diseases and disease-transmission modeling.

A survey study was published by Assoc. Prof. Jaranit Kaewkungwal in the *American Journal of Tropical Medicine and Hygiene* entitled "Issues and challenges associated with data-sharing in LMICs: perspectives of researchers in Thailand". It revealed that Thai researchers are less concerned with regards to informed consent and the feasibility of conducting research and sharing data. They were more concerned with the importance of appropriate acknowledgment and protecting the legal rights of the primary data collectors and providers. The implications of these results are important for future efforts to include LMICs in data-sharing frameworks.

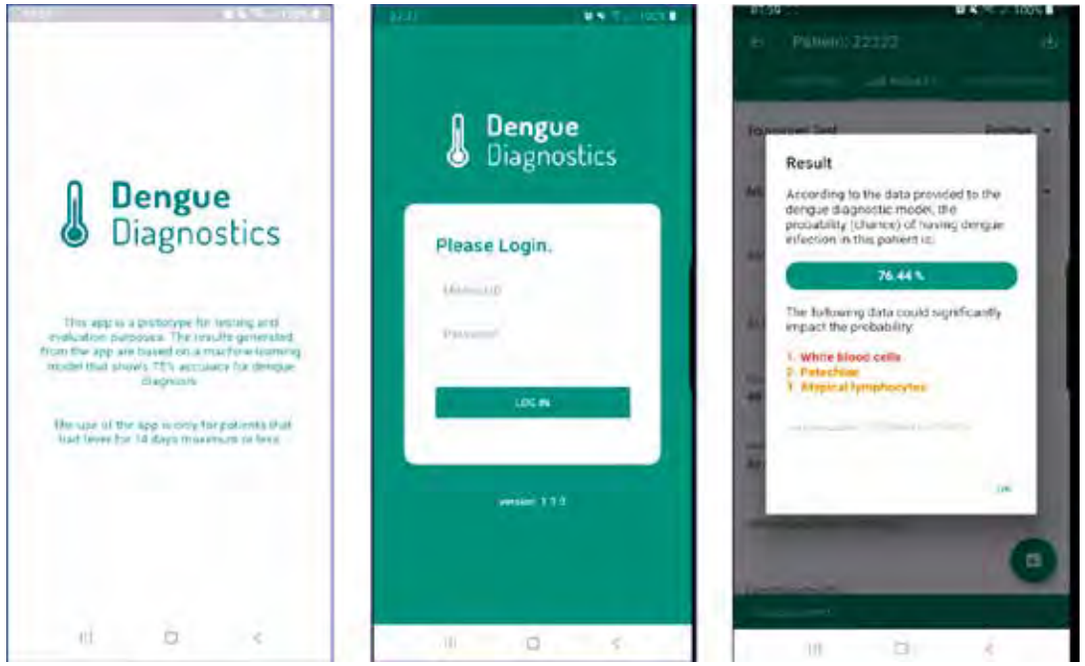
Research project

Assoc. Prof. Direk Limmathurotsakul and collaborators from MORU, Thailand, the UK, Singapore, South Africa, and India, are working on a project called "Antibiotic Footprint", which is an interactive guide to help people understand the total amount of antibiotics consumed around the world. It will allow a user to explore antibiotic consumption and data from different countries. It aims to generate a communication tool using the antibiotic footprint concept. The Antibiotic Footprint project has been launched at www.antibioticfootprint.net and is undergoing ongoing testing.

Asst. Prof. Chawarat Rotejanaprasert and Assoc. Prof. Saranath Lawpoolsri Niyom are developing a mobile application to facilitate dengue diagnostic decision-making in resource-limited settings. An Android application prototype has been developed and available in the Google Play store with limited permissions. The team is working with Prof. Peter Haddawy, Faculty of Information and Communication Technology, Mahidol University, and the University of Bremen, Germany. They were awarded 380,000 THB by the iTPA Institutional Translation Partnership of MORU for the development of this project.



User interface development for point-of-care dengue diagnosis software in resource-limited settings



COVID-19

Assoc. Prof. Direk Limmathurotsakul and researchers from the Ministry of Public Health, Thailand, found that the consistent wearing of masks, hand washing, and social distancing are effective protective measures against COVID-19. This case-study was published in *Emerging Infectious Diseases*.

Asst. Prof. Chawarat Rotejanaprasert, Assoc. Wirichada Pan-ngum, Assoc. Saranath Lawpoolsri Niyom, and Prof. Richard Maude of MORU, conducted a preliminary estimation of temporal and spatiotemporal dynamic measures of COVID-19 transmission in Thailand and published the results in *PLOS One*.

The Department of Tropical Hygiene, in collaboration with Prof. Hiroshi Nishiura of Kyoto University School of Public Health, received 10 million JPY funding from the e-ASIA Joint Research Program for a project on mathematical modelling of heterogeneous contact and movement patterns for preventing COVID-19 (MAC-19). This cooperative research project aims to achieve the implementation of mathematical models by parameterizing heterogeneous contact via social contact survey and quantifying movement patterns of humans using ICT techniques. Mutually compensating techniques in expertise areas between Thailand and Japan, this project will offer modelling methods to optimize interventions against COVID-19. The project is currently being implemented.

Awards and academic promotion

Prof. Srivicha Krudsood received an Outstanding Alumni Award from Ratchawithi Hospital, Thailand.

In 2020, Assoc. Prof. Wirichada Pan-ngum received two Outstanding Lecturer Awards from the Faculty of Tropical Medicine, Faculty Senate 2020 and Mahidol University Faculty Senate.

Dr. Saranath Lawpoolsri Niyom and Dr. Wirichada Pan-ngum were promoted to Associate Professor in 2020.

Department of Tropical Nutrition and Food Science

Assoc. Prof. Karunee Kwanbunjan
Head

Facts and Figures

8	7	10	฿420K	3	6	5
Academic staff	Support staff	Journal publication	Grants received	Funders	Ongoing research projects	Collaborators

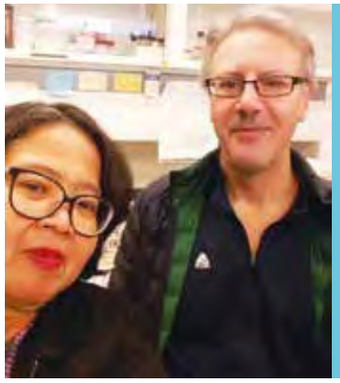
2020 Highlights

Research publications

Assoc. Prof. Karunee Kwanbunjan and PhD student Ms. Devi Savitri Effendy evaluated the impact of a nutrition education intervention on children's dietary diversity scores (DDSs), in Southeast Sulawesi Province, Indonesia. The study showed the educational intervention had a significant effect on children's DDS. The study results indicated that nutrition education delivered through nutrition classes combined with regular home visits by cadres (community volunteers) as influencers provided a great potential for adoption to complement other nutrition programs in community health centers.

This study, published in *Maternal and Child Nutrition* is beneficial for Indonesian policy-makers on child health and mothers and children in Sulawesi Province, Indonesia.

Assoc. Prof. Karunee Kwanbunjan in Sulawesi Province, Indonesia during the study



Asst. Dumrongkiet Arthan training migrant health workers volunteers in Samukt Sakhon

Asst. Prof. Dr. Pornrutsami Jintaridth received a staff mobility research grant from Mahidol University in 2018 to join the research study "Testing assays for cell transport and/or metabolic pathways, developing assays for epigenetic analyses", organized by the Simon Fraser University, Burnaby, Canada. She and Canadian collaborator, Assoc. Prof. Amandio Vieira studied "Transport of the thyroid hormone carrier protein transthyretin into human epidermoid cells". Transthyretin (TTR) is a protein with a growing number of biological functions in addition to its well-established binding and circulatory transport of thyroxine, and indirect retinoid transport through interaction with retinol-binding protein. Misfolded and aggregated wild-type and mutant TTRs are involved in amyloid diseases. They sought to understand transthyretin (TTR) endocytic pathways for TTR. This study was published in *Endocrine Research*, in 2020.

In a study on commercially-available edible insect products in Japan, Asst. Prof. Pattaneeya Prangthip and Japanese collaborators found that diving beetle and cricket products contained relatively high amounts of vitamin B12. According to the study, the consumption of approximately 80 g of cricket products would provide the recommended dietary allowance for adults. This information can benefit farmers, business owners and people who require or prefer to consume vitamin B12 naturally (without synthetic tablets). This study was published in *Food Chemistry*.

Prof. Rungsunn Tungtrongchitr and Ms. Banchamaphon Pheungruang were involved in a study entitled "Relationships of apelin concentration and APLN T-1860C polymorphism with obesity in Thai children", published in *BMC Pediatrics*. According to the study, apelin and its receptor system play a role in modulating feeding behavior and energy homeostasis. The study showed that apelin concentrations of obese children were lower than normal-weight children and that apelin concentrations were related to certain cardiometabolic parameters. The findings of this study provide useful information concerning the management and assessment of obesity risk.

Research projects

Asst. Prof. Dumrongkiet Arthan is in partnership with Asst. Prof. Ngamphol Soonthornworasiri of Department of Tropical Hygiene, the Ministry of Public Health Thailand, World Health Organization, NGOs and other Thai government agencies in Thailand, and hospitals and schools in Samut Sakhon Province for the project "Capacity Building for Health Literacy (NCD and COVID-19) in Thai-Myanmar Community (2020-2022)".

Asst. Prof. Dr. Pornrutsami Jintaridth and Assoc. Prof. Amandio Vieira worked in a lab in Simon Fraser University.

Infographic poster in English language

This important and collaborative project aims to educate migrant workers in Thailand on health literacy by producing instructional media and social media platforms on health promotion for COVID-19 prevention and distribute these online and offline. The project will also promote capacity building by training migrant workers in factories and communities at Samut Sakhon to become health worker volunteers. Another goal of the project is to build an E-learning and training course for migrant health worker volunteers in factories and communities in Samut Sakhon.

From these projects, Dr. Dumrongkiet and team intend to determine knowledge, attitudes and practices towards COVID-19 and NCDs among migrant workers in Thailand.

Together with Dr. Arthan's networks, the project has produced COVID-19 prevention videos and infographic posters in 5 languages; English, Thai, Lao, Khmer, and Burmese, that were shared on social media platforms. The team also distributed instructional media offline and with migrant workers in Samut Sakhon.

Asst. Prof. Pornrutsami Jintaridhi and collaborators received Brand's research grant award 2019 to study short-chain fatty acid occurring in the fermenting process of soybean

Posters and reading materials on COVID-19 were posted and distributed in Samut Sakhon Province

meal for fermented soybean (Tua Nao) from natural microbiome for its usefulness in health and nutrition and impact on the human metabolism. The study duration is 2-years (2019-2021).

The goal of this project is to produce fermented soybean meal enriched short chain fatty acid. It is expected to be produced at an industry level and become an innovative product in Thailand. Currently, the team is working on the analysis of short chain fatty acid and metagenomic analysis in fermented soybean meal (67 samples).

Dr. Pornrutsami presented this project as an invited speaker in the session "Gut microbiota and natural products: to fight against COVID-19" of the Joint International Tropical Medicine Meeting (JITMM Virtual 2020) held 15-16 December 2020.

Awards

The project "Capacity Building for Health Literacy (NCD and COVID-19) in Thai-Myanmar Community" received a Collaborative Award on COVID-19 Prevention from Samut Sakhon province.

In 2020, Asst. Prof. Dumrongkiet Arthan received a certificate as the best advisor on student affairs for the academic year 2019 from the Faculty of Graduate Studies Alumni Association, Mahidol University, Thailand.

Migrant health volunteers trained by Mahidol University, Thai Health Promotion at Samut Sakhon Hospital

Department of Tropical Pathology

Prof. Parnpen Viriyavejakul
Head

Facts and Figures

4	8	17	฿4.5M	6	6	8
Academic staff	Support staff	Journal publication	Grants received	Funders	Ongoing research projects	Collaborators

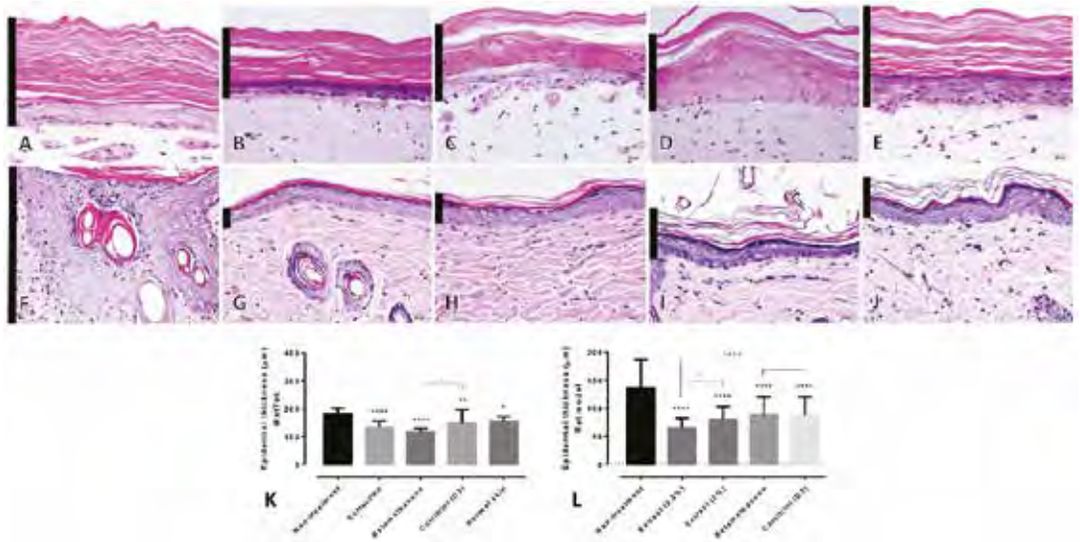
2020 Highlights

Research publications

Assoc. Prof. Sumate Ampawong and Thai collaborators published the study entitled "Evaluating the effect of rice (*Oryza sativa* L.: SRNC05053-6-2) crude extract on psoriasis using *in vitro* and *in vivo* models" in *Scientific Reports*.

Mali Nil Surin rice

Oryza sativa L.: SRNC05053-6-2 or black rice (Mali Nil Surin rice) contains anthocyanin, which exhibits strong antioxidative and anti-inflammatory properties. The present study explored the antipsoriatic property of the crude extract from black rice used in human psoriatic artificial skin and an imiquimod-induced rat psoriasis model. The extract improved epidermal integrity by maintaining the expression levels of psoriasin, β-defensin, koebnerisin 15L, koebnerisin 15S, caspase-14, involucrin and filaggrin. In addition, inflammation decreased, owing to the antioxidative effects exerted via Nrf-2 and

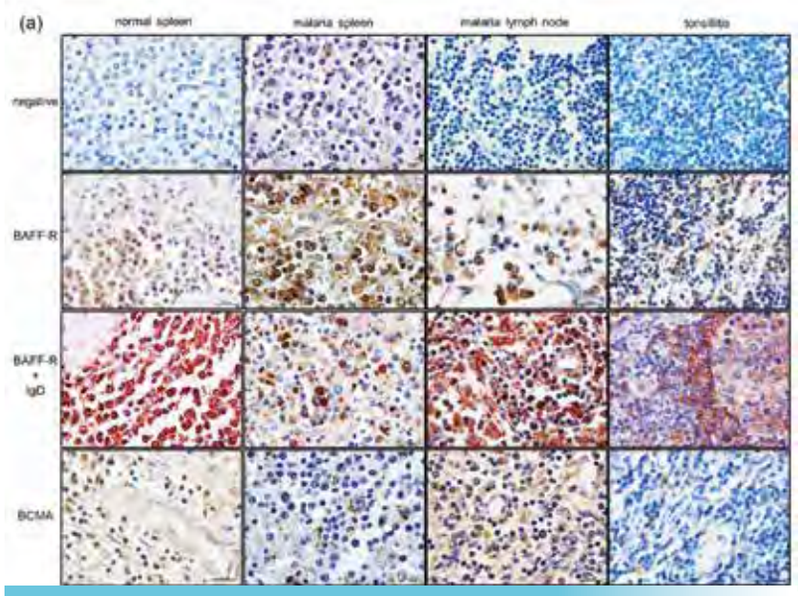


Histopathological evaluation in artificial psoriatic human skin and imiquimod-induced psoriasis rat skin

the immunomodulatory effects exerted by the regulation of IL-10, TGF- β, IL-6, IL-8, IL-20, IL-22, TNF-α and CCL-20 levels. Therefore, *O. sativa* L.: SRNC05053-6-2 extract appears to be a potential candidate for the treatment of psoriasis.

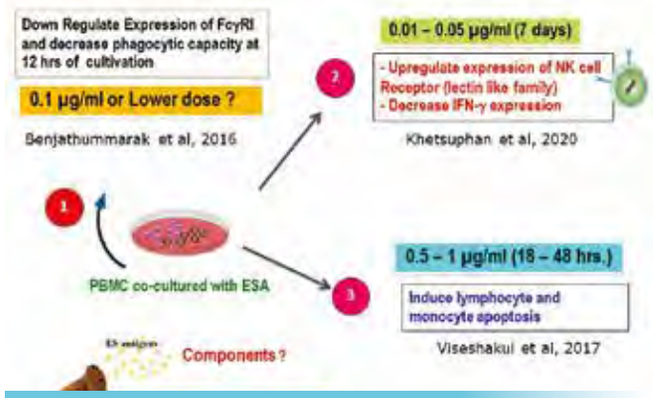
This study provides new information on the therapeutic effects of anthocyanin on human diseases and can be beneficial for researchers working on the treatment of psoriasis.

Assoc. Prof. Yaowapa Maneerat, Ms. Wilanee Dechkhajorn, and other researchers in the Department published an article entitled "The activation of BAFF/APRIL system in spleen and lymph nodes of *Plasmodium falciparum* infected patients" in *Scientific Reports*. With this study, the researchers are the first to explore the possibility that the spleen and lymph nodes may be important sites of activation of B cells through the BAFF/APRIL signaling system during *P. falciparum* infection. The results of their study will benefit researchers interested in the pathogenesis of malaria.



Expression of the cognate receptors of BAFF/APRIL in human lymphoid tissue. Immunohistochemical staining of BAFF-receptor (BAFF-R) and B cell maturation antigen (BCMA) in sections of normal spleen, spleen and lymph node from a patient with falciparum malaria, and bacterially infected tonsil at magnification ×1000.

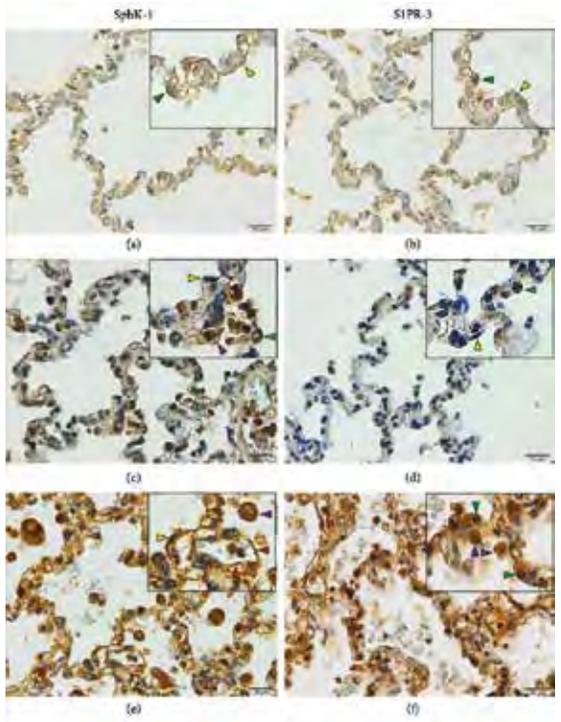
Assoc. Prof. Yaowapa Maneerat and collaborators investigated the effects of *Gnathostoma spinigerum* infective stage larva excretory-secretory products on NK cells, monocyte, and lymphocytes in peripheral blood mononuclear cell culture, focused on the expressions of IFN-γ and killer cell lectin-like receptors. The study was published in *Parasitology Research.*



The authors' overall in vitro findings in interaction between human immune cells and G. spinigerum third stage larval excretory-secretory product proposes at least 3 evasion strategies of the infective larvae in human gnathostomiasis.

Prof. Parnpen Viriyavejakul and Assoc. Prof. Chuchard Punsawad of Walailak University investigated the expression of sphingosine Kinase-1 (SphK-1) and sphingosine-1-phosphate receptor-3 (S1PR-3) in severe *Plasmodium falciparum* malaria with pulmonary edema (PE). Using immunochemistry, they found that both the SphK-1 and S1PR-3 proteins were overexpressed in the lung tissues of severe *P. falciparum* malaria patients with PE, suggesting that SphK-1 and S1PR-3 mediate the pathogenesis of PE in severe malaria. The study suggests that targeting the regulation of SphK-1 and/or S1PR-3 may be an approach to treat pulmonary complications in severe *P. falciparum* patients.

The work was published in *BioMed Research International* and will be helpful for researchers working in the field of malaria pathogenesis.



Representative images of immunoperoxidase staining for Sphk-1 and S1PR-3 in the lung tissues of severe P. falciparum malaria patients. (a, b) Normal lung tissues. (c, d) Lung tissues of severe P. falciparum malaria patients without PE. (e, f) Lung tissue of severe P. falciparum malaria patients with PE. Green arrowheads indicate alveolar type II cell. Yellow arrowheads indicate alveolar type I cell. Red arrowheads indicate endothelial cells. Purple arrowheads indicate alveolar macrophage. Green asterisks indicate the lumen of the blood vessel. All images were acquired at 400x magnification.

Research projects

Assoc. Prof. Sumate Ampawong received a grant of 1,572,000 Baht from the Agricultural Research Development Agency

(ARDA) for his project "Efficacy study of Mali Nil Surin rice extraction to develop medicinal products for psoriasis alleviation". The work has been published in *Scientific Reports*.

Dr. Sumate is collaborating with researchers from Chulalongkorn University and other faculties of Mahidol University, Thailand.

Assoc. Prof. Sumate Ampawong

Assoc. Prof. Yaowapa Maneerat

Assoc. Yaowapa Maneerat completed her project "An indicative gene profile of acute coronary heart disease in Thai familial hypercholesterolemia patients" in 2020 and is currently working on the final revision of the manuscript.

Dr. Yaowapa was awarded 439,000 Baht from the Faculty of Tropical Medicine, Mahidol University, Fiscal Year 2019 Grant, for her on-going project "Biomarkers for coronary heart disease risk in Thai post-menopausal women". She is collaborating with Dr. Suyanee Mansanguan of Bhumibol Adulyadej Hospital, Bangkok.

In the previous and current studies of non-communicable diseases, Dr. Yaowapa's focus is to find appropriate biomarkers from blood and the gut microbiome for coronary heart disease (CHD) risk. It is expected that the results may be applicable in precision medicine (both diagnosis and post-treatment) for Thai CHD patients.

Assoc. Prof. Urai Chaisri

Assoc. Prof. Urai Chaisri, as co-investigator, is working on 3-year project (2020-2021) entitled "MRI study on aging-related iron deposition, oxidative stress and ferroptosis induced whole organ damage in beta-thalassemic mice". The study explores aging-related iron deposition, oxidative stress and ferroptosis induced brain, liver and heart damage in beta-thalassemic mice using MRI. Moreover, the effects of the combination therapy of deferiprone and a Thai herb (*Centella asiatica*) on iron deposition, oxidative stress and ferroptosis induced brain, liver and heart damage in aging beta-thalassemic mice will be studied. The results of this study may elicit the roles of aging-related iron deposition, oxidative stress and ferroptosis induced organ damage and the benefits of iron chelation therapy in aging thalassemia patients.

Dr. Urai is working with researchers from the Faculty of Veterinary Science and the Faculty of Medicine Siriraj Hospital, Mahidol University for this project, which was awarded 1,500,000 Baht by the Thailand Research Fund.

Prof. Parnpen Viriyavejakul

Prof. Parnpen Viriyavejakul is currently investigating cytoskeletal and junctional protein damage in endothelial cells in severe *Plasmodium falciparum* malaria. Further work involves exploring possible drugs to restore cytoskeletal and junctional damage in the hope that severe malaria complications, such as pulmonary edema and brain edema, can be prevented. The work recently received a 1,500,000-Baht grant from Mahidol University Mini-Research Cluster (MU-MiniRC), Mahidol University 2021.

COVID-19

Miss Wilanee Dechkhajorn, as co-investigator, and collaborators from Chulalongkorn University and i+MED Laboratories Co. Ltd received a 500,000-Baht grant from the Research Gap Fund fights COVID-19, *National Science and Technology Development Agency* (NSTDA) for their project "Nucleic acid lateral flow immunoassay (NAFL) for rapid naked eye diagnosis of COVID-19 by multiplex-recombinase polymerase amplification".

The goal of this work is to develop a nucleic acid lateral flow immunoassay (NAFL) for the rapid naked-eye diagnosis of COVID-19 using isothermal amplification technique by multiplex-recombinase polymerase amplification. The NAFL can be used for screening COVID-19 patients in a small hospital and in remote and undeveloped areas, including those with limited laboratory equipment. With the success of this work, the spread of SARS-CoV-2 can be reduced. The team is preparing the manuscript and the process of commercialization.

Scientific conferences

The researchers of the Department of Pathology attended the COVID-19: The Global Health Challenges for the New Decade Virtual Conference, organized by Rajavithi Hospital, Bangkok, Thailand, on 15-17 July 2020.

The Department also participated in the Joint International Tropical Medicine Meeting (JITMM Virtual 2020) on 15-16 December 2020.

Awards and academic promotion

Dr. Urai Chaisri and Dr. Sumate Ampawong were promoted to Associate Professor in 2020.

Scientists of the Department of Pathology (From left) - Miss Wilanee Dechkhajorn, Mr. Charit Srisook, Miss Tapanee Kanjanapruthipong, and Miss Supattra Glaharn

Support staff (From left) - Mrs. Benja Boonsang, Mrs. Vasana Boonkert, Miss. Wimon Ngoenkong, and Mrs. Jaruchat Boonnachot

Department of Tropical Pediatrics

Assoc. Prof. Kriengsak Limkittikul
Head

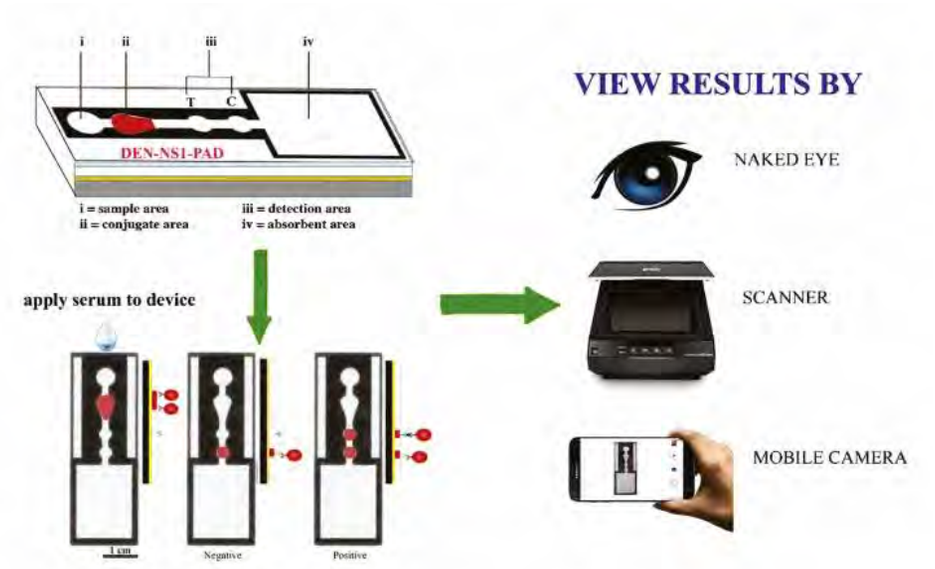
Facts and Figures

6	10	6	฿14.22M	6	10	4
Academic staff	Support staff	Journal publication	Grants received	Funders	Ongoing research projects	Collaborators

2020 Highlights

Research publications

Prof. Chukiat Sirivichayakul, the TIDES study group, and collaborators from Takeda Vaccines, published their findings from a dengue vaccine trial conducted in Asian and Latin American endemic countries. They reported that the tetravalent dengue vaccine (TAK-003) was well tolerated and effective against dengue in children regardless of serostatus before immunization. The study entitled "Efficacy of a tetravalent dengue vaccine in healthy children aged 4-16 years: a randomised, placebo-controlled, phase 3 trial" was published in the *Lancet*, a prestigious journal with an impact factor of 60.392 (2019).



In collaboration with the Tak Provincial Health Office and Mae Sot Hospital Thailand, Asst. Prof. Weerawan Hattasingh and researchers from the Department of Tropical Hygiene published "Evaluation of immunization services for children of migrant workers along Thailand-Myanmar border: compliance with Global Vaccine Action Plan (2011-2020)" in *Vaccines (Basel)*. The study reported the success of the Thai government's immunization program.

Assoc. Prof. Kriengsak Limkittikul and Asst. Prof. Supawat Chatchen reported their evaluation of microfluidic paper-based analytical devices (μPADs) utilizing a sandwich immunoassay on wax patterned paper functionalized with anti-dengue NS1 monoclonal antibodies for point-of-care detection of dengue NS1 (DEN-NS1-PAD). They confirmed that the DEN-NS1-PAD can potentially be used in point-of-care dengue diagnostics. The study entitled "Dengue NS1 detection in pediatric serum using microfluidic paper-based analytical devices" was published in *Analytical and Bioanalytical Chemistry* in collaboration with researchers from Universitas Islam Indonesia and King Mongkut University of Technology Thonburi, Thailand.

Research projects

Assoc. Prof. Kriengsak Limkittikul and colleagues are collaborating with Takeda Vaccines, USA on a phase 3, open-label, randomized trial to investigate the immunogenicity and safety of the co-administration of a subcutaneous dengue tetravalent vaccine (live, attenuated) (TDV) and an intramuscular recombinant 9-valent human papillomavirus (9vHPV) vaccine in subjects aged ≥9 to <15 years in an endemic country for dengue (DEN-308). The project aims to provide immunogenicity and safety data on the co-administration of human papillomavirus vaccine with TDV dengue vaccine in healthy subjects aged 9-14 years. The project, which was awarded 15 million Baht for 1 year, is currently in the preparation stage and will start the on the first trimester of 2021.

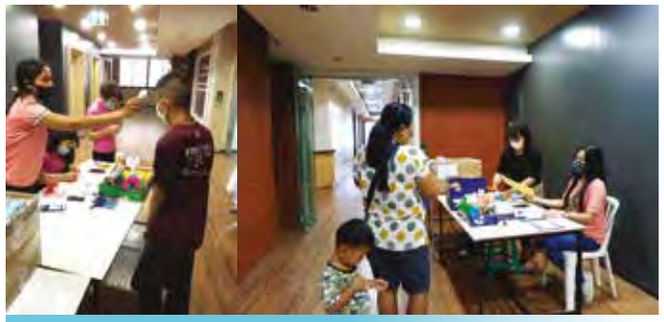
The Department Hospital was awarded 1.6 million Baht for 1 and a half years to conduct a feasibility study on the uses of Zika point-of-case diagnostic tests. The team will work with the University of Colorado, USA to evaluate the feasibility of the test kit in implementation, surveillance, and clinical use. The core team comprises Assoc. Prof. Kriengsak Limkittikul, who is leading Zika surveillance in pregnancy at Rajavithi Hospital; Asst. Prof. Supawat Chatchen, who is investigating the incidence of Zika virus infection in Bangphae District, Ratchaburi Province in 2011-2015; and Dr. Wasin Matsee, who is leading the study on DEN/Zika/CHIK infection among febrile patients in the Hospital for Tropical Diseases, Faculty of tropical Medicine, in Bangkok. These studies will commence in the first trimester of 2021.

Scientific conferences

Assoc. Prof. Kriengsak Limkittikul was a presenter in "The Hot Issue of Tropical ID" session at a short-course training: Update on Pediatric Infectious Diseases 2020" held 19-21 February 2020 at the Sukosol Hotel, Bangkok, Thailand.

Assoc. Prof. Chukiat Sirivichayakul, Asst. Prof. Watcharee Arunsodsai, and Asst. Prof. Weerawan Hattasingh, participated as expert speakers on "Tropical and traveler infections", "Congenital infection" and "Antibiotics", respectively, in the 24th Annual Meeting of the Pediatric Infectious Diseases Society of Thailand, 16-18 October 2020, at the Royal Cliff Beach Resort & Spa, Pattaya, Thailand.

Vaccine trial activities in 2020



Registration and temperature screening

History taking and physical examination

Blood sampling tube preparation

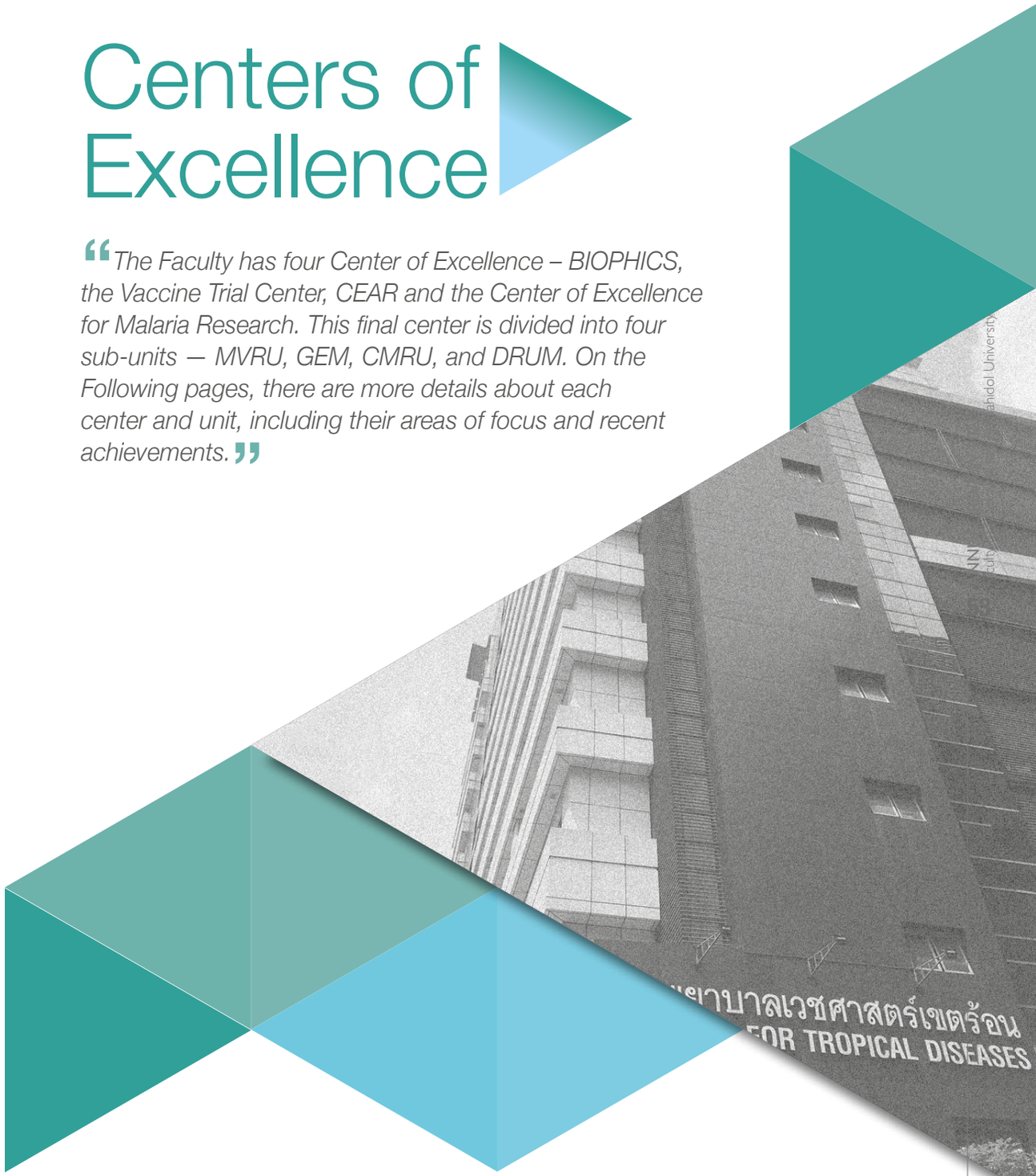
Venipuncture

Vaccination

Diary card instruction and review

Centers of Excellence

"The Faculty has four Center of Excellence – BIOPHICS, the Vaccine Trial Center, CEAR and the Center of Excellence for Malaria Research. This final center is divided into four sub-units — MVRU, GEM, CMRU, and DRUM. On the Following pages, there are more details about each center and unit, including their areas of focus and recent achievements."



Center of Excellence for Biomedical and Public Health Informatics (BIOPHICS)

Mr. Amnat Khamsiriwatchara
Chief Executive Officer (CEO)

Facts and Figures

25	3	฿20M	6	12	7
Staff	Journal publication	Grants received	Funders	Ongoing research projects	Collaborators

2020 Highlights

BIOPHICS and researchers from the Department of Clinical Tropical Medicine and Mahidol Vivax Research Unit conducted malaria-cross sectional surveys in Surat Thani province to determine the prevalence and risk factors of *Plasmodium* infection in a near-elimination setting in southern Thailand.

The researchers found that prevalence of *P. falciparum* and *P. vivax* is very low. However, most of the infections were asymptomatic, including unexpectedly detected *P. knowlesi* infections. The identified risk factors are being male and staying outdoors at night-time.

The findings of the study will be informative researchers, policy-makers, and public health officers involved in malaria elimination efforts in Thailand and Southeast Asia. The study was published in *International Journal of Infectious Diseases.*

Center of Excellence for Antibody Research (CEAR)

Assoc. Prof. Pongrama Ramasoota
Head

Facts and Figures

5	5	3	฿65M	6	9	10
Staff	Journal publication	Honors and Awards	Grants received	Funders	Ongoing research projects	Collaborators

2020 Highlights

Research publications

Dr. Pongrama Ramasoota and Japanese collaborators demonstrated that a recombinant chimeric flavivirus (DV2ChimV) can be used to perform neutralization assays, *in vitro* and *in vivo* ADE assays, including protection assay in mice. The results of the study suggest that chimeric virus is an effective tool for the evaluation of antibodies against dengue virus.

The study, entitled "Chimeric flavivirus enables evaluation of antibodies against dengue virus envelope protein *in vitro* and *in vivo*", was published in *Scientific Reports.*

In a study entitled "Human heavy chain antibody genes elicited in Thai dengue patients during DENV2 secondary infection", researchers at CEAR confirmed that immunoglobulin heavy chain variable (IGHV) 1-69, 3-23, and 3-30 were frequently discovered in Thai DENV2 infected patients. The findings, published in the *Japanese Journal of Infectious Diseases,* provide new data on the human B cell response during secondary DENV2 infections. The study also presents supportive data for the design and development of dengue vaccine and therapeutics.

In the study entitled "The activation of BAFF/APRIL system in spleen and lymph nodes of *Plasmodium falciparum* infected patients" Assoc. Prof. Yaowapa Maneerat and Dr. Surachet Benjathummarak reported the occurrence of expression of the B cell-activating factor (BAFF)/a proliferation-inducing ligand (APRIL) system and changes in falciparum lymphoid tissues. The study was published in *Scientific Reports.*

Research projects

Assoc. Prof. Pannamthip Pitaksajjakul received a 1.3 million Baht fund from The Health System Research Institute for a project that aims to develop therapeutic human monoclonal antibody (mAb) against non-structural 1 (NS1) protein of dengue virus. The developed mAb will be used for both viral neutralization during the febrile viremia phase and to reduce the severe manifestations of dengue during the critical phase caused by dengue NS1 protein. Dr. Pannamthip is collaborating with Professor Yee Chin Lin, Faculty of Medicine, National Cheng Kung University, Taiwan for this project.

The project "Development of therapeutic human and canine monoclonal antibodies against rabies virus using phage display technology" is led by Dr. Ramasoota and Dr. Apidsada Chorpunkul. They are working with researchers from Kasetsart University, Suranaree Technology University, and the Thai Red Cross. The project was awarded a 4 million Baht grant by the Thailand Research Fund.

The National Research Council of Thailand & Japan Promotion of Science (JSPS) awarded Assoc. Prof. Pongrama Ramasoota a 1.5 million Baht grant for the project "Validation of therapeutic human monoclonal antibody against dengue virus". Dr. Atsushi Yamanaka (Osaka University) and Dr. John Kaundinya (BSV-Biosciences Company) are involved in the project.

COVID-19

Dr. Pongrama Ramasoota, Dr. Pensiri Pusingha, Dr. Surachet Benchathammarak, Dr. Pannamthip Pitaksajjakul, Dr. Yong Pooworawan, and Akkapot Chamkasem are working on a project "Development of therapeutic human monoclonal antibody against SAR COV 2" funded by the Japan International Cooperation Agency (JICA) (55 million Baht) and National Science Technology Development Agency (NSTDA) (4.7 million Baht).

The goal of the project is to develop therapeutic neutralizing human monoclonal antibody (NhumAb) against SAR COV 2 using phage display and SPYMEG technologies and test the neutralizing activity of NhumAb using the SAR COV 2 Pseudo virus. The team is collaborating with researchers from Osaka University, Japan.

Awards and academic promotion

Dr. Ramasoota received the Mahidol University Award on Invention and Innovation 2019 from Princess Maha Chakri Sirindhorn, Thailand Outstanding Researcher Award 2020 from the National Research Council of Thailand, and Outstanding Alumni 2020 from Kasetsart University.

Dr. Pannamthip Pitaksajjakul was promoted to Associate Professor and Dr. Pongrama Ramasoota's Collaborative Professorship at Osaka University was renewed.

Scientific conference

CEAR attended and presented at the Joint International Tropical Medicine Meeting 2020 (JITMM Virtual 2020) on 15-16 December 2020.

Genomics and Evolutionary Medicine Unit (GEM)

Asst. Prof. Thanat Chookajorn
Head

Facts and Figures

4	4	฿3.5M	3	3	5
Staff	Journal publication	Grants received	Funders	Ongoing research projects	Collaborators

2020 Highlights

The Genomic and Evolutionary Medicine Unit, headed by Asst. Prof. Thanat Chookajorn, has been very active during the COVID-19 pandemic, especially in conducting genomic surveillance programmes in Thailand and developing an innovative diagnostic test kit for SARS-CoV-2. The results of GEM and collaborators' projects inform Thai government decision-makers about the current COVID-19 situation in the country.

Dr. Thanat is part of the COVID-19 Network Investigations (CONI) Alliance, which is composed of experts and researchers from the Mahidol Oxford Research Unit (MORU), Ramathibodi Hospital, Armed Forces Research Institute of Medical Sciences (AFRIMS), National Electronics and Computer Technology Center (NECTEC), Khon Kaen University, Department of Disease Control, Thailand, the ARTIC Network and the Wellcome Sanger Institute, United Kingdom.

Research publications

Dr. Thanat Chookajorn published a letter in *Proceedings of the National Academy of Sciences of the United States of America (PNAS)* entitled "Evolving COVID-19 conundrum and its impact". In the letter, Dr. Thanat stressed the importance of accurate virus lineage tracking in COVID-19 control. Dr. Thanat states that during the COVID-19 pandemic, the scientific community must be extra-cautious in interpreting the results of COVID-19 studies and any potential misinformation must be addressed promptly.

The CONI Alliance implemented genomic surveillance of COVID-19 in Bangkok, Thailand by sequencing 27 swab samples from COVID-19-positive patients in Ramathibodi Hospital from 13-28 March 2020. The findings, which were published in *Virus Research*, suggest that local expansion of A/Thai-1 strongly indicates a series of local transmission events.

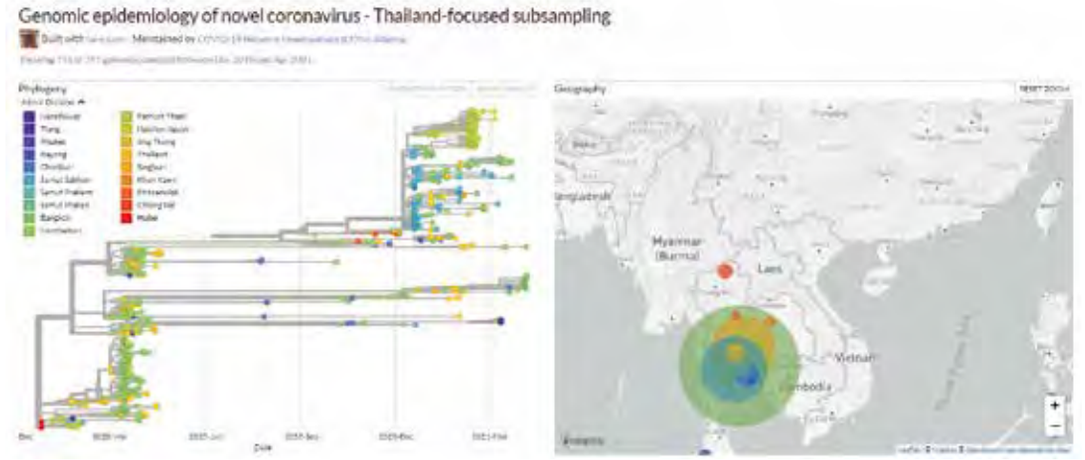
The article "Pitfalls of exceptions for COVID-19 travel quarantine: lessons from a dignitary visit to Thailand" published in the *Journal of Travel Medicine* is a case report using genomic investigations highlighting the importance of travel quarantine, face masks, and social distancing.

If the quarantine requirements must be waived for important visitors, the authors recommend conducting COVID-19 testing upon arrival, compliance with strict social distancing, and the wearing of personal protective equipment for those who will come in contact with the visitor. The authors reiterated the importance of quarantine among international travelers.

Research projects and COVID-19

Dr. Thanat and the CONI Alliance are leading the genomic investigation and surveillance of COVID-19 in Thailand and the implementation of RT-LAMP technology and genome evolution analysis for SARS-CoV-2 diagnosis.

Figure 1GEM member performs SARS-CoV2 genome analysis



Nextstrain builds focusing on lineages of interest in Thailand available at https://coni.team/resource/

The CONI Alliance has been implementing a genomic surveillance programme for Thailand. During the first wave (February 2020 – May 2020), the team sequenced 10% of the COVID-19 cases in Thailand. During the new wave, they have been running genomic surveillance analyses for multiple cohorts throughout the country. The CONI Alliance is now the largest contributor to the COVID-19 genomic sequencing programme in Thailand.

The data are routinely and immediately deposited in GISAID and used to generate the Thai Nextstrain build for the research and public-health communities [https://coni.team/resource/]. The team regularly appraises the leadership at the Ministry of Public Health and the Ministry of Higher Education, Science, Research, and Innovation of the COVID-19 situation in Thailand. The team has assisted ministerial officials in many outbreak investigations, such as the BNH quarantine facility, Pornphat market, and Bang Khae market. At present, genomic data are used to monitor the effectiveness of control measures and the emergence of vaccine escape mutations. The work has led to the development of RT2-LAMP, which allows quick detection of COVID-19 in emergency cases. The Alliance is supported by both Thai and international funders to assist local hospitals and public-health authorities throughout the pandemic.

Aside from genomic surveillance for COVID-19, Dr. Thanat Chookajorn also conducts a malaria drug development project. The project, "Artemisinin Booster Compound Development", developed compounds that can boost artemisinins' antimalarial activity against parasites with reduced artemisinin susceptibility. The project was supported by MORU's Institutional Translation Partnership (iTPA)

Mahidol Vivax Research Unit (MVRU)

Research Prof. Jetsumon Prachumsri
Director

Facts and Figures

28	23	2	฿99M	6	13	>20
Staff	Journal publication	Honors and Awards	Grants received	Funders	Ongoing research projects	Collaborators

2020 Highlights

Research at Mahidol Vivax Research Unit (MVRU) involved malaria-endemic populations in remote areas outside Bangkok. Due to the COVID-19 pandemic, some studies were delayed and others have been postponed temporarily, including expected research outcomes.

While the pandemic affected the activities of MVRU and the research community as a whole, Prof. Jetsumon Prachumsri sees opportunities emanating from the pandemic. Multidisciplinary researchers from various institutes around the world have joined forces to fight COVID-19. Processes have been streamlined for many regulatory policies involving the research and development of medical science products. There was also more funding to support many fields of medical research besides COVID-19.

For Prof. Jetsumon, the pandemic opened more opportunities for researchers in Thailand to identify new partners in medical research, which strengthen our research workforce and provide increased access to sponsored research funding sources.

Research publications

Prof. Jetsumon Prachumsri was part of a study that compared malaria diagnostics using ultra-sensitive (us)-qPCR compared with standard qPCR in cross-sectional surveys conducted in Thailand, Brazil and Papua New Guinea (PNG). The researchers found that us-qPCR yields more precise prevalence estimates for both *P. falciparum* and *P. vivax* at all studied levels of endemicity and represents a significant diagnostic improvement. This study was published in *Malaria Journal*.

Standard and direct membrane-feeding assays (SMFA and DMFA) are fundamental assays for evaluating the efficacy of transmission-blocking intervention candidates against *Plasmodium falciparum* and *vivax*. To compare different candidates precisely, Dr. Chalermpon Kumpitak, Dr. Kirakorn Kiattibutr, Prof. Jetsumon Prachumsri and collaborators analyzed *P. vivax* DMFA (PvDMFA) data from 22,236 mosquitoes tested from 96 independent assays. The study revealed that it is better to report % transmission reducing activity or % inhibition in oocyst intensity with a proper error range, rather than the observed % transmission blocking activity or % inhibition in the prevalence of infected mosquitoes, both in SMFA and DMFA. This study, which was published in *Scientific Reports*, strongly supports future transmission-blocking intervention development by providing a rational method to compare different candidates.

Dr. Wanlapa Roobsoong and Prof. Jetsumon Prachumsri were involved in a study that reported the development of the first small animal model for investigation of *P. vivax* blood-stage interventions. Human liver-chimeric FRGN huHep mice infected with *P. vivax* sporozoites were infused with human reticulocytes, allowing transition of exo-erythrocytic merozoites to reticulocyte infection and development into all erythrocytic forms, including gametocytes, *in vivo*. The invasion-blocking potential of a monoclonal antibody targeting the essential interaction of the *P. vivax* Duffy Binding Protein with the Duffy antigen receptor was tested by passive immunization. This antibody inhibited invasion by over 95%, providing unprecedented *in vivo* evidence that PvDBP constitutes a promising blood-stage vaccine candidate and proving our model to be highly suitable to test blood-stage interventions. The study was published in *iScience*.

Research projects

One of the major research projects of MVRU is MIST, the first *Plasmodium vivax* malaria infection study in Thailand and Asia to support drug and vaccine development. MIST is a collaboration between the Faculty of Tropical Medicine and Mahidol Oxford

Photo courtesy of NSTDA.

Tropical Medicine Research Unit (MORU). This study, funded by the Wellcome Trust, aims to challenge volunteers with *P. vivax* parasites to evaluate the protection or treatment efficacy of vaccines or new anti-malaria compounds. MIST1, which began in late 2020, aims to produce *P. vivax*-infected blood to be used further to evaluate blood-stage vaccine. In this study, first 2 volunteers were challenged by *P. vivax*-infected mosquitoes. The parasites' development in the blood was monitored. Up to 250 ml of blood was collected before the volunteers showed symptom or parasitemia reached the defined threshold to ensure the safety of the volunteers. The collected infected blood was processed and cryopreserved for the MIST2 study, which is planned to start once the pandemic situation in Thailand is resolved.

Another research project of MVRU is the mRNA Transmission Blocking Vaccine (TBV) for *P. vivax*. This study aims to produce and evaluate a new platform for a transmission-blocking vaccine, mRNA-TBV, against *P. vivax*. This study has been funded for 2 years by the Global Health Innovative Technology (GHIT) Fund. MVRU is collaborating with Ehime University, Japan and the University of Pennsylvania, USA for this project.

COVID-19

MVRU teamed up with researchers from the National Science and Technology Development Agency (NSTDA) to successfully develop COVID-19 Detection Kit (COXY-AMP). COXY-AMP, a rapid COVID-19 colorimetric detection kit, is a simple one-step procedure by adding the test RNA into COVID-19 and Internal Control reaction tubes and incubating them in a heating block or water bath at 65°C for 75 minutes. If SAR-CoV-2 RNA is detected in the sample, the color of the COVID-19 sample will turn from purple to yellow. The results can be visualized with the naked eye without the need for further expert analysis. Efficacy testing on 146 specimens using the COXY-AMP kit showed 92% sensitivity, 100% specificity, and 97% accuracy. Moreover, the LAMP technique takes only 75 minutes, which is twice as fast as RT-PCR technique and the cost per test is one third that of RT-PCR.

The COXY-AMP test kit has been certified to meet the Medical Device Technology performance requirements of the Food and Drug Administration of Thailand (FDA). Furthermore, the research team by BIOTEC-NSTDA, jointly with the Faculty of Tropical Medicine, Mahidol University under the name 19-Xolution team, submitted the COXY-AMP test kit to an international XPRIZE Rapid COVID testing competition, held by the non-profit XPRIZE Foundation. The Thai team was among 20 finalists out of 702 teams from 70 countries worldwide. Although the research team was not among the 5 winners in the competition, it is the only one from Asia and it is a first successful step that reflects the potential of Thai research, which is of the same quality as international technology standards. It also builds a reputation both domestically and internationally for the Faculty of Tropical Medicine and Mahidol University.

Honors and awards

Dr. Jetsumon Prachumsri was promoted to Research Professor. She is the first researcher in Mahidol University to receive the title.

Prof. Jetsumon also received the Mahidol Award in Research and was named Outstanding Alumnus of the Faculty of Science, Mahidol Universisty.

Clinical Malaria Research Unit (CMRU)

Prof. Srivicha Krudsood
Head

2020 Highlights

Research publications

Prof. Srivicha Krudsood was involved in a study that evaluated the performance of tafenoquine in preventing relapse of *Plasmodium vivax* malaria. Tafenoquine, a single-dose 8-aminoquinoline, has recently been registered for the radical cure of *P. vivax*. The results of clinical trials conducted in Ethiopia, Peru, Brazil, Cambodia, Thailand, and the Philippines, involving 522 enrolled patients with *P. vivax* infection, demonstrated that single-dose tafenoquine resulted in a significantly lower risk of *P. vivax* recurrence.

▸ The study was published in *The New England Journal of Medicine*, a prestigious journal with 74.699 impact factor.

▸ Prof. Srivicha Krudsood co-authored an article entitled "Pharmacogenetic assessment of tafenoquine efficacy in patients with *Plasmodium vivax* malaria" published in *Pharmacogenetics and Genomics*. The study was the first genome-wide association study to evaluate genetic influence on response to tafenoquine in *P. vivax* malaria.

▸ An article entitled "Severe orthostatic hypotension in otherwise uncomplicated *Plasmodium vivax* infection" described the case of a non-immune, previously healthy, Thai woman presenting with *P. vivax* infection with well-documented orthostatic hypotension. The patient developed persistent orthostatic hypotension three days after being cleared of *P. vivax* parasites. The authors, who include Prof. Srivicha Krudsood and Prof. Polrat Wilairatana, discussed the treatment and potential causes of hypotension; published in *Malaria Journal*.

▸ Prof. Srivicha Krudsood was part of the study of the Department of Pathology that demonstrated the polarization of M1 macrophages in the lungs of severe *P. falciparum* malaria patients with pulmonary edema (PE). The results of the study provide new insights into how to reduce lung damage in severe *P. falciparum* malaria. The study was published in *Malaria Journal*.

▸ Prof. Polrat Wilairatana and other researchers in the Department of Clinical Tropical Medicine investigated the incidence of traveler's diarrhea (TD) among adult foreign travelers to Thailand. They found that about one-third of foreign travelers developed diarrhea (some were severe cases) during the first month of arrival and identified risk factors associated with the incidence of TD--young age, eating street food, not routinely washing hands after toilet use.

To reduce the risk of TD, the researchers recommend the practice of good personal hygiene and avoidance of food and drinks obtained from unsanitary sources. The results of the study were published in the *American Journal of Tropical Medicine and Hygiene.*

Research projects

Prof. Srivicha Krudsood leads an ongoing project entitled "Evaluation of Malaria Detection Function Leveraging New Products in Thailand".

The goal of the project is to confirm the detection potential for malaria patients and asymptomatic cases.

Prof. Srivicha and team are collaborating with the National Center for Global Health and Medicine, Japan. The project was funded by the National Center for Global Health and Medicine, Japan, and the Japan Agency for Medical Research and Development.

Field work at Ratchaburi Province

Vaccine Trial Centre
VTC

Prof. Punnee Pitisuttithum
Head

2020 Highlights

36th Anniversary

The Vaccine Trial Centre has celebrated its 36th year anniversary. To commemorate this special occasion, the Center published a chronological book that encompasses the history and journey of the Center. The book also highlights the work done over the previous 36 years and future plans.

Through the leadership of Prof. Punnee Pitisuttithum, the Vaccine Trial Centre has published 178 papers in peer-reviewed journals, cited 11,701 times (65.7 citations per publication), and attained 42 *h*-index since its establishment.

Research publications

- The Vaccine Trial Centre was involved in a study that analyzed immune response profiles of HIV vaccine regimens based on the results of RV144 in clinical trials (RV144, HVTN 097, and HVTN100), to test the hypothesis that within each trial, there were participant subgroups sharing similar immune responses and that their frequencies differed across trials. The results of the study were published in *PLoS ONE* titled "Landscapes of binding antibody and T-cell responses to pox-protein HIV vaccines in Thais and South Africans"
- In a study entitled "HIV vaccine delayed boosting increases Env variable region 2–specific antibody effector functions" published in *JCI Insight*, the authors suggest that late boosting may improve the HIV-1 vaccine efficacy of the combined ALVAC-HIV and AIDSVAX boosting regimen used in the RV144 clinical trial.
- The results of Prof. Punnee Pitisuttithum's RV306 trial was published in the *Lancet HIV*. RV306 was a double-blind, randomized clinical controlled trial which evaluated the immunological effect of late boosting of RV144 regimen (AIDSVAX B/E and ALVAC-HIV) in HIV-uninfected Thai volunteers, aged 20-40 years. The study demonstrated that combined AIDSVAX B/E and ALVAC-HIV, with longer intervals between the primary vaccination series and late boost, improved immune responses and might also improve the efficacy of preventing HIV acquisition.
- Prof. Punnee Pitisuttithum was involved in a study that analyzed the boosting regimens of RV305, a HIV vaccine trial designed to evaluate the immunologic impact of late boosting with either the boosting protein antigen alone, the canarypox viral vector ALVAC alone, or a combination of both. The study results were published in the *Journal of Infectious Diseases*. It was found that IgG1 antibody levels and most functional responses increased upon protein boosting, regardless of the viral vector-priming agent combination. This suggests that late protein boost alone is enough to increase functionally potent vaccine-specific antibodies previously associated with a reduced risk of infection with HIV.

Research projects

- The Vaccine Trial Centre completed a phase III double blinded, randomized, controlled, non-inferiority trial to evaluate the immunogenicity and safety of trial Fluvac, a seasonal trivalent inactivated split virion influenza vaccine, in healthy Thai subjects aged 65 years and above. The Government Pharmaceutical Organization (GPO), Thailand funded the study.
- The Centre has an ongoing study clinical trial: a phase II international, multi-center, randomized, double-blind, placebo-controlled clinical trial (V503-049), to study the efficacy, immunogenicity, and safety of the 9vHPV vaccine, a multivalent L1 virus-like particle vaccine, in the prevention of persistent oral infection with HPV types 16, 18, 31, 33, 45, 52, or 58 in adult males, 20-45 years of age. Merck Sharp & Dohme (MSD), a pharmaceutical company, is funding this trial.
- The National Science and Technology Development Agency (NSTDA) provided funding to the Centre to conduct a phase II/III randomized, observer-blind, active –controlled study (DTA201) to compare the non-inferior immunogenicity of a combined Diptheria-Tetanus-recombinant acellular pertussis (DTaP) vaccine to a licensed DTaP based vaccine (non-recombinant), when administered to healthy toddlers aged 18-36 months.
- HPV021, a 2-year clinical trial that aimed to evaluate the effectiveness of HPV vaccine among women aged 20 years or more, was completed in 2020. Prof. Punnee and team are in the process of publishing the results of their study. The trial was funded by the National Vaccine Institute.

Prof. Punnee receives the prestigious Dushdi Mala Medal from His Majesty the King Vajiralongkorn.

COVID-19

Early in 2021, Prof. Punnee Pitisuttithum was granted funding to conduct a phase 1/2 randomized, placebo-controlled, observer-blind trial to assess the safety and immunogenicity of NDV-HXP-S vaccine in Thailand. The NDV-HXP-S is the first Thai-made COVID-19 vaccine manufactured by GPO. The trial is estimated to complete in 2023.

Awards

In 2020, Prof. Punnee received the prestigious Dushdi Mala Medal from His Majesty the King Vajiralongkorn for her significant contributions to science throughout her academic and research career. The Dushdi Mala Medal is one of the highest-ranked medals in Thailand awarded among those who demonstrate outstanding expertise in the fields of arts and sciences.

Prof. Punnee receives the prestigious Dushdi Mala Medal from His Majesty the King Vajiralongkorn

In the following year, Prof. Punnee was awarded the Khon Dee Sri Mahidol (Moral Gems of Mahidol) 2019, from Mahidol University Alumni Association under the Royal Patronage of His Majesty the King.

Drug Research Unit for Malaria (DRUM)

Dr. Rapatbhorn Patrapuvich
Head

The Drug Research Unit for Malaria (DRUM) established core test models at the Faculty of Tropical Medicine, Mahidol University, to support the antimalarial drug development research program: asexual blood stage, sexual blood stage, liver stage, hypnozoite stage, mosquito stage, drug resistance assay and high-throughput assay models.

Antimalaria drug discovery at DRUM.

2020 Highlights

Dr. Rapatbhorn Patrapuvich won the Presidents' Challenge Travel Award of the American Society of Tropical Medicine and Hygiene (ASTMH) Annual Meeting 2019 for her work on the new model for anti-*P. vivax* hypnozoite assay.

Dr. Rapatbhorn Patrapuvich won the Presidents' Challenge Travel Award of the American Society of Tropical Mediciine and Hygiene (ASTMH annual meeting 2019.

In January 2020, Dr. Rapatbhorn Patrapuvich was appointed as Pre-Erythrocytic Stage Expert Consultant (PE-EC) under the project entitled "Malaria Evolution in South Asia (MESA)" of the US-NIH ICEMR South Asia. She is responsible for providing technical assistance and input to the MESA-vector biology team, especially at the National Institute of Malaria Research (NIMR), field unit in Goa, India. She oversees the mosquito-stage and liver-stage experiments conducted under the program. She is also responsible for training, mentoring, supervision and managing vector biology program-related interaction and communication.

In November 2020, DRUM, in partnership with the Excellent Center for Drug Discovery (ECDD) and the Clinical Malaria Research Unit (CMRU), won the International Cooperation Development Scholarship from Mahidol University to set up a joint collaborative unit with malaria research teams at the University of Washington in Seattle, USA and establish the "Mahidol University - University of Washington Malaria Research Initiative" Program at the Faculty of Tropical Medicine, Mahidol University. The program will support malaria research and the establishment of innovative new medicines for malaria prevention at DRUM in Thailand.

"Mahidol Univesity - University of Washington Malaria Research Initiative" Program at DRUM.

"International academic collaboration is central to the work of the Faculty. Currently, six international organizations or units are hosted, covering a range of research and activity areas. The following pages describe the work of each collaboration and their highlights in 2020."

- Mahidol-Osaka Center for Infections Diseases (MOCID)
- Mahidol Oxford Tropical Medicine Research Unit (MORU)
- Malaria Consortium Asia
- Silom Commnuity Clinic at TropMed
- Southeast Asian Ministers of Education Organization (SEAMEO) Tropical Medicine and Public Health (TropMed) Network
- WorldWide Antimalarial Resistance Network (WWARN)

Collaboration

Mahidol Osaka Center for Infectious Diseases (MOCID)

Prof. Tatsuo Shioda
Director

Facts and Figures

6	4	฿2M	1	5	20
Staff	Journal publication	Grants received	Funders	Ongoing research projects	Collaborators

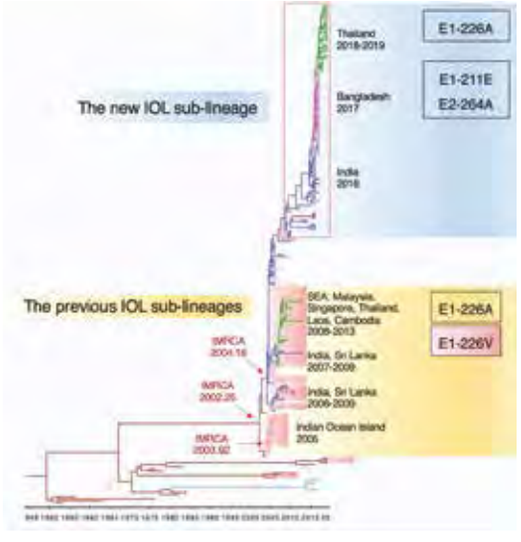
2020 Highlights

Research publications

Prof. Tatsuo Shioda, Ms. Juthamas Phadungsombat, and co-authors investigated the lineage or genotype of chikungunya virus (CHIKV) that re-emerged in the Indian subcontinent and Southeast Asia in 2016. The researchers collected CHIKV-positive sera samples from Dhaka City Bangladesh and Bangkok, Thailand in 2017 and 2019, respectively. Using CHIKV genome sequencing and phylogenetic analyses, the researchers found that the lineages of CHIKVs Indian Ocean Lineage (IOL) of genotype ECSA were introduced in Bangladesh in late 2015 and Thailand in early 2017.

The study entitled "A novel sub-lineage of chikungunya virus East/Central/South African Genotype Indian Ocean lineage caused sequential outbreaks in Bangladesh and Thailand" was published in *Viruses*.

MOCID was part of a Japanese cohort that developed a new CHIKV antigen-detecting IC rapid diagnostic test (RDT) based on newly generated anti-E1 MAbs that can detect all three genotypes of CHIKV, including the Asian genotype, which previously could not be identified by the old version of the CHIKV test kit.



The results suggest that the new CHIKV E1-antigen RDT can be used in areas where Asian genotypes of CHIKV exist. Moreover, the authors conclude that further validation with a large number of samples is needed. The authors published the study in *Virology Journal*.

Prof. Tatsuo Shioda and co-authors from MOPH, Thailand and Osaka University, Japan published an article entitled "Molecular characteristics of dengue viruses in patients hospitalized at the Bamrasnaradura Infectious Diseases Institute, Thailand" in the *Japanese Journal of Infectious Diseases*. The authors showed that the genotypic diversity of the dengue virus in Thailand is increasing as the Cosmopolitan genotype has increased since their previous study, in 2016-2017. The results of the study can be useful to researchers and policy-makers in Thailand involved in dengue research, control, and prevention.

Research projects

Dr. Hisham Imad is collaborating with Dr. Wasin Matsee and Prof. Tatsuo Shioda in the project "Clinical case series: Chikungunya infection in patients who presented to the fever clinic at Bangkok Hospital for Tropical Diseases during the 2019 outbreak in Thailand." The project aims to characterize the clinical and laboratory features of 27 patients with chikungunya infection who presented to the hospital fever clinic during the month of October 2019.

They have published their work in the *Tropical Medicine and Infectious Disease* journal, entitled "Chikungunya manifestations and viremia in patients who presented to the fever clinic at Bangkok Hospital for Tropical Diseases during the 2019 outbreak in Thailand". The team is planning a detailed analysis of patients' cytokine production.

The newly developed CHIKV E1-antigen RDT

A preliminary study of an immunochromatography test (ICT) for differential arboviral detection is being conducted by Ms. Kanaporn Poltep and researchers at FTM. Their goal is to develop an ICT that can differentiate DENV serotypes and identify Zika virus and CHIKV from patient serum samples in Thailand.

COVID-19

Prof. Tatsuo Shioda and researchers from Japan published "Neutralizing and binding activities against SARS-CoV-1/2, MERS-CoV, and human coronaviruses 229E and OC43 by normal human intravenous immunoglobulin derived from healthy donors in Japan" in *Transfusion*. They found that normal human intravenous immunoglobulin (N-IVIG) has no direct effect on SARS-CoV-1/2, MERS-CoV but has slight effect on HCoV OC43 and HCoV 229E.

A pilot evaluation of the performance of a new point of care test kit for COVID-19 at Hospital for Tropical Diseases, Bangkok, Thailand is being conducted by Dr. Pornsawan Leaungwutiwong and Dr. Hisham Imad. They aim to evaluate the performance of a new IC test kit to detect SARS-CoV-2. Currently, the team is preparing a manuscript for journal publication.

Scientific conference

MOCID made oral presentations at JITMM Virtual 2020, entitled "Genome analysis of re-emerged chikungunya virus" and "Development of new immunochromatographic chikungunya antigen-detection kits"

Mahidol Oxford Tropical Medicine Research Unit (MORU)

Prof. Nicholas Day
Director

2020 Highlights

MORU is a longstanding collaboration between the Faculty of Tropical Medicine, the University of Oxford, and the Wellcome Trust. It began in 1979, and over the past four decades has grown into a highly integrated research network working in over 25 countries in Asia and Africa. The 'MORU Tropical Health Network' now encompasses nearly 800 researchers, laboratory scientists and support staff, with just over 200 of these based in the Network's headquarters, 'MORU Bangkok', which is embedded in the Faculty's Bangkok Campus. In Bangkok, we have departments of Malaria and Critical Illness, Microbiology, Mathematical and Economic Modelling, Pharmacology, Clinical Therapeutics, Epidemiology, and Bioethics and Engagement. MORU Bangkok supports the wider MORU Network with its Clinical Trials Support Group, and also hosts the Network's Finance, Administration and Logistics functions.

In Thailand, we have a large research unit on the Thai Myanmar border, the Shoklo Malaria Research Unit (SMRU), which carries out research on malaria, microbiology, and maternal and child health. There are also research units embedded in provincial hospitals in Chiangrai (scrub typhus and sepsis) and Ubon Ratchathani (melioidosis).

Outside of Thailand, there are MORU Network research units in Lao PDR (LOMWRU), Cambodia (COMRU), Myanmar (MOCRU), and in the Democratic Republic of the Congo (KIMORU), and the MORU Medicine Quality department is based in Oxford and Lao PDR. We conduct collaborative clinical research at around 50 clinical research sites across Asia, Africa and South America.

2020 was a difficult year, with substantial interruptions to ongoing clinical research activities because of the pandemic and many of our staff pivoting to help with the COVID-19 response. Despite the challenges of the pandemic, in 2020 MORU published over 300 academic articles in peer-reviewed journals. In addition, for the first time, we also made extensive use of pre-print servers, so that we could get the results of our COVID-19 research into the public domain as quickly as possible.

COVID-19

MORU was able to adapt to the unprecedented challenges that came with the pandemic and was swift to shift its focus to **COVID-19 projects**. Our researchers have assisted the authorities with PCR testing, virus sequencing, and public engagement, championed and participated in the COVID-19 Research Coalition, sat on a number of WHO COVID-19 Committees, and conducted research studies to inform policy and clinical management. We published 23 papers on SARS-CoV-2 and COVID-19 in 2020, including papers on epidemiology, virology, social science, and management. We contributed to the RECOVERY trial in the UK, which showed that hydroxychloroquine did not reduce mortality in severe COVID-19 infection. Major MORU-led projects include the following:

The **COPCOV** study is a multi-centre, multi-country, randomised, double-blind, placebo-controlled assessment of the prophylactic efficacy of chloroquine/ hydroxychloroquine in preventing COVID-19 illness in healthcare workers and others at risk of contracting COVID-19. Participants are randomised 1:1 to receive chloroquine or hydroxychloroquine (whichever is available in the country) or a matched placebo as daily prophylaxis given for three months. The study's main objective is to determine if chloroquine or hydroxychloroquine prophylaxis prevents symptomatic proven (virologic or via serology) coronavirus disease (COVID-19). The study began in Thailand in April 2020 and the UK was the next country to recruit across 8 sites. Since then, recruitment has started in Pakistan in Asia, and Kenya, Mali, Niger and Zambia in Africa. Further sites in set-up and due to recruit in 2021 include Benin, Côte d'Ivoire, Ethiopia, Guatemala, Indonesia and Nepal.

Our **Critical Care Asia ICU Network** operates in 42 hub ICUs (ICUs committed to all three work packages) in 8 countries. This has been expanded to other collaborating ICUs during the pandemic, and working with

Hydroxychloroquine

COPCOV study

Critical Care Asia Network

ISARIC (International Severe Acute Respiratory and Emerging Infection Consortium), a MORU-supported and -developed platform, has collected sharable data on over 58,000 ICU patients from 231 ICUs across Asia and Africa. Progress can be viewed in real time on our Critical Care Asia dashboard. The ICU Network is also participating in the REMAP-CAP clinical trial, and has contributed to published results on the role of IL-6 inhibitors and hydrocortisone in COVID-19.

The **PRIORITISE** (Prognostication of Oxygen Requirement in Non-Severe SARS-CoV-2 Infection) study aims to develop a simple tool with a high negative predictive value to help health workers identify patients who can safely be triaged away from a health facility. In low- and middle-income countries (LMICs) hospital capacity is often extremely limited and supplemental oxygen therapy is the practical ceiling of care for many patients with COVID-19. It is vitally important that health workers are able to accurately identify patients at low risk of deterioration. These patients can be safely discharged away from the health facility, ensuring available resources are allocated to patients most likely to benefit. Recruitment into PRIORITISE began in two sites in India (Patna, Bihar and Vellore, Tamil Nadu) in October 2020, and subsequently in the Philippines. In addition to the Asian sites, PRIORITISE is also recruiting in Rio de Janeiro, Brazil.

Prior to the rollout of vaccines for COVID-19, governments have relied primarily on non-pharmaceutical interventions to mitigate the impacts of the pandemic. It is essential that authorities and policy makers consider how these restrictions impact different social groups, and in particular, vulnerable groups. To address this gap in evidence, we conducted a mixed-methods study in five countries ('**SEBCOV**' - Social, ethical and behavioural aspects of COVID-19): Thailand, Malaysia, the United Kingdom (UK), Italy and Slovenia.

In collaboration with the Department of Disease Control, MoPH Thailand, we evaluated the effectiveness of **personal protective measures** against SARS-CoV-2 infection. Our findings support consistent wearing of masks, handwashing, and social distancing, to protect against COVID-19.

Substandard **medicine quality** threatens to undermine most health system outputs, especially in LMIC settings. We prepare monthly surveys of global literature on substandard and falsified COVID-19 vaccines and on Medical Product Quality Report of COVID-19 Issues.

Research activity and highlights (non-COVID-19)

Malaria has been an important research focus for over four decades, encompassing epidemiology, diagnosis, drug resistance, pathogen biology, pathophysiology, treatment and elimination. Clinical studies are performed in a wide network of clinical trial sites in Asia and Africa, with a focus on antimalarial resistance, the pharmacology of antimalarial drugs, and treatment strategies. MORU researchers published over 100 papers on malaria in 2020.

In 2020, we published the large multi-centre multi-country **TRAC II study,** showing the efficacy, safety and tolerability of triple artemisinin combination therapies (TACTs) to treat multi-drug resistant falciparum malaria, which is a major and worsening threat to global malaria control and elimination efforts. A large follow-up project funded by FCDO (Foreign, Commonwealth & Development Office; formerly, DFID (Department for International Development) with the acronym **DeTACT**, has already started, is expanding the evaluation of TACTs (Triple Artemisinin Combination Therapies) to African countries and aims to have TACTs ready for deployment by the end of the project.

The **MIST study**, a close collaboration between MORU and the Faculty of Tropical Medicine, involves the development of the first *Plasmodium vivax* controlled human infection models in Thailand, started in 2020. The first human volunteers were infected, and valuable strains of *P. vivax* were obtained for further use. Our **Mother and child health (MCH)** research aims to improve the chance for mothers to survive delivery, and for healthy infants to survive the neonatal period and to thrive. Infections remain a major cause of mortality and morbidity and are closely tied to malnutrition, unsafe sex, unsafe water, sanitation and hygiene. Our MCH research has lead to over 60 publications in 2020, including for example studies of the efficacy, tolerability and pharmacokinetics of different treatments to treat malaria in pregnancy.

Our **Microbiology & non-malaria infections** research focuses on melioidosis, scrub typhus and other rickettsial infections, antimicrobial drug resistance, leptospirosis, sepsis and severe sepsis, the management of fever in rural areas, and the evaluation of diagnostic tests.

We published 21 papers on **melioidosis**, including a randomized controlled trial,

Mother and child heatlh at SMRU, Wang Pha Clinic

comparing a 12-week regimen and 20-week regimen of oral trimethoprim-sulfamethoxazole for an oral eradication treatment, and recommended the 12-week regimen of TMP-SMX for oral eradication treatment of melioidosis.

We estimated the burden of **scrub typhus** in Thailand, and used dual RNA-seq to provide insights into the biology and host-pathogen interactions of the causative organism, *Orientia tsutsugamushi*. We also showed that Oxford Nanopore sequencing technology could be used to assemble the whole genome of *Rickettsia typhi*, the cause of **murine typhus**.

Antimicrobial drug resistance (AMR) remains a major focus of MORU research, and we have multiple research and engagement programmes on the use and misuse of antibiotics and antimalarials and the drivers, epidemiology, mathematical modelling, nature, prevention and treatment of drug-resistant infections. These resulted in the publication of 80 papers in 2020.

Across its network, MORU uses **mathematical, epidemiological, economics and statistical models** to support investigations into the transmission, control and elimination of tropical diseases, and our **Bioethics & Engagement Department** conducts ethics research, such as how to ethically involve children, pregnant women, migrants and other under-served groups in medical research.

Malaria Consortium

Mr. Charles Nelson
Chief Executive

From left to right: Sam Uan-Nual (Administrative Officer), Dr Htin Kyaw Thu (Regional Representative and Technical Specialist), Dr Leo Braack (Senior Vector Control Specialist), Shobiechah Aldillah Wulandhari (Technical Officer)

Facts and Figures

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Staff	Support staff	Journal publication	Grants received	Funders	Ongoing research projects	Collaborators

2020 Highlights

Research publications

A study entitled 'Fostering social innovation and building adaptive capacity for dengue control in Cambodia: a case study' was published in *Infectious Diseases of Poverty*. The authors presented outcomes of the ongoing efforts to engage Cambodian communities and schools in dengue control and health development. Through community-based interventions such as education empowerment, communication and behavioral change, and participatory mapping, social innovation products were realized, including: 1) approximately 9,000 adult mosquito traps made locally from recycled plastic water bottles and other discarded materials; 2) a revised dengue curriculum with hands-on activities for transformative learning; 3) larvivorous guppy fish distribution systems led by community members; 4) co-design of dengue prevention communication material by students and community members; and 5) community mapping. This study could be helpful for anyone implementing public health interventions among communities.

The Malaria Consortium was involved in a study that developed a new assessment method for identifying adult *Anopheles* vector mosquitoes using matrix-assisted laser desorption ionization-time of flight (MALDI-TOF) mass spectrometry (MS). They determined that the head of *Anopheles* mosquitoes is best suited for identification of field specimens and may improve routine use of MALDI-TOF MS. The study was published in *Malaria Journal*.

Dr Leo Braack and co-authors from University of Pretoria, South Africa investigated the diversity, distribution and abundance of mosquito vectors in areas in northern South Africa with cases of zoonotic arbovirus outbreaks. The researchers collected mosquitoes in horse farms, wildlife reserves, and parks in certain provinces routinely from 2014 to 2017 using carbon dioxide-baited light and tent traps. They identified dominant species of mixed dengue and malaria vectors in particular areas but *Aedes* species had the widest geographical distribution in northern South Africa. This suggests that surveillance and vector control programs should be improved in mixed rural and peri-urban areas where the risk for mosquito-borne disease transmission to humans and domestic stock is greater. The authors published the study in *Journal of Vector Ecology*.

Research projects

DR Hans Overgaard and DR Nay Yi Yi Linn were awarded 872,273 USD for the

project 'Student-driven dengue suppression in Yangon', a three-year project that aims to assess the efficacy of supporting school students to introduce a package of dengue vector-reduction tools to reduce dengue incidence in Yangon. The researchers were supposed to initiate the full set of interventions in June 2020, but due to COVID-19 lockdown measures and school closures, they had to postpone until June 2021. We have, therefore, concentrated on literature reviews and refining standard operating procedures (SOPs).

For this project, the Malaria Consortium is collaborating with the Myanmar Ministry of Health & Sports, Myanmar Ministry of Education, Norwegian University of Life Sciences, Mahidol Oxford Research Unit, and the Global Health Asia Institute.

An ongoing project, the 'APMEN Vector Control Working Group (VCWG) support for capacity-building in vector control in Asia Pacific' is being conducted by the Malaria Consortium as the Implementing Agent on behalf of the Asia Pacific Malaria Elimination Network (APMEN). Malaria Consortium was funded with 117,000 USD by Sumitomo to strengthen the capacity for malaria vector surveillance and vector control in National Malaria Control Programmes in the 21 Member States in Asia Pacific. The team develops training courses and supports appropriate institutions to host these courses. They also hold regular Learning Webinars and maintain an information-sharing website on vector control.

The collaborators of Dr Braack and Dr Htin Kyaw Thu in these activities of the APMEN VCWG are the National Malaria Control Programmes of 21 Member States of the Asia Pacific Malaria Elimination Network (APMEN), University of California San Francisco (USA), USA Centers for Disease Control & Prevention, and James Cook University (Australia).

Awards

Dr Htin Kyaw Thu with Asia Foundation Development Fellows, second row, leftmost with Mr. Ban Ki-moon, former 8th Secretary General of the United Nations, taken in Seoul, Republic of Korea.

Dr Htin Kyaw Thu received a prestigious award from Asia Foundation Development Fellows as one of their Exceptional Young Asian Leaders. In the same year, he was promoted to Asia Regional Representative for the Malaria Consortium.

Scientific conferences

The Malaria Consortium participated in the Annual WHO RBM VCWG meeting in Geneva, Switzerland, in February 2020. Dr Leo Braack and Dr Htin Kyaw Thu each gave a presentation on different aspects of the work they are doing on vecto- control capacity-development in the Asia Pacific.

The Malaria Consortium organized and presented a series of webinars with international experts addressing an audience of Asia Pacific vector-control practitioners, to facilitate state-of-the-art knowledge on specific subjects.

Silom Community Clinic @ TropMed

Dr. Joseph Woodring, Clinical and Behavioral Research Section Chief, and Clinic Director
Dr. Chaiwat Ungsedhapand, Clinical Research Study Physician
Dr. Eileen F. Dunne, Program Director, Division of HIV/AIDS Prevention CDC Thailand

Facts and Figures

60	11	6	7	5	14
Staff	Journal publication	Honors and Awards	Funders	Ongoing research projects	Collaborators

2020 Highlights

Research publications

Dr. Sarika Pattanasin from the program published a study with collaborators in Thailand and the US on an assessment of HIV-1 infection among men who have sex with men (MSM) attending the Silom Community Clinic (SCC) in Bangkok, Thailand from 2005 to 2018, in the *International Journal of Infectious Diseases*. They reported that HIV infection among Thai MSM increased from 2005-2009, but subsequently declined after 2015. In contrast, the incidence among young MSM remained high. The authors suggest that targeted and effective HIV prevention for the young are needed.

The findings of the study can inform health policy makers to reduce HIV infection in Thailand, HIV researchers, and Thai MSM about the HIV situation in Bangkok, Thailand.

The Silom Community Clinic (SCC) at TropMed was involved in a qualitative study that evaluated the facilitators and barriers affecting pre-exposure prophylaxis (PrEP) adherence among Thai MSM in the HPTN 067/ADAPT Study, in Bangkok, Thailand. Interviews with study participants revealed 6 facilitators of adherence: availability of PrEP regimens when needed, simplicity of the regimen requirements, ability to plan sex, social and tech support, flexibility to choose a preferred PrEP regimen, and optimizing investment in health promotion. On the other hand, the 6 barriers to adherence were low/no perceived HIV risk, intoxication, concerns about side effects, HIV stigma, inability to forecast sex, and cost of daily PrEP.

The information obtained from this study will be beneficial for health providers and counselors, research scientists, and Thai MSM. The study was published in *AIDS Care*.

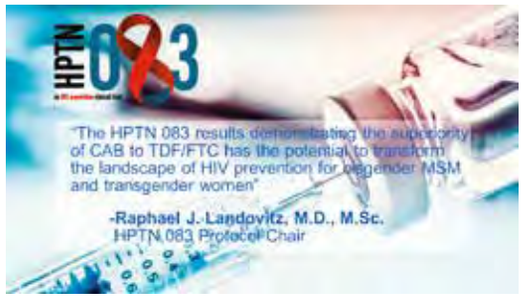
Dr. Thitima Cherdtrakulkiat and other Thai researchers completed genome sequences of three *Neisseria gonorrhoeae* isolates from Thailand with multidrug resistance and multilocus sequence type 1903 MRA. The authors submitted the sequences to GenBank. An article on this study was published in *Microbiology Resource Announcements*. The results of the study will contribute knowledge to the scientific community working on the anti-microbial resistant organism, health providers, and the general public.

Research projects

- HPTN 083: A Phase 2b/3 Double Blind Safety and Efficacy Study of Injectable Cabotegravir Compared to Daily Oral Tenofovir Disoproxil Fumarate/Emtricitabine (TDF/FTC), For Pre-Exposure Prophylaxis in HIV Uninfected Cisgender Men and Transgender Women who have Sex with Men (2017-2024)

  Dr. Eileen Dunne and Dr. Taweesap Siraprapasiri are leading the HPTN 083 study, a phase 2b/3 double blind safety and efficacy study of injectable cabotegravir compared with daily oral tenofovir disoproxil fumarate/emtricitabine (TDF/FTC), for pre-exposure prophylaxis in HIV uninfected cisgender men and transgender women who have sex with men (2017-2024).

  The study aims to compare HIV incidence among participants randomized to oral CAB/CAB LA (oral lead in and injections) vs. oral TDF/FTC and compare the safety of oral CAB/CAB LA vs. oral TDF/FTC.



On 14 May 2020, a Data and Safety Monitoring Board (DSMB) reviewed HPTN 083 study data and recommended that the blinded part of the study be stopped early for successfully meeting its specified objectives. The study results showed that CAB LA, administered every eight weeks, provided high efficacy compared with TDF/FTC. After a more extensive analysis of the interim study data, the regimen containing CAB LA was found to be statistically superior to daily oral TDF/FTC for PrEP among the cisgender men and transgender women who have sex with men enrolled in HPTN 083. A total of 52 incident HIV infections occurred, with 13 incident infections in the CAB arm (incidence rate 0.41%) and 39 incident infections in the TDF/FTC arm (incidence rate 1.22%). The hazard ratio for the CAB versus TDF/FTC arms is 0.34 (95% CI 0.18-0.62), corresponding to a 66% reduction in incident HIV infections in study participants given CAB compared to TDF/FTC. These results were presented at AIDS 2020.

- Dr. Andrew Hickey and Dr. Suparat Khemnark are conducting the study "TGWSM: Feminizing hormone therapy and the rectal mucosa immune environment in transgender women – Bangkok, Thailand (2020-2025)" to examine the effects of feminizing hormone therapy and risk-behaviors on the rectal mucosa environment, including cellular environment and permissiveness for HIV infection.

  Another goal of the study is to assess differences in the rectal mucosal environment and the mucosal transcriptome between and within study cohorts, including participants enrolled in the U.S. and Thailand cohorts.

COVID-19

Dr. Woodring and co-authors from Bamrasnaradura Infectious Diseases Institute, Bangkok, Thailand published an article entitled "Clinical characteristics of patients hospitalized with coronavirus disease, Thailand" in *Emerging Infectious Diseases*. These are the earliest data on patients with severe SARS-CoV-2 infection and hospitalization in Thailand.

The Silom Community Clinic and Department of Disease Control, Ministry of Public Health are leading a project "Community engagement, communication, and access needs to support implementation planning for a novel COVID-19 vaccine (COVAX Study)".

The goals of the study are to evaluate the acceptability and challenges for COVID-19 vaccine implementation within key groups in Thailand, to understand behavioral and cultural factors influencing the acceptability of vaccine, and to evaluate vaccine messaging to provide guidance on key communication themes and messages for a COVID-19 vaccine.

Dr. Woodring and team at the US Centers for Disease Control and Prevention–Thailand Ministry of Public Health Collaboration held a COVID-19 Program for Southeast Asian Health Professionals via Facebook Live webinar that reached over 135,000 healthcare professionals throughout Southeast Asia.

Awards

The Silom Community Clinic received the Centers for Disease Control DHAP 4th Annual Awards - Excellence in Partnering-International for the significant contributions of public health partner organizations that advance the mission of the CDC/ATSDR. Effective Community Engagement in the COPE4 Study, from the National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, CDC.

The Silom Community Clinic received the Legacy in Partnership Award in the Thailand Ministry of Public Health and the U.S. CDC's 40th anniversary of cooperation on August 26, 2020

The US Embassy in Bangkok awarded the Silom Community Clinic numerous awards in 2020.

- Group Customer Service Award for supporting the program above and beyond job duties during laboratory personnel shortfalls.
- Group Eagle Award for excellence in emergency planning for the CDC Division of HIV/AIDS Prevention (DHAP)-Thailand research and program operations during the COVID-19 pandemic.
- Combined Group Certificate of Appreciation & Mission Time-off Award for outstanding service to CDC for setting up a Regional Incident Command Structure (IMS) during the pandemic response to COVID-19 from January - April 2020.
- Combined Group Honor, Meritorious Honor Award & Certificate of Appreciation for decisive national leadership and outstanding clinical, laboratory and technical support in the pandemic response to COVID-19 within the US Embassy-Bangkok Community.
- Group Eagle Award for significant commitment and teamwork in support of the Young Men who have Sex with Men (YMSM) Cohort Study, a study that provides contemporary data on the HIV epidemic among adolescent boys and young men in Thailand that can inform prevention approaches directed toward this population.

Scientific conferences and events

Dr. Eileen Dunne co-organized a session entitled "Updates on HIV prevention" with Prof. Punnee Pitisuttithum at JITMM Virtual 2020, held 15-16 December 2020. Dr. Chaiwat Ungsedhapand gave an oral presentation "Injectable long-acting cabotegravir-an HIV prevention alternative?" and Dr. Andrew Hickey presented "Combination HIV prevention services among young men and transgender women selling or trading sex in Thailand, the COPE4 study".

Organized the 40 Year Collaboration of the Thailand Ministry of Public Health – U.S. CDC: Together We Unite to End HIV Epidemic, Bangkok Art & Culture Center (BACC), Nov 24 – Dec 6, 2020

Presented the "Friend of Silom Clinic Award 2020" on the 30th Anniversary Celebration of the Division of HIV/AIDS Prevention (DHAP) Thailand, in the Pratap Singhasivanon Conference Room, 17th Floor, Rajanagarindra Building, Faculty of Tropical Medicine, Mahidol University, on 18 December 2020. The award was presented to the Dean and others at the Faculty of Tropical Medicine, Mahidol University.

New staff

The following staff joined the Silom Community Clinic at TropMed in 2020.

- Ms. Siriphak Pongthai, Pharmacist
- Ms. Potcharawan Reansoi, Associate Pharmacist
- Ms. Naraporn Phaiboon, Nurse Manager
- Mr. Poomin Nongchang, Research Nurse

Southeast Asian Ministers of Education Organization Tropical Medicine (SEAMEO TROPMED) Network

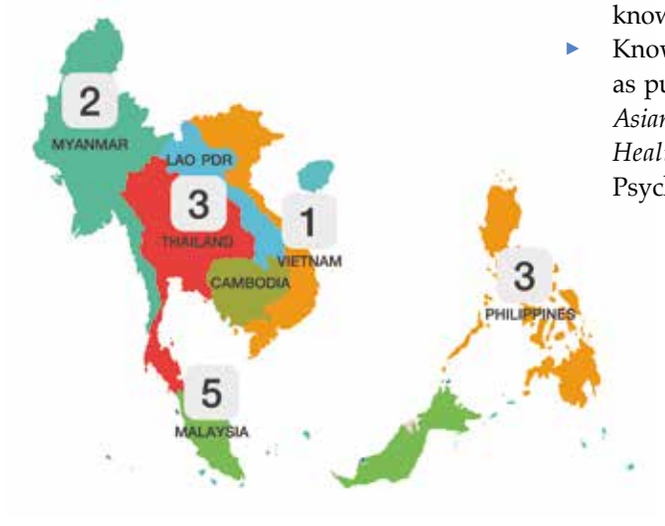
Assoc. Prof. Dr Pratap Singhasivanon
Secretary General/Coordinator
SEAMEO TROPMED Network

SEAMEO TROPMED Network, with a mission in sync with the dynamic regional and global health landscape and in its 54th year of existence, continues to implement its core programmes through SEAMEO TROPMED Malaysia, SEAMEO TROPMED Philippines, SEAMEO TROPMED Thailand and SEAMEO TROPMED Network Office. The continuous conversations and engagement of TROPMED Network with Member Countries, Development Partners and other stakeholders, provided an enabling environment for the implementation of its strategic approaches given the challenges of the year 2020 due to COVID-19 pandemic.

Strategic Approaches of SEAMEO TROPMED Network to fulfill its mission include:

Human resource development through:

- Academic degree programmes of SEAMEO TROPMED Regional Centres' implemented through face-to-face and online modes with > 1,000 students enrolled during the year
- Short Training Courses organized (56 for the year) with >2,500 participants
- Scholarships (for Masters and PhD levels) awarded to 14 health professionals in the region
- Seminars & Conferences that served as platforms for discussion of health and health-related issues and for sharing new knowledge
- Knowledge management activities, such as publication of 6 issues of the *Southeast Asian Journal of Tropical Medicine and Public Health* (SEATROPH)and 3 modules on Psychosocial Health.



Collaboration with development partners on special projects focusing on health and health development challenges in the region

- LIFE for SEA-ED Project (Learning to Investigate by Field Experience for SEA Emerging Diseases)

- Psychosocial/Mental Health in the School Setting: Addressing a Hidden Epidemic in Southeast Asia
- Development of a Concept Note: Establishment of Training Consortium on Emergency Response- Southeast Asia Region

Participation in SEAMEO-wide activities

- Organized Inter-Centre Collaboration: Workshop: Enhancing Early Childhood Care and Education through Family Education and Health Literacy
- Engagement with MOE Thailand
- SEAMEO Strategic Planning
- SEAMEO Experts' Consultation Meeting
- Contributed article to SEAMEO Magazine
- CDM, HOM, SEAMEC Meetings

Provision of technical assistance to Member countries, health and health development organizations, and academic institutions in the region and beyond

SEAMEO TROPMED Network's response to COVID-19 pandemic:

- Organization of COVID-19 webinars:
- Participation in COVID-related webinars of other organizations/countries
- Dissemination of relevant information
- Providing technical assistance

The COVID-19 pandemic to a certain extent affected the implementation of a number of programmes of the Network due to limited travel opportunities, learning-outcome priorities of the education sector, as well as the immediate responses imposed by COVID-19. However, the Network and its Centres were quick to adapt and develop measures to respond to these challenges.

Management-related Activities

- Governing Board Meeting 2020
- Network's In-House Meeting (Executive Meeting)

WorldWide Antimalarial Resistance Network (WWARN)

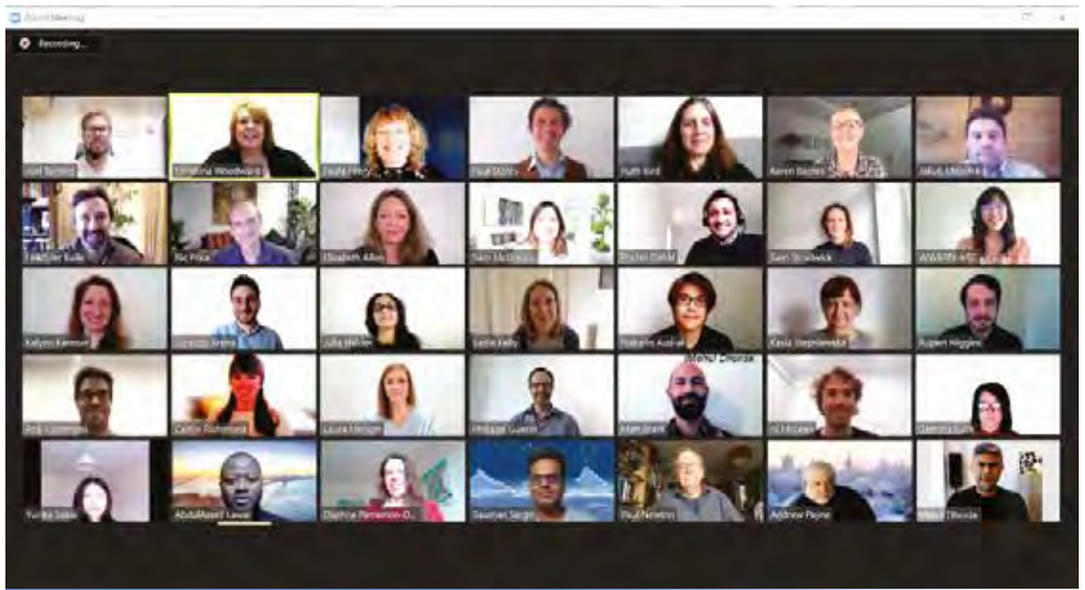
Dr. Mehul Dhorda
Head

2020 Highlights

The WorldWide Antimalarial Resistance Network (WWARN) is a collaborative platform generating innovative resources and reliable evidence to inform the malaria community on the factors affecting the efficacy of antimalarial medicines. WWARN is part of the Infectious Diseases Data Observatory (IDDO), a scientifically independent, multi-disciplinary coalition of the global infectious disease community. It provides the methods, governance and infrastructure to translate data into evidence that improves outcomes for patients worldwide.

IDDO
INFECTIOUS DISEASES DATA OBSERVATORY

During 2020, WWARN continued to work with collaborators on projects, including malaria in pregnancy, anti-malarial resistance and the efficacy of drug treatments, as well as work to support standardised data collection and research to inform guidelines and policies.



Zoom meeting of IDDO and WWARN staff.

As part of IDDO's effort to combat COVID-19, in partnership with the University of Cape Town MRC Collaborating Centre for Optimising Antimalarial Therapy (CCOAT) and The Global Health Network, WWARN's Clinical Trials Toolkit was repurposed to collect pharmacokinetic and electrocardiogram data in COVID-19 clinical trials.

Publications in 2020 include:

- Efficacy and tolerability of artemisinin-based and quinine-based treatments for uncomplicated falciparum malaria in pregnancy: a systematic review and individual patient data meta-analysis
- The risk of *Plasmodium vivax* parasitaemia after *P. falciparum* malaria: An individual patient data meta-analysis from the WorldWide Antimalarial Resistance Network
- Pregnancy outcomes and risk of placental malaria after artemisinin-based and quinine-based treatment for uncomplicated falciparum malaria in pregnancy: a WorldWide Antimalarial Resistance Network systematic review and individual patient data meta-analysis
- The WorldWide Antimalarial Resistance Network Clinical Trials Publication Library: A Live, Open-Access Database of Plasmodium Treatment Efficacy Trials
- Towards harmonization of microscopy methods for malaria clinical research studies
- Dealing with indeterminate outcomes in antimalarial drug efficacy trials: a comparison between complete case analysis, multiple imputation and inverse probability weighting
- Malaria Clinical Trials Toolkit - a pathway with a step-by-step guide for researchers on how to plan, design, execute and interpret malaria clinical trial results

Establishing centres in Thailand and Australia

WWARN has established two regional centres, in Thailand and Australia, with the aim to improve regional malaria intelligence and aid containment efforts.

The WWARN Asia-Pacific Regional Centres promote the collection of high-quality data on antimalarial drug efficacy and surveillance of drug-resistant parasites and facilitate the use of WWARN's research and data analysis tools to simplify and harmonise data, securely store results and analyse comparative or collective pooled analyses.

Activities include:

- Building capacity for clinical research and surveillance initiatives activities in malaria-endemic countries
- Promote and facilitate collaboration among regional research partners
- Partner with the Faculty of Tropical Medicine, Mahidol University, and the Mahidol-Oxford Tropical Medicine Research Unit (MORU) to support regional clinical trials and provide tailored support to researchers
- Development and promotion of standardised tools to collect, collate and map multidrug-resistant malaria
- Pharmacokinetic-pharmacodynamic modelling to optimise dosing strategies for combination therapy for multidrug-resistant malaria
- Meta-analytic approaches to optimise the radical cure of *Plasmodium vivax* malaria through safer and more effective use of primaquine and tafenoquine

Melioidosis

A joint project between IDDO and MORU is in progress to assess the feasibility of developing a data platform for individual-participant level data from melioidosis clinical studies. This is part of a scoping exercise that includes a systematic review of clinical studies to assess the efficacy of antibiotic treatment for melioidosis, and is led by Assistant Professor Direk Limmathurotsakul, based at Mahidol-Oxford Tropical Medicine Research Unit (MORU), Mahidol University.

Scrub typhus

A joint project between IDDO and MORU is in progress to assess the feasibility of developing a data platform for individual participant level data from scrub typhus clinical studies. This is part of a scoping exercise, which includes a systematic review of clinical studies to assess the efficacy of antibiotic treatment for melioidosis, and is a joint collaboration between MORU, IDDO and the Eijkman-Oxford Clinical Research Unit in Jakarta, Indonesia. This work is part of Dr Kartika Saraswati's DPhil.

Febrile illness

Febrile illness is one of the most common reasons for healthcare visits globally. Once malaria is excluded, identifying the primary causative pathogens is restricted due to the limitations of diagnostic facilities and the scarcity of comprehensive surveillance data. In a major international study, researchers carried out extensive systematic reviews in Africa, Latin America, and Southern and South-Eastern Asia to map the most common causes of non-malarial febrile illness across different endemic regions. The results have been incorporated into an open access, online database with an interactive map that can filter data by a range of categories.

A series of articles has been published in *BMC Medicine* with several collaborators from MORU.

Clinic in Bamako by Dominic Chavez (World Bank).

- The Bangkok School of Tropical Medicine
- The Hospital for Tropical Diseases
- Central Equipment Unit
- Laboratory Animal Science Unit
- Tropical Medicine Diagnostic Reference Laboratory
- Special focus- Office of International Cooperation and Networking (OICN)
- Clinical Research Coordinating Center (CRCC)
- Joint International Tropical Medicine Meeting (JITMM)

Facilities and Services

"Alongside the department, centers, and collaborations, the Faculty has an important set of facilities and services for researchers, students and the general public. The following pages give more information on the work and achievements of –."

Bangkok School of Tropical Medicine

Dr. Wirongrong Chierakul
Deputy Dean for Education and Quality Development

The COVID-19 pandemic brought significant challenges to the Bangkok School of Tropical Medicine during the reporting period. As international travel and face-to-face classes were limited, so were the important activities of the school, such as student exchange, field trips, and laboratory work. The BSTM responded to these challenges by maximizing the technological capabilities and infrastructure of the Faculty of Tropical Medicine, to continue to serve its students amid the pandemic.

2020 Highlights

- The Master's and Diploma programs for Biomedical and Health Informatics (BHI) were finally offered as full online courses. Interested students from around the world can apply and be admitted to the course without coming to Thailand. The BHI programs of the BSTM are the first 100%-online international graduate programs of Mahidol University.
- The BSTM developed an online learning management system (www.tm-online.org) that will allow students to access TropMed courses anywhere, anytime. It offers more than 150 online courses in BSTM programs that are taught by experts and educators in the Faculty of Tropical Medicine.
- As part of the online education strategies of the BSTM, Dr. Wirongrong Chierakul conducted a virtual microscopy laboratory. Using a physical laboratory, instructors performed microscopy and uploaded the captured images online in real time. This allows students to magnify and examine the uploaded slides or specimens virtually. According to Dr. Wirongrong, the virtual lab has been an important instrument in conducting online classes, especially for programs requiring lab activities.
- In the middle of 2020, face-to-face classes were gradually allowed, but social distancing was still strictly observed. Classrooms were attended

with half capacity to accommodate one-seat-apart arrangement. To enable the participation of all students, Dr. Wirongrong set up 'hybrid classrooms' in which classes were multi-broadcast so that students in separate classrooms could attend and learn lessons at the same time.

The BSTM in the 'new normal'

The BSTM is motivated to improve its online services and produce innovative teaching strategies that will provide inclusive and quality education to all students. The recent upgrades to the Faculty's IT and Educational Technology facilities are perfectly timed, since they support the necessary online activities and operations of BSTM significantly.

While the BSTM can transform most of its courses to online mode, Dr. Wirongrong understands that some programs may be difficult to translate online, such as Clinical Tropical Medicine courses, which require laboratory work, field surveys, hospital rounds, and other related physical activities. Moreover, some currently enrolled students have not been able to come back to Thailand due to travel restrictions. Online classes have been difficult for students in countries with intermittent internet connections.

As the BSTM faces unprecedented change in its educational services, Dr. Wirongrong is collaborating with members of the Faculty and experts in Mahidol University to come up with a strategy that is sustainable, applicable, and will provide a quality education for all in the 'new normal'.

Student Affairs Highlights

Assoc. Prof. Wirichada Pan-ngum
Assistant Dean for Student Affairs

In 2020, Trop Med Student Affairs continued working collaboratively with other faculty services to support our current students in their studies, by i) creating a good study environment within and outside the Faculty, ii) promoting life-long learning by providing in-house soft skills training, and student functions, iii) delivering good student welfare and well-being services.

It is most important to ensure that the students maintain a good work-life balance while studying. Student Affairs set up an advisory panel team consisting of voluntary lecturers from the Faculty to look after first-year students adjusting to the new postgraduate environment and preparing for research. The committee meets every other month to share updates on the students, and resolve issues and problems to determine the best solution for all involved. All students are encouraged to join soft skills training to allow them to learn extracurricular skills, reflect on the activities, and develop plans to practice those skills in the future. Students often vote for the topics to meet their own needs.

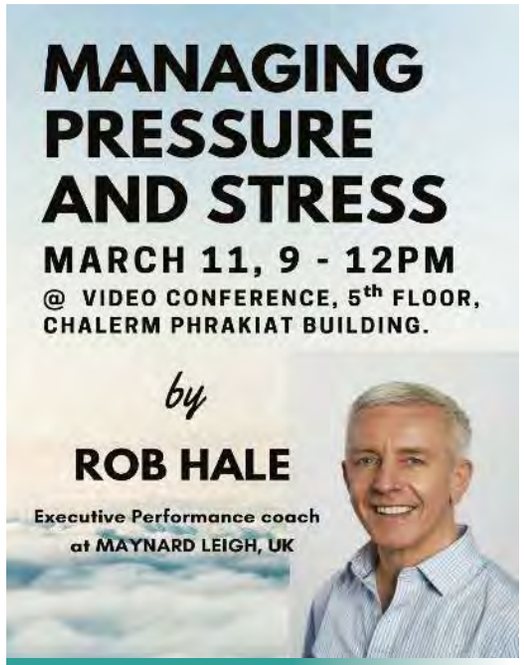
The Student Affairs Committee meets every second month to update, strategically plan student activities, and discuss ideas and issues to ensure our students have memorable experiences and good opportunities while studying at the Faculty.

Academic Forum held at the Tropical Disease Research Center, Kanchanaburi, 17-18 January 2020

CSR activity – Seed bomb and salt lick at Salakpra Wildlife Sanctuary, Kanchanaburi

'Live like Thai'- Aj. Kasinee Buchachart and Aj. Ngamphol Soonthornworasiri introduced Thai culture and traditions in August 2020

Student Affairs and the Tropical Medicine Alumni Association, Thailand, have been working to strengthen the alumni network and engagement, improve and update the alumni database, and ensure the rights and benefits of our Alumni for Trop Med and Mahidol services. Quarterly alumni newsletters are produced to keep our alumni up to date with news and events in the Faculty.



Sress management training by Rob Hale, Executive performance coach from the UK, was held in March 2020

Quarterly issue of TropMed Alumni Newsletter is published to promote alumni engagement and strengthen the network.

As we are facing a big change in the population structure, the decrease in student admissions has become an issue for all education institutes, and we are not an exception. We have strategically worked to promote the institutional expertise of tropical medicine and health research. Activities in 2020 included the TropMed Open House for MUIC, Alumni academic talk and symposium, launching an extensive stakeholder survey to identify and update the needs for tropical medicine graduates, from employers and the Alumni Association. This work is ongoing.

In March 2020, the TropMed Open House was organized to welcome MUIC students to learn more about the Faculty of Tropical Medicine, including studies, life experience, opportunities, and support.

Hospital for Tropical Diseases

Assoc. Prof. Watcharapong Piyaphanee
Director

Dr. Sant Muangnoicharoen
Deputy Director

Highlights in 2020

The Hospital for Tropical Diseases faced a challenging, yet rewarding, year during the COVID-19 pandemic. The Hospital became one of the leading hospitals in Thailand to take care of suspected and confirmed cases of COVID-19.

On 3 February 2020, the Hospital encountered the first confirmed COVID-19 case from a Chinese traveler. One year later, the Hospital now takes care of 133 confirmed COVID-19 cases in dedicated isolation rooms designed for COVID-19 patients. The Hospital is also providing extensive screening and testing for patients under investigation. To date, the Hospital has conducted safe COVID-19 testing and screening 9,000 times, without infections or deaths among Hospital staff.

The Hospital for Tropical Diseases transformed many of its facilities to respond to the challenges brought by the COVID-19 pandemic. The Hospital converted its fever clinic on the first floor to a state-of-the-art fully negative pressure clinic, comprising 2 doctor examination rooms and 1 treatment room. The Hospital built a fully functional video call system to ensure maximum infection control and protection between patients and staff. In March 2020, the Hospital opened a separate acute respiratory clinic outside the

main Hospital building to help prevent contamination of the main Hospital premises with pathogens.

To ensure continuity of patient care, the Hospital started telemedicine services for patients unable to visit the Hospital in person. Since the number of travelers declined during the COVID-19 pandemic, the telemedicine services play a major role in Travel Clinic services, mainly provided to international travelers.

While the Hospital adapted rapidly to the COVID-19 pandemic, it continued to provide services for both inpatients and outpatients and excellent tropical-medicine services. The Hospital extended its area of service by opening new parasite, diarrhea, and child vaccination clinics. In 2020, the Hospital recorded more than 30,000 outpatient visits and more than 1,200 inpatient admissions.

The main inpatient diagnoses remain tropical infectious diseases, including pneumonia, dengue, malaria, and rickettsial diseases. The major diagnosis for outpatient cases are diabetes, high blood pressure, kidney disease, and musculoskeletal pain. The Hospital also offered alternative-medicine services, such as acupuncture and Thai traditional massage.

The Hospital for Tropical Diseases received its 2nd reaccreditation from the Health Care Accreditation Institute of Thailand. This affirms that the Hospital ensures the highest standards of patient care and continuous quality improvement.

The Hospital for Tropical Diseases is looking forward to a great year ahead.

Central Equipment Unit

During the COVID-19 pandemic in 2020, six equipment training events were held offline and online for students and staff on how to use laboratory equipment proficiently and responsibly. The goal of the training was to introduce a standardized procedure and instill the idea that 'users are owners' and users should take utmost care when using laboratory equipment.

New scientific techniques and technologies are included in the Central Equipment Unit training themes, to introduce a wider range of techniques to our researchers and help advance research in tropical diseases.

In 2021, 3 new high-throughput items of equipment will be installed:

1. Digital PCR; 3rd-generation PCR
2. Gel Documentation, Chemiluminescence and Fluorescence Imaging system
3. Gas Chromatography with Electron Capture Detector (GC-ECD)

This equipment will greatly enhance the efficiency of our scientific research, especially research into emerging and re-emerging tropical diseases.

New Qiagen Digital PCR, 8th Floor, Rajanagarindra Building

Laboratory Animal Science Unit

The Laboratory Animal Science Unit of the Faculty of Tropical Medicine (FTM-LAU) provides animal facilities and services for Faculty members, and also to other institutions, to support their research, testing and teaching. Animal research conducted at FTM-LAU includes research into immunodiagnostics, parasitic infections and life cycles, malaria infection, toxicity of herbal extracts, nutrition, physiology and pharmacokinetics.

In 2020, the Unit served a total of 19 research projects from the Faculty of Tropical Medicine, Faculty of Dentistry, and Faculty of Public Health, Mahidol University, and other institutes, such as Kasetsart University and Chulalongkorn University.

FTM-LAU will continue to improve the quality of animal facilities, services and develop standard operating procedures for effective services, to promote the welfare of laboratory animals and support research at our Faculty.

Technical services, such as animal restraint, marking, blood and organ collection, necropsy, anesthesia and euthanasia, were provided by trained veterinary technicians.

Routine daily animal care and observation were conducted along with specific care according to protocol-related activities

Tropical Medicine Diagnostic Reference Laboratory

The Tropical Medicine Diagnostic Reference Laboratory (TMDR) is a laboratory with ISO 15189:2012 and ISO 15190:2003 accreditation for the testing of dengue virus. TMDR is awaiting further accreditations, as follows: HTLV-I/II, chikungunya virus, Zika virus, detection of parasites using direct wet smear and concentration technique.

During the COVID-19 pandemic, TMDR developed into a testing laboratory for SARS-CoV-2 diagnostics for the Hospital for Tropical Diseases and interested agencies. TMDR requested authentication for SARS-CoV-2 testing from the Department of Medical Science, which was received on 9 March 2020. To date, TMDR has tested 2,535 samples.

TMDR is also participating in the Malaria Infection Study Thailand (MIST), a project that aims to develop a model that can safely and quickly test vaccine and drug candidates to treat *Plasmodium vivax* malaria. The role of TMDR in this project is to screen samples for mosquito-borne diseases and sexually transmitted diseases and also to coordinate the distribution of samples to laboratories outside the Hospital for Tropical Diseases for testing TMDR is currently unable to do, for the accurate diagnosis of participants in the study and within appropriate timeframes.

In addition to testing for diagnosis, TMDR contributed to the assessment of LAMP diagnostic kits for SARS-CoV-2 for the National Science and Technology Development Agency (NSTDA). The outcomes were outstanding and the product participated in the XPRIZE contest, also entering the final 20 of 700 product innovations from around the world.

Special focus - Office of International Cooperation and Networking (OICN)

Prof. Kesinee Chotivanich
Deputy Dean for International Relations

Mr. Peerawat Maipanich
Head

Facts and figures

5	3	14	10	6	3
New MOUs	Training and course hosted	Student/staff exchanges organized	Visiting lectureships assisted	International alliances maintained	Issues of TROPMED Inter News published

The Office of International Cooperation and Networking (OICN) is one of the support offices of the Faculty of Tropical Medicine. It is responsible for supporting the Faculty with international collaboration, networking, and alliance management.

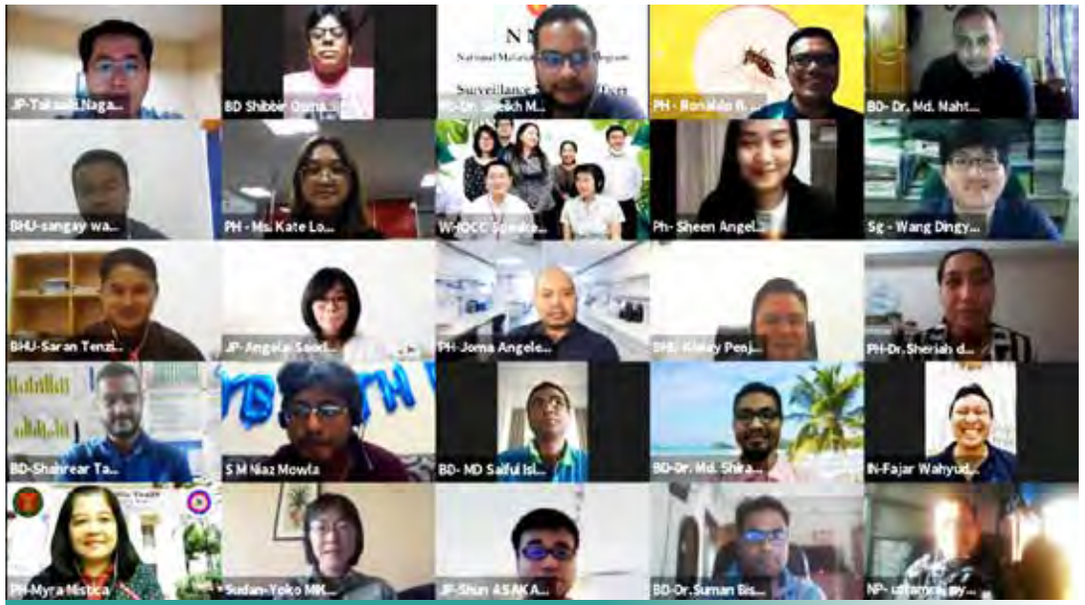
The major roles of the OICN involve facilitation of MOUs (Memoranda of Understanding) with international and national institutions, coordination with internal and external partners of the Faculty, organization of short courses and training, and facilitating student/staff exchanges and visiting lectureships. The Office also shares announcements and events online and publishes *TropMed InterNews*.

Prof. Kesinee Chotivanich (center) with OICN staff

2020 Highlights

MOU Signing Ceremony between the Faculty of Tropical Medicine, Mahidol University and the Faculty of Medicine, Universitas Brawijaya, Indonesia

- The Faculty of Tropical Medicine was acknowledged by Mahidol University for its long-lasting partnerships with international collaborators. For example, ongoing partnerships with SEAMEO TROPMED Network (55 years) and MORU (for 40 years). This affirms that the efforts and strategies of OICN and the Faculty are effective in strengthening relationships and international alliances.
- The OICN facilitated new MOUs with Brawijaya University, Indonesia, Barcelona University, Spain, and The Wellcome Clinical Research Network in Asia, Singapore. Meanwhile, the MOUs with MORU and Silom Community Clinic @TropMed were renewed for 8 years and 5 years, respectively. Currently, OICN is enabling 50 collaborative activities under MOUs in Asia (36), Europe (10), North America (5), and Australia (1).
- On 23-27 November 2020, the OICN hosted the Faculty's first-ever virtual training course, the 18th Virtual Training Course on Management of Malaria, at www.malariatraining.org. The virtual training course was attended by over 60 participants from 12 Asian and African countries. The course received positive feedback from participants.



The 18th Virtual Training Course on Management of Malaria was conducted via Zoom

- The Faculty received funding from Mahidol University and the Siam Commercial Bank partnership "Digital Convergence University", to facilitate digital platforms for international online courses and professional training. Through this support, OICN organized 5 international online courses and 2 professional training events.
- The Faculty of Tropical Medicine was assigned to host the WHO Collaborating Centre for Case Management, Training and Research on Malaria (THA-87), from 2020 to 2024. This 4-year online training course aims to strengthen the technical and managerial capacities of malaria programs, including field-based training. The training will include sessions on research priorities that will inform strategy and policy development. OICN will be responsible for collaboration and networking.
- The OICN organized a training program on the technology of medicine and public health for doctors and health practitioners from the Lao PDR. The training was held from 29 January 2020 to 28 February 2020 at the Faculty of Tropical Medicine and other hospitals in Ratchaburi Province. The training was initiated by Her Royal Highness Princess Maha Chakri Sirindhorn.

Training program in the technology of medicine and public health for doctors and health practitioners from Lao PDR

OICN in the 'new normal'

The COVID-19 pandemic affected the operations of OICN significantly. As the pandemic halted international travel, many ongoing projects, such as student exchanges, visiting lectureships, and international training were postponed or cancelled. OICN was forced to shift its services online.

As Prof. Kesinee and Mr. Peerawat noted, major challenges to transitioning OIC services to online mode are the need for rapid technical preparations for online activities, and managing the substantial resultant surge in requests and inquiries from partners. Despite the difficulties, OICN was able to adapt to the unprecedented changes and continues to serve its internal and external partners 'smartly'.

OICN introduced "OICN-SMART", a work strategy that will focus on Service, MOUs, Alliances, Relations, and Training. It promotes SMART Work, SMART People, and a SMART Team in a SMART Place. This strategy will maximize the efficiency and effectiveness of online and digital services in providing OICN services.

Clinical Research Coordination Center (CRCC)

Assoc. Prof. Saranath Lawpoolsri Niyom
Head

The Clinical Research Coordination Center (CRCC), established in 2020, is a new support office in the Office of Research Services. It was founded under the Strategic Plan of the Faculty of Tropical Medicine 2018-2022, which focuses on creating global and social impact through research.

The CRCC supports researchers in the Departments and Centers of Excellence, especially with clinical research projects, to increase their research potential, multidisciplinary research, or any research that can add value to their research capacity.

The CRCC provides project management, consultation, coordination, and support for clinical research work to educators and researchers at the Faculty of Tropical Medicine. It is also the main center responsible for coordination with various agencies and funding sources wishing to collaborate with the Faculty in developing clinical research.

The CRCC aims to enhance the research potential of all researchers and to increase research efficiency in the Faculty. The CRCC provides various assistance and services to Faculty researchers according to the requirements of different research projects. The operations of the CRCC are depicted below.

Joint International Tropical Medicine Meeting (JITMM)

JITMM Virtual 2020

The Faculty of Tropical Medicine successfully organized the Joint International Tropical Medicine Meeting (JITMM Virtual 2020) on 15-16 December 2020. Due to the pandemic, JITMM was held virtually (www.jitmm.com) for the first time. JITMM Virtual 2020 is the first fully-virtual scientific conference of Mahidol University.

With the theme "Tropical Disease Control amid the COVID-19 Pandemic", JITMM Virtual 2020 highlighted the impact of the pandemic on tropical-medicine research and other related diseases, and discussed future trends in the field post-pandemic.

Dr. Tedros Adhanom Ghebreyesus, Director-General of the World Health Organization, and Prof. Sir Nicholas White, Professor of Tropical Medicine, University of Oxford and Mahidol University, were Keynote Speakers for the Opening and Closing of JITMM Virtual 2020, respectively.

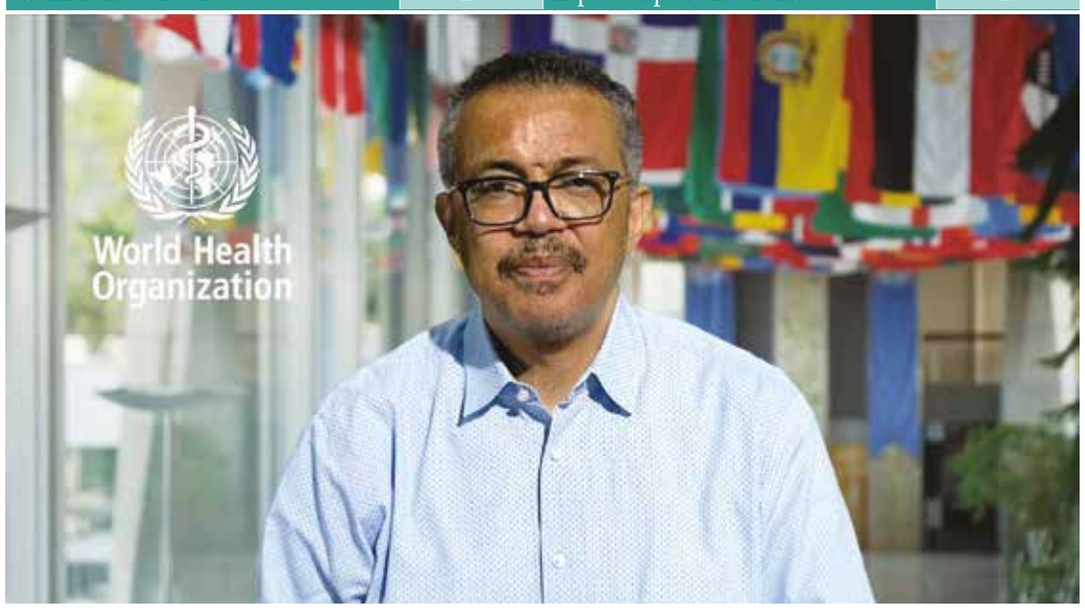
JITMM Virtual 2020 hosted over 200 presentations, and was attended by over 900 participants from 31 different countries.

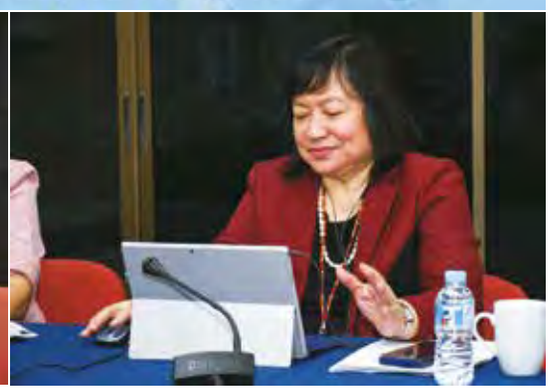
With support from The Wellcome Trust, 29 Conference Awardees and 97 participants from LMICs attended and presented at the Conference.

JITMM Virtual 2020 provided a platform for the scientific community to network and exchange knowledge with fellow researchers around the world amid the pandemic. It demonstrated that JITMM can achieve its aims in both physical and virtual settings.

JITMM Virtual 2020 in Numbers

Participants	943	Sessions	220
Countries	31	Oral presentations	173
Conference Awardees	29	E-poster presentations	47





Awards 2020

RECIPIENT	AWARDS	FROM
Prof. Kesinee Chotivanich	Appointed member of the Health Sciences Program in Pathology	Bureau of Science, Office of the Royal Society, Thailand
Prof. Punnee Pitisuttithum	Dushdi Mala Medal Sri Mahidol Kondee (Lecturer)	His Majesty, King Vajiralongkorn Alumni Association of Mahidol University, Thailand
Prof. Srivicha Krudsood	Outstanding Alumni Award	Ratchawithi Hospital, Thailand
Assoc. Prof. Dorn Watthanakulpanich	Mahidol University Award (Teaching)	Senior Council of Mahidol University, Thailand
Assoc. Prof. Paron Dekumyoy	Appointed Visiting Associate Professor	Taipei Medical University, Taiwan
Assoc. Prof. Pongrama Ramasoota	Thailand Outstanding Researcher 2020 Outstanding Alumni 2020	National Research Council of Thailand Kasetsart University, Thailand
Assoc. Prof. Wirichada Pan-ngum	Outstanding Lecturer Awards	Faculty of Tropical Medicine, Faculty Senate and Mahidol University Faculty Senate
Asst. Prof. Santi Maneewatchararangsri	Outstanding Research Presentation Award for the diagnostic innovation entitled "Recombinant antigen-based IgM-ELISA for leptospirosis diagnosis: screening from acute undifferentiated febrile illness patients"	The Council of University Faculty Senate of Thailand annual conference and Mahidol Quality Fair 2020