

INTRODUCTION

The objective of the Minority Health Research Training (MHRT) program at the University of Hawaii at Manoa (UHM) is to encourage students from under represented (including minority) backgrounds to pursue careers in science; and expose students to biomedical, clinical, and behavioral health research and global health issues that relate to health disparities. The program also aims to enable collaborations between colleges/universities and international research programs. Funded by the National Institute of Minority Health and Health Disparities (NIMHD), National Institutes of Health (NIH), the UHM MHRT program is in its sixth year.

The MHRT program is a short-term international research training opportunity offered to undergraduate, post-baccalaureate, and pre-doctoral students from under-represented backgrounds. MHRT students are from various academic disciplines at UH and have diverse ethnic backgrounds. To date, the MHRT program has trained six (6) cohorts of students totaling 60 students.

Selected students learn to conduct research during the spring semester and spend 8-9 weeks during the summer at their international training sites under the guidance of their assigned in-country mentor and their UH mentor. In addition to life-changing research and cultural experiences program benefits include: up to 10 credits of directed research courses in the spring and summer semesters and while abroad students are provided with a stipend, travel, and living expenses.



PROGRAM DIVERSITY

A profile of our students show a diverse ethnic background and various academic disciplines (Tables 2 and 3). Majority of our students are Filipinos (n=26), followed by those of Vietnamese, Korean or Japanese descent (n=12) and those of Hawaiian descent (n=8). Five students come from low socio-economic background and three from the rural area. Although the majority of our students have a science background, few students with non-science backgrounds have been admitted and successfully completed the program.

RESEARCH SITES

UH has partnered with leading scientists who serve as research mentors for MHRT students at their universities in Thailand, Cameroon, Liberia, Germany, Laos, Palau, and India. In 2019, students had the opportunity to do research again in Thailand and India. An overall list of our international research institutions can be seen in Table 1.

City, Country	Department, Institution
Bangkok, Thailand	Department of Microbiology and Immunology, Mahidol University, Ramathibodi Hospital, Mahidol University, Rangsit University, South East Asia Research Collaboration with Hawaii (SEARCH), Thai Red Cross AIDS Research Center, US Army Medical Component of the Armed Forces Research Institute of the Medical Sciences
Chiang Mai, Thailand	Department of Radiological Technology, Chiang Mai University Department of Microbiology, Chiang Mai University
Yaounde, Cameroon	Biotechnology Centre, University of Yaounde I, Virology Unit, Centre Pasteur du Cameroon, Mycobacteriology Unit, Centre Pasteur du Cameroon, Centre for Research on Medicinal Plants and Traditional Medicine, IMPM
Monrovia, Liberia	University of Liberia
Luang Prabang, Laos	Lao Friends Hospital for Children
Koror, Palau Island	Palau Community College
Kamataka, India	Public Health Research Institute of India
Pune, India	Indira College of Pharmacy
New Delhi, India	School of Biotechnology, Jawaharlal Nehru University
Munich, Germany	Department of Physics, Ludwig Maximilian University of Munich
Arkansas, USA	University of Arkansas for Medical Sciences Campus
Washington, USA	University of Washington, Seattle; Washington State University, Pullman
Guam, USA	University of Guam
American Samoa, USA	American Samoa Community Cancer Coalition



Figure 1. MHRT International Research Sites - 2014-2021

MHRT STUDENTS PROFILE

For the past 6 years, the MHRT program received 133 applicants. After rigorous screening process which includes scoring of written application, interviews by minimum 3 faculty members and comments from student references, 60 (45%) students were admitted to the MHRT program.

METRICS OF SUCCESS

We have developed a system that has us successfully remain in contact with all former trainees. We track their career path, presentations, and publications.

Career Path: Table 2 outlines the current status of MHRT trainees from the previous six (6) cohorts.

Presentations: Of the 60 graduates from the six cohorts, 17 presented at the UH John A Burns School of Medicine Biomedical Research Symposium for Health Disparities; 11 at the local American Society for Microbiology. Two trainees who presented at SACNAS received recognition of excellence. Abstracts are submitted for presentation at the CUGH 2020 meeting in Washington DC.

Publications: Publications *per se*, have not been a metric we use to evaluate our program, since undergraduates who are conducting research for the first time are unlikely to produce publishable results. However, 5 trainees are co-authors on peer-reviewed publications. The 3 pre-doctoral students are still working on their dissertations and have yet to publish their research.

Total 85 UG & Grad students	N (%)	Total 8 MS and PhD students enrolled since MHRT program year 2020. Status as of MHRT program year 2021: 2 enrolled in Masters, 4 enrolled in PhD, 1 completed Masters, 1 completed PhD and current postdoc
Enrolled in:		
MS program	12 (14.1)	
PhD program	5 (5.9)	
Postdoc	2 (2.4)	
MD program	6 (7.1)	
DO	3 (3.5)	
GCERT	5 (8.3)	
Other postbac	3 (3.5)	
Employed	20 (23.5)	
PharmD	3 (3.5)	
Other prof doctoral programs (DDS, DrPH, DPM)	3 (3.5)	
MPH	3 (3.5)	
JD	3 (3.5)	
MTOM	1 (1.2)	

MHRT Year Students (n)	Gender		*Ethnicity								Other Criteria	
	Men	Women	Hawaiian	Pacific Islander	Filipinos	Hispanic	American Indian	White	African American	**Other Ethnicities	Socio-Economic Background	Rural Area
2014 (7)	4	3	1	0	3	0	1	1	0	1	2	0
2015 (11)	5	6	3	2	4	0	0	0	2	2	1	0
2016 (9)	5	4	2	2	3	0	0	0	2	0	0	0
2017 (12)	4	8	0	1	6	1	1	0	1	2	0	1
2018 (12)	3	9	1	0	6	1	0	0	0	4	0	1
2019 (9)	3	6	1	2	4	1	0	0	0	1	0	0
2020 (13)	6	7	1	1	6	0	0	2	1	2	0	0
2021 (12)	5	7	2	0	3	3	0	2	0	2	8	2
2014 - 2021 (85)	35	50	11	8	35	6	2	5	2	16	11	4
%	41	59	13	9	41	7	2	6	2	19	13	5

*Few trainees in the White and other ethnicities categories also belonged to other criteria categories; **Thai, Vietnamese and Japanese



RESEARCH PROJECTS

Students engage in a variety of international health research projects in tropical medicine and infectious diseases, and community based participatory research (Table 4). Some of the topics include HIV, malaria, flaviviruses such as dengue, chikungunya and Zika, and bacterial pathogens such as *B. pseudomallei* and Mycobacteria. Additionally, the MHRT program provides the opportunity to share experience with other trainees upon returning to the US and provides opportunities for students to publish their research and/or present their research findings at local and national conferences. After completion of the research project, students are given the opportunity to conduct research with UH mentors.

Topic	No.	Project Title
HIV		
1	Association of HIV and anal HPV in at-risk populations in Bangkok	
2	HIV health disparities among transgender women in Thailand	
3	Anal human papillomavirus infections are associated with an increased risk of acquiring HIV	
4	Intrauterine growth restriction of babies born to HIV-positive women: Identification of possible mechanisms responsible for low birth weight	
5	MRI/MRS study in drug abusers in Chiang Mai, Thailand	
6	Multiplex DNA sequencing utilizing DNA origami and Kientaq	
7	Assessing monocyte inflammation, gut macrophage activity, and gut microbiome influence on cognitive outcomes in HIV-infected patients	
8	PREP users of the community-led service delivery sites in Thailand	
9	Correlates of HIV testing among Transgender Women attending the Tanagering Community Health Center	
10	Identifying Structural Brain Differences in the Brains of Human Subjects who use Methamphetamine	
11	Successful Skin Swab Collection from HIV Patients in Cameroon	
12	Gut microbiota may contribute to the elevated inflammation in perinatally HIV-infected children despite treatment	
13	Preferences for PREP Service Delivery of MSM and TGW from Community-based Centers in Thailand	
14	Reasons for pre-exposure prophylaxis discontinuation among men who have sex with men and transgender women at risk for HIV infection	
15	Development and characterization of topical formulations of adefovir dipivoxil for the prevention of HIV infection	
Malaria		
16	Circulating T-follicular helper cell response to Plasmodium falciparum antigens in Cameroonian adults	
17	Biomarkers of fever: Expression of cytokines and CRP levels in febrile patients in Cameroon	
18	Biological activities of medicinal plant products in the management of malaria and cardiovascular diseases in Cameroon	
19	Ultra-sensitive Detection of Plasmodium falciparum using Saliva	
20	Submicroscopic Plasmodium falciparum infection in pregnant Cameroonian women receiving Intermittent Preventive Treatment	
21	Presence of Plasmodium species mixed infections from asymptomatic children in Cameroon	
Arboviruses		
22	Dengue virus immunology	
23	Arbovirus surveillance in Aedes aegypti and Aedes albopictus mosquitoes in Central Cameroon	
24	Virus discovery in Thailand	
25	Production and characterization of mouse monoclonal antibodies to Chikungunya virus using hybridoma technique	
26	Virus detection in mosquito samples from malaria endemic areas in Thailand	
27	Construction of a Recombinant Antigen for Detection of Zika Virus Infection	
28	In silico Prediction of Chikungunya Virus (CHIKV) specific HLA Class I Restricted CD8 T cell epitopes and the study of Cytokine Storm during Acute CHIKV Infection	
29	Molecular evolution and phylogeny of Zika viruses in Thailand	
30	The effects of CXCL10 on cytokine expression in peripheral blood mononuclear cells during zika virus infection	
Enteroviruses and other viruses		
31	Sero-epidemiology of filovirus-specific antibodies in canines	
32	Sero-epidemiology of Lassa virus-specific antibodies in canines	
33	Detection of Hepatitis E virus in raw pork from markets in Bangkok and Western Thailand	
34	Simultaneous detection of enteric viruses associated with gastroenteritis by multiplex reverse transcription polymerase chain reaction assay	
35	Human polyomavirus BK and JC in chronic kidney diseases and transplant patients in Bangkok, Thailand	
36	Virus detection in mosquito samples from malaria endemic areas in Thailand	
37	Chronic Kidney disease biomarkers	
38	Molecular characterization of hepatitis C circulation in Cameroon	
39	An assessment of the prevalence of oral HPV among smokeless tobacco user women in Mysore, India	
40	Evaluation of the relationship between viral sexually transmitted infections including HSV-2 and adverse birth outcomes among rural pregnant women in Mysore District, India.	
41	Development of oral formulations of adefovir dipivoxil to improve the treatment of hepatitis B virus infection	
Bacteria & Fungus		
42	Effect of lipid A variation of Burkholderia pseudomallei on host cell response	
43	Expression of yeast specific antigen of Penicillium marneffei in vitro and in THP-1 cells	
44	Identification of human genetic determinants associated with outcome in melioidosis	
45	Helicobacter pylori modulates HIV immunopathogenesis	
46	Do Nontuberculous Mycobacteria isolated from clinical samples of patients in Cameroon cause disease? A cross sectional study	
47	The Cytokine Response, Phagocytosis Index, and Cellular Viability of Penicillium marneffei and Penicillium citrinum	
48	Purification of Monoclonal Antibodies to Produce a Latex Agglutination Test for the Detection of Melioidosis	
49	Molecular epidemiology of Burkholderia pseudomallei isolates in Buriram, Thailand	
50	Expression of extracellular lipase and protease activities in pathogenic mycelial phase of Malassezia species	
51	Gene expression and host biomarkers for diagnostics and predicting outcome in melioidosis	
Parasites		
52	Morphological characterization and molecular identification of Angiostrongylus spp. in Thailand using the COX1 gene as a marker	
53	Thai water box jellyfish: species identification, and toxicological response	
54	Evaluation of pure hirsutinoides compounds and their cytotoxicity to MCF-7 human breast cancer cells	
55	Reduced consumption of traditional foods, increased urbanization and Type 2 Diabetes mellitus in the Republic of Palau	
56	Study of Palauan traditional medicine, Phaleria nissidae as a treatment for diabetes in M1N6 Mouse beta cell line	
57	Evaluation of a novel pediatric nutrition consultation service in Lao PDR	
58	Study on hosts and helminths in the field of tropical diseases	
Diagnostic Imaging		
59	Development of Analysis Software for Quality Control of Magnetic Resonance Imaging (MRI) System	
Environmental Health		
60	Fine Particle and Human Health Impact Assessment in Bangkok, Thailand	

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