Hawai‘i Pacific Neuroscience Summer Internship Program

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In 1993, the Medical School Hotline was founded by Satoru Izutsu PhD (former vice-dean UH JABSOM), it is a monthly column from the University of Hawai‘i John A. Burns School of Medicine and is edited by Kathleen Kihmm Connolly PhD; HJH&SW Contributing Editor.

Introduction

Hawai‘i Pacific Neuroscience (HPN), a multi-disciplinary neuroscience center, is the largest neuroscience teaching facility in the state of Hawai‘i. Each year, more than 40 fellows, residents, medical students, post doctorate, and graduate-practicum students complete educational rotations through HPN, ranging from one month to the entire year. Students have come from the University of Hawai‘i, Tripler Army Medical Center, Hawai‘i Pacific University, Hawai‘i School of Professional Psychology, and Chaminade University, as well as mainland universities such as Yale University, Stanford University, University of California-Los Angeles, Johns Hopkins University, and Columbia University. In addition, HPN has been a community partner of the John A. Burns School of Medicine (JABSOM) since 2011 and frequently mentors JABSOM students throughout the academic year. Since 2017, through a summer internship program, HPN has provided both undergraduate and graduate students with experience in the healthcare field.

Neuroscience Summer Internship Program

The Neuroscience Summer Internship Program (HPN-SIP) exposes undergraduate and graduate students residing in Hawai‘i to neurological care by providing opportunities to work in clinic settings and exposure to clinical research. Prior to 2017, pre-medical students traveled to the mainland to find similar opportunities and internships. As a response to this gap in opportunities, the program was created for pre-medical students wanting to experience professional neurological research in Hawai‘i. Students with a desire to go into the field of clinical research or medicine and enrolled at an accredited college or university at any level are welcome to apply. Since the program’s inception in 2017, over 230 students have participated in the eight-week intensive research program. By interacting with a multidisciplinary team of neurologists, students learn to navigate the benefits and pitfalls of clinical research. Additionally, team leaders, many of them JABSOM students, have the opportunity to mentor students and to be exposed to clinical research.

The HPN-SIP 2019 students and physicians

In 2019, approximately 60 students, including international applicants, applied for the competitive research program, and 30 students were accepted. Students came from schools including Chaminade University, Stanford University, and University of Caen (France). Students worked in small groups and were assigned team leaders, typically medical students who guided pre-medical students in their academic journey. Many of the team leaders were JABSOM students who dedicated their summer to mentoring the HPN-SIP students, some of whom may be their future classmates. Working in their groups, alongside HPN physicians, the students conducted retrospective data analyses on their chosen therapeutic topic. At the conclusion of the program, the students presented posters of their work in the annual summer symposium. The top poster was selected by a panel of community physicians.

In addition to conducting research, students attended seminars led by HPN physicians and community members. A range of topic titles included "MD, PhD, or Both" to "Autism Spectrum Disorders as Revealed by Epigenetics." Students were encouraged to participate in community events, such as the Epilepsy Foundation's 4th of July Freedom walk, in efforts to learn the "why" behind research.

2019 Abstracts

Therapeutic areas presented by the HPN-SIP students included: Multiple Sclerosis, Alzheimer's Disease, Parkinson's Disease, migraines, seizures, and stroke. In choosing topics, HPN took into consideration the community's interests. For example, both the Parkinson's and Epilepsy Societies of Hawai'i expressed an interest in having student research areas pertinent to their organizations. Keeping the community in mind, HPN chose the six topics for the 2019 cohort. Students had the opportunity to rank their top choice projects to which they were assigned.

Below are this year's HPN-SIP abstracts. Winners of the 2019 final symposium poster presentation were JABSOM team leaders, Julie Crocker (MS3) and Maiya Smith (MS2) with the poster: *Association Between Smoking, Atopic Disease, and Multiple Sclerosis Severity in Hawai'i Patients*.

Project 1: Association Between Smoking, Atopic Disease, and Multiple Sclerosis Severity in Hawai'i Patients

Students: Nicholas Van, Lauren Pak, Kylee-Ann Tawara, Lauren Takasato

Team Leaders: Julie Crocker, Maiya Smith

Advisors: Pat Borman MD, Jason Viereck MD, PhD, Kore Kai Liow MD, FACP, FAAN

Multiple Sclerosis (MS) is a demyelinating disease of the central nervous system. While the cause of MS remains unclear, there are numerous genetic and environmental factors that may contribute to an increased severity of MS. One established risk factor is smoking and another potential risk factor that is being explored is atopic disease. This study sought to evaluate whether smoking and the presence of atopic disease is correlated with severity of MS. Results showed that smokers had statistically significant increased averages of symptom severity than nonsmokers (smokers = 3.08 ± 3.26 versus nonsmokers =1.15 ± 1.43). No significant difference was found by atopic disease status. This data supports current research found on the continental US concerning symptom severity in regards to smoking and shows that this evidence still holds true amongst Hawai'i's diverse population.

Project 2: Botox as a Treatment for Migraines: A Comprehensive Study on Hawai'i's Native Hawaiian Population

Students: Keahonui Kam, Sierra Burgon, Spencer Ng, Maveric Abella, Gavin Ha

Team Leaders: Carol Lu

Advisors: Kore Kai Liow MD, FACP, FAAN

Migraines are characterized by recurring debilitating headaches. Botulinum toxin is sometimes used for chronic migraine management, however, literature demonstrates little evidence on their effectiveness. This study sought to investigate the therapeutic effect of botox injections and analyze the difference in migraine presentation amongst Native Hawaiians. Results showed that Native Hawaiians present with migraines similarly to other ethnicities, but overall receive less therapeutic relief from botox treatment. With a migraine diagnosis, Native Hawaiians may be at higher risk of developing hypertension, stroke, and PTSD. Several lifestyle choices and medical conditions can put Native Hawaiians at a higher risk of cardiovascular diseases, including poor diet, physical inactivity, tobacco/alcohol use, and obesity. Native Hawaiians also are more likely to present with symptoms of numbness and coordination issues, which may be related to their increased prevalence in cardiovascular diseases such as stroke, which share similar symptoms.

Project 3: Correlation Between Alzheimer's Disease and Education

Students: Abigail Majo, Bryce Sakata, Samantha Masca, Gavin Ha

Team Leaders: Camille Burgos, Celine Coyle

Advisors: Kore Kai Liow MD, FACP, FAAN

Alzheimer's Disease (AD) is a progressive neurodegenerative disease that causes an irreversible decline in memory and cognitive skills. Obtaining a higher education is shown to have a protective effect on developing AD. Although the relationship between education and AD has been previously studied, the results remain inconclusive. The current study sought to strengthen the relationship between education level and AD by examining the severity of AD based on the Mini-Mental Status Exam or the Montreal Cognitive Assessment. The results

showed that AD patients with higher education (>12 years) had statistically significant higher cognitive function in comparison to AD patients with lower education (< 12 years). This supports the role of education as protective against developing AD. Studies should continue exploring the correlation between AD and education in other states with a range in education quality and examine other activities that may have a protective effect in developing AD.

Project 4: Leading Risk Factors for Ischemic Stroke: A Comparative Ethnographic Study of Patients In Hawai'i

Students: Joseph Among, Ryan Ogasawara, Kacie Oyadomari, Nicholas Regaspi, Emily Kang

Team Leaders: Juliette Capitaine

Advisors: Pat Borman MD, Jason Viereck MD, PhD, Kore Kai Liow MD, FACP, FAAN

Stroke is a leading cause of death and disability worldwide. Established risk factors include hypertension, diabetes, hyperlipidemia, smoking, and alcohol consumption. Although there have been studies exploring the correlation between ethnicity and certain risk factors, little is known of the stroke risk in Native Hawaiians and other Pacific Islanders (NHOPI). Investigating the relationship between ischemic stroke and NHOPI, results showed that NHOPI patients had significantly more diabetes, higher BMI and were a decade younger at the onset of stroke, than other ethnicities. Asian patients had more hypertension and were mostly males, in comparison to NHOPI patients who were more frequently female. White patients tended to be mostly male, and drink significantly more alcohol than the other ethnicities. Future studies could include underrepresented populations such as African Americans, Hispanics, and Mixed-raced people. The conclusions from this study can better inform medical recommendations for stroke prevention specific to ethnicity.

Project 5: The Relationship Between Cigarette Smoking and Oral Levodopa Equivalent Daily Dose (LEDD) in Parkinson's Disease Patients

Students: Luke Taylor, Ariel Chon, Shu Yi Shi, Maya Ogasawara

Team Leaders: Christian Ogasawara

Advisors: Kore Kai Liow MD, FACP, FAAN

Studies have found that smoking leads to a later onset of motor symptoms and a reduced risk for developing Parkinson's Disease (PD). However, other studies have produced contradictory findings. Among the many symptomatic treatments for PD, Levodopa remains the treatment standard. Levodopa equivalent daily dose (LEDD) is a useful tool to summarize the total anti-parkinsonian medications a patient is receiving. This study sought to compare the average oral LEDD of current smokers and non-smokers in our PD sample. Results showed that LEDD dosages in current smokers were significantly lower than non-smokers, with a very low overall prevalence of current smokers relative to the expected for Hawai'i's elderly population. With inconsistent results among studies looking at nicotine as a PD treatment, further research needs to be done with a larger sample size.

Project 6: The Use of Systemic Anti-Inflammatory Medication in Intractable versus Not-Intractable Seizures

Students: Caroline Feng, Jessica Huang, Chirstyn Okuno, Kevin Nguyen

Team Leaders: Huanli Hu, Alyssa Wicknick

Advisors: Pat Borman MD, Jason Viereck MD, PhD, Kore Kai Liow MD, FACP, FAAN

A seizure is defined as a sudden, uncontrolled electrical disturbance in the brain, which can cause unusual movements, sensations, behavior, and loss of consciousness. Epilepsy is the tendency for seizures to recur. Intractable seizure disorder is defined as continued seizure activity, at least once per month, for 18 months, despite the use of two or more anti-epileptic medications. Overall, 20%-40% of seizures are intractable, which accounts for 80% of the health costs of epilepsy management. Inflammatory processes continue to be one of many areas of interest in the development of new epilepsy treatments, particularly for intractable seizure disorders. The researchers hypothesized that patients with intractable seizures will have a higher rate of anti-inflammatory drug use than those with not-intractable seizures. Results found that there was no statistically significant difference in the percentage of patients taking varying quantities of systemic anti-inflammatory medications between the groups, nor in the amount of specific types of anti-inflammatory medications taken between each group. Our data suggests that the use of known systemic anti-inflammatory medications do not influence seizure control. Further studies could investigate other inflammatory pathways.

Conclusion

HPN's vision is to increase the number of future healthcare providers in Hawai'i. Exposing pre-medical students to possible future health career paths at home is important to Hawai'i's future, especially given the growing physician shortage in Hawai'i. The HPN summer research program was designed with this shortage in mind by catering to Hawai'i's local talent and providing students with opportunities for both academic pursuit and community outreach.

After completion of the summer 2018 internship program, Carol Lu, an undergraduate student at Johns Hopkins University, stated:

Now, more than ever, I wish to do research in cognitive neuroscience, and I intend to do everything I can to get there. Though my time at HPN has come to an end, for now, I know

even greater things await me ahead at John Hopkins University, where I have committed to studying neuroscience and cognitive science. In ten years' time, I will have obtained my Ph.D and will be conducting and leading research that will make an impact in this world.

A year later, Carol returned to HPN as a 2019 summer student leader. Her abstract was accepted for national presentation at the 2019 American Epilepsy Society meeting in Baltimore. Carol is an example of how HPN's summer internship program can help pave the road for Hawai'i students to grow and develop into healthcare leaders and future innovators.

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