

**Keio SFC Academic Society Research Grants for Research Projects**

**Results Report for the research project on:**

**“Internship at the National Center for Global Health and Medicine (NCGM) Research Institute in Tokyo, Japan: A General Study on Malaria parasites, Infections, Disease Pathogenesis, Diagnosis, and Therapeutics, and Development of Basic Laboratory Experimental Skills.”**

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The National Center for Global Health and Medicine (NCGM) in Shinjuku, Tokyo, is home to one of Japan's leading research institutions focused on health and medicine. As an undergraduate student passionate about infectious disease biology, I was fortunate to secure a 6-month internship (February – July) in the Department of Malaria and Tropical Medicine at NCGM. Under the guidance of esteemed researchers, particularly led by Dr. Shigeyuki Kano, I delved into cutting-edge research in this field.

As part of the internship at the National Center for Global Health and Medicine (NCGM) in Tokyo, Japan, a comprehensive study on malaria parasites, infections, disease pathogenesis, diagnosis, and therapeutics was undertaken. The purpose was to deepen understanding of malaria, an infectious disease prevalent in tropical regions, particularly Africa, and develop essential laboratory experimental skills. Although intended to span from February to July, I completed a trial month in February to assess the internship and resumed in April after applying for funds to continue. Consequently, the internship was typically held in part of April, May, June, and July, encompassing both theoretical and practical components. I worked two days a week, specifically on Wednesdays and Fridays, typically from 10 am to 4 pm each day.

During the research internship, I investigated the characteristics, life cycle, and specific symptoms of the five well-known malaria parasites. This included conducting a comprehensive review of academic literature, textbooks, and illustrative materials. Additionally, I engaged in practical activities such as microscopy to observe and identify the different parasites, discerning their differences and similarities. These efforts enabled me to achieve a thorough understanding of malaria infections and their diverse manifestations.

As an aspiring medical scientist, this internship provided me with an introduction to practical medical laboratory techniques used in disease research. Under the guidance of Dr. Komaki-Yasuda and Dr. Yano, research scientists in the Department of Malaria and Tropical Medicine, I conducted various fundamental laboratory experiments including cell culturing, nested PCR tests, microscopy, Rapid Diagnostic Tests, LAMP method, and Automated Hematology Analysis. These techniques are essential for researching malaria and other tropical diseases. One of the projects I worked on was Kelch13 sequencing, where I studied the Kelch13 (K13) propeller protein and its association with *Plasmodium falciparum* malaria infections. This protein is crucial, and mutations in it have been linked to delayed clearance of malaria parasites in patients treated with Artemisinin-based Combination Therapies (ACTs), the primary treatment for uncomplicated malaria. These mutations are believed to contribute significantly to the growing resistance of malaria parasites to current therapeutics.

Through the lens of sequencing genes (K13 sequencing), I learned the process of collecting blood samples as dried specimens and extracting them from their storage compartments. I acquired skills in conducting PCR tests to detect malaria infection, isolating a gene (K13) from malaria-infected blood samples, and conducting a series of tests leading to the sequencing of a gene to eventually obtain a complete DNA sequence through computational analysis. Additionally, I gained proficiency in presenting scientific data and figures during presentations and in reports.

Overall, I acquired in-depth knowledge of malaria and fundamental laboratory skills. The practical experience I gained significantly contributed to my understanding of malaria pathogenesis, diagnosis, and potential therapeutics, applicable to various medical research fields, including drug and vaccine development, aligning with my career aspirations in infectious disease research and global health. Furthermore, the internship provided me with valuable networks in tropical medicine, which I anticipate will be invaluable as I pursue my journey as a researcher in similar fields. Through this experience, I identified and affirmed suitable courses and research areas for postgraduate studies, guided by the methods and topics explored during the internship.

The internship has greatly enriched my understanding and abilities in global health research, laying a solid foundation for my future endeavors within the scientific realm. It has been an invaluable journey at the NCGM, offering not only practical skills but also vital theoretical insights crucial for tackling the urgent health issues presented by diseases like malaria. This experience has equipped me to make meaningful contributions to the scientific community and address the ongoing challenges in infectious disease research.