OUR VISION

The Partnership for Global Health Technologies (PGHT) is a collaboration between the State University of Zanzibar (SUZA), Mnazi Mmoja Hospital, Muhimbili University, and Boston University students. PGHT aims to improve the quality of health care in Zanzibar by applying biomedical engineering principles within a public health context. We use an interdisciplinary approach to address the most pressing issues in healthcare delivery in East Africa.

Zanzibar, Summer 2018
QUALITY CONTROL OF MALARIA RAPID DIAGNOSTIC TESTS

Organizations such as ZAMEP (Zanzibar Malaria Elimination Program) are striving to eliminate malaria from Zanzibar, Tanzania. The island, just like numerous other African countries, faces the problem of inaccurate malaria diagnosis due to invalid mRDTs (malaria rapid diagnostic tests) results. During summer 2018, the team worked in Zanzibar with the hope of collecting data samples from local dispensaries with an end goal of creating a device that indicates the validity of mRDTs. In order to feed data into the device, the team used an imaging device to take pictures of the flow front of mRDTs as well as collected microscopy slides and dried blood samples (DBS). The slides and DBS samples were taken to cross check the mRDT results. The team collected 202 samples with 3 positives and 199 negatives. We also worked towards establishing a strong relationship with ZAMEP in order to allow for collaboration and the flow of information back and forth.

In Boston, we now plan on getting the PCR results in order to confirm the mRDT results and publish a report on the findings of mRDT validity. In order to further strengthen our dataset, we aim to generate more positive blood samples as well. Finally, we also plan on continuing working on the algorithm for the device in order to incorporate photo analysis.
**Water Quality Testing**

Over the summer the Water Quality team conducted a needs assessment on Zanzibar island in order to identify areas of need in the existing water management system. The final aim of the study is to engineer a device which will address these areas of concern. Interviews were conducted with the Director General of the Zanzibar Water Authority (ZAWA), the water quality laboratory head and with the Ministry for Disaster Relief. Supplementing these interviews were focus groups carried out with various community members. Key concerns were a shortage of technical staff at the water quality laboratory, no regular well testing schedule and an over-reliance on distributing chlorine to the public for them to treat their own water sources. Based on these findings, a device that remotely treats water sources and monitors coliform bacteria levels would reduce the laboratory staff’s workload as well as ensuring regular water treatment. A number of rough device sketches were produced over the summer and will be evaluated for future prototyping.

**Point-of-Care Liver Function Monitoring**

Performing laboratory testing to monitor liver function remains a major challenge in low-resource settings. Factors contributing to this include limitations with cost, lack of trained technicians as well as ill-equipped and overburdened testing facilities. Therefore, this project has been investigating the feasibility of a rapid, low-cost, easy-to-use and point-of-care (POC) diagnostic device to quantify liver enzyme levels. Recently, there have been two major focuses driving the project. First is the development of a test-strip, based on the principles of paper-based microfluidics with screen-printed modified-carbon electrodes. This strip has been paired with a low-cost potentiostat to quantify the assay. Second is the continued development of the coupled assay itself, which is meant to characterize levels of ALT (alanine aminotransferase) in the blood to help monitor liver function. Current efforts are focused on running this assay on the test strip and making necessary modifications to ensure that accurate and consistent results can be obtained for physiological levels of the enzyme.
MATHEMATICAL MODELING OF MATERNAL HEALTH AT MNAZI MMOJA HOSPITAL

The modeling team aims to create a computational model that simulates the maternity ward at Mnazi Mmoja Hospital (MMH) and determines how resources can be allocated to reduce maternal mortality rates. This summer, the modeling team went to Zanzibar to continue improving the current computational model and to expand the model to incorporate data regarding blood transfusions and surgery procedures at the maternity ward. While there, we conducted various interviews with staff members at MMH and at the national blood transfusion center and we collected data files from the maternity and blood transfusion departments at the hospital. Over the course of the next year, we aim to organize and analyze the data collected for trends, incorporate this data into the computational model, and further our relationship with the health care workers we have contacted while in Zanzibar.

STUDENT VOICES

While working in Zanzibar, one thing I learned is that you can’t expect things to go according to plan. It’s a slow-paced culture, which was jarring to me because I’m used to sticking to schedules. Furthermore, complications which are uncommon in America and other wealthier nations are to be expected when working in Zanzibar; there will be times where water and electricity are cut off and sometimes there will be shortages of supplies necessary to continue running tests. Working in this kind of environment requires patience, but it was also really rewarding because there were so many people that were excited to work with us and were enthusiastic about our projects.

- DANA ALMBERG
Dear Friends,

We continue to benefit from the energy, enthusiasm and exceptional abilities of our students. Their maturity inspires me every day. During the last quarter, our students did some outstanding work in Zanzibar and added a new project on improving the hygiene and water quality in the island. The work done by the students in this, and existing areas of malaria diagnostics, liver disease and maternal health is not just a sign of their intellectual prowess, but also a demonstration of their capacity to understand and manage complex projects at the interface of science, public health, policy and social justice. One sign of that is our recent publication in BMC Health Systems Research that was conceived, crafted and driven by our PGHT students. The publication not only shows the current gaps in capacity in maintaining oxytocin quality, but also highlights concrete steps in which the challenge can be managed. I encourage all of you to read the paper and share your thoughts with us.

Our PGHT students continue to inspire me and my team beyond their work in Zanzibar. Their efforts in improving refugee health and well-being, as well as improving the condition of those who are in the cross-hairs of conflict in Yemen is a source of inspiration for so many students on campus and beyond our institution. I cannot express my gratitude for all that they do, and for all that they enable me to do.

I hope that you will continue to support our work, and will share your thoughts, input and advice with us. I look forward to hearing from you.

Yours,

MUHAMMAD H. ZAMAN

HOWARD HUGHES MEDICAL INSTITUTE PROFESSOR

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