

## Diagnostic Lab-in-a-Backpack



“This is really important because so many people who are willing to go and help people don’t have the materials to do the job....The potential of this to save lives is really quite staggering.”  
-Bill Clinton, CGI U 2008

### Global Health Challenge

Physicians traveling to rural communities in Sub-Saharan Africa face a number of challenges. Poor infrastructure and the remote locations of villages prevent medical teams from bringing electronic diagnostic equipment. Additionally, tuberculosis, AIDS, and malaria are rampant through segments of the population. A 2007 UNAIDS reported 22.5 million cases of AIDS in Sub-Saharan Africa. Since follow-up visits are difficult, doctors need the tools to make an accurate diagnosis the first time. Collaboration with Baylor International Pediatric AIDS Initiative (BIPAI) and Baylor Shoulder to Shoulder physicians provided the background for the design of a portable diagnostic lab in a backpack. The pack aims to aid physicians in Botswana, Lesotho, Malawi, and Tanzania.

### Appropriate Solution

The original backpack was developed from a prototype designed by BIOE 451 design Team SouthFace- Jamie Lai, Junho Lee, Neel Srikishen, Nick Taboada and Po T. Wang and was field tested in Honduras. Our design updates the features and power source of the backpack and includes tools specific to Sub-Saharan Africa. The Lab-in-a-Backpack contains all of the tools necessary for diagnosis of the major health issues in Sub-Saharan Africa. These tools are powered either by rechargeable AA and AAA batteries or a rechargeable lithium battery through a power control unit designed by Jenna Hook. Developments made by our BIOE 260 design team (Jeanie Ling, Peony Kim, Elizabeth Nesbit, and Roxana Daneshjou) include a more efficient 100x oil emersion microscope, a centrifuge, and several rapid diagnostic tests. The Lab in a Backpack targets the health issues of rural villages in Sub-Saharan Africa, which have little access to health care. Beyond Traditional Border interns will deliver the backpacks to various clinics in Botswana, Lesotho, Tanzania, Guatemala and Honduras. Furthermore, Dr. Maria Oden, Dr. Rebecca Richards-Kortum, HHMI, BTB, and the PAC doctors have been pivotal to the implementation of this design.

### Current Status

The Lab in a Backpack will be tested based on six criteria: portability, security, cost, durability, physicians’ needs, and convenience. Planned field tests include weighing the Lab in a Backpack exposing the cover to water, testing portability with student volunteers, calculating costs, and assessing user-friendliness. Additional field testing at the sites will allow reassessment of item durability and relevance. Future groups may re-assign weighted design criteria values to adjust the prototype. Presently, Beyond Traditional Borders spearheads the distribution of the backpacks. The backpacks will impact the public health of rural regions in Tanzania, Botswana, Malawi and Lesotho. On each medical trip, approximately 25 children will be examined. If we assume that the backpack lasts for a year, and that each doctor has weekly trips, each backpack will impact over a thousand children.

*An initiative for the advancement of appropriate, high-value innovations in global health biotechnology*

### BEYOND TRADITIONAL BORDERS



Rice University  
6100 S. Main St. - MS142  
Houston, TX 77005

Ph: 713-348-4549  
Fax: 713-348-5877

E-mail: [beyondtraditionalborders@rice.edu](mailto:beyondtraditionalborders@rice.edu)

#### Team Members

Roxana Daneshjou, Peony Kim,  
Jeanie Ling, Elizabeth Nesbit,  
Jamie Lai, Junho Lee,  
Neel Srikishen, Nick Taboada,  
Po T Wang, Jenna Hook,  
and Laura Barg-Walkow



Bridging the healthcare  
gap worldwide

**BIPAI** Baylor International  
Pediatric AIDS Initiative  
at Texas Children's Hospital

**HHMI**  
HOWARD HUGHES MEDICAL INSTITUTE

This initiative is made possible by a grant to Rice University from the Howard Hughes Medical Institute through the Undergraduate Science Education Program.