A Bioengineering Innovative Approach to Reducing the Impact of Malaria at the Border between Burma and Thailand

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Background

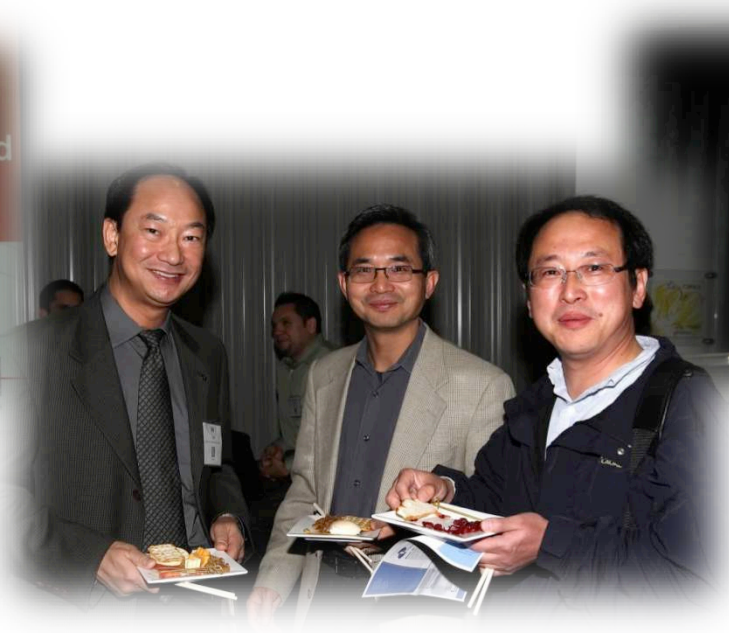
- Part of the BME Capstone Design Course Sequence
- Company-mentored design projects
- Multidisciplinary teams – with senior students from Materials Sciences, Mechanical Engineering, & Electrical Engineering
- Lecture topics – design process and tools; innovation; design for function, ergonomics, manufacturability, safety; FDA regulation; market analysis; cost analysis; presentation skills; team & leadership skills

Objectives: Students Will

- Demonstrate leadership and teamwork skills in a project team environment.
- List and define the various steps in bringing a biomedical product from concept to market.
- Identify and assess challenges in each of the steps.
- Apply engineering principles and practices to meet the challenges.
- Establish initial contacts with major local BME companies.

Edwards Lifesciences Strategic Grant

- 2012-2013 Strategic Grant
  - PI: William C. Tang
  - $25K awarded for the 2012-2013 BME Senior Design Course
  - To promote team skills, leadership skills, communication skills, & conflict resolution skills



Edwards Lifesciences Strategic Grant

- Vital elements supported by the Grant:
  - Team building bootcamp
  - Leadership trainings & practicum by Edwards Lifesciences managers
  - Overseas expedition student teams – to experience providing medical care in remote locations and third-world environments

Overseas Expedition Student Teams

- Carefully select highly motivated and deserving students with strong leadership potentials to form the expedition teams.
- 3 expedition teams:
  - Lanzhou, China – to work with underprivileged children and their families who are in need for heart surgery (partner: *Angel Heart International*, March 21 – 30).
  - Lima, Peru – to visit HIV/STD patients within the gay / transgender sex workers population (partner: *Public Health Program, UCI*, March 23 – 30)
  - Thailand-Myanmar border – to witness the frontline malaria battleground (partner: *Public Health Program, UCI*, *Tropical Diseases, Mahidol U*, April 24 – May 3).

Lanzhou, China

- Students:
  - Hanna Chang, Michael Kim, Michael Klopfer, Megan Knight, Ji In Hwang, Daniel Youseff

Lanzhou, China

- Partner: Angel Heart International
  - Voluntary charitable organization
  - Raise fund from donors
  - Select children in need of heart surgery with dire financial needs
  - Provide supports for
    - Surgery costs
    - Emotional needs of the child and the family
    - At-home follow-up visits

Lanzhou, China

- Gansu Provincial People's Hospital – operates in one of the poorer provinces in China

Lanzhou, China

- Pre-surgery hospital visit – provide comfort

Luò, Zhāohuī (2.5 years old)
Ventricular Septal Defect

Yin, Chuan (2 years old)
Patent Ductus Arteriosus

Lanzhou, China

- At-home visit

Lanzhou, China

- At-home visit

Lanzhou, China

- At-home visit

Lanzhou, China

- Clinic visit

Lanzhou, China

- Surgical room

Lanzhou, China

- Surgical room

Lanzhou, China

- Post-surgery hospital visit

Lanzhou, China

- Post-surgery hospital visit

Lanzhou, China

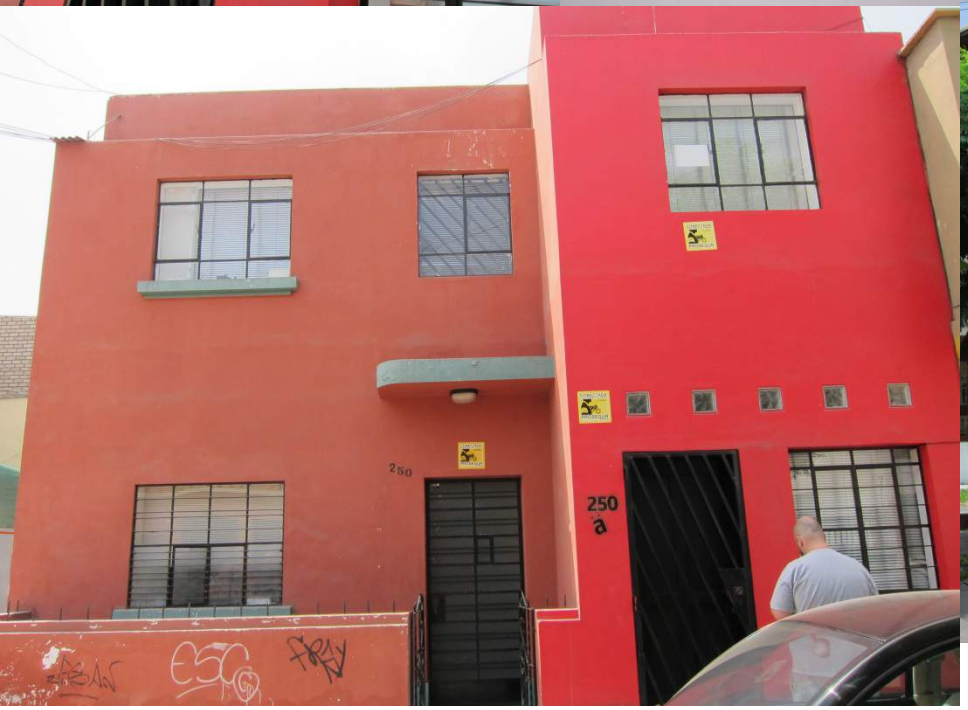
- What we have learned:
  - "Realized how important it is to improve general health education in third world countries"
  - "Gained new perspectives: Success is not a position or wealth, but ***positive*** impacts on others' lives"
- Follow-up actions:
  - Start a club on campus to continue AHI legacy
  - Aims to bring awareness about the organization, recruit members, and raise funds to sponsor more surgeries and volunteer trips
  - Leadership / teamwork training by providing workshops and instructional tours of medical facilities

Lima, Peru

- Students:
  - Vlad Satchouk, Nigel Fernandez

Lima, Peru

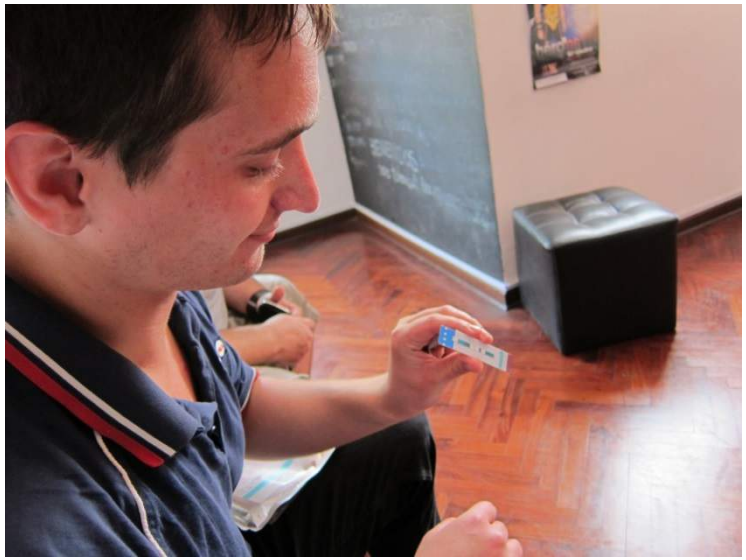
"The Little Clinic That Could"
-Hugo Sanchez



Lima, Peru

- Community
- Education
- Diagnostics & Prevention
- Future Guidance & Counseling

Lima, Peru



Lima, Peru - Impacta

Lima, Peru - Socios En Salud

Lima, Peru - Centro de Salud

Lima, Peru - Centro de Salud

Lima, Peru - Carabayllo District

- Need for rapid tests
- Point of care diagnostics
- Micro Loans
- Resource Limited Areas

Lima, Peru - Carabayllo District

Lima, Peru – BS3 facility

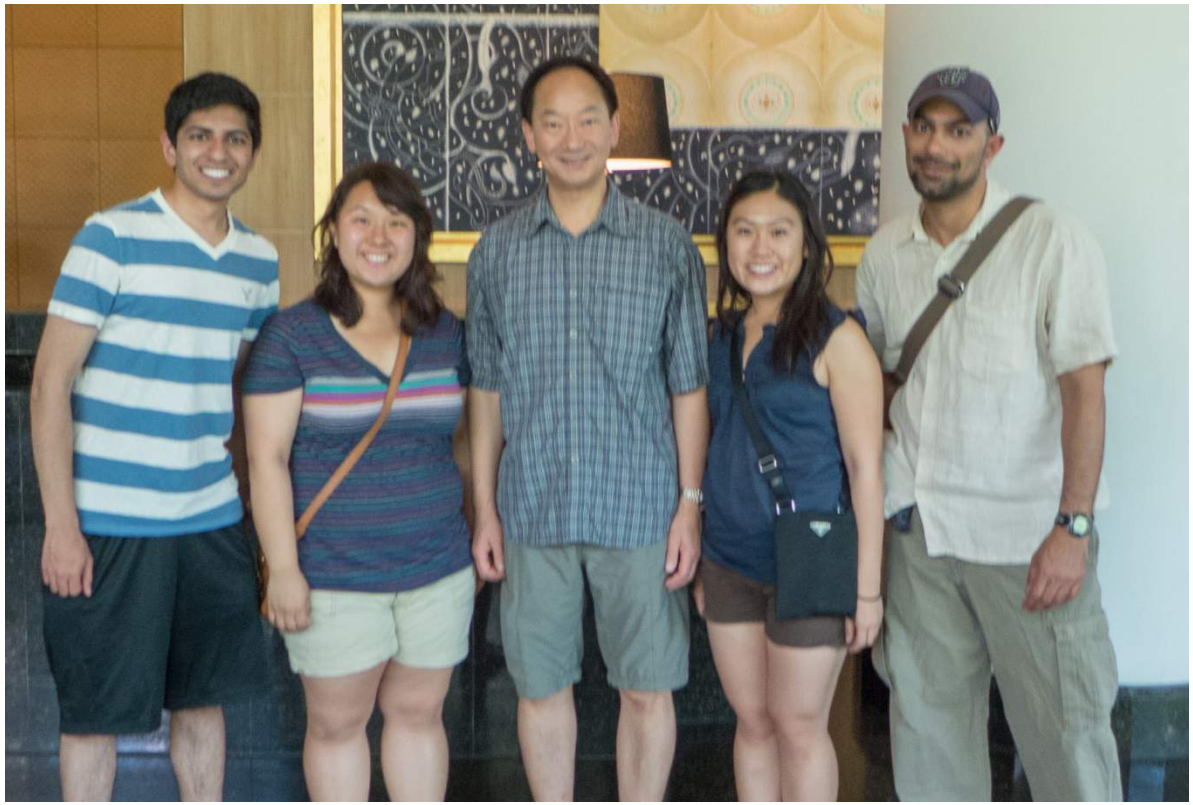
Made out of a shipping container!

Lima, Peru

- What we have learned:
  - "Ostracized gay / transgender sex workers – no social pathways to change status, no medical/social assistance"
  - "Technology alone, no matter how advanced, is useless without understanding the local communities and working with partners toward social changes."
- Follow-up actions:
  - Revise the diagnostic platform to include HIV and STD detection
  - On the spot test results
  - Work with organizations who promote social and policy changes

Thailand-Myanmar Border

- Students:
  - Reaz Rahman, Amanda Ngo, Tracey Tien, Abdullah Siddiqui



Thailand-Myanmar Border

- Partners:
  - Prof. Guiyun Yan, Public Health, UCI
  - Prof. Jetsurmon Prachumsri, School of Tropical Diseases, Mahidol University, Bangkok, Thailand

Thailand-Myanmar Border

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Thailand-Myanmar Border

ICEMR workers go village-to-village, house-to-house to screen for fever
Finger prick blood sample is collected if fever identified

Thailand-Myanmar Border

Interview a malaria-stricken child

Thailand-Myanmar Border

Sorting and preparing blood samples to be delivered to clinics

Thailand-Myanmar Border

Lab test – results not available until the next day

Thailand-Myanmar Border

Thailand-Myanmar Border

Experience at the villages – extreme living conditions

Thailand-Myanmar Border

Experience at the villages – extreme living conditions

Thailand-Myanmar Border

Experience at the villages – hard to reconnect with patients diagnosed with malaria from day to day.

Thailand-Myanmar Border

Experience at the villages – Tha Song Yang Clinic – Burmese cross the border to seek medical help – 2 hours on foot and boat

Thailand-Myanmar Border

Gentleman being diagnosed for malaria

Thailand-Myanmar Border

Malaria was diagnosed by technician trained in examining blood samples

Thailand-Myanmar Border

Burmese girl and her dad walked 2 hours crossing the border to seek help at the clinic. She was diagnosed with *Plasmodium Virax* and was given medicine. She and her dad then walked back to Burma. It is very likely that she will contract malaria again due to the prevalence of the infection in her home village.

Thailand-Myanmar Border

Experience at the villages – Tha Song Yang Hospital crowded and overworked

Thailand-Myanmar Border

- What we have learned:
  - "Living conditions, social conditions, education levels, etc. unimaginable to us born and raised in the US."
  - "Medical technology must fit the target groups' social, economical, and cultural contexts."
- Follow-up actions:
  - Revise the malaria diagnostic approach
  - Work with other charitable organizations who understand the situations and deploy in the field
  - Test with saliva samples to eliminate finger pricks
  - Test results within 15 min so drug can be administered on the spot

Acknowledgements

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- Mahidol University:
  - Prof. Jetsumon Prachumsri, School of Tropical Diseases
- Peru:
  - Epicentro, Impacta, Socios En Salud, Centro De Salud, Cayetano University