The Chain Reaction

Humanitarian Solutions Worldwide

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United States Water Quality Project

BY ADAM COOPER

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The first time I heard about the Flint Water Crisis was during my sophomore year at Stetson University in DeLand, Florida. Sitting in my water policy class, I was curious what water quality looked like in my area, an older part of Florida. What I found shocked me – DeLand was consistently testing barely compliant with Environmental Protection Agency standards and was the only city in the county to have such an issue. As if by fate, Dr. Satinder Ahuja began the U.S. Water Quality Project and I happily jumped on board to figure out what was happening in my area and around the country.

Like any good researcher, I first looked at the existing methodology. Through talking with local utility departments and reading the literature the EPA provides, I wanted to make sure that the values my city was giving were representative of our population. As we've seen with Flint, it is in the best interests of those in power to remain compliant to standards, often sacrificing data integrity. I found some alarming practices they used to collect samples, with very little interaction or education provided. They would drop off collection bottles and written instructions without ever interacting with constituents, which introduces a bias against those functionally illiterate or untrusting of the government. From my time working on the Arsenic Education project, I have learned that this connection is integral to establishing trust and buy-in. This lack leads to large rates of noncompliance, which my city experiences among certain demographics. Those illiterate (who can't read the materials dropped off on their doorsteps without human interaction) and untrusting of the government (due to prior discrimination) won't test their water, and the policy is to move onward to the next homes if they encounter this.

Wanting to see if the neighborhood of Spring Hill – a functionally segregated community in DeLand – may be experiencing a case of environmental racism where their households were being undertested, I began my undergraduate senior research project in conjunction with the CWB lead project. Working with a local community center, I offered free water quality testing to Spring Hill residents. Very fortunately, all have tested

What's Inside this Issue

Our Mission

Chemists Without Borders solves humanitarian problems by mobilizing the resources and expertise of the global chemistry community and its networks.

Our Vision

A global support network of volunteers providing mentoring, information and advice to ensure every person, everywhere, has affordable, consistent and persistent access to:

- Essential medicines and vaccines
- Sufficient safe water
- A sustainable energy supply
- Education in green chemistry and business which people can apply in their daily lives and teach to others
- Safe processes in work environments where chemical hazards exist
- Emergency support, including essential supplies and technology

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below the EPA threshold so far. As I graduate, I am leaving behind more volunteers to continue to provide this service for the neighborhood and hope to implement similar community-based water testing programs where appropriate. I believe this model is fully reproducible in any community and can succeed in institutions with chemistry programs who have strong connections with their local communities. Community-based models aren't just suited for low/middle-income countries, but low resource environments everywhere. We need more volunteers who can monitor water in their communities.

For additional information or to participate in this project,
please contact Satinder Ahuja at sutahuja@atmc.net

AIDSfreeAFRICA Malaria Free Zone Program: A Behind the Scenes Look

BY SHARA PANTRY
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Malaria is a serious disease caused by a parasite. It is transmitted from one person to another by the bite of an infected mosquito. When a mosquito bites an infected person, it picks up a small amount of blood, which contains the parasite. The parasite, mixed with the mosquito's saliva, is injected into the next person the mosquito bites, and this person becomes sick as well. Malaria symptoms include fever, chills, body pain, vertigo, loss of appetite and sleepiness. When left untreated, malaria can result in kidney failure, seizures, and even death because the parasite destroys red blood cells. Malaria is a serious problem in Cameroon, especially for children below the age of five.

In 2015, AIDSfreeAFRICA spearheaded a malaria free zone (MFZ) program in Yaounde, Cameroon (for more information visit http://aidsfreeafrica.org/our-programs/malaria-free-zone-mosquito-nets/). The goal of the program is to reduce the malaria infection rate while educating the residents on how malaria can be transmitted and prevented. As a part of the MFZ program, bed nets are permanently affixed to windows to make the entire structure a malaria-free environment.

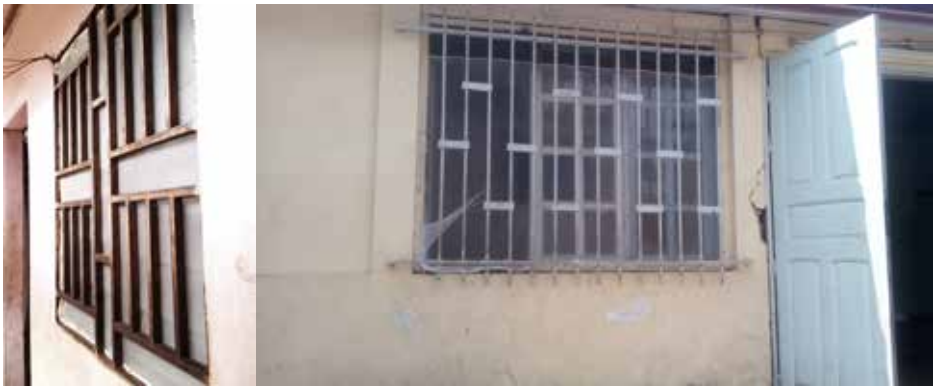
Collection and washing of old mosquito nets

In this newsletter, Hilbert Kamo, a Cameroon native employed by AIDSfreeAFRICA, helped to answer important questions regarding the malaria free zone program.

Are most people willing to get the nets put on their windows?

At the start, it was not easy, but now the number of people willing to get mosquito nets fixed is increasing.

What materials are needed for installing netting to a window?
To install netting on a window, the following items are needed: nails, hammer, a net, gloves, detergent/soap, a bucket and sometimes wood. Many items are donated or purchased by AIDSfreeAFRICA, but old bed nets are often collected from trash sites.



Windows with affixed mosquito netting

How do you decide which homes to put the netting?
Individuals who bring their bed nets to AIDSfreeAFRICA become a priority for having netting installed on their homes. Sometimes people offer to help to install the netting, moving them to the top of the list.

Homeowners may also come forward and request to have nettings put on their homes. If they offer to pay a small amount of money for the service we make an appointment immediately. Some people understand that participating in the program will save them money on hospital bills since they avoid getting malaria. We also work with local community institution such as schools, health centers and places of worship.

How long does it take to install the netting on the windows for one home?
It takes anywhere from four to ten hours to install netting on the windows of a home. The time varies depending on the number of windows that need to be netted and whether or not volunteers, who often live there, help with the installation. Fortunately, two locals recently applied to volunteer with the malaria free zone program.

For additional information or to participate in this project, please visit the AIDSfreeAFRICA site and send a message.

Update on developing a method for measuring arsenic in rice in Bangladesh

BY JULIAN TYSON, DEPARTMENT OF CHEMISTRY, UMASS AMHERST
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Progress on this project can be followed in reports in earlier Newsletters (#22 and #25). The goal of our CWB project is to adapt the EZ test kit made by Hach (for the determination of inorganic arsenic in water) to the determination of inorganic arsenic in rice. Once the CWB arsenic-in-water test kit is available, which is also based on the Hach EZ procedure, it is envisioned that this can also be adapted for the analysis of rice. There are four crucial stages in the process: (a) extraction of all of the inorganic arsenic from the rice into solution, (b) the generation of arsine, (c) its removal from solution, and (d) its reaction with the mercuric bromide crystals on the

test strip to give the yellow/brown coloration whose intensity can be related to the concentration of arsenic in solution.

Much of the recent work has been concerned with refining the preparation of the XBAG gels, which is how the arsine generation reagent (sodium borohydride) is added. Gels are prepared by mixing the reagent with an alkaline solution of agar and xanthan gum that sets on cooling in a mold to give disk-shaped gels that are stable for several days.

We have now devised an overall procedure in which a few grams of ground rice is heated to near boiling in a capped 50-mL centrifuge tube with 1 dilute nitric acid for 30 min. The contents are transferred to a Hach reaction vessel, allowed to cool, antifoam agent, sulfamic acid, and one XBAG are added, and the vessel immediately capped. After 40 minutes, the strip is removed and the depth of color interpreted in terms of the arsenic concentration in solution.

We are currently in the process of validating the method by the analysis of rice to which a known concentration of inorganic arsenic has been added and have shown that satisfactory results are obtained for rice that has been spiked at both the 100 and 500 μg per kg levels.

We do not yet have results for the analyses of rice by our test-kit method and by an instrumental based method, but we have been working on developing a procedure for analysis in which plasma-source mass spectrometry (ICP-MS) is used. This will provide additional information to that obtainable from the atomic fluorescence spectrometry (AFS) method we have developed for the analysis of single rice grains.

I'm very grateful to the undergraduates who worked on aspects of the project this past semester (Nick Fragola, Chloe Zhang and Alex White) and those who worked on the development and application of the AFS and ICP-MS methods (Jem Sibbick, Patrick Moquin, and Katrina Nguyen). I also thank the organizers of the "Analytical Chemistry in the Developing World" symposia at the 225th ACS National Meeting in New Orleans in March of 2018 for the invitation (and financial support) to attend and present our progress on this project [1].

Work is now suspended for the summer but will resume at the beginning of September (with Nick, Chloe and Alex), so we estimate that the validation will be completed by the end of the fall semester.

1. ANYL 271: Development of a test-kit method for the determination of arsenic in rice in Bangladesh, https://plan.core-apps.com/acsnola2018/abstract/0c0c5e88-aa86-4b26-be20-adb014bfb2f4 (accessed May 31st 2018)

For additional information or to participate in this project, please contact Julian Tyson at tyson@chem.umass.edu

Promoting the Bangladesh arsenic project in college competition

BY JOHNATHAN NEISHIWAT
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As a student representative of Chemists Without Borders, I was intrigued at the opportunity to raise awareness and funding for a worthy cause in my local community. In 2017, I had spoken to Dr. Kronquist about opportunities to promote the initiatives of Chemists Without Borders at my college. When I received an email from my college about a social entrepreneurship contest, I immediately thought of presenting the Bangladesh arsenic project. Unfortunately, many water wells in Bangladesh are contaminated with arsenic. The Bangladesh arsenic project provides clean drinking water to schools and homes throughout Bangladesh. During this two month-long competition, I practiced both my public speaking and entrepreneurial skills in order to pitch the necessity of investing in the Bangladesh arsenic project.

In the final round, speaking in front of more than a hundred people (not including the viewers on social media), I presented a slide show of the working model of the Bangladesh arsenic project. We placed third and received a donation of $250 from the Hynes Institute. At the conclusion of the competition, I was approached by a woman from Bangladesh who was appreciative of the efforts and made me personally promise her that I would continue to work on this goal of providing clean water to the people of Bangladesh. It was truly a humbling experience and I am proud to have had the opportunity to represent Chemists Without Borders.

For additional information or to participate in this project,
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