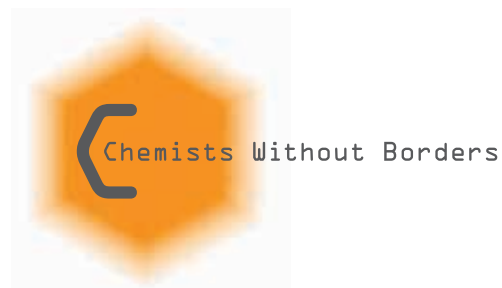


# The Chain Reaction

Humanitarian Solutions Worldwide

Newsletter 21 • September 30, 2016



## Chemists Without Borders' Contractor Finishes New Ring Well at Terail High School in Bangladesh

BY RAY KRONQUIST



Students taking water from CWB ring well at Terail High School

In the fall of 2014, four Chemists Without Borders interns visited Terail High School in Terail/Chittagong, Bangladesh and gave a presentation on the health hazards of arsenic in drinking water.

They also trained the students how to measure arsenic concentration. In the course of making these measurements, it was found that the school well was contaminated with arsenic to a concentration of 250 ppb (parts per billion) This was five times the allowed concentration in Bangladesh and twenty five times the level allowed by the World Health Organization. Thus students had been drinking contaminated water that was damaging their health.

During 2015, the Chemist Without Borders team worked to put a coalition together to replace this well at Terail High School and another well at Sitakunda High School that was also contaminated with arsenic.

We were able to get authorization for a new well from the schools, engineering support from the local Department of Public Health Engineering (DPHE), assistance in transferring funds from the Asian University for Women, and funding from two Rotary Clubs.

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### 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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Please support our work by making a generous donation [here](#). All donations are tax-deductible as permitted by law.

Rotary Club Khulshi in Chittagong funded the new ring well at Sitakunda High School, which was finished at the end of February 2016. Rotary Club Shallotte in North Carolina funded the new ring well at Teriail High School, which was finished at the end of June 2016.

The Sitakunda High School well brings clean water to about 2,500 students; the Teriail High School well supplies clean water to about 1,500 students.



Student Committee at Teriail High School with new ring well

In addition to organizing the construction of the well at Teriail High School, Chemists Without Borders Program Manager, Shahena Begum, also worked with the Student Committee at Teriail High School. She explained how the well should be maintained, thus ensuring that it will operate well into the future.

Chemists Without Borders is now planning to extend its Arsenic Education Project to twenty high schools and its well construction project to replace eight contaminated wells in the coming year. We are seeking organizations who would like to sponsor a school and fund the construction of their well. The cost is \$2,500 per well to supply clean water for over a thousand students. Interested organizations can contact: [info@chemistswithoutborders.org](mailto:info@chemistswithoutborders.org).

## A Field Trip to Nepal: Sample Collection and Analytical Analysis of Select Medicines

BY TONI L.O. BARSTIS, PH.D. AND NATALIE HARTMAN

SSFFC (substandard, spurious, falsely labeled, falsified, and counterfeit) pharmaceutical production poses a serious health threat worldwide.<sup>1,2</sup> It is projected that up to half of the medicines sold in developing countries are low in quality.<sup>3</sup> In these countries, paper analytical devices (PADs) can provide an inexpensive, rapid, and easy way to screen for low quality pharmaceuticals. In 2011, Barstis and University of Notre Dame collaborators Drs. Marya Lieberman and Patrick Flynn invented PADs for use in the field.<sup>4</sup> About the size of a business card, a PAD is a paper-based device that employs simple colorimetric chemical tests, some aimed at the functional groups of the active pharmaceutical ingredient (API) and excipients of the genuine medicine and others aimed at those of substituted APIs and fillers of counterfeit medicines.

In a benchmark study, both PADs (Figure 1) and instrumental (UPLC-MS) analyses are being used to screen the quality of select medicines in Nepal. Throughout the month of June 2016, Barstis and Hartman, along with Dr. Basant Giri and other Nepali collaborators, collected five different medicines from four different regions (Northern, Central, Southern, and Southeastern) of Nepal. Following the World Health Organization's recommendations for sampling protocol,<sup>5</sup> the researchers aimed to collect at least 30 of each medicine from each region and to carefully record information about the pharmacy, location, and manufacturing. Additionally, digital, geo-tagged pictures of each pharmacy were obtained on site. In total, nearly 600 samples were collected

for analytical analysis: 133 albendazole-400mg tablets, 113 omeprazole-20mg capsules, 120 azithromycin-500mg tablets, 104 amoxicillin/clavulante-625mg tablets, and 128 ciprofloxacin-500mg tablets.

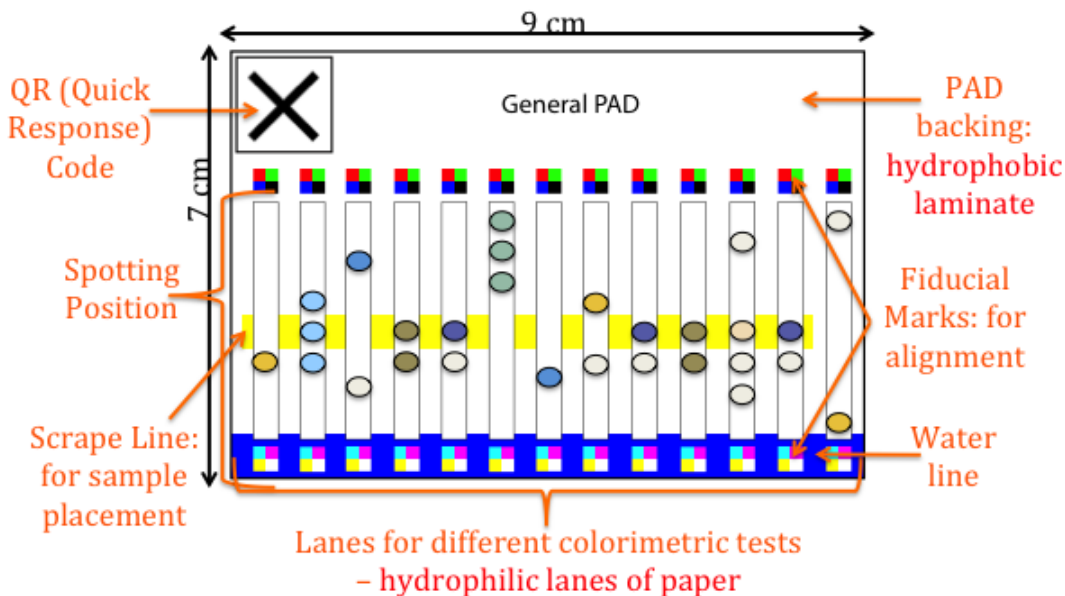


Figure 1: Anatomy of a paper analytical device (PAD)

Currently, Barstis and her U.S. collaborators are digitally storing the collected information in a relational database and analytically analyzing each pharmaceutical. Preliminary information has been collected on the albendazole, ciprofloxacin, and omeprazole samples. Agreement was shown between the PADs and UPLC-MS: both detecting the appropriate API and the lack of substituted APIs. However, quantitative UPLC-MS results show that certain brands of albendazole and ciprofloxacin medicines contain low, barely acceptable amounts of API and qualitative PADs results show that many omeprazole samples collected from the southern regions of Nepal may be degraded. Additional work needs to be completed before conclusive results are disclosed, but the authors aim to complete this analytical analysis so as to provide the first comprehensive and scientific study of the quality of select medicines in Nepal.

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# Invitation to teach Chemistry at the University of Cameroon

BY DR. ROLANDE HODEL

AIDSfreeAFRICA's vision is a thriving pharmaceutical production industry established throughout Sub-Saharan Africa. The organization's founder and president, Dr. Rolande Hodel just returned from this year's International AIDS conference that was held again in Durban, South Africa. Durban 2000 fought for access to antiretroviral drugs and the prices came tumbling down, allowing 17 million people to be on treatment today. Durban 2016 heralded the UNAIDS set 90-90-90 target for 2020 to end AIDS by 2030. (90% know their status, 90% on treatment, 90% with no detectable viral load, <http://i-base.info/htb/27174>) How does that translate into action on the ground? What can you, the reader do to reach the goal of an AIDS free world?



Dr. Hodel just signed a far reaching collaboration agreement with the Catholic University of Cameroon (CATUC). In this agreement CATUC and AIDSfreeAFRICA agree to work together to further science education, to support drug production, and drug access. CATUC will provide a safe space for Dr. Hodel to live and work. Safety has become an issue, not because of Boko Haram, but because of AIDSfreeAFRICA's experience with greedy individuals who do not shy away from creating a legal dilemma for the unsuspecting non-profit which is used as leverage when embezzlement is uncovered. AIDSfreeAFRICA is convinced that the collaboration with CATUC affords us layers of protection sufficient for us to continue our work which has been impactful and rewarding. We want to honor our donor's gifts and create lasting impact.

Today our wish is to reach the scientists and companies that can and want to help us to build teaching and quality control laboratories. We are looking for chemistry laboratory equipment such as HPLC's, GC, MS, water titration, water filters, water distillers, balances, centrifuges, autoclaves, TLC supplies and more. We are also looking for professors who would like to teach a course lasting between one week to one month.

The University is a safe campus with accommodation available. If you are at all interested, send me a message at [RRHodel@aol.com](mailto:RRHodel@aol.com)

Please read more on our web site [www.AIDSfreeAFRICA.org](http://www.AIDSfreeAFRICA.org) and join us on FB and Twitter.

## Developing an Method to Measure Arsenic in Rice in Bangladesh

BY JULIAN TYSON, DEPARTMENT OF CHEMISTRY UMASS AMHERST

Preliminary experiments have shown that the Hach EZ test kit is not suitable for the measurement of inorganic arsenic in the solution obtained when powdered rice is extracted by hot, dilute mineral acids. The problem appears to be the suppression of the reactions at the surface of the zinc powder by the starch that is also extracted. An alternative chemistry based on the use of sodium borohydride is currently under investigation and looks promising. However, the reaction of borohydride with acid is much faster than the reaction of zinc with acid, and it is necessary to find a way to slow the borohydride reaction down. Several methods, including encapsulation in a perforated gelatin capsule and adding the reagent in tablet form, are being studied. A short video and press release has been issued by UMass Amherst (<http://www.umass.edu/newsoffice/article/measuring-arsenic-bangladesh's-rice-crops>).

# Chemists Without Borders Health Education Course Begins at Agami's Burhani BSRM School in Chittagong, Bangladesh

BY RAY KRONQUIST



Shahena Begum teaches first health education class at Agami's Burhani BSRM School

On Wednesday, August 17, 2016, Chemists Without Borders' Program Manager for Bangladesh, Shahena Begum, met with students at the Burhani BSRM School in Chittagong, Bangladesh to begin a nine week course on health education. The BSRM School is a high school supported by Agami, a San Francisco Bay Area based non-profit that helps fund about 20 schools in Bangladesh.

The course will cover the following lessons:

1. Water contaminants, including arsenic and organic contaminants: How unsafe water can make us sick.
2. When We See the Doctor: a discussion of health measurements, such as blood pressure, heart rate, glucose, blood tests, X-rays, etc. How medical tests can tell us about our health.
3. Nutrition: What kinds of food keep us healthy?
4. Exercise: Why we need it to stay healthy?
5. Hygiene: How bacteria and viruses make us sick. Importance of washing hands.
6. Mental Health: Stress, Bullying, Empathy, Friendship. How our situations make us feel bad and how we can feel better again.
7. Meditation: How to relax and quiet our mind.
8. Sleep: Why it is important and how we can fall asleep more easily?
9. Conclusion: What did we learn about staying healthy?

The lessons were written in English by an international team of Chemists Without Borders volunteers and translated into Bangla by a team of Bangladesh students at the Asian University for Women in Chittagong, Bangladesh. Each lesson will consist of a presentation of the material followed by a class discussion. The class will be interactive, with students telling what lifestyle practices are followed in their homes. The students will share what they learn with their families and report back to the class on those discussions. The intention is that each student gains some insight and modifies their lifestyle in a way that improves their health. Measurements of blood pressure, heart rate and glucose level will be taken on each student, so the students can see how doctors gain information about their patients from measurements like these.

As we get feedback from the students in the current course, we will be modifying the lessons to make them appropriate for students in an Agami primary school in Dhaka in the next phase. It is our hope that this informal way of discussing health information will eventually be disseminated to schools throughout Bangladesh.