The Chain Reaction

Humanitarian Solutions Worldwide

Newsletter 20 • June 30, 2016

Chemists Without Borders Receives Award from the American Chemical Society

BY DR. RONDA GROSSE

Congratulations to Chemists Without Borders for receiving an American Chemical Society P3 Award! The purpose of the Partners for Progress and Prosperity (P3) Award is to encourage and recognize successful and exemplary partnerships. These partnerships must result in impactful outcomes that improve the public perception and appreciation for chemistry, promote career advancement opportunities, support entrepreneurship in the chemistry enterprise, advance advocacy efforts with government and thought leaders, or support STEM (science, technology, engineering, and mathematics) education or research. Chemists Without Borders is being recognized for its humanitarian work in improving water quality and science education in South Asia and Africa. We are grateful to all our volunteers and the ACS for their support and partnership! We accepted the P3 award at the Central Regional ACS meeting in Covington, Kentucky.

Sierra Leone Chemistry Education Project

BY A, BAKARR KANU

The Ongley-Myers Sierra Leone Chemistry Education Project continue to make progress. Our project goal is to develop green chemistry laboratory experiments that support introductory chemistry for high schools and first-year college courses in Sierra Leone, Africa. Sierra Leone suffered a brutal Civil War from 1991 to 2001 that devastated much of the country's infrastructure. In an effort to provide much needed educational help to Sierra Leone, Chemists Without Borders (CWB) volunteers is continuing to partner with other organizations to develop greatly-needed chemistry materials to resume science coursework and enhance student learning in Sierra Leone. The hope is to have a basic kit with lab activities ready for use in Sierra Leone by September of 2017. Currently, eleven labs have been written and the main goal of the project in 2016 will be to test labs, make modifications as appropriate and assembly kits that will be taken to Sierra Leone in 2017 when the first workshop will be conducted. The team led by Dr. A Bakarr Kanu is currently identifying and approaching several funding agencies to secure funding for this project. At the beginning of 2016, our team was successful in securing a small grant of from the American Chemical Society Global Innovation Section. This money from this grant will be used to start assembling some kits for the project. The project, however, will need a lot more funds if it is to proceed to the next stage. Our plan moving forward is to submit more proposals for funding to organizations that support international projects.

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

Chemists Without Borders is a registered 501(c)(3) with the Internal Revenue Service. EIN: 14-1984379

Support for AIDSfreeAFRICA Cameroon Lab Upgrade

BY DR. ROLANDE HODEL

Dr. Rolande Hodel has been on the board of directors of Chemists Without Borders since the organization's inception. However, Dr. Hodel spends most of her time running her own non-profit called AIDSfreeAFRICA. While both organizations view chemistry as central to worldwide technological development, AIDSfreeAFRICA focuses on establishing pharmaceutical production, increasing drug access, and providing science education in the African nation of Cameroon. AIDSfreeAFRICA is asking for your support for two important projects: to build a modern reference laboratory in Cameroon for quality control of pharmaceuticals and water and upgrading teaching laboratories.

Almost all the drugs consumed in this country are imported from abroad, since local production facilities are still unreliable. Unfortunately, drugs are too often stored and transported in conditions that allow significant degradation in quality, rendering the drugs ineffective. A large percentage of drugs is imported into Cameroon by unlicensed people who do not know how to transport and store drugs properly. The government recently has made attempts to step in and get control of drug import and distribution, but at present, this remains an uphill battle. Currently drugs of unknown origin, which lack information on the chain of custody are circulating in Cameroon. No one knows how severe and widespread the problem is, because the country lacks sufficient testing capacity.

To remedy the situation, AIDSfreeAFRICA is planning to establish a testing laboratory. We are asking you, our readers, to let us know how and from where we may get the following equipment:

HPLC(s), analytical balance, centrifuge, autoclave, water distiller, FT-IR, UV-vis, pH-meters (with pH and ion selective electrodes), and digital thermometers.

In the picture on the left, a teacher at the Catholic High School in the village of Mamfe, North West Region in Cameroon is standing in the school's teaching laboratory. In the picture on the right, Professor Rolande Hodel is teaching inorganic chemistry in a laboratory at Westchester Community College in Valhalla, NY, USA. With some help from donors like you, the lab on the left can look like the one on the right. AIDSfreeAFRICA's goal in Cameroon is to upgrade chemistry laboratories and elevate the level of teaching to make students ready for the twenty-first century.

Please contact Dr. Hodel directly to discuss how you can contribute to these efforts.

See www.AIDSfreeAFRICA.org
Contact: RRHodel@aol.com

Flint Water Crisis

BY DR. RONDA GROSSE

Chemists Without Borders, along with multiple organizations, has investigated what happened in Flint that led to the recent water crisis there. Since government agencies acknowledged the problem of Flint river sourcing without using proper corrosion controls that resulted in lead contamination in the city's water supply, work to rectify the problem has moved swiftly. In addition to providing bottled water to residents, lead testing kits, filters and replacement filter cartridges have been made available at local fire stations, schools, as well as being distributed to homes in affected areas. Chemists, the Red Cross and numerous local agencies are there to ensure water testing and purification are done correctly. The Michigan state government and U.S. federal government have now authorized large sums of funds to replace corroded pipes and repair the water system infrastructure overall. The water supply was switched back to Detroit last fall and plans are in place to source from Lake Huron via a new Great Lakes Water Authority system. For technical consultation, the city of Flint retained Professor Marc Edwards from Virginia Tech, who oversaw the studies which revealed the serious problem with Pb contamination. A number of other chemistry and medical experts are contributing and programs are being set up for ongoing monitoring and education.

Lakota Water Filter Project

BY DR. LINDA SMITH, DIRECTOR OF FILTERS FOR FAMILIES

Filters for Families is redesigning the SONO mini filter to better serve the Lakota Tribe on the Pine Ridge Reservation. Our goal is to raise $5,000 for Phase I of the project by August 2016. This will pay for several different housing units (household styles), multiple types of removal materials, water analyses, and field expenses. Water analyses will include water samples from local ground water in one district and filtered water from different units. There are ten districts on the reservation, preliminary data indicate water quality varies among the districts. The most common metal contaminates are: arsenic, bismuth, lead and uranium. However, not all these are found in all preliminary water tests. Ground water is mixed with Missouri water in areas where the Mni Wiconi and Rural Water Projects provide piped water. This project will focus on well water sources for those who do not have access to pipe water. After funding is secured, field work will begin September 2016 and analyses completed by November 2016. A report will be available by December 2016.

UMass Amherst Undergraduates work on Arsenic Projects for Chemists Without Borders

BY JULIAN TYSON, DEPARTMENT OF CHEMISTRY UMASS AMHERST

For a number of years, I have been exploring ways of expanding the opportunities for undergraduate research, a high-impact educational practice. I'm particularly interested in creating opportunities for students at early stages of their undergraduate studies. One such opportunity is a course-based research experience. This involves students taking the first or second semester of Honors General Chemistry participating in a one-credit colloquium on the basis of joining my research group and working on a project related to my interests in the environmental and analytical chemistry of arsenic. Students choose from a limited list of project topics, are assigned to groups of 2-4, including one upper-level student from an analytical chemistry class (either "Quant." or "Instrumental"). They then work on their assigned topics, during a 10-hour period that my colleague, Professor Hans Mentzen, and I make available in the analytical chemistry teaching laboratories.

Since the spring of 2014, when I first became aware of the work of Chemists Without Borders in Bangladesh, I have asked students to work on projects related to (a) the determination of arsenic by a (very) low-cost, field test-kit method, (b) the remediation of contaminated ground water by low-cost, solid-phase extractants, and, more recently, (c) the determination of arsenic in rice by a method to be implemented by student interns at the Asian University for Women in Chittagong. A common feature of these projects is that a naked-eye, colorimetric measurement is made with the EZ Arsenic test kit from the Hach Company, modified in the light of the results of the first project. In parallel, undergraduates, including a Bangladeshi student (Istiaque Rafiyu) from Chittagong, are pursuing semester-long independent studies on similar topics. We are in the process of writing the first reports on these projects. More information on the CWB-UMass arsenic projects is available at 10.11648/j.ijema.s.2015030301.16.

Low Cost Arsenic Test Kit Project

BY RANDY LOGAN AND CHRIS LIZARDI

Previously known as the Penny per Test Project, the Low Cost Arsenic Test Kit Project has the goal of manufacturing arsenic test kits for use in Bangladesh. In a country such as Bangladesh, where millions of rural citizens are at risk for drinking arsenic contaminated well waters above the WHO designated limit of 10 ppb. It is imperative that the population have access to testing procedures to ensure their drinking water is safe. The team found that the lowest cost option available to the people of Bangladesh, as well as Bangladeshi laboratories and public health departments, was to manufacture arsenic testing kits in the country. This option serves to employ Bangladeshi citizens, help purchase local raw materials at low costs, and minimize shipping costs and tariffs. The greatest benefit for this option is the empowerment of Bangladeshi citizens, employing them and giving them greater chances to protect their families with knowledge on the safety of their drinking water.

Since the last update in the March newsletter, Chemists Without Borders has worked extensively with faculty and staff at the Asian University for Women (AUW). We have been in collaboration with the dean of Biological Sciences, Prof. Andrea Phillott, and the Chemistry Lab Officer, Mr. Shawon Barua. Additionally, we have hired on two interns to work during the Spring and Summer semesters at AUW, Ms. Adity Shayontony Das, and Ms. Sumayea Shafiul. Our two interns are both second year students in the Department of Biological Sciences who have worked quickly to locate suppliers in Bangladesh and secure quotations for the materials and reagents needed to manufacture the arsenic test kits. The team is now in the process of "number crunching" to assess the economic feasibility based on local sourcing of materials, as well as securing lab space at AUW in which a pilot-scale study can be operated. Assuming positive progress on these items, the next phase of the project will be fundraising to provide the capital necessary for the pilot-scale study of the manufacturing process.

Paper Analytical Devices

BY PROF. DEANNA O'DONNELL, HAMLINE UNIVERSITY

Paper Analytical Devices (PADs) are being developed by the Lieberman group at the University of Notre Dame to identify substandard and counterfeit pharmaceuticals in the developing world, where access to sophisticated analytical instrumentation is scarce. Dr. Deanna O'Donnell (Hamline University) partnered with Dr. Marya Lieberman (Notre Dame) to develop a three week laboratory experiment using PADs to teach undergraduate students the foundations of qualitative and quantitative analysis in their analytical chemistry course. In the first week, students learn how to fabricate PADs and develop a number of color standards to positively identify different chemical components found in pharmaceutical tablets through statistical analysis. Using the same colorimetric tests in the real-world PADs, students identify active pharmaceutical ingredients (API) such as antibiotics and fever-reducing agents and common diluents such as chalk and starch. During the first week in lab, students also work in groups to make their own mystery pill that will be tested by another group to identify the diluent used and the concentration of the API ciprofloxacin. The remaining two weeks of the laboratory experiment require the students to collaboratively design an experiment to answer the research question "Can Paper Analytical Devices be used to quantify ciprofloxacin in a tablet?". The experimental design process leads to review of concepts such as concentration, statistics, calibration, limit of detection, dynamic range, chemical interferences, internal standards, solubility, limiting reagents, and acid-base chemistry. Student engagement is high during this laboratory as they see value in answering this research question because of its real-world application.

Chemists Without Borders Fall ACS Meeting Symposium and Mixer

BY DR. RONDA GROSSE

Chemists Without Borders will be hosting an all-day symposium at the Fall ACS meeting in Philadelphia, "Mobilizing Chemistry Expertise to Solve Humanitarian Problems", followed by a social hour. We have 10 excellent speakers lined up from academia, industry, government and non-profit organizations on Sunday, August 21, 2016. We will highlight efforts to apply chemistry to improve the lives of those across the globe. Presentation topics include clean water initiatives, expanding access to quality medicines, science education, and advancements in inexpensive analytical methodologies that can be readily applied in developing countries. Directly following the presentations, we will have a mixer with refreshments. This will be a great opportunity for those interested in using chemistry to help others. We look forward to fruitful discussions regarding the far-reaching benefits of these efforts and ideas toward addressing challenges associated with this type of humanitarian work. Please join us!

Distributed Pharmaceutical Analysis comes to Skidmore College

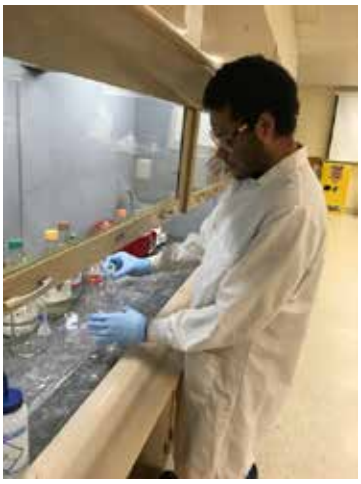
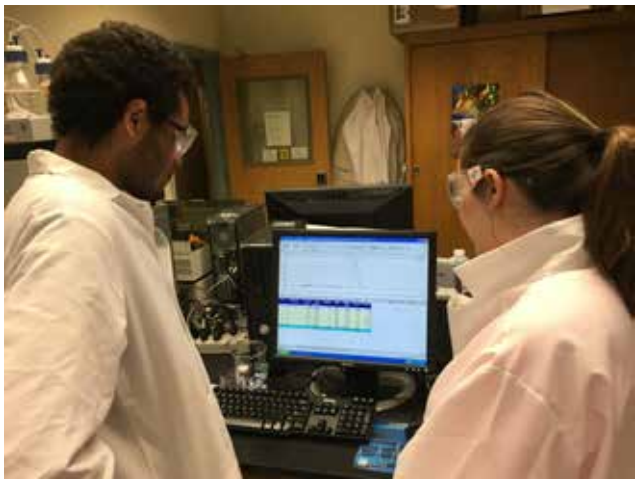
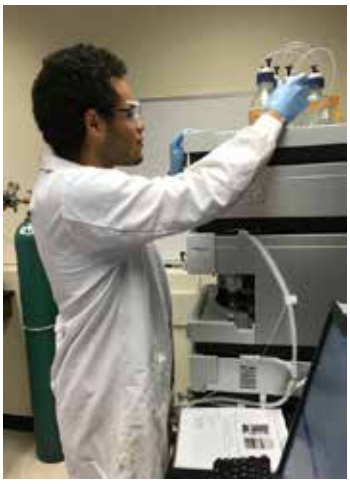
BY PROF. KIMBERLY FREDERICK, DEPARTMENT OF CHEMISTRY, SKIDMORE COLLEGE

Last August I heard Prof. Marya Lieberman from the University of Notre Dame talk about her partnership with Moi Hospital in Eldoret, Kenya involving testing of pharmaceutical samples for authenticity. Colleges were being recruited to serve as satellite analytical labs in a model Dr. Lieberman refers to as distributed pharmaceutical analysis (DPAL). My students are exclusively undergraduates who are always interested in how they can make a positive difference in the world. These analyses would not only provide a valuable service to the regulatory agency in Kenya where the pharmaceutical samples originated, but also would provide a learning platform for my students to show them that their data really mattered. I call that a win-win!

As an analytical chemist, my courses are concerned with the process of producing accurate and precise analysis results. The DPAL model utilizes a rigorous set of quality control/system suitability tests to insure that the results that are produced can reliably be submitted to back to the regulatory agencies. These include replicate analysis, spike recoveries, and establishing a control chart among others. These, coincidentally, are the same tests I want my students to be able to perform in my Analytical Chemistry course.

Prof. Lieberman and her group provided us with approximately a dozen different packets of each of two antibiotics: ciprofloxacin and amoxicillin/clavulanate along with a manual describing the various tests we needed to successfully complete before moving on to the actual samples. In order to determine the system suitability and analyze the samples, we had 5 four-hour lab periods. In hindsight, it would have been helpful to have had an additional week. Anyone else interested in implementing this project but needing to do it in a shorter period of time could perform the system suitability test themselves and then leave the analysis of the pills to the students which would make it easier to complete the project in a one or two lab periods.

As an educator, the DPAL project was absolutely perfect for what I wanted my students to learn. I also think it was a transformative experience for the students who didn't really seem to believe that their results were going to be used by the Kenyan regulatory agency. As one student said, "It was a phenomenal experience. Knowing that through chemistry I could actually help other countries was really surreal" and "The experience made me realize that academic chemistry could actually have a real impact on the world. Before this semester that fact wasn't so clear."

Pictured: Nathan Canada and Talia Stortini

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