The Chain Reaction

Humanitarian Solutions Worldwide

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Bangladesh Arsenic Project Now On The Path to the Rotary Global Grant

BY JOAN CHANG

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Chemists Without Borders has been approved to apply for a Rotary Foundation Global Grant – with thanks to Rotary Club of San Francisco West! The Bangladesh Arsenic Project presentation and grant proposal were delivered by Joan Chang in October 2017. In January 2018, Rotary Club of San Francisco West voted to accept the process for Chemists Without Borders to apply for a Rotary Foundation Global Grant, worth from $30,000 to $200,000, including fundraising and matching by Rotary Foundation. This heralds the beginning of a hopeful long-term partnership between Rotary Club of San Francisco West and Chemists Without Borders.

As shared at the presentation, this project is taking place at Teriail High School near Chittagong, Bangladesh. This model is much cheaper than a replacement of the many arsenic-contaminated wells. Instead wells will be tested for arsenic, data will be collected, a clean water source to the high school will be identified, and clean drinking water will be delivered to homes that had been using contaminated wells, based on the delivery model now being used by Drinkwell Systems.

If this model succeeds in Teriail High School District, it can be replicated throughout all 7,000 high school districts in Bangladesh and potentially save the 43,000 lives each year that are lost to arsenicosis. The Department of Public Health Engineering may also help to install new wells and current volunteers can train new volunteers to start a health education course in the schools.

The application for a Rotary Foundation Global Grant is detailed and includes setting goals and standards, performing community assessment, creating a budget, purchasing, setting a schedule, getting technical review, and fundraising which may include funds from any Rotary Club in the world. There must be a host sponsor in the community of interest who is responsible for carrying out the project, including financial management.

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

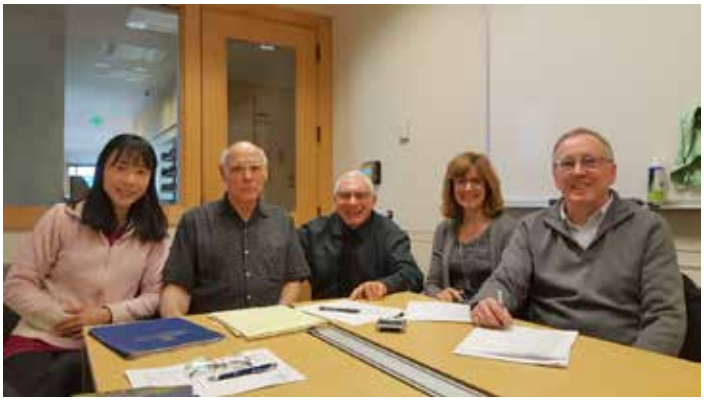
A global support network of volunteers providing mentoring, information and advice to ensure every person, everywhere, has affordable, consistent and persistent access to:

- 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

There must be an international sponsor outside the community to match funding for a minimum combined $30,000. Chemists Without Borders has identified Rotary Club Khulshi (Rotary Club of Chittagong Khulshi) as the host sponsor (see photo below), and Rotary Club of SF West as the international sponsor. Other Rotary Clubs are allowed to be involved in the project, and Rotary Club Chittagong South has also been contacted.

Members of Rotary Club of Chittagong Khulshi



Members of Chemists Without Borders with Members of Rotary Club of San Francisco West

Rotary Club of San Francisco West has been working together with Chemists Without Borders in every step of the online Global Grant application and joint meetings were held in person at the University of California, San Francisco, in December 2017, January 2018, and February 2018. Hereafter, joint meetings will be held by video-conference to accommodate participants from different locations.

Note: Rotary Club of San Francisco West belongs to Rotary District 5150, one of the highest-contributing Rotary Districts in the world. For more information about the Rotary Club of San Francisco West, please visit their website: https://www.facebook.com/RotaryClubofSFWest/

For additional information and/or to participate in this project, please contact Joan Chang at joanchang@chemistswithoutborders.org.

Cameroon's Need for Basic Laboratory Services: A Call for Action

BY ROLANDE HODEL
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AIDSfreeAFRICA's mission is to implement and advance pharmaceutical drug production in Sub-Saharan Africa. Although AIDSfreeAFRICA has been working in Cameroon since 2005, the organization has only recently decided to tackle the problems that arise because of the general lack of basic laboratory services in the African nation.

Image removed by sender.AIDSfreeAFRICA is often approached and asked to take samples of pharmaceutical drugs to the USA and test them for their composition and quality. The import of pharmaceuticals in Cameroon is largely unregulated. Much of the imported drugs are brought into the country from Nigeria by salespeople who buy and

sell drugs with little regard for the origin of the drugs. Additionally, the salespeople are not educated on how to transport or store drugs properly. We suspect that the main problem with drug quality in Cameroon is degradation due to heat and humidity rather than the counterfeit drugs. However, without the ability to quality control drugs on a large scale, it is hard to say.

Another problem is created by falling drinking water levels, which causes people to drill more wells. However, once water is found the question is: is this water suitable for consumption?

The ability to analyze drugs, water, animal feed, and soil samples is just one area that needs attention. When you factor in the additional need to enhance laboratory education in high schools and universities, it becomes apparent why we are asking our readers to respond to this article. If you would like to help in our efforts, we are looking for chemistry/biology equipment, especially for quality control work and science laboratory education. Please consult our website to see a list of equipment needed.

We are fortunate that the Cameroon government is welcoming our efforts. We are currently negotiating a contract to receive one laboratory room in a government research facility in Bamenda/Mankon. We are looking forward to finalizing the discussions, signing the contract, moving in, and getting started.

For additional information and to participate in this project, please send AIDSfreeAFRICA a message. Let them know how you would like to partner with their organization to help Cameroon!

Selection of Clean Water Source for Chemists Without Borders Bangladesh Arsenic Project

BY MALIHA BINTE MOHIUDDIN
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Twenty million people are affected by illnesses caused by arsenic poisoning, and an estimated 43,000 people die each year from arsenic-related illness in Bangladesh. Chemists Without Borders has been working in Bangladesh on the arsenic problem for about three years. We have developed a model to solve the arsenic problem that we think could be replicated nationwide in Bangladesh:

Basically, we propose to test all the wells in each high school district for arsenic and then get clean water to the high schools by providing new sources. Clean water from the high schools for drinking and cooking is delivered to all the homes that take water from the wells contaminated with arsenic.

The model is economically attractive, since it does not depend on replacing all the wells that are contaminated with arsenic, a process that would be very expensive.

The second phase of the overall project, getting clean water to the high schools, could serve as the subject for a master's thesis in the field of Disaster Management. The thesis would include the following tasks:

1. A survey of all the possible water sources in Bangladesh, listing pros and cons for each;
2. A selection of the two or three best sources for the current project for delivering water to the homes;
3. A deeper study of the best sources, gathering information on the actual installations in Bangladesh to see

what the outcomes have been, what problems have occurred, and what the risks of each are. Finally, a selection of the best choice for the current project;
4. Development of a production and installation plan with costs, time lines and project management.

Some of the possible clean water sources include the following:
5. Various water filters including the Sono arsenic filter, Alcan Enhanced Activated Alumina filter, the Activated Alumina filter made by the Bangladesh University of Engineering and Technology, and the Stevens Institute of Technology filter;
6. BRAC WASH;
7. Drinkwell's water-filtration system;
8. Deep tube wells that go down to deep aquifers (greater than 200m) that are typically not contaminated with arsenic.

The last two of these options might be the most preferable. The work of the master's thesis would be to gather the data in order to confirm or disprove that hypothesis.

The author is a Youthmappers leadership fellow at the Institute of Disaster Management and Vulnerability Studies, University of Dhaka, Bangladesh.

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Mapping Arsenic-contaminated Wells in Bangladesh

BY ANKITA SHASTRI
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Safe drinking water is a basic human need. Despite this, in many places around the world do not have access to it. In Bangladesh, arsenic in the form of arsenite and arsenate becomes mobilized by biochemical and geochemical processes in the groundwater that feeds drinking wells. Consuming high levels of arsenic can lead to arsenicosis (a highly debilitating disease), cancer, and death. Around 20 million people in Bangladesh are sstill uffering from the consequences of drinking arsenic-contaminated water.

Chemists Without Borders believes this is a problem that can and should be addressed so that no one in Bangladesh has to live with unsafe drinking water and its harrowing consequences. How can we achieve this cost-effectively?

Identifying and mapping wells with unsafe levels of arsenic is a first step in providing safe drinking water. In order to do this, a global team of Chemists Without Borders volunteers consisting of Greg in Austrailia, Shahena Begum and Paromita Basak in Chittagong, Maliha Mohiuddin in Dhaka, Brandi Revels in Switzerland, Joseph Aubertin in Canada, Ray Kronquist in California, and I in California have come together to converge on an efficient, scalable, and simple procedure to map arsenic-contaminated wells along with those that are safe to drink from. At the start, students at Teriail High School, near the city of Chittagong, go to wells in their high school district and record both the GPS-located coordinates of the well along with levels of arsenic measured in the water. GPS apps that can work offline on a smartphone, such as Maps.Me and OsmAnd, can be used here.

This information can be collected in a water quality-tracking app. Here, the quality of water from a well and its location can be marked on an online map, which will be available to everyone with access to the Internet. We

searched and tested various apps containing a well-resolved map of Bangladesh that could display landmark features for reference, store key characteristics of the water and well, and was already used by other humanitarian organizations. We found two such apps, OpenStreetMap and mWater to be promising. In addition, GPS mapping of wells is easily integrated within these apps.

Online map from mWater showing well locations that contain arsenic data.

Once we have identified all the wells in the district that are contaminated with arsenic, we will install a clean water source at the high school and provide a service to deliver enough water for drinking and cooking to the homes that use the contaminated wells. This is a very economical model, since we don't try to replace large numbers of contaminated wells. We are validating the model at Teriail High School and hope to replicate it all over Bangladesh.

For additional information and/or to participate in this project, please contact Ankita Shastri at ashastri08@gmail.com

Drought Relief / Climate Control and Reversal

BY JOSEPH AUBERTIN
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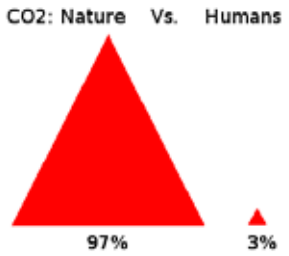
Only 3% CO_2?

The Paris Accord is trying to micro-manage Human CO_2 Emissions which only represent 3% of all CO_2 emissions. Nature (plant decay and wildfires) makes about 97% of all CO^2 emissions. Experts say: "Even if humans reduced CO_2 emissions to near zero, it would take centuries to remove the remaining CO_2 from the air and the oceans". Biochar from "emissive" biomass can be scaled up to remove more CO_2 than we dig up and burn, and even carbon from years past (historic carbon).

A Matter of Scale: How Much Carbon Must We Remove?

Humans produce 3% of all CO_2 emissions. Our daily contribution is 25 Mtonnes of carbon causing 87 Mtonnes of CO_2. To balance this amount of fossil carbon entering the atmosphere, we must bury 1 Mtonne of biochar every 50 minutes (about the size of one Great Pyramid).

Reversing Climate Change: We Attack the Other 97%



We aim to attack the other 97% of CO_2 emissions, which is mostly "biomass decay" caused by bacteria.

Decay and Wildfires

The natural decay of organic material in forests and grasslands and the action of forest fires results in the release of huge amounts of CO_2 every year. In comparison, human activities only amount to a tiny fraction of that.

Put Bacteria on a Diet

Ninety percent of CO_2 is produced by bacteria breaking down biomass to supply their energy needs. How do we stop them? The answer is to "put them on a diet" by gasifying the biomass which turns it into biological charcoal (biochar). Bacteria do not have the ability to consume charcoal, so it stays in the soil for a very long time.

Charring (not Burning) Agro-Waste

Worldwide, farmers burn wheat straw, rice straw, and corn stalks to accelerate minerals recovery, but produce CO_2 emissions, many in areas in drought.

What is Biochar?

Biochar is charcoal (biocarbon) made from biomass such as farm and forestry waste, wood chips, grasses, leaves, and even municipal solid waste. Bacteria can't consume charcoal, keeping carbon trapped in the soil for a very long time. Making biochar from biomass that would decay quickly, can avoid emissions and store huge amounts of carbon.

Biochar is an amazing agricultural amendment that can:

- hold water, resulting in 50% reduction in water use;
- retain minerals, for up to 40% reduction in fertilizer use;
- increase yields by as much as 50%;
- render semi-arid areas fertile, reclaiming land from soil erosion.

Soil from thin air

As a bonus, gasifying waste co-generates bioenergy that can be used to cook food, produce electricity, or pump water.

Drought Relief

Climate change can greatly amplify the frequency and impacts of drought. As a result, failed crops cause spikes in food prices, leading to social unrest, mass migration, and famine. As global populations increase, we will also need to farm new areas that are currently arid and desertic.

Biochar can combat desertification and soil erosion by holding water and minerals, allowing agriculture in areas increasingly affected by drought. Biochar helps plants use water more efficiently, so crops can grow with half as much water. Biochar mixed with sand dunes even extends existing arable land with new soil, especially combined with drip farming.

Food in the desert?

In short, biochar increases climate resilience and food security.

Solutions for Drought

The focus of this Chemists Without Borders project is "Solutions for Drought". As drought is one of the major effects of our changing climate, the more we use biochar to relieve it, the more naturally occurring CO_2 is removed from the atmo-

sphere.

Making biochar from biomass that would decay quickly, can avoid emissions and put huge amounts of carbon back in the ground. By preventing a small portion of natural CO_2 emissions, we can restore balance to the climate, allowing the world to continue using fossil fuels until we have time to replace them. Biochar also improves yields and allows farmers to make better use of their available water, creating a carbon negative economy that feeds the world.

Each recieved the same amount of water

Let's show the world how biochar can quickly make climate change a thing of the past, while providing agriculture the tools to feed more people with less water.

This article was originally published on [the Chimistes Sans Frontieres website](#).

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Selfish Volunteering

BY MARIA STELLA PORTELLI
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Sometimes I ask myself, but why am I doing this? Why spend hours volunteering instead of starting the TV series my colleagues were raving about at lunch or have that extra hour of sleep? Before this is confused for an attempt at humble bragging let me tell you that my answer is very much selfish!

So much so, that I am going to skip the how-good-it-is-to-help-others lecture. We have all heard that. In my opinion, volunteering is more than anything a learning experience where individuals can dare to bud new skills, while nurturing existing ones. All of this leading to self-development. This personal growth can in turn be used to find more fulfilling jobs or simply satisfy our inner drive to be better at life.

Having said all this, seeing volunteering solely for its perks, or as a duty, will ironically impair the benefits reaped at both ends. Contrastingly, I find that the purely altruistic attitude is somewhat of an illusion.

To me, volunteering should be a selflessly selfish act. Which I translate to mean: actions that will buy you happiness/expertise/opportunities are done without expecting or feeling entitled to anything in return.

What I really want to say here is that we should be more mindful. Acknowledging we are helping ourselves as much as we our helping others balances the power difference between the volunteer and (for a lack of a better word) 'those in need'.

My suggestions? Choose to volunteer with organizations that share your values and passions. This way, you can have fun and find a sense of community while consolidating your skills doing meaningful things. Your time may be limited, but with good communication and commitment amazing things can be built. Is Chemists Without Borders an organization that inspires you to contribute? If so, get in touch. We would love to have you on board!

For more information on volunteering for Chemists Without Borders, visit our website's Get Involved page.

Support Chemists Without Borders!

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You can make a donation at http://www.chemistswithoutborders.org/index.php/donate.