Preventing Cholera by Providing Clean Drinking Water

Donating PUR Packets to the Renman Orphanage in Haiti

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Summary (AR)

Cholera, a gut bacterial infection, is very common among countries that lack access to clean water and have poor sanitation standards. Haiti, the poorest country in the western hemisphere, fits right into this description. The cholera outbreak was not caused by the most recent earthquake in Haiti. However, it did exacerbate the spread of this bacteria. Homes were destroyed forcing people to live in large concentrated tent camps where cholera can spread easily. After all, it only takes a cup of contaminated water to contract the cholera infection. The infection can cause severe dehydration and can eventually lead to death. The most efficient way to reduce the spread of this infection is to prevent it, by providing clean drinking water sources.

Video Link

Clean Drinking Water in Haiti: http://www.youtube.com/watch?v=T-zw8bFvP7o
The Issue: Cholera and Water in Haiti

Introduction (AS)
Access to clean drinking water in a developed country like the United States is not something most of us worry about on a day-to-day basis. It flows from the tap, comes bottled, filtered, and we use it to shower and clean our clothes. However, according to the World Health Organization (WHO) 1.2 billion people live in places of the world where water is physically scarce. When water is unavailable people are forced to rely upon unsafe sources of drinking water and they are unable to bathe properly. Poor quality drinking water increases the risk for contracting diarrheal diseases such as cholera, typhoid fever, dysentery, and other water-borne infections. The WHO says that providing safe water and sanitation is critical in reducing the impact of cholera, but providing potable drinking water and sanitation to 1.2 billion people where water is physically scarce is an enormous challenge. A more recent public health challenge, and the focus of our Classipedia, is the outbreak of cholera in Haiti 9 months after the magnitude 7.0 earthquake hit in January 2010 and the lack of potable drinking water.


Statistics (AS)
There is currently a global water shortage occurring that will continue to be a major problem as the global population rises. However for most of us, clean drinking water is something we take for granted. It is a vital resource that we often waste or unnecessarily pay for in plastic bottles. But for roughly 1 billion people in the developing world, clean drinking water is scarce. Water scarcity is either lacking enough water or lacking access to potable water. In developing countries people often have no choice but to travel long distances to find safe and reliable sources of drinking water, consuming time and resources. This is known as economic scarcity. Physical scarcity is where there simply isn’t enough water in certain areas (The Water Project).

“On July 28, 2010 the United Nations General Assembly declared safe and clean drinking water and sanitation a human right essential to the full enjoyment of life and all other human rights.” Yet an approximate 1.5 million children die each year from diseases linked to lack of clean water and sanitation, and 2.6 billion people lack even basic sanitation (WHO 1). In addition, “unsafe water and lack of basic sanitation cause 80% of diseases and kill more people every year than all forms of violence, including war,” (charity water). Children under five years old make up 90% of the 42,000 weekly deaths due to unsafe water and unsanitary living conditions. “The UN predicts that one tenth of the global disease burden can be prevented simply by improving water supply and sanitation,” (charity water). Millennium Development Goal 7 is to ensure environmental sustainability, and it is broken down further into target 7c: halve the proportion of the population without access to safe drinking water and basic sanitation, by 2015 (UNDP). According to a U.N. MDG Report published in July of 2010, “safe water supply remains a challenge in many parts of the world,” (p. 59). Additionally, “with half the population of developing regions without sanitation, the 2015 target appears to be out of reach,” (p. 60).

If these statistics aren’t telling enough of how drastic the effects of a global water shortage are, consider those that relate drinking water to diarrheal diseases. Each year an approximate 1.8 million children die because of diarrheal diseases, and illnesses like cholera and dysentery kill
more children than HIV/AIDS or malaria combined (CSDW). Even more astounding is that Mumbai has a good supply of water, however a 2003 SoClean study found the supply to be considerably contaminated at 1600 fecal coliform (bacteria from human waste) per 100 ml of water (The Water Project 2). This is a major public health concern because one of the places the cholera bacterium is typically found is in water that’s been contaminated with feces by someone infected with cholera (CDC). While Mumbai actually has a water source, it faces other problems such as overpopulation, lack of sanitation, and slums.

Haiti, the poorest country in the Western Hemisphere with 80% of the population living below the poverty line, faces the more troublesome problem of water scarcity (CIA). In 2008 The Center for Human Rights and Global Justice published the results from a six-year study in Port-de-Paix, Haiti that concluded, “55.2% of the population has access to an improved water source, while close to 70% does not have direct access to potable water,” (CHRGJ, p. 15). Individuals also reported going to garbage-filled rivers to collect water for their household needs, including drinking (p. 36). The population expended quite a bit of time and resources into collecting water, taking trips two to three times a day that lasted 25 to 35 minutes. It should also be noted that the women and children were most likely to collect the water, thus preventing some children from going to school (p. 34-35).

“Haiti is considered a water stressed country. Total available water resources per capita are about 1,660 cubic meters and less than 1% of these are in use,” (Water.org). Properly functioning water treatment facilities for the general public are essentially non-existent in the country as well. It is this very problem of contaminated water that is the leading cause of infant mortality and illness in children in Haiti (Haiti Water). Diseases such as malaria, typhus, chronic diarrhea, and other gastrointestinal infections are caused by a contaminated water supply, and all are endemic to Haiti (Haiti Water).

On January 12, 2010 a 7.0-magnitude earthquake hit the poverty stricken and structurally vulnerable country of Haiti just 15 miles from the capital of Port-au-Prince. The quake destroyed the capital and its surrounding areas, left more than 1.5 million Haitians homeless, and killed 230,000 people (Time)(CBS News). Refugee camps were set up for more than a million people displaced by the disaster, but they were overcrowded and lacked access to sanitation and clean water, something most Haitians were familiar with (Scientific American). It is common after a disaster to see consequences such as disruption to water and sanitation systems, and the relocation of populations to unacceptable and overcrowded refugee camps having the potential to spread infectious diseases (WHO 2). These exact conditions provide a prime breeding ground for cholera, which is an acute diarrheal disease that can lead to death if untreated. Malnourished children and people with HIV have a greater risk of death if infected due to having a low immune system (WHO 2).

More than nine months after the earthquake hit Haiti, a cholera outbreak emerged and was confirmed on October 21, 2010 (Scientific American)(CDC 2). There is a misconception that this outbreak of cholera occurred as a direct result of the January earthquake, but the CDC confirmed that it is not. There haven’t been outbreaks of epidemic cholera in Haiti since the mid-nineteenth century (CDC 2). Additionally, the outbreak began in the areas of Artibonite and Plateau Central, north of the capital, and not in the area of the earthquake (Scientific American). Typically,
cholera is commonly found in India and sub-Saharan Africa (CDC 3).

Efforts to treat those infected and to contain the outbreak from spreading began immediately. U.S. Ambassador Kenneth Merten issued a disaster declaration in light of the outbreak on October 22 and on October 26, USAID deployed a Disaster Assistance Response Team to coordinate USAID Office of Foreign Disaster Assistance emergency response efforts (relief web). USAID/OFDA’s plan had four components: providing chlorine to increase the amount of safe drinking water, providing sachets of oral rehydration salts and medical supplies, expanding national education outreach regarding hygiene, and increasing the number of cholera treatment facilities (relief web). The WHO’s Region for the Americas (PAHO) had stocks of antibiotics, IV fluids, and medical supplies. PAHO also provided powdered chlorine for water purification, tested water that was distributed to the camps, and provided clean water to hospitals (WHO 3). However, the epidemic quickly spread to the capital and claimed 1,186 lives in the first month since the outbreak was declared (CNN). Angry Haitians accused U.N. soldiers of bringing the disease over with them from Nepal, but tests on water and fecal samples from the Nepalese military camp conducted by the U.N., Haiti’s government, and private organizations all came back negative for cholera. CDC researchers say they are currently unable to identify exactly the strain of cholera that arrived in Haiti (CNN).

The problem with the cholera epidemic in Haiti was that the relief efforts were, and still are, severely underfunded (Voice of America). The U.N. says cholera cases are starting to slowly decline but the emergency is far from over. The Haitian government reported more than 231,000 cholera cases and more than 4,500 deaths since the outbreak. It is projected that the disease is likely to exist in Haiti for months and years to come now that it is present. The U.N. says they have received only $80 million of the $175 million they need to carry out life saving programs in Haiti. Initially the mortality rate was as high as 9%, and it is now down to 2%, (Voice of America).

The Water Project 1 - http://thewaterproject.org/water_scarcity.asp
Charity water - http://www.charitywater.org/whywater/
CSDW - http://www.csdw.org/csdw/the_facts.shtml
The Water Project 2 - http://thewaterproject.org/water_scarcity_and_sanitation.asp
CDC 1- http://www.cdc.gov/cholera/general/
Time - http://www.time.com/time/specials/packages/article/0,28804,1953379_1953494_1955284,00.html
Bacteria and Contamination (AR)

The risk for contracting cholera is relatively low in very developed countries like the U.S. due to our high standards of sanitation (in most parts). However, in underdeveloped countries like Haiti, it becomes increasingly more difficult to keep the contamination at bay, thus raising the risk of infection. According to an informational article about cholera, Vibrio Cholera, the cholera infection is caused by the bacterium *Vibrio cholerae*. It’s an infection of the small intestines caused by ingestion of water or food contaminated with the bacterium (eMEDtv). Bacteria making a living in the small intestines tends to bring a slew of gastrointestinal track issues. However, the bacteria itself has certain characteristics that escalates its pathological abilities.

The bacteria is part of the gram positive family (eMEDtv), which means they have a tough outer peptidoglycan layer. This layer of proteins makes them that much more tougher to kill or to penetrate. This, of course, is something that scientist and health care providers must keep in mind when finding a way to treat an infected person or when creating medicine to kill off these bacteria. This tough resistant outer layer also accounts for the bacterium's resilience in the outside world. Their resistance to environment and other factors, allows them to strive in pools of water and food. Furthermore, the bacteria is a facultative anaerobic (eMEDtv), meaning it can survive with or without oxygen. Adding even more to its resistance to the environment.

The bacterium is in the *Vibrio* genus, meaning they have a curved rod shape and contain a flagellum for movement. They utilize their flagellum to move about in the human body. Once inside, they attempt to travel to the small intestines, where they will set up camp and do what they were built for-reproduction, however, in their case they multiply (eMEDtv). It is important to note that in order for this bacteria (and many infectious bacteria like it) to become a problem there needs to be a population of more than one million in the contaminated water one is drinking (MayoClinic staff). This directs the fact that infection is almost entirely dependent on the contamination level of what you take in. One million is typically how much you would find in a cup of water, so it is definitely not impossible to get infected by drinking just one cup of contaminated water.

Once a good amount have cultured in the small intestines, they begin to “produce and release harsh toxins” (eMEDtv), which is the main cause of one of its symptoms, watery diarrhea. The loss of large amounts of fluids in a short period of time, leads to dehydration after continuous
affects. Lin states that some patients have been known to lose “as much as one liter of fluids an hour” (Cholera in Haiti has spread...). Other symptoms include but not limited to: vomiting and nausea, muscle cramps (due to loss of salts and other important/essential minerals, for example, sodium and potassium). Another serious and very fatal symptom would be hypovolemic shock. This occurs after the effects of dehydration. According to the Mayoclinic staff, when “low blood volume causes a drop in blood pressure and a corresponding reduction of oxygen reaching your tissues”. This usually is a fatal condition and it’s one of the biggest killers due to the intake of this bacteria.

Issues Involved with Contamination, Bathrooms, Sanitation and Prevention (AR)

There are many ways to contract cholera. These ways include: the intake of undercooked contaminated food (seafood), spreading through food preparation due to failure of washing one’s hands. However, the most common source of cholera infection is contaminated drinking water, (Mayoclinic staff). Moreover, because these bacteria are resistant to many factors, they persist very long periods of time in stagnant water (lakes, latrines and drinking water sources). Therefore, complications occur when latrines and sources of drinking water are in close proximity of each other; spreading to drinking water. According to the CDC (Center for Disease Control), “in the epidemic (in Haiti), the source of the contamination is usually the feces of an infected person that contaminated the food and/or water.” Cholera is an intestinal infection, so fecal contamination is very likely. Also, since water treatment facilities are almost non-existent contamination of this method becomes a common occurrence.

Although it was not likely that the spread of cholera in Haiti was due to the major earthquake, it was still a major factor in its development and spread. According to Bupa, “Cholera is also common in circumstances where people can’t get access to clean water or sanitation is poor - for example, after a natural disaster or in a war zone”. As mentioned, the natural disaster that was the earthquake could have proliferated the spread of this infection. The quake did destroy much of the main city, and with that created a thriving zone for the bacteria to spread. The country was deprived of their own mechanisms for development. People were in close proximity, bathrooms were lacking and water was sparse.

There are countless ways to prevent cholera. Including: washing your hands before preparing food and after using the bathroom, avoid food that has not been completely or thoroughly cooked (this can apply in any country, not just Haiti). However, probably the most important is to watch what you are drinking. The Mayoclinic suggest, “drink only bottled water or water you've boiled or disinfected yourself.” Because water is so essential to life, it is difficult to constantly keep watch of what goes into your body. Moreover, when you add places like Haiti into the equation, where food and water is already difficult to come by, cleanliness is not top priority to most people. This is where foreign help comes into play. It is up to volunteers to help them. To provide them with clean drinking water, or even better to provide them with a way to purify the water they already have.

2010 Haiti Cholera Outbreak, CDC- http://www.cdc.gov/haiticholera/cholera_qa.htm
Cholera Information, BUPA- http://www.bupa.co.uk/individuals/health-
Cholera in Haiti has spread to every part of the country, CDC reports by Rong-Gong Lin in the LATIMES-http://www.latimes.com/health/boostershots/la-heb-cholera-haiti-20101208,0,4182902.story

Solutions to provide clean drinking water, thus reducing the spread of cholera (CK, KM)

Bleach In Water (KM)
A solution to cleaning water and preventing the spread of cholera is adding household bleach into contaminated water. Just 8 drops of household bleach to one gallon of water or 2 drops of bleach to one liter of water will clean water making it safe and most importantly Cholera free. Stir the water with a clean utensil and wait 30 minutes before using (1). This technique is used when chlorine treatment formulas are not available. The disadvantage to using this technique is measuring the correct amount of bleach per liter or per gallon of water. Most bottles of bleach do not have a dropper to measure out the bleach. The smaller bottles of bleach may have a cap that dispenses the bleach in droplets. But, many people do not have the instrument such as a dropper to know how much to put into the water (2). It is important to check the strength of the bleach as well. Most household bleach contains about 3.5% to 5% of chlorine (3). If the strength is more or less than 3.5% to 5%, then the amount of bleach must be adjusted. Also, if one wanted to make safe water for more than a liter or gallon at a time, then the ratio again must be adjusted. Here in the United States, bleach costs approximately $2.00 for a large 3 quart bottle. In Haiti, bleach may not be easily accessible and costs may vary. However, a 3 quart bottle of bleach will be able to clean many liters or gallons of water. Bleach’s shelf life is about 6 months so if one does decide to add bleach into water to clean and kill cholera bacteria, it can be a good investment (2). Bleach will not only clean water but it can clean surfaces of kitchens and food preparation areas and containers to hold safe water. To clean containers for safe water storage, bleach is one of the best ways to kill all germs. The CDC has listed steps to clean containers with bleach and are as followed: 1. with soap and safe water, wash and rinse the container. 2. Clean and disinfect the container by diluting 1 part household bleach with 100 parts of water in the container. 3. Cover the container shake well and release some water out of the tap to clean the inside of the tap if the container contains a tap. 4. After at least 30 seconds, pour the mixture out of the container. 5. Allow the container to air dry and make sure the container is completely dry before adding safe water into the container (4). Bleach’s multiple uses can greatly help keep the areas clean and reduce the risk of contracting cholera.

2. http://www.iwawaterwiki.org/xwiki/bin/view/Articles/The+Jolivert+Safe+Water+for+Families+Project+in+Rural+Hait

PUR packets (CK)
P&G and the Center of Disease Control combined their efforts in finding a possible solution to the global contaminated water crisis in underdeveloped countries. What they came up with is something called PUR packets. These PUR packets contain technologies and treatment that
developed countries use in their own municipal waters. It is a combination of treatments that come in the form of powder in a packet, and to use this treatment it involves a few steps. First, one PUR packet is poured into ten liters of the local contaminated water. After the packet is added, stir for five minutes and then allow the FLOC to settle for five minutes. FLOC is the large particles that form due to the packet contents combining with the contaminants in the water. The contents of the packet help the contaminated particles to aggregate, which allow the contaminants to clump together and therefore sink to the bottom. This FLOC settles to the bottom of the container which allows the water that is clean on top to be poured out easily. A clean empty container is set up with a clean cloth securely tied in the opening to act as a filter. Now the near-pure water is poured through this filter into the second container, leaving the FLOC in the first container. The contaminants and the rest of the contaminated water that is left over from the first container are then disposed in latrines, and not dumped back into the water sources. This is an important step, so that continual contamination of water supplies is prevented. The near-clean water that is now in the second container is left to sit for another twenty minutes, to allow through cleaning from the PUR packet. After this time the water is ready to drink. Some may have concerns with the timing in this system, because not every area or village has the luxury of owning clocks or watches. This may prove to be an obstacle in doing each step for the correct amount of time to get clean water. The solution for this obstacle that P&G and the CDC came up with, is to compare the time to the cleaning water processes with the amount of time it takes to cook a local food. An example that is given is that for the twenty minute time period in the process, the program suggests to cook a green banana. A green banana takes about twenty minutes to cook, the equivalent time needed for this step. When the green banana is ready, so will be the water!

These packets considerably improve the quality of the drinking water and are very effective in removing disease causing organisms. PUR packets are 99.9999% effective in removing disease causing protozoa, intestinal viruses, and intestinal bacteria, including cholera in contaminated water. PUR packets have been proven to remove dirt, pollutants, and have the ability to decrease the world’s underdeveloped countries diarrheal disease by 90%. P&G and the CDC try to distribute these packets around the world through volunteers and not-for-profit organizations. These two work together to make the PUR packets cost as little as possible so they can distribute it as much as possible. PUR even pledges a contribution to this cause for every PUR filtration product that is bought on the market. Each packet runs about ten cents each, $7.50 to give a child clean drinking water for a year, and $30.00 to give a family clean drinking water for a year. This is a low cost and effective way to reduce diseases and save lives. This way to clean water is also cost effective because the packets are very little in size and weight, and are easily shipped, much easier than shipping bottled water or other larger and heavier products. The World Health Organization considers the PUR packets to be an effective technology to clean contaminated water.


Boiling Water (CK)
Boiling water at very high temperatures is very effective in killing pathogens. The water must be boiled at very high temperatures, within a certain amount of time for this method to be effective. Within thirty minutes the water must reach a temperature of 160 degrees Fahrenheit, or at 185
degrees Fahrenheit within a few minutes. It is suggested to let the water boil at least an extra minute to be sure that all the pathogens are killed. The same temperatures may be used if the water is being boiled at high altitudes, however if this is the case just allow the water to be at the high temperature for a few extra minutes (1). When this process is done, the flavor of the water can be improved by pouring the water into another clean container, and then back into the original clean container. Boiling water lets air escape from the water, and repeating this step, air is added back into the water allowing for a more satisfying taste. Boiling water in this way can kill microorganisms and pathogens; however it does not remove all contaminants such as heavy metals, salts, among other substances. If suspended substances fall out of the water, boiling may not be the only step needed to purify the water (2).


Clay cone with colloid silver lining (CK)
Clay pots may be used to help filter water in underdeveloped countries as well. This interesting idea to help filter water started off in an average Pot Shop that ended up being North America’s first clay water filter producer (1). At this shop, one if its main goals is to produce clay pots that can filter contaminants out of water. Along with this shop there is an organization called Potters for Peace that also aids in the cause to get clean drinking water with clay pots. The way in which these clay filtering pots are made, are that first clay and sawdust are mixed together. Then this mixture is molded into a cone shape and then fired at 1,700 degrees Fahrenheit in a kiln. In this high temperature, the sawdust burns away which leaves the cone pot to have very tiny pores, which is great for filtering. The cone is then lined with colloidal silver that has the ability to kill disease causing microorganisms. With this combination of materials and structure of the clay pot, the water can be screened and decontaminated. An interesting way to get these pots to the desired destination is to make the pots at the actual site that needs the filtering cones. This can be accomplished by using the local clay in the cone-making recipe (1). It could be a great idea if organizations like the Potters for Peace did something like this: go to the effected contaminated water area, make clay pots from local clay and sawdust, and then apply the colloid all at the disaster/needed site. In this way perhaps it would cut some shipping fees and perhaps this skill of making these pots can be taught to the locals who live there. If this skill and product is taught to locals on how to both use and make it, it will eventually allow the locals to have their own systematic way to get clean water when it is scarce. This is a new and innovative way in which to cleanse water, and perhaps it can be fine tuned to make it a tool that locals can make and use themselves rendering them self sufficient and self reliant in getting clean water.


Cholera Education (KM)
Educating people of cholera and how it spreads is the best way to keep cholera from spreading. Prevention is the best technique to reduce the number of people contracting Cholera. The CDC, Center for Disease Control and Prevention, created an 80 page packet and has distributed it out to special leaders they call community health workers of different communities of Haiti that educate them on cholera, how to identify if an individual has cholera, what it does to the body, ways to prevent it, and ways to treat it if an individual has it. This packet can be seen here online.
The CDC knows educating the people of Haiti can greatly reduce the amount of cholera stricken individuals, thus reducing the amount of deaths. The CDC would like a community leader who is knowledgeable about cholera and one who knows what to do to help the sick. The CDC has put explaining about cholera and other important facts about prevention in terms everyone can understand. Their definition of Cholera is not in biological terms. They are straight and to the point. They explain it with the symptoms so that people can look for these types of things and start treatment as soon as possible. “Swallowing cholera germs picked up from surfaces or objects that contain feces from a person sick with cholera. Cholera is a disease that causes watery diarrhea that can look like cloudy rice water. Watery diarrhea causes rapid loss of water and salts from the body (dehydration). Loss of water and salts can lead to death within hours if not treated” (1).

The CDC explains ways in which cholera can be prevented. These techniques are ways to prevent the cholera bacteria from entering another bodily system without the need of medical attention such as a shot. All these preventions are done at the home and within the community. The CDC emphasizes so much on using and drinking safe water. Cholera is spread by contaminated water so if people learn to use safe water, the number people with this deadly illness will decrease. Safe water is water that has been treated with an approved chlorine formula, boiled water, and bottled water that has been unopened. Water coming through pipes may not always be clean so therefore the CDC insists on taking the extra precaution and treating it with chlorine or boiling it before using. It is important to wash hands often with soap and safe water. It not only kills cholera germs but many other disease spreading germs as well. It is advised to wash hands frequently especially before and after preparing and eating food, after going to the latrine, after cleaning up a baby’s diaper, and after coming in contact with a person who has cholera (1). Food can also be contaminated with the cholera bacteria. To prevent cholera coming into the body through food, everyone must cook food thoroughly. Seafood is very important to cook thoroughly because seafood lives in water and the water may be contaminated with cholera. Therefore, it is important to be cautious in preparing and cooking food. It is advised to eat it while it is still hot. Fruits and vegetables should be peeled before eaten. The skin of the fruit or vegetable is the part most exposed to the cholera bacteria therefore, one must peel it off. It is important to use latrines instead of defecating in bodies of water. Defecating in bodies of water spreads the cholera bacteria and begins the cholera life cycle again. If there is no latrine within the community, it is important to defecate and bury it at least 30 meters away from any body of water. This is important especially when the rains come. Defecating close to the water may cause the rains to wash the feces into the body of water and then cause the cholera cycle to start all over again. Lastly, the CDC suggests all families to keep places such as the kitchen, bathing area, and washing area clean. If possible, clean counter tops with soap and safe water or diluted bleach. Wash utensils and dishware with safe water and soap and store them in a safe place away from contaminated water. When washing clothes, it is best to use safe water to prevent any contact with the bacteria (1).

In this packet, the CDC describes the ways in which different water treatments are used. They list the steps and directions on how to use different types of water cleansers as bleach in water, Dlo Lavi, Aqua Tabs, and Pur packets. The CDC wants community health workers, workers who know certain specifications and aspects of cholera to know how each of these techniques is used. It is very important for the Community Health Workers to know the measurements for all the
water purifying techniques for the safety of the community. The Community Health Workers must also know about how to store the safe water. The CHW are required to know what containers are best used for storing safe water. Containers with lids and a tap or small opening is best to prevent contaminated hands, cups, utensils, or other objects from coming in contact with the water (1).

All in all, the CDC believes that educating the people of Haiti of the preventions of cholera is the best defense to this illness. Cholera vaccines are not effective during this outbreak (1). Preventative measures are the best ways to keep cholera from affecting those within a community.


Aquatabs (CK)
Aquatabs are used to purify water and are used in a wide variety of situations. They are used for emergency situations, in peacekeeping and defense forces, the marines, army, camping, traveling, household use, and various other ways (1). Aquatabs can be used regularly by people who do not have a clean supply of water as well. The way Aquatab works is that it is simply added to contaminated water and it dissolves within the prescribed water proportions. Thirty minutes is needed to allow the tablets to work properly, and the result of this will disinfect and purify the water. It has the ability to kill microorganisms and prevent diseases such as dysentery, cholera, and typhoid (1). Major pathogens will be killed when using this, and some examples include but are not limited to: “E.coli 0157, AIDS/HIV, MRSA, GRSA, Anthrax, Salmonella, Tuberculosis, Campylobacter, Enterococcus, Listeria monocytogenes, Pasteurella multicauda, Pseudomonas mirabilis, Shigella sp, Staphylococcus aureus, Vibrio cholerae, Bacillus cereus, Bird Flu, Polio Myelitis and Rota Virus” (1). It is a safer alternative of obtaining clean water when compared to the bleach method. A major ingredient that Aquatabs have that aid it in obtaining clean water is NaDCC (Sodium Dichloroisocyanurate), and it has been approved by the US EPA (1).

Aquatabs can come in different sizes to allow use for different situations and is very cost effective. Tabs can vary in size, and each size-amount cleans the corresponding amount of water. These different size Aquatabs allow all different amounts of water to be cleaned for the appropriate situations that are at hand. For example a 8.5 miligram tablet can purify one liter of water, while one granule will purify over one thousand liters of water (1). Because of the various option sizes of Aquatabs, this product can be adapted to different situations which leads to its widespread use, so much that thirteen million people use the tabs daily. It is used by many government agencies and disaster sites, and is commonly used in emergency situations. There are about 20,000 Aquatabs always in reserve to be better prepared for disaster emergencies, such as earthquakes that ruin water supplies. The shelf life for Aquatabs is about three to five years, so once it is brought to an area where disasters have occurred, they can be stored and used for long amounts of time. Aquatab is also cost effective because it is even cheaper than boiling water. The rational for this is that the cost for the amount of fuel to bring water to a boil to clean the same amount of water that an Aquatab can clean, would be overall more expensive (1). Aquatabs are therefore cost effective and adaptable to different situations.
**Dlo Lavi (KM)**
Dlo Lavi is a liquid chlorine formula that is used to clean water and make free of the cholera germ and it safe to drink. It was created in Haiti and is fairly easy to use. When used properly and with the correct amounts, cholera germs will be killed making the water safe and clean to drink and use. Dlo Lavi is liquid chlorine formula that comes in little bottles. The Dlo Lavi cap is the exact measurement that must be used to clean water. One capful can clean twenty liters of water. If the water is murky and unclear, two capfuls of Dlo Lavi will clean 20 liters of water to make it clear, clean, and safe. It is important to thoroughly mix the Dlo Lavi into the water and wait 30 minutes before using. If possible, it is important to cover the container filled with water if there is one available to keep from becoming contaminated (1). The Population Services International, PSI, distributes Dlo Lavi throughout Haiti. It is easy to use and just a small capful can clean 20 liters of water. The whole bottle can treat 30, 5 gallon buckets (2). 30 times 5 gallons equals 150 gallons of water or about 568 liters of water one 4 ounce bottle of Dlo Lavi treats. This is best especially for families. They would be able to share the water, use the water for drinking, bathing, cleaning, and cooking. The water can be used for about a month but it is advised to use as quickly as possible so the water will not become contaminated. Dlo Lavi’s shelf life is about 18 months, per family it costs about $8.03 and per bottle it costs $0.63 (2). All in all, Dlo Lavi is quite easy to use and cleans 20 liters of water for just one capful. It is important to use the proper amounts of Dlo Lavi for the amount of water one has. Dlo Lavi is used to treat a large amount of water that could be stored and used throughout the week. It is best to have a container with a lid and tap to keep it cholera free.

2. [http://www.iwawaterwiki.org/xwiki/bin/view/Articles/The+Jolivert+Safe+Water+for+Families+Project+in+Rural+Haiti](http://www.iwawaterwiki.org/xwiki/bin/view/Articles/The+Jolivert+Safe+Water+for+Families+Project+in+Rural+Haiti)

**Lifestraw (CK)**
Lifestraw is a filtering device for water that is portable. It acts as a straw: one end can be placed in a water source while the other end of the straw is sucked. By the time the water enters the straw and then enters the mouth, the water will be filtered and clean to drink (1).

“What first meets the water when sucked up is a pre-filter of PE filter textile with a mesh opening of 100 micron, shortly followed by a second textile filter in polyester with a mesh opening of 15 micron. In this way all big particles are filtered out, even clusters of bacteria are removed. Then the water is led into a chamber of iodine impregnated beads, where bacteria, viruses and parasites are killed. The second chamber is a void space, where the iodine being washed off the beads can maintain their killing effect. The last chamber consists of granulated active carbon, which role is to take the main part of the bad smell of iodine, and to take the parasites that have not been taken by the pre-filter or killed by the iodine. The biggest parasites will be taken by the pre-filter, the weakest will be killed by the iodine, and the medium range parasites will be picked up by the active carbon.” (2).

This straw removes 99.999% of all waterborne diseases that may cause diarrheal effects such as *Vibrio cholerae*, *Escherichia coli*, *Entamoeba histolytica*, *Campylobacter*, *Pseudomonas*
*aeruginosa, and Giardia lamblia* among others. The straw also has iodine lined in the filters that eliminate some viruses and parasites (2). Children three years and older may use this straw effectively (1).

There are two types of Lifestraws: personal Lifestraw and Lifestraw family. Personal Lifestraws are individual straws and can allow purification of water for one person for one year. Lifestraw family is the same as personal Lifestraw except in just one way. Lifestraw family can purify larger amounts of water at a time, therefore allowing more people to get clean water at once. Lifestraws may cost around $3.50, and although the cost for each one may be higher than some of the other water purification systems, it’s technology and use is ground breaking (3).

1) [http://www.vestergaard-frandsen.com/lifestraw/lifestraw/131-how-can-i-donate-lifestraw](http://www.vestergaard-frandsen.com/lifestraw/lifestraw/131-how-can-i-donate-lifestraw)

**Oral Rehydration Therapy (KM)**

Oral rehydration therapy, ORT, is an at home way to prevent dehydration caused by Cholera. Using oral rehydration salts at the onset of diarrhea will help prevent an individual from suffering from dehydration. Cholera is deadly and can kill healthy individuals in a matter of hours due to dehydration. Using oral rehydration salts in safe, clean water helps keep the body hydrated while waiting for a health professional to give the proper care and treatment for cholera. Oral rehydration salts, ORS, is a sugar-salt solution that is comprised of different essential compounds the body needs such as: Sodium Chloride, Sodium Bicarbonate, Potassium Chloride, and Glucose (1). “The glucose contained in ORS solution enables the intestine to absorb the fluid and the salts more efficiently” (2). Oral rehydration salts come in packets and are distributed by UNICEF, and the World Health Organization. To make the solution, one will add one packet of the oral rehydration salts to one liter of safe, clean water. Mix thoroughly and give the solution to the individual in small but frequent amounts. It is also important to give the solution to the individual regularly until he or she is able to meet with a health professional. It is best to give the solution to the individual after every watery stool. This will keep the body hydrated which is very important for all vital organs. If the ORS packets are not available, one can just make their solution at home. Mixing a leveled half a teaspoon of salt and six leveled teaspoons of sugar together into one liter of safe, clean water will also have the same effects as the ORS packets. It is extremely important to mix the proper amounts when making this solution at home. Having too much sugar in the solution will make diarrhea worse. Too much salt can be very harmful for the individual. No damage is done if the solution is a little diluted (3). Giving the sick individual lightly salted rice water is also an alternative to help keep the body hydrated as well (4). It is important that the individual drinks this solution and also, safe, clean water while eating a proper diet. One does not need a health professional to mix the solution. Any adult will be able to mix this solution as long as they follow directions. The World Health Organization states that oral rehydration salts are effective if used at the onset of acute diarrhea. 80% of mild to moderate cases of cholera can be successfully treated with just oral rehydration salts. The other 20% suffering with a severe case of cholera need to be seen by a health professional and get more advanced treatment (4). Using oral rehydration salts will greatly help the body from being dehydrated during their ailment. It is important to give the solution in small and frequent amounts at the onset of diarrhea. This oral rehydration therapy can help save the lives of adults.
and children.

1. http://rehydrate.org/ors/ort-how-it-works.htm

Building A Well (CK)
Building a well in third world countries can be beneficial in supplying clean water for communities. Wells are deep holes made into the earth that have a system of pipes and screens that allow it to collect water from deep in the Earth (1). The screens that are apart of the well system are in place to filter out the dirt and other particles that could back up the system. Well systems collect water deep in the ground, which allows the water to be free of contaminates that the other near by water supplies may be exposed to. Having a cap or valve system on the well will help avoid outside contamination of water so that the water will stay clean. When the well is made there are certain precautions that the community receiving the well must know, such as not to dump toxins in this area so the water will remain clean (1). If rules are adhered to, this well will be free of organisms and contaminants, and can provide a close, clean water supply for the community.

Wells provide a clean water supply that is safe to drink when constructed correctly. There are many forms of wells that vary in shape, size, and construction. Wells should not be made by anyone, but rather by professionals that know what they are doing to ensure that the well is made correctly to provide clean water as expected (1). The process of building a well can take a long time, however it will change a community for the better. To build a well such as this in a third world country could run at a high cost. There are many organizations that help out in building wells in disadvantaged areas in the world. One of the many organizations that support this cause is the Charity Water organization, and they estimate that each water well will cost around $5,000 to $20,000 dollars depending on whether the well is built for a community, school, or hospital (2). Anyone can donate any amount they want to an organization such as this, or even start a group to try to raise money to donate the cost of a whole well. A group at Rutgers University is funding a well, and Rutgers affiliates should be proud that members of their University will be helping out a whole community and changing their lives forever for the better.


Summary of Solutions (AS)
All of the proposed solutions above will effectively provide clean, cholera free water for the people of Haiti, but each also has certain limitations and drawbacks. For example, treating contaminated water with bleach would not be an effective means of treatment for an impoverished group of people that have neither the tools to measure the proper quantity of water nor the drops of bleach. Lifestraws, though very innovative, are too expensive because they can only be purchased in bulk and would need to be replaced every year. An education campaign is excellent in the long run but this is something that has already been implemented in Haiti. Building a well is the largest investment of money but will provide an entire community with
clean water and is a long term solution. We did not see this as a feasible option due to the large amount of money we would need to raise in such a short time period. Boiling water would not be a suitable method in Haiti due to the poverty, destruction, and tent camps. Plus, heavy metal contaminants still remain in the water, as the solution above described. With the clay pots it doesn’t seem like they could be supplied fast enough to satisfy the great demand for clean water in Haiti. We believe the PUR Packets are the best solution to the crisis in Haiti because they are simple to use and economical. They were created specifically for use in underdeveloped countries so factors like not owning a clock for the timing process have been taken into account. These packets are readily available and an excellent way to provide the people of Haiti with clean, safe water until more temporary sources are established.

The Service Project: Helping in Haiti

Our issue revolves around the problem of clean drinking water in Haiti. After the recent earthquake, clean drinking water has become even more scarce than before. Due to the destruction, people in parts of Haiti were forced to live in “temporary” tent villages, where thousands were crammed into a relatively small space with limited bathrooms. These “temporary” villages still exist as Haiti is at a standstill and unable to rebuild. The lack of clean drinking water in this already impoverished country proved to be key limiting factor in controlling the spread of cholera. As of February 17, 2011, the overall cholera caseload in Haiti was 241,360 with 4,573 deaths (1). This gut bacterial infection has been thriving in many parts of the country and will likely remain present there for many years (1). The World Health Organization says that providing clean drinking water is critical in reducing the outbreak of this disease. And, that is exactly what our service project is about. We aim to help those in Haiti who are still in need of clean drinking water and in the process do our part in lessening the impact of this epidemic on a country that has suffered enough.

We began by researching what we could possibly donate to achieve this goal. Through our research we found many great ideas including: LifeStraws (portable filtering system), Dlo Lavi (liquid chlorine formula), Aquatabs (disinfects and purifies water) and Pur Packets (disinfects and purifies water). We decided to focus our attention on the Pur Packets for their ease of use, availability and cost effectiveness. Two of us ordered 1 Pur package each. Each package contains 3 PUR Packets, 2 collapsible water containers and a cloth for filtering. The second step was to find a foundation where we could send this package to. Through our many efforts to contact groups who are willing to accept our donations and through the help of Professor Fagan, we found a recipient for our donation. We contacted Reverend Michel J. Pugin through email and he replied with open arms. He is in part with Renmen, a foundation working with an orphanage in Haiti. Renmen is a non-profit organization located in La Plaine du Cul de Sac, a city North of Port-au-Prince. They work with minority youth and families by providing financial support, education, food, clothing, and counseling (2). We hope that these PUR packages will bring a smile to those children of Haiti and that they enjoy their safe and clean drinking water.

Editorials

Angel Reyes
Is your water clean? Is it clean in Haiti?

One of the most common things we take for granted in America is the importance of clean water. Poor quality water can increase the risk of contracting diarrheal diseases such as cholera and dysentery. As many are well aware of, a 7.0 magnitude earthquake recently hit Haiti last early last year. The impact devastated thousands of poor neighborhoods, including the country’s capital Port-au-Prince. Millions of people go without clean drinking water for most of their lives, however, Haiti is already a poor country and clean water has been difficult to come by even before the earthquake. The catastrophe has expedited the situation with thousands of people living in remote tent villages trying their best to survive with what they have. Cholera, a bacterial infection of the gut, was first confirmed after the earthquake had hit, even though cases of cholera were present before the impact.

Cholera is very deadly, it could kill of dehydration and other infection related conditions if not dealt with. The chances of contracting cholera and other food/drink related infections is almost minuscule in developed countries like the US, however, in an underdeveloped country like Haiti, the risk increases exponentially. Due to low sanitation efforts and difficulty of retrieving clean water, it becomes even harder to keep contamination at bay after. The problem with the cholera epidemic in Haiti is that relief efforts are severely under funded. Many people have generously donated their money and time to help those people in need. Nevertheless, there still resides the factor of providing clean water to the victims. As a class service project, our group here in Rutgers University is sending a care package with personal water filtering systems and PUR packets (removes dirt and eliminates disease causing microorganisms) to a worthy cause in Haiti. We hope to provide a family with clean drinking water for many days to come.

For us who really don’t think about how clean our water is, think about how serious the situation is in Haiti. The people of Haiti may not have a choice in what they drink. It’s either: drink what they have in front of them or die of thirst.

Name: Angel Reyes
Subject: International
Length: 367 words
Newspaper: Courier News (Central Jersey)

Krystle Mangawang
Don’t Forget About Haiti

A massive earthquake hit Japan March 11, 2011. There are many advertisements to ask people for their efforts to help the people of Japan recover from this horrible natural disaster. While this natural disaster is pretty horrendous, we still have to remember our friends who live close to home in Haiti. It has been a little over a year since Haiti was struck by the 7.0 magnitude
earthquake and still the Haitian people are struggling to get back on their feet. We also have to remember Haiti is plagued with Cholera in October of 2010. Cholera is a deadly infection that can kill a healthy human being within hours without proper treatment. Its main symptom is acute diarrhea which causes severe dehydration and in turn causes death.

*Vibrio cholera* is the bacterium that is the cause of cholera. It lives in the water and anyone that drinks contaminated water will in turn get cholera. There is not a medicinal treatment that can be used effectively in Haiti so therefore, the Haitian people must depend on prevention and education of cholera. The CDC, Center for Disease Control and Prevention, has named prevention and education as the best strategy to rid cholera in Haiti. Simple tasks such as sanitizing the hands and learning how to rid of the cholera bacteria from their water sources by using chlorine based products is the best way to prevent cholera from killing thousands of others.

During this time, please consider our friends who are still in need in Haiti. They not only are suffering from losing their homes and their families from the earthquake but now they are stricken with a deadly infection. Non-profit organizations are still accepting donations for this cause. Depending on the organization you choose, you can help save the lives of the people of Haiti by giving them tools to rid the waters of the cholera bacteria. Take time and remember that they do not have a stable or wealthy government such as Japan that would be able to stand up after its fall. Even after a year, the Haitian people still cannot find the money to rebuild the ruined cities or even build better temporary homes other than tent homes even after all of the world’s efforts. Worst of all, the Haitian people are dying every day from Cholera. Water is essential for the human body and their water supply is detrimental to the population. Let us all reach out a helping hand.

Name: Krystle Mangawang
Newspaper: Courier Post, South Jersey Newspaper
Length: 416
can consist up to hundreds of thousands of people, to possibly up to a million people. The living conditions that are present in these tent cities include over crowdedness and unsanitary living situations. Water sources that are present in these tent cities are contaminated because these cities do not have the luxury of plumbing and ceramic tiled bathrooms as we have here. Instead defecation can be found on public walking grounds and near the water supplies they drink from, because they do not have enough designated areas for bodily excretory purposes. This increases the amount of contamination that already is present in the Haitian water, and introduces new contaminants such as microorganisms as well.

Haitians are forced to drink this contaminated water because clean water supplies are limited or not in reach to the population. Families are forced to go to their local contaminated water sources and knowingly collect water from there and drink it. Many are aware that what they are drinking may cause a threat to their health, possibly death, but also understand that to avoid drinking water is a certain death, so this is a risk they are willing to take. Efforts have been made to help this Haitian water crisis, however as the media wound down its focus on Haiti’s need for help and focused on other many major crisis’ of the world, everyone must be reminded that Haitians are still suffering from poor water conditions.

Haitians are dying from their contaminated water supply, a microorganism cholera increasing this death rate. A cholera outbreak in Haiti occurred after the earthquake, and this has had a major impact on its population. Cholera produces unfavorable symptoms when infected, including severe diarrhea. This leads to severe dehydration and with Haiti’s limited supply of fresh water sources, and water sources in general, many die from dehydration. Water is a need that every human needs for survival, yet the water there can cause their life to end.

Help the Haitians. Do not forget about them even though they are out of the media spotlight. There is something you and I can do. We can give the gift of clean water by simply making small donations to companies that help to clean their water supplies, we can all save lives together through clean water. Non-profit organizations are still accepting donations for the cause, so what’s stopping you from helping?

Author: Christina Kmiecik
Newspaper: The New York Times
Accepts submission of any length
Word Count: 583

Ali Schmerler
To the Editor:

News coverage regarding the 7.0-magnitude earthquake that hit Haiti in January of 2010 and the outbreak of cholera nine months later has been notably absent until very recently. USA TODAY’s article “Haiti choosing president amid uncertainty, anger” highlighted the two polar-opposite candidates but failed to go in depth as to how daunting it will truly be to assume the role as Haiti’s President and rebuild the nation.
As the poorest country in the Western Hemisphere, Haiti was plagued with problems before the earthquake hit. Access to clean water and sanitation was extremely scarce, GI illnesses were endemic, and these conditions were exacerbated after the quake displaced over a million people into overcrowded tent shelters that still exist. The outbreak of cholera, which causes severe dehydration and is lethal, if untreated, exposed how extreme the problem of water scarcity is. Relief efforts were, and still are, severely underfunded, but there are many non-profit organizations committed to providing clean water to Haiti that are still accepting donations.

We must realize that Haiti does not have the capacity to rebuild on its own; Haiti is not Japan. The infrastructure was sub par, the government was corrupt, sanitation wasn’t available to all, and clean water was extremely scarce before the earthquake, unlike in the developed nation of Japan. Haiti was previously not a fully functioning country and must be rebuilt completely anew. Clean drinking water and sanitation are human rights according to the U.N. General Assembly, yet we take them for granted in the U.S. We cannot forget about Haiti.

Name: Ali Schmerler
Newspaper: USA TODAY
Length: 259 words