Enema-Based Rehydration: Field Medicine in Times of Uncertainty

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Decker Weiss, NMD, FASA

It is estimated that, worldwide, approximately 2 million children under the age of 5 die from dehydration as a result from gastroenteritis; this accounts for 18% of all deaths of children under 5. Commonly known forms of rehydration include the use of intravenous (IV) rehydration and oral rehydration therapy (ORT), including oral rehydration salts (ORS). In the 1800s, a third form of rehydration – enema/colonic – was created and perfected by Russell Thacker Trall, MD (1812-1877). Dr. Trall published works such as Diseases of the Throat and Lungs (1861), Diphtheria (1862), Digestion and Dyspepsia (1874), and Handbook of Hygienic Practice (1865), which advocated the use of water-based therapies. Water-cure healing treatments were discussed at a 1980 meeting at the Smithsonian Institute, in which Dr. Trall reflected on the death of soldiers fighting in the Civil War. In his presentation he says:

The soldiers of our camps and hospitals were dying off fast of typhoid fever, pneumonia, measles, dysentery, etc., and quite unnecessarily. I knew that the application of our system of hygienic medication would save most of their lives.

As IV rehydration became readily available, deaths attributed to diarrhea and dehydration saw a significant decline. However, for practical and clinical considerations, it may be time for all 3 forms of rehydration – not only oral and IV, but also enemas – to be made available to healthcare workers in the field. When to choose each form of rehydration may depend on location, availability of rehydrating agents, and the underlying cause of the dehydration. If there is a need to counter a bad intestinal microbe in the field, enema-based rehydration using various techniques may be best, as it allows for the possibility of treating/displacing/killing the microbe directly in the colon. The use of probiotics/prebiotics, if available, may be complementary to rehydration therapies.

THE HAITIAN CHOLERA EPIDEMIC

At 16:53 Haitian time (21:53 UTC) on Tuesday, January 12, 2010, a magnitude 7.0 earthquake occurred, with the epicenter near the town of Léogâne, Haiti, 25 km (16 miles) west of Port-au-Prince. Casualty numbers were estimated by the Haitian government at 230,000 but may be closer to 90,000. Six months after the earthquake, an...
estimated 20 million cubic yards (20 million cubic meters) of debris remained, making most of the capital impassable and leaving thousands of bodies buried. Relief camps built of shelter boxes, tents, and tarps housed an estimated 1.6 million people, and nearly no transitional housing had been built. Most of the camps had no electricity, running water, or sewage disposal, and the tents were beginning to fall apart. As a result, many individuals developed cholera, a student diarrheal illness caused by the bacterium Vibrio cholerae. The ongoing Haiti cholera outbreak is the worst epidemic of cholera in recent history, according to the US Centers for Disease Control and Prevention (CDC). As of January 2013 – more than 2 years after the earthquake – cholera had killed more than 7900 Haitians.10

The outbreak began in mid-October 2010 in the rural Center Department of Haiti, about 100 kilometers (62 miles) north of the capital, Port-au-Prince. By March 2011, it had killed 4672 people and hospitalized thousands more; however, earlier cases were reported.11-13 It is thought that the Nepalese soldiers brought cholera to Haiti when they joined the UN Peacekeeping Force in 2010, by allowing sewage from their camp to be spilled into a nearby river.14 Approximately 1 in 20 (5%) infected persons will have severe disease characterized by profuse watery diarrhea, vomiting, and leg cramps. In these people, rapid loss of body fluids leads to dehydration and shock. Without treatment, death can occur within hours.15

AN OBSERVATIONAL CASE STUDY

DESIGN

The following study was a case series in the field within earthquake-mangled Port-au-Prince, Haiti, of children and toddlers exhibiting symptoms consistent with the clinical diagnosis of cholera.

SETTING OF UNCERTAINTY

Our team arrived Friday, April 30, 2010, and worked in various camps for 10 days, including a day at Miller Hospital. We came self-contained with oral antibiotics, probiotics, wound-care supplies, several hundred IV bags, and appropriate needles and tubing. Partnering with Naturopaths International, Arta Research, and a local charity, we worked in the temporary communities of Haiti comprised of shelter boxes and UN tents. On Tuesday, May 4, 2010, frequent aftershocks led to an absence of medical support. As we arrived, we found a line of patients waiting, along with 2 Creole (Haitian) translators, so we set up our team in a “shack on a hill” and went to work.

INTERVENTION

Within an hour, our first dehydrated patient showed up with a typical presentation for a dehydrated infant: sunken fontanelle, lethargy, dry lips and cuticles, and rapid breathing. She received a brief history from the mother that the baby was 6 months old and had been vomiting and experiencing diarrhea for 10 hours. This presentation and timeline were consistent with the clinical diagnosis for cholera.1 Her attempts to breastfeed or rehydrate had been unsuccessful. Recently, the infant’s diarrhea had stopped and her diaper was dry. Quickly came the concern as to how a non-invasive cardiologist could possibly handle a rush of very sick infants, toddlers, children, and adults. There was no field test or lab nearly to confirm the suspicion of cholera, but clinically it was identical to what is listed in textbooks. Another challenge was that our pediatric IV skills were not sufficiently developed to work effectively in this environment.

So, in the spirit of “necessity is the mother of invention,” we plugged tubing into a 200 cc bag of Lactated Ringer’s solution and snipped the end off the plastic line. The line was lubricated at the tip of the tube and placed 3 inches inside the baby’s rectum as the drip was started. Our goal was to start with 25 cc, and then allow the baby to evacuate it out. At first the baby was placed prone on the mother’s lap; after 25 cc were infused, we shifted the baby to a 45-degree angle and let the baby evacuate. This presented with varying degrees of success. Sometimes the baby or toddler would re-evacuate (with aggressiveness), and other times we needed to compress the abdomen in order to make the evacuation more successful. In a few cases, it poured out similar to how it was run in. This process of “fill and evacuate” was continued for up to 250 cc, after which a slow drip was initiated directly into the rectum; this consisted of 9% saline that was infused at approximately 2-3 mL/min. If the child was rehydrating but not sufficiently responsive, “evacuate” was continued for up to 250 cc, after which a slow drip was initiated directly into the rectum; this consisted of 9% saline that was infused at approximately 2-3 mL/min. If the child was rehydrating but not sufficiently responsive, we would change to a 0.5% dextrose solution with 0.45% or 0.9% saline until the patient would re-evacuate. At the end of the rehydration cycle, a powdered probiotic/probiotic formula was placed directly into the child’s rectum by opening up a capsule of a probiotic/probiotic, and including it in the rehydration’s last 50-75 cc. The probiotic/probiotics were developed by the consortium of a well-known Canadian nutraceutical company. Each individual capsule contained 10 billion colony-forming units (CFU) of probiotics, including Lactobacillus acidophilus (CUL-60 & CUL-21), Bifidobacterium bifidum (CUL-34), as well as 100 mg of fructooligosaccharides (FOS). We chose to add the probiotic/probiotic into the final stage of the enema because of its known effect on other known intestinal infections, such as Clostridium difficile.16

One advantage of the treatment was its simplicity; we simply had a mother sitting on a chair in the shade with her baby lying on her lap, and the IV bag hanging from a tree branch. Our peak flow rate was 10 patients (subjects) at once. (Fortunately, there were plenty of trees and shade near our ‘shack.’) It took approximately 80-100 minutes to perform each intervention, depending on the degree of symptom severity. In the future, it may be advantageous to start with enema-based rehydration and, as the subject reanimates, move to oral rehydration. In this instance, only enema-based rehydration was performed in the clinical setting, but it was suggested to the subjects that they continue oral rehydration upon discharge.

RESULTS

Within 16 hours, we treated over 125 people for various conditions, including diarrhea. A member of the crew was sent to report the incident to Miller Hospital and Notre Dame. However, when we returned to the ‘shack on a hill’ 48 hours later, we found there was no follow-up done, possibly due to the localized aftershocks. As Haiti is politically hazardous, we cannot be sure if the hospital was aware of the message, although we were able to verify that there was no “cholera alert” reported. However, upon return, we were pleased to find that all 36 toddlers and infants were alive and thriving, with no apparent symptoms of dehydration, diarrhea, or potential cholera.17 We attempted to verify that the same 36 toddlers and infants we treated initially were the ones present in our follow-up by having each mother sign in once again with her baby’s name, age, weight (if they knew it), and symptomology. We then had our translator do his best along with our staff to match up each subject to his or her therapeutic intervention.

STRENGTHS AND LIMITATIONS OF THE STUDY

This study had both strengths and weaknesses. Among the weaknesses was a lack scientific method applied to the “shack on the hill Medical Center,” as well as the overall diagnostics of the population. If we had been able to better
anticipate the conditions before arriving in Haiti, we would have brought Gary Blair-media and nectaxa to confirm the diagnosis. In the event we encountered potential cases of cholera [10] we later learned that a crew from one of the hospitals went to the field site 3 days after our follow-up, but found no recurring diarrheas to treat, and several new cases. They did not, to our knowledge, plate samples in an effort to rule in or out a diagnosis of cholera.

Despite the "lack of scientific method," the strengths of the study included that the procedure is easy to perform in the field, is low risk, and serves as a low-cost method of bowel evacuation, rehydration, and food correction. It should be considered for either a research trial or for use again in a field situation. Eventually, with proper study, enzyme-based rehydration may be listed along with IV and oral rehydration (ORT) as either a standalone therapy or as a pre-ORT adjunctive option. If necessity is the mother of invention, we think we should put this mother's invention into use. It may well save thousands of lives.

**Clinical observation; no testing, no scientific verification, and minimal documentation

**Contributions:** Decker Weiss drafted the manuscript. DW conceived and supervised the study, and conducted the procedure in the field. Heather Ulich commented on and edited the draft. DW would like to honor contributions from Scott Atran PhD, Rich Davis, Barry Ritz, PhD, Gottfried Kelermann, PhD, and Richard Garwin, PhD. All authors have read and approved the final version of the manuscript for submission.

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This study may be approved for data-sharing, but it has not been explored to date. There is no additional data available.

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Decker Weiss, M.D., FASA, is the first naturopathic physician to complete a conventional internship, residency, and fellowship in a conventional medical system. Dr Weiss trained in the Columbia Hospital system, the Arizona Heart Hospital, and the Arizona Heart Institute. Founder of the Scottsdale Heart Institute and the Center for Neuro-Endo-Immuno-cardiologic Studies, Dr Weiss consults with NauteScience, Inc. on practitioner-medical education.

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