COCA Call: Cholera in Haiti - Why U.S. Clinicians Need to Care
Date/Time: December 15, 2010 (12:00 PM - 1:00 PM ET)
Presenter: Dr. David Swerdlow, CAPT U.S. Public Health Service, Incident Manager, CDC Haiti Cholera Response (Nov 15-Dec 8), Senior Advisor for Epidemiology, National Center for Immunization and Respiratory Diseases - CDC

Coordinator: Welcome and thank you for standing by. At this time all participants are in a listen-only mode. During the question-and-answer session, you may press star 1 on your touch-tone phone. Today's conference is being recorded. If you have any objections, you may disconnect at this time.

I'll turn the meeting over your host for today's conference to Ms. Loretta Jackson Brown. You may begin.

Loretta Jackson Brown:

Thank you, Debbie. Good afternoon. I'm Loretta Jackson Brown and I'm representing the Clinician Outreach and Communication Activity, COCA, with the Emergency Communications System at the Centers for Disease Control and Prevention. I am delighted to welcome you to today's COCA Conference Call, "Cholera in Haiti - Why U.S. Clinicians Need to Care."

We are pleased to have Dr. David Swerdlow from the Centers for Disease and Control and Prevention with us today to provide an overview of cholera, provide an update on the current cholera situation in Haiti, and to discuss appropriate cholera treatment for infected persons traveling into the U.S.

During today's call, you will hear the presenter referring to slides in his PowerPoint presentation. The PowerPoint slides, that is available from our COCA Web site at Emergency.cdc.gov/coca. Click on Conference Calls, the slides that can be found under the call in number and call passcode. There are

no continuing education credits provided for this call. Following the presentation, you will have an opportunity to ask our presenter questions. Dialing star 1 will put into the queue for questions.

Today's presenter, Dr. David Swerdlow is a Captain with the U.S. Public Health Service and Senior Advisor for Epidemiology in Emergency Response, the National Center for Immunization and Respiratory Diseases at the Centers for Disease Control and Prevention. He was the Incident Manager of CDC's Haiti Cholera Response from November 16 through December 9, 2010.

Dr. Swerdlow has led cholera outbreak investigations in the U.S. and internationally. Previously he was Team Lead of a National Surveillance Team Enteric Diseases, Epidemiology Branch National Centers for Zoonotic, Vector-Borne, and Enteric Diseases, CDC. He served as Team Lead during CDC's response to Hurricane Katrina and to the 2001 Anthrax attacks.

He is a Clinical Assistant Professor of Medicine, Emory University School of Medicine, Atlanta, Georgia, and an Adjunct Associate Professor at Rollins School of Public Health, Emory University, Atlanta, Georgia. A former CDC Epidemic Intelligence Service Officer, Dr. Swerdlow is Board Certified in Internal Medicine and Infectious Disease.

If you're following along on the slides, you should be on Slide 3. Again, the PowerPoint slide set is available from our COCA Web site at Emergency.cdc.gov/coca.

At this time, please welcome today's presenter, Dr. Swerdlow.

Dr. David Swerdlow:

Thanks, Loretta. That was a very nice introduction. It's a real pleasure to be doing this COCA call.

It's sort of ironic, I guess you could say, because I did a very similar call to this, a COCA call, back in 1992, when cholera was ravaging Peru and other countries in South America. And we actually did a call just like this, preparing U.S. physicians for possible cases, and we also published a number of articles in JAMA and some other journals to try to prepare U.S. clinicians for the possibility of cholera. So, it's interesting that we're here again today almost 20 years later, thinking about the same issues.

I am a physician, but I'm an Epidemiologist, and so I always like to be able to start off a talk with clinicians thinking about epidemiology a little bit. And it just so happens that John Snow on Slide 4 was what we think of as the first Epidemiologist, and the reason it's relevant is that he became famous working with a cholera outbreak in 1848 on Slide 5.

And it's just nice to remind people how epidemiology started, since we're thinking about cholera, and back in 1848 of course no one knew what the organism was or what the bacteria was. In fact, most people thought that cholera was spread by air and there was this big outbreak in London and people who were getting sick in this area that was low-lying and has this, what was called a miasma. And it was thought that people passing through the miasma would get cholera.

And what John Snow did is actually map out, he was one of the - he was the first GIS modeler and he mapped out cases of cholera and showed where they lived, and that's the map that you - the actual real life map is what you can see

on Slide 5. And he realized that people that were getting water from that one pump on Broad Street was - were actually more likely to get sick, and the actual real life data is from Slide 6 showing the - three of the companies that supplied water and if you look, this looks just like a table that we create today where we calculate attack rates, and so he has Number of Houses, Deaths from Cholera, and Deaths per 10,000 houses. And as you can see, the death rate from the Southwark and Vauxhall Company was much higher than other companies, and that's why he thought that the cholera was being spread by that pump on Broad Street.

And on Slide 7 you see his actual paper, because back then it was publish in Paris back then too, and this was the actual paper that he published. And of course, as - you know the story that people didn't believe him. They thought that cholera was spread by the miasma and he had to actually go and steal the handle off the pump and that supposedly stopped the cholera outbreak. And so now, we always say in epidemiology that, you know, "Where's the pump handle and can we take the pump handle off the pump," to - characterize by John Snow.

So the next slide, Slide 8, shows slides from back then indicating that, you know, water borne transmission of cholera was very important in those days.

So Slide 9, I will be talking about the organism today, the clinical features, the diagnosis, the treatment, and the epidemiology. And we'll look at cholera worldwide, cholera in Latin America, cholera in Haiti, and then cholera among returning travelers.

So, cholera is not just one thing. This slide shows the - Slide 10 shows the microbiologic characterization of Vibrio cholera. And so as you can see, if

you follow the boxes that there are a lot of types of Vibrio species, but, you know, other ones cause - certainly do cause disease, like Vibrio vulnificus, et cetera. But, only Vibrio cholera, to the left on that slide, causes these kinds of epidemic diseases.

And even among Vibrio cholera, there are many types of - many serogroups like cholera O-1, O-2, O-3, O-4, and - but only - until recently only O-1 caused pandemics and epidemics. The other ones can cause diarrhea, but they don't cause outbreaks. But then, as we'll see later on, recently there was a new addition to that group and that was O-139 and we will talk about that a little more.

So, Vibrio cholera can be divided between the ones that are non O-1, non O-139, which cause disease but not outbreaks, versus O-1/O-139, and then within O-1 and O-139, you can have different biotypes. And biotype can be either El Tor or Classical, and then even among any given El Tor cholera or any given Classical cholera, it can be a different serotype; it can be Inaba or Ogawa. And then, they can all Toxigenic or Non-toxigenic.

And so all combinations exist, but when we're thinking about cholera is causing outbreaks, we're thinking about a - it's either El Tor or Classical, and of course almost everything in recent decades has been El Tor. It can be either Inaba or Ogawa, but it has to be Toxigenic to be able to cause cholera.

So, the next slide on 11 shows the actual Vibrio cholera and it comes from the word for comma, because under the microscope it looked like a comma.

So, Slide 12 looks at the characteristics of Vibrio cholera and as you can see, there are some characteristics that make it very amenable to sort of Twentieth

Century cholera. So, all types of cholera are salt resistant, and so that's why when you think of cholera you think of seafood and marshes and estuaries, because it can grow within salty environments.

And it can - it is also heat and acid sensitive, so boiling water kills cholera and the acidity of the stomach can kill cholera. Certain foods that are acidic will not allow cholera to grow. But, over the - as - we'll talk a little bit later about the different pandemics and when Classical cholera came and went and El Tor became prominent.

But, El Tor cholera is sort of considered to be sort of the Twentieth Century stealth cholera. And the reason for that is that Classical cholera caused most people who got it to get sick, where as El Tor cholera has a very high proportion of people who have asymptomatic infections. And so, the data I'm showing here were characterized early in the pandemic of El Tor cholera that began in the 1960's.

And in fact, I don't think that these numbers necessarily fit for some of the recent outbreaks, but the classic teaching is that El Tor has 75% to people who are ill are asymptomatic, 18% that are mild diarrhea, and 1% to 2% have severe cholera or cholera gravis. And I think those numbers are actually higher recently, but that's sort of the classic teaching.

And the reason that that's important is because it means that many infections asymptomatic and therefore controlling it is very difficult. It's this stealth nature of El Tor cholera that, you know, if you try to set up a quarantine and said, "Okay, anyone who has diarrhea can't pass," then you're missing most of the people, and that's why this cholera is so hard to control. It also has this other characteristic of being fast growing in the food, so food borne

transmission has become more prominent with El Tor cholera, and it also has lengthy survival in the environment, again making control difficult.

So, we'll move on to Slide 13. With cholera, the infectious dose is actually pretty high, 106 to 108. That's more than some other organisms that you hear about like dysentery, which only needs a few organisms to make people sick. And so, the high infectious dose means that it's less likely to be transmitted person-to-person like dysentery is.

We should say that the infectious dose does vary with vehicle of transmission and also with gastric acidity. So gastric acid will kill cholera, so that'll affect which vehicles are more likely to transmit cholera. So, something that buffers the acidity will be more likely to allow the organism to infect somebody. The incubation period is usually one to three days.

Slide 14 shows a picture of the B subunit of the cholera toxin, it's called the poisoned doughnut by some, but it shows the beta subunit of the actual toxin.

And Slide 15 we won't go through, but it is a model of how cholera causes Secretory diarrhea. And so, you can see the - this is a picture of the gut, the bowel, and you can see the Vibrios, and it's not the actual Vibrio that's causing the problem, it's the toxin that's produced. And the toxin attaches and activates to cyclic AMP, which causes more secretion of chloride, less absorption of sodium, and it allows water and potassium and bicarbonate to flow out of the bowel.

Slide 16 describes what you see with what we call Cholera Gravis, or severe cholera. So, Cholera Gravis, again severe cholera - severe diarrhea and it leads

to - also leads to vomiting, muscle cramps because of the loss of potassium, dehydration, electrolyte imbalance, and ultimately death.

So the next slide, Slide 17, there's two critical aspects of cholera that guide everything that we do, and on this slide is number one. So, Cholera Gravis can lead to a loss of 1 liter of fluid per hour and that's over 10% of a person's - that can lead to over 10% of your body weight being lost.

And, you know, when you think about an emergency room and people coming in after a car accident and they've had a lot of blood loss, we'll usually think of it if they're in shock they've lost 10% of their body weight. So, the shock that you see from cholera is equivalent to having been in a severe car accident and losing a lot of blood.

You can get hypotension in one hour, although usually it's a little longer, and death in two hours. So, critical point one about cholera is that it can kill in two hours, so that's the critical thing that drives everything that we do with control of cholera, is that it can kill someone in two hours. And in fact, we'll talk about it, but in Haiti we have seen deaths within two hours.

This is a slide I took, Number 18, in Malawi Africa in a Refugee Camp many years ago, and just showing the rice, water, diarrhea.

So, what does the dehydration look like? Well, a person who has hypotension -- Slide 19 -- has rapid thready pulse, loss of skin turgor, sunken eyes, they're thirsty, they have altered mental status, but they actually are arousable, and they eventually will get anuria and renal failure.

This is, Number 20, is a slide from the early days of the seventh pandemic in the 1960's, but it shows a person that's arousable but clearly out of it and with sunken eyes and inadequate skin turgor.

This is a slide that was taken from an article by David Sack in 2004, and you can see the clear lack of skin turgor on the belly on this child.

This is a slide, Number 22, from the - early in cholera's history in the 1800's and it's kind of interesting. It shows a couple things. One is the woman on the right is the same person after having cholera and she has sunken eyes and lack of skin turgor, et cetera, but she also looks angry. And cholera in many languages actually can mean someone who's angry and - in Italian and some other languages, so it's interesting the connotation of cholera with anger.

So, Slide 23 describes the electrolyte composition of diarrheal stools in patients with cholera. And I wouldn't expect anyone to memorize this, but it is interesting that when you look at how much sodium there is and how much potassium there is and how much bicarbonate there is, you can really see how you can lose a lot of sodium and a lot of potassium and so much bicarbonate leads to an acidosis.

Slide 24 shows the complications of losing these minerals. So, loss of sodium leads to hypotension, loss of potassium leads to muscle cramps, ileus, and arrhythmias. Loss of bicarbonate leads to acidosis, which leads to this whole cycle of worsening vomiting, and then people can't drink and so they get more dehydrated and more acidotic and it's a bad cycle. And then also, the loss of glucose leads to hypoglycemia, which can cause convulsions and unconsciousness; although, as we said, usually people are arousable.

Well, how do you diagnose cholera? Well, the main way to do it is through stool cultures, and again going back to that early slide where we showed all the different types of cholera, you really do need to show that it's not just cholera that it's a toxigenic strain that's either O1 or O139.

There are also rapid tests that are available now and serology; although, serology is usually used more in, not research settings, but settings where you have - you want to look back and see who is ill.

The - Slide 26 shows Microbiological Diagnosis, so you do a culture of a rectal swab or a stool specimen. It has to be transported in a transport medium like Cary Blair, and then it needs to be on selective agar, TCBS. And that's actually an important point because if you're a physician out in the field and - or, you know, in the United States and you have a returning traveler and you send a stool culture, they will not automatically, in fact they probably won't use TCBS, and therefore you will miss the diagnosis. So, in order to make the diagnosis of cholera with a culture you do need to use special selective agar, otherwise the culture will not be positive.

This slide shows the typical yellow colonies of Vibrio cholera on TCBS.

This slide shows the newer rapid diagnostic tests.

Slide 29 talks about who you should be - consider to have cholera. And so, this depends where you are. If you're in Haiti this would be very different. If you're in the United States, it would like different as well. So, this is a very, you know, non-specific list. It all depends on your circumstances. But, your suspicion should be increased in adults with dehydrating diarrhea.

That first statement leads to confusion all over the world. It's not that kids don't get cholera, they get plenty of cholera, and in fact they're severely affected and probably die at a higher rate. It's just that kids get lots of diarrhea from lots of different causes. So, we don't want to confuse people with this sentence, but the fact is that kids can get diarrhea, severe diarrhea from a lot of causes, whereas adults if you do have dehydrating diarrhea it be more likely that it was cholera.

Any deaths from dehydration regardless of the age; any recent travel to the affected areas, so that certainly applies here; recent consumption of high risk foods such as undercooked seafood and shellfish, crabs, et cetera. Again, depending on the epidemiology initially all cases should be cultured. However, once the diagnosis is confirmed then you don't need to keep culturing people. It - but that all depends on where you are and what the epidemiology is. In the United States, certainly all isolates should be confirmed by the State Laboratory and CDC, and reported.

So the next slide is Slide 30, and we talk about treatment. The first thing is to assess the degree of dehydration, determine - and then you determine if rehydration should be oral or IV. Of course, you do not wait for laboratory confirmation to treat. And remember I said that there are two critical points about cholera, and so the first one was that people die within two hours, the second one is that death rates from severe cholera can be decreased from 50% to 1 - less than 1%.

And so, that's an absolutely critical point that people can die of cholera quickly, but you can save them if you give them rehydration, and so that again drives everything that we do. In other words, everybody in a place like Haiti

needs to be within an hour or two of rehydration therapy, and so that's really a critical aspect of what we do.

The next Slide, 31, we won't go through, but it talks about how you decide and what kind of dehydration there is, no dehydration, moderate dehydration, severe dehydration, and how you treat. So, a person who is moderately dehydrated can get oral rehydration, a person with severe dehydration can get IV and oral rehydration.

Oral Rehydration Therapy, oral rehydration salts are recommended, 80% to 90% of patients should be able to be treated with oral rehydration, and even persons who require IV can - should be able to soon switch to oral rehydration. Intravenous therapy, Ringer's lactate is the recommended IV fluid and we'll show you why in a second.

People do use normal or have normal saline, but it's not as effective, and D5W is really ineffective. It doesn't have any sodium or ability to increase your blood volume in an effective way and should not be used. Unfortunately, we, in – in outbreak settings around the world I have seen people trying to use it.

The next slide, Slide 33, shows a picture of someone who was saved, and this is all the bottles of IV fluid that are required to save him. And this was really in the days before oral rehydration.

Slide 34, shows a picture from Peru and it shows a nurse making up the oral rehydration salts in a liter container.

Slide 35 shows encouragement of drinking, and that's something I found in several parts of the world where it's easy to say, "Okay, have people drink oral rehydration solutions," but in fact they really need a lot of encouragement, and we in fact hired oral rehydration officers in refugee camps just to get people to drink. So it's effective, but it - you have to work at it and you have to make sure there's encouragement.

Slide 36 was one I took from a refugee camp in Malawi Africa, and again the critical thing was making sure people were encouraged to drink.

Slide 37 shows the composition of rehydration solution, and so again the same set of data that we showed before for cholera stools is at the top. But, the - so you can see the high sodium and the high potassium and the high bicarbonate. With ORAL - WHO oral rehydration salts you see they - it does have sodium and it does have potassium and bicarbonate, and of course glucose to enable sodium to be absorbed.

Rehydralyte is a solution that is available in the United States and it's a little more readily available than WHO-ORS certainly, and it does have relatively good concentrations of all the minerals or glucose, et cetera. Some of the other ones are not recommended, things like Gatorade and all that because they just don't have the composition.

And then at the bottom in Ringer's Lactate, and so you can see that Ringer's Lactate has plenty of sodium, but it doesn't have a lot of potassium and of course with an IV fluid you can't give too much potassium too fast. So, you really have to rely on oral rehydration to replace potassium when you're rehydrating somebody with Ringer's Lactate.

So Antimicrobial Therapy, antimicrobial therapy is used - can be useful. I'll show the data in a couple of slides, but it does reduce fluid losses. It can reduce duration of illness and duration of carriage, so it is recommended in severe cases. Of course, you need to consider the resistance pattern that can change over time, and in cholera outbreaks we did do surveillance where we would get a couple of strains every week to make sure that things weren't changing. And it's not recommended for prophylaxis, so we can talk about that a little bit later.

So antimicrobial therapy in a typical setting does some good, but you don't see saved lives on this slide and that's because what saves lives is rehydration therapy. In a typical setting where you're rehydrating people adequately you probably are not saving more lives by antimicrobial therapy.

Does that apply to all settings? You know is it possible that in a place where you're overwhelmed that maybe you can save lives if you could get people out quicker? It's possible. But in general, in a place like Bangladesh where there's adequate rehydration, antibiotics don't necessarily save lives.

We'll go quickly through the next couple of slides just to - this is for reference of which antibiotics are recommended. Doxycycline, just a single 300 milligrams dose is usually recommended. Pregnant women can get Azithromycin or some other antibiotics, for children, Azithromycin or Erythromycin. Some people do recommend using Doxycycline, even though they are children, because it's only one dose and it probably won't have an effect on bones or teeth. But, I guess if you have these other antibiotics available you can use those as well.

Now, this is the data that I referred to before, Slide 41, and as you can see the - it shows the effect of tetracycline treatment on duration of diarrhea. And again, the green lines are - the green bars are the treated and the blue lines are controls, and at the bottom it shows days after start of treatment. And so, you can see that people who are in controls, the blue bars, have - still have diarrhea for up to five or six days, whereas the treated patients with antibiotics have resolution sooner. So, antibiotics can make a difference. Again, the most important thing is rehydration.

So now, let's move to Slide 42 and think about epidemics and pandemics and epidemiology. So this slide, 42, is from the 1800's and it shows - it's a little hard to see, but it - cholera is coming over from the old world. You can see the - you can see London on the other side, and you can see this person asleep. And if you look carefully you it says science, and then it says New York City, so the idea was that science was asleep while cholera was coming over.

Slide 43 shows the cholera pandemics that we know about, and as you can see there were many outbreaks, many pandemics during the 1800's. And it was generally felt that sanitation systems, as we know it in the United States, came about because of these pandemics, and because of cholera that we have municipal water supplies and good sanitations, and those kinds of improvements.

As you can see, we don't know what kind of cholera it was early on, but - and eventually we know that the earlier pandemics Number 5 and Number 6 at least were Classical, this cholera that's more severe, whereas since 1961 the seventh pandemic has been El Tor. And just one quick note, there was a second - this second strain O-139, began in 1992.

Slide 44 shows the global spread of cholera from 1961 to 1991. This was - this slide was made at the very beginning of the pandemic in Peru, and as you can see it - when it reached Africa in the 1970's it was really quite devastating. Somehow it managed to avoid Latin America until 1991, and then somehow managed to avoid the Caribbean until this year.

On Slide 45, it's just quickly mentioning the - this 1992 event of the Vibrio cholera O-139 and I won't talk about it a lot. But, it was a new strain and did spread quite a bit, but then hasn't really been very prominent.

So worldwide, what kind of things have transmitted cholera, Slide 46. Well, it's been transmitted by water and food contaminated with Vibrio cholera, one from human feces or from environmental reservoirs, usually this - these estuarine environments, the salty environment. Cholera is not thought to be transmitted person-to-person and there's a couple of reasons for that, one is that - the high infectious dose and observations.

And so, in the United States for - we had over 200 imported cases of cholera or cholera from the Gulf Coast up until the 1990's. And for 200 of those cases, there was only one case where secondary - there was a secondary case. So in other words, among 200 cases only 1 person spread it to someone else in their family. Further, healthcare workers are thought not to be at very high risk for cholera. So, that's some of the lines of evidence why we don't think that person-to-person contact is an important way that cholera is transmitted.

This slide shows Documented Vehicles of Cholera Transmission, again water, municipal water supplies, shallow wells, et cetera. Seafood, raw muscles, raw oysters, clams, et cetera. And others, especially in Africa, Millet gruels and porridges and rice with peanut sauce, et cetera.

Slide 48 shows a crab. The cholera actually produces this enzyme called chitinase that actually helps the organism bury its way into the chitin of crabs.

The next slide, 49, is the-it's a picture of high risk crab.

So Slide 50, we're going to move now to cholera in the Americas. So, this slide was from - data from 1973 to 1995 and you can see there that there's a Gulf Coast focus in the Gulf Coast. That was identified in 1973, but then cholera began in January of 1991 and marched on throughout Latin America over the next few years.

Slide 52 is a picture from Peru. As you can see, the system the healthcare system there was very different than what you might expect is happening now in Haiti. There were hospitals that were - at least in the cities where I was along the coast, these things may have been very different in the Amazon. But, where I was along the coast there were hospitals, there were nurses, there were doctors and people got excellent care.

Slide 53 shows the different - all the countries in the Western Hemisphere after 1991 and numbers of cases and deaths. And I - as you can see, Peru had the lion's share with over 600,000 cases and 4400 deaths.

Slide 54 shows what were the risk factors for transmission of cholera in Latin America? And as you can see, drinking unboiled water from these large municipal water systems that were probably initially okay, but then you'll see some picture as people actually broke into the water lines and took water from the water line - directly from the water mains, and that lead to contamination in the systems.

Also, deficient peripheral distribution, home water storage, water got contaminated in the home, as well as raw and undercooked shellfish. Eating foods from street vendors, et cetera.

Slide 55 is a slide I took in Peru and it showed how easily the water systems could - water containers could get contaminated. And in Peru we actually cultured the organism from water containers like that, but also looked at the water supplies like the wells, et cetera, and the water was pretty clean. So, as you moved from the well to the distribution system to the water containers it got more and more contaminated.

Slide 56 is another slide from Peru showing people breaking into the water lines.

Again, 57.

And I think on 58 - Slide 58 was from the Amazon area and I was not there, but other people from our group were. And clearly the situation there it would be different with different ways of contamination.

What happened in Peru, Slide 59? While there short-term interventions, emergency interventions, education of the public, chlorinating water supplies, boiling water, then there were mid-term measures like we developed a system of home water storage vessels and home chlorination of water, and then longer-term solutions with real sanitary reform. And cholera eventually died out in Latin American and it probably had something to do with these sanitary reforms.

So Slide 60, we'll move on to Cholera in Haiti. Haiti has a population of about 10 million, it has the Western Hemisphere's highest infant mortality rate, it has the lowest gross domestic product in the hemisphere, and 55% of people are in extreme poverty. It had the lowest water and sanitation coverage in the hemisphere, and this was actually before the earthquake. Only 12% received piped water and 17% had adequate sanitation.

The earthquake occurred in January, as you know, with over 200,000 people dead and there's over 1.3 million people still in displaced camps with about 1300 internally displaced person camps in Haiti. As you know, an outbreak of watery diarrhea was identified on October 19.

Slide 62, this shows one of the first investigations of one of the hospitals just a few days later.

Slide 63 shows the current situation. As of December 9 there were 104,000 cases, 50,000 hospitalizations, and over 2000 deaths.

Slide 64 shows hospitalized cases by day from October to December 4, so the yellow bars represent numbers of cases, and the red line represents the daily hospital case fatality rate. And we do think that the case fatality rate has come down during the course of this outbreak, you know, probably better access to hospitals, et cetera, so we are encouraged by that. However, in other outbreaks around the world, we have been able to get the case fatality rate to be less than 1% and we're really not there yet.

Slide 65 shows deaths by day and from October to December 4. We should remember that there is some lag in reporting of deaths, but hopefully the number of deaths per day is going down.

The - Slide 66 show cumulative total cholera cases and case rate, so this is cumulative, the other slides were per day. And as you can see, we've gone above - well as of December 9 we've gone above 100,000.

Now, Slide 67 compares cholera deaths by week between Peru and Haiti, and we just wanted to compare it to another outbreak where we have had experience, and so the blue line is Haiti and the white line is Peru. So, this is not really scientific in the sense that we're not looking at attack rates per population or per 100,000 or anything like that we're just looking at deaths by week. In fact, the population of Peru is higher, so - in fact this probably - what you're seeing is probably even an under estimate of how bad things are.

But as you can see, the numbers of deaths increased dramatically in Haiti and they increased in Peru, but not nearly as much. So clearly, the number of cholera deaths in Haiti is much higher than it was at Peru at the beginning of the outbreak.

Slide 68 shows results of some - a study that we did in the initial region of Haiti, the Artibonite region, and this was reported in the MMWR last week. We did look at 87 deaths. What we learned was that nearly half died outside of the hospital and less than half drank oral rehydration solutions at home. In fact, among the community deaths, only 23% had drank ORS before they died. So, that's really a pretty profound statement that people were not getting oral rehydration.

The median time to death from onset of symptoms in the community was 12 hours, but again there's that two hours that they were - the range was two hours to eight days. And then, among those who did seek care or try to seek

care, 13% actually died in route, and so they weren't even able to get to care and that's a critical issue that needs to be rectified. Thirteen percent died at home after they were discharged, so they weren't given enough oral rehydration.

Why didn't people go seek healthcare? Well, some of it was education. They did not think they had cholera or they didn't realize that they needed to seek care. But, maybe important as well was that the health facility was considered to be too far and they lacked transportation.

I should mention that this was a convenience sample. It was early in the outbreak. We don't know if this represents what's happening now, so you know, a lot of these numbers could change. However, I think the main overall points are pretty important that people died quickly and they weren't getting ORS.

So, what are the -- Slide 69 -- what are the factors that contribute to severe outbreak in Haiti? Poor water and sanitation, limited access to treatment and inexperience with treatment, probably underlying conditions like malnutrition, maybe HIV, possibly blood group O.

We did find that blood group O was a factor associated with severity in Peru and it's very interesting that the proportion of people with blood group O, in parts of the world where there's not cholera, traditionally, is much higher than in places where there is always cholera for eons, like in India and Pakistan. So, it we think that the proportion of people with blood group O is probably lower than Peru, but probably higher than elsewhere, so that may have some factor for why there's severity in Haiti.

And finally, we've talked a lot about the El Tor biotype, but what we've found with this cholera in Peru - in Haiti, but also since 2005 around the world the predominant strain is an El Tor biotype. So, it has this stealth characteristic or the El Tor strain, but it has a Classic toxic gene. So, there is some evidence, at least one previously published paper that suggests that this strain has the characteristics of El Tor, but it has the - potentially it's more severe, more like a Classic toxin strain.

So, the final subject is cholera in United States and travelers, Slide 70.

Slide 71 shows cases of cholera by year from '96 to 2005, so you can see that every year we have a certain number of cases. Some are from that domestic focus that we talked about in the Gulf, others are associated with foreign travel, and then there's others that we just don't know where they came from. But - so every year there are - you know, there are cases of cholera in the United States.

There - since things began in Haiti there have been cases in the Dominican Republic, some with Haitian travel history, but other that are - happen just in the Dominican Republic. And we'll - this all will be reviewed in an upcoming MMWR article. We have to confirm everything first, et cetera.

In the United States there have also been lab-confirmed cases, most of them - all of them so far are in persons traveling back from Haiti, and again this will all be reviewed in an upcoming MMWR. But, the point of this slide is sort of the point of why we're doing this COCA call is that there are people who probably will come back from Haiti or Dominican Republic and could potentially have cholera. And since cholera can kill, it's important for clinicians to be able to recognize it.

What is some advice for travelers to areas affected by cholera? Avoid unboiled, untreated water, carbonated drinks without ice are probably safe, avoid foods from street vendors, avoid raw or undercooked seafood, eat foods that are cooked and hot and fruits you peel yourself, and do not bring perishable seafood back into the United States, I'll talk about that in a minute, and we always tell people boil it, cook it, peel it, or forget it.

So, Slide 74 is a picture that I actually took. I actually bought those crabs and that was my briefcase when I was an EIS Officer, but it was because in 1991 there were cases of cholera among people who brought crabs back in their suitcases from Ecuador. There was an outbreak in New Jersey and there was an outbreak in New York. So, it is something to think about it that people could bring back foods and cause little outbreaks of cholera in the United States.

So, what about other control measures? Do we recommend antibiotic treatment of family contacts? Possibly that could work under the ideal setting if you had enough healthcare workers and you had enough community workers. If you could get antibiotics to people from a family where they got cholera, it's probably that other people in the family might be brewing this - might have drank the same water or the same bad food.

So, you could conceivably give antibiotics to family contacts. In fact, that's hardly ever done just because of the circumstances. In fact, no outbreak where I've been a part of has that been successfully done.

Mass chemoprophylaxis is generally thought to never be useful. The antibiotics only last one or two days. The - you could develop a resistance.

You get - have people think that they're going to be not susceptible anymore. Under the rarest of circumstances someone might consider it, like a prison or a cruise ship, but in general mass chemoprophylaxis is not recommended.

Quarantine? It sounds like a good idea, people always try to do it, in fact it doesn't work because as we showed most cases of cholera are asymptomatic so you would be able to find them anyway.

Now vaccine, we're not going to talk a lot about vaccine. Slide 76 mentions that there is one oral vaccine that's commercially available, but it's not licensed in the U.S. or Haiti. It requires a cold chain and two doses 7 to 14 days apart. It probably is pretty effective, but it's not recommended by WHO at the current time. It takes too long to deliver, by the time you've delivered it and given two doses and develop immunity, a couple weeks later the cholera outbreaks are usually over. However, this all is being reviewed and - by PAHO, by CDC, by others, and we will probably have a lot more discussion about whether this should be revised.

Finally, Slide 77 shows Safe Water System that was developed after cholera in Peru and in Africa in the 1990's, and it's being used all over the world. It's a way of making sure that people can't contaminate their water buckets, and also get chlorine.

And the final slide shows a picture of some storage containers that were produced in Haiti and used in Haiti since 2001, not since the cholera pandemic - not since the cholera outbreak started. This was since 2001, so we're trying to increase that.

And that's it for me. Thank you very much for your attention.

Loretta Jackson Brown:

Thank you, Dr. Swerdlow for providing our COCA audience with such a wealth of information. We will now open the lines for the question-and-answer session.

Coordinator: If you would like to ask a question, you may press star 1. Please record your first and your last name clearly when prompted. To withdraw your request, you may press star 2. One moment, please.

Once again if you would like to ask a question, you may press star 1.

At this time, I'm showing no questions.

Loretta Jackson Brown:

I would ask if our presenter, Dr. Swerdlow, would like to emphasize a few take home points for our presenters [participants].

Dr. David Swerdlow:

Sure. Just the same ones I've already mentioned that cholera can kill in two hours, but is very treatable. And so, ensuring that everybody has access to oral rehydration is the critical thing that needs to be done to save lives, and obviously that's easier said than done, especially in a whole country like Haiti. But certainly, being able to have - make sure that everyone has access to oral hydration is the critical portion of what we need to do to save lives.

And for U.S. clinicians, you have to think about cholera otherwise the diagnosis won't be made because you need to use special diagnostic agar, and you need to tell you lab that that's what you're suspicious of. And you would

want to treat a potential patient before you get any results back from the lab and make sure they're monitored and make sure they have the appropriate rehydration in order to save lives.

I think those are the main points.

Loretta Jackson Brown:

Thank you. Operator, do we have any more questions?

Coordinator: We do have a question from (Marcy Gold). Your line is open.

(Marcy Gold): Thank you for your presentation. What are the prospects for controlling the spread of cholera to other countries in this region?

Dr. David Swerdlow:

Well, I don't know if we know the answer to that. You know, as we talked about with El Tor cholera in particular, it's the - it's a stealth cholera. And so, most people who have it are asymptomatic, and so it can be very hard to contain.

We - you know, we're certainly hopeful that we can contain it, but it's already had cases in the Dominican Republic and people have brought it back from - you know, from Haiti to the U.S. Luckily in the U.S., you know, we have good sanitation so if a person has cholera in the U.S. they're not going to spread it. But, that's not necessarily the case in the other countries in the Caribbean.

The good news is, I think, is that, you know, other countries don't have the sanitary systems and water systems like - that Haiti do, they have better

sanitation and water. And so, we have seen cases in the Dominican Republic and that certainly needs to be watched and carefully monitored and responded to, but we certainly haven't had in the Dominican Republic what you have in Haiti.

So, it's hopeful that other countries with better water supplies and better sanitation won't have outbreaks, but it's very difficult. Unless you stopped all movement of populations it's very difficult to stop the spread of cholera. And I should say plenty of times since the 1960's, when the seventh pandemic began, groups did try to quarantine and prevent having quant-sanitaria and prevent movements of population and it just has never worked. People - if people want to get to another place they'll get there no matter what you do.

So some things sound like good ideas, but in practice they've never really worked.

Coordinator: Once again if you'd like to ask a question, you may press star 1.

At this time I'm showing no further questions.

Loretta Jackson Brown:

On behalf of COCA, I would like to thank everyone for joining us today, with a special thank you to today's presenter, Dr. Swerdlow.

If you have additional questions for today's presenter, please email us at COCA@cdc.gov. Put "Dr. Swerdlow" in the subject line of your email and we will ensure that your email is forwarded to him for a response. Again, that email address is COCA@cdc.gov.

The recording of this call and the call transcript will be posted to the COCA Web site at Emergency.CDC.gov/COCA within the next few days.

To receive information about upcoming COCA calls, please subscribe to COCA by sending an email to COCA@cdc.gov and write "Subscribe" in the subject line.

Thank you again for being a part of today's COCA Conference Call. Have a great day.

Coordinator: Thank you. This concludes today's presentation. You may disconnect at this time.

END