Ancestral Origin and Dissemination Dynamics of Reemerging Toxigenic *Vibrio cholerae*, Haiti

[Announcer] This program is presented by the Centers for Disease Control and Prevention.

[Sarah Gregory] Hello, I'm Sarah Gregory, and today I'm talking with Dr. J. Glenn Morris, the director of the Emerging Pathogens Institute at the University of Florida. We'll be discussing the origin and spread of cholera in Haiti.

Welcome, Dr. Morris.

[J. Glenn Morris] Thank you. It's good to be on.

[Sarah Gregory] What is *Vibrio cholerae*?

[J. Glenn Morris] Well, actually *Vibrio cholerae* are free-living environmental microorganisms, and the who genus *Vibrio* are, again, free-living environmental microorganisms. They are found most commonly in estuarine areas, and they are found globally. And they cause a variety of different disease manifestations. *Vibrio cholerae* has some strains that produce cholera toxin, and the strains that produce cholera toxin are able to cause the disease cholera. I would note that there are a number of other strains of *Vibrio cholerae* that do not produce cholera toxin, which are generally categorized as "non-O1 *Vibrio cholerae* strains," which can cause milder diarrheal disease. But when we're talking about cholera (the disease cholera), we're really talking about *Vibrio cholerae* strains that have the genetics to produce a pretty nasty toxin called cholera toxin.

[Sarah Gregory] And what kind of symptoms does it cause and how dangerous can they be?

[J. Glenn Morris] It can be pretty dangerous. As I said, it comes back to the toxin. As I frequently tell my students, cholera is in many ways a very simple disease—it's all about cholera toxin. Cholera toxin is the main virulence factor. It's a heat-labile enterotoxin. To get a little technical, it causes increased chloride secretion by intestinal crypt cells and decreased sodium chloride coupled absorption by villus cells. The bottom line from all that is...what it means is that you get really bad diarrhea. There is profuse movement of water into the intestine.

As I said, it's a pretty potent toxin. Many years ago, before IRBs were quite as active as they are today, there were volunteer studies where volunteers were fed quantities as small as 25 micrograms of cholera toxin, and the volunteers fed 25 micrograms had a diarrheal purge in excess of 20 liters, which is a whole lot of diarrhea, and is definitely fatal if one is not plugged into an IV. Essentially, clinically, what one can see are rates of diarrhea that can exceed a liter per hour, and in the most severe cases, known as cholera gravis, what you see is volume depletion and circulatory collapse which can occur literally within a matter of hours.

In the absence of treatment, mortality rates of up to 40% are reported. This is one of these diseases (epidemic diseases) where literally you can see bodies in the road. People die and die very rapidly with onset of this very profuse diarrhea. From a therapeutic standpoint, what's interesting is the fact that the toxin does not affect glucose-mediated transport, which forms the basis for oral rehydration. So there is excellent simple therapy, which is taking oral rehydration. But in the absence of therapy, this is a devastating disease.

[Sarah Gregory] So basically it just sucks the body dry?

[J. Glenn Morris] Essentially, yes.

[Sarah Gregory] Okay. Let's go back for a second. You mentioned before IRBs. Would you explain to us what an IRB is?

[J. Glenn Morris] Sorry, an Institutional Review Board that reviews studies. I think an Institutional Review Board in today's world would be a little reluctant to allow someone to be feeding cholera toxin to a volunteer. However, the study was done, and it very clearly demonstrated that infinitesimal amounts (microgram amounts) of this toxin are enough to cause really, really profuse diarrhea. And as I said, the game is all about the cholera toxin. It is in many ways a simple disease. If you have a strain that produces cholera toxin, you get profuse diarrhea and you can die.

[Sarah Gregory] How old is cholera and how global is it and how much damage has it caused worldwide?

[J. Glenn Morris] Actually, cholera is one of the great pandemic diseases of mankind. You know, we've recently gone through the COVID pandemic, so that's probably the newest great pandemic disease of mankind. But the history for cholera goes back millennia, according to some authors, since "time immemorial" in South Asia and Bengal. It's well documented in medical history, case histories from Asia back 2,000 years ago, and it was enough of a problem that in the Hindu pantheon, there is a goddess of cholera, Olidevi, who people would offer gifts to try to reduce the likelihood that cholera would hit their particular community.

Now, sort of in the modern history of cholera, starts in 1817 when what was called the first pandemic of cholera occurred—and I will tell you a preview of coming attractions, there are seven pandemics which have been identified. The first pandemic was in 1817, it was identified in Oman, it was associated with movement of troops from Bombay to the Persian Gulf, spread as far north as the Republic of Georgia. The third pandemic was 1852 to 1859 in Europe and the Americas. That pandemic is perhaps best known for having John Snow, who in 1854 linked cases of cholera with sewage-contaminated water pumped from the Thames.

[Sarah Gregory] I want to interrupt you here just to say that there's a book called *The Ghost Map* listeners might want to look into. It's really fascinating. It's the story of Snow and London and the cholera epidemic.

[J. Glenn Morris] No, I am in complete agreement. I was actually going to put in an ad for that as well. It is a great book, and I think, you know, the story of John Snow, again, basically he stopped the epidemic by removing the pump handle. And for all of us who have training in epidemiology, this is sort of the critical moment in the history of epidemiology. But it was cholera, and it was the third pandemic, and it was 1854, so as part of the overall flow of this great pandemic disease of mankind.

Now, more closer to the present time, current cases are basically due to what's called the seventh pandemic. Actually—and I think with COVID we've become very familiar with variants—and what happened in 1937, a cholera variant showed up for the first time, with mild cholera-like illness in Wadi El Tor on the Sinai Peninsula among pilgrims from Mecca, and this became the El Tor variant of cholera. It sort of was seen occasionally, but then suddenly there were explosive outbreaks beginning in 1961 in the Celebes in Indonesia, with subsequent global spread. And we continued to be in the midst of the seventh pandemic even today. The strains that we see circulating globally today are the El Tor variant that arose in the seventh pandemic.

So again, this is a disease with a very long history, very much entwined with the history of mankind, but one that, you know, is...and I think that's one reason why the studies that we continue to do are important is that this is a disease that still causes major difficulty at a global level, particularly in areas where there's breakdown of public health infrastructure or where there may be environmental or human-source humanitarian disasters—which limit our ability to put in place therapeutic interventions, such as oral rehydration—but where the disease can continue to spread is a major cause of serious disease in humans.

[Sarah Gregory] How does cholera get endemic in a country in the first place?

[J. Glenn Morris] Again, sort of going back into the history of cholera and now with modern genetic studies, it's clear that the homeland of cholera is the Bay of Bengal in the estuarine delta regions of the Ganges...where the Ganges and Brahmaputra rivers come together. In these areas, what one sees are seasonal outbreaks that have occurred literally for thousands of years. And it has always been postulated that there were environmental reservoirs—again, this is an environmental organism—with environmental triggers leading to spillover of the disease into human populations. Now again, freshly passed stool in a cholera patient has a much lower infectious dose than the stool coming out of the environment, and so once an outbreak occurs and begins...and the strains begin circulating in human populations, it can spread very rapidly with rapid increases in case numbers. So you seem to be having a situation where there may well be an initial environmental reservoir, spillover into humans—although, again, not well documented—rapid expansion within human populations, and then the disease tends to wane and goes away until the next year.

But as I said, the data are not definitive. And what is of particular concern is that outside of Asia (outside of the homeland of cholera), what one tends to see is introduction of cholera. A person carrying cholera, who are with the disease, comes into an area, particularly an area in the midst of a humanitarian or environmental disaster, spreads it to another person, and then it takes off rapidly within human populations. And then you get an epidemic and then after a year or so, the epidemic stops—we're not quite sure why; that's one of the interesting research questions—and then a couple years later, it may suddenly spring up again with a new epidemic. And so, there's sort of the pattern in the Bay of Bengal homeland, but then we have sort of a less of an understanding of what drives the emergence of epidemics in areas outside of that homeland area. And again, that's sort of what got us interested in Haiti initially.

[Sarah Gregory] So walk us briefly through the history of cholera in Haiti and then the timeline of what happened starting with the 2010 epidemic.

[J. Glenn Morris] Okay. In 2010, as you may remember, Haiti had a massive earthquake (January 12th, 2010). It caused incredible destruction within the country. It basically resulted in destruction of much of the existing public health infrastructure—sewage systems, water systems, medical systems...absolutely devastating earthquake. And at least for our school of medicine here, for a number of other relief organizations and schools of medicine, there was a major effort made to provide relief for that earthquake. Now, when earthquakes occur, people sometimes say, "Oh, we always worry about cholera". But everybody said, "Eh, you know, there hadn't been cholera in Haiti for 100 years, it's an island, how would cholera get to Haiti? No, that's not something we need to worry about".

But sure enough, the first case of cholera appeared on October 21st in 2010. The first cases were along the Artibonite River, which is a river in central Haiti, and what seems to have happened—

and again, while there are reasonable data supporting this, it's not 100% certain—but what seems to have happened is that potentially members of a peacekeeping force...and again, there were peacekeeping troops present in Haiti at the time—there was a peacekeeping unit from Nepal, that unit was camped along the Artibonite River. Their sanitation system was rudimentary, there were possible issues with the chlorinator chlorinating the raw sewage that was going into the river.

And what appears to have happened or what has been postulated is that one or more members of this peacekeeping troop may have brought cholera with them from Nepal, either as a very mild case or maybe even as an asymptomatic infection, it got into the river—I said before, this is an environmental organism—it got into the river, it started spreading. From an epidemiology standpoint, John Snow would have loved it. You could track the cases. As you went down the river, case numbers moved, case numbers began to increase. The organism moved into human populations, began to rapidly spread across the country of Haiti. You could follow it along the main roads, you could see it spread. We actually did studies that, you know, where we tracked the geolocation of the different cases as they occurred and you could watch it spreading along major highways, then moving onto minor highways, moving back into the countryside, getting back into rivers, spreading along rivers, moving back onto highways, rural roads.

And ultimately, there were close to a million cases of cholera identified. 820,000 is the official number given, 10,000 deaths reported out of a population of 11 million. Probably a whole lot more cases that were never clearly identified. It was, on top of the earthquake, this was a devastating follow-up epidemic that had a major impact on Haiti. Now, again, what subsequently happened was that case numbers, as they tend to do, started declining. And again, it was a different environment from Bengal. This was not the languid delta rivers that one sees in Bengal. These were rapidly running rivers coming out of the mountains, moving rapidly to the sea. So we weren't quite sure what was going to happen, whether cholera was going to disappear forever from Haiti or...you know, again, what was the pattern that it was going to assume?

[Sarah Gregory] Well, on that note, why don't you tell us about your study and how you went about it.

[J. Glenn Morris] As part of our study, since the very first days of the epidemic, we had been monitoring environmental and clinical sites in Haiti, collecting isolates from patients from the environment. And again, in contrast to many of the earlier cholera studies, we had the availability of much more sophisticated tools that allowed us to sequence the microorganisms, to track them, to track their spread. And so, what we watched, interestingly, was the slow decline in cholera, trending downward until February 2019, there were no more clinical cases being reported in Haiti. And actually, three years later, no more clinical cases identified, the Prime Minister declared the country cholera-free, and there was actually a big ceremony, great rejoicing, "cholera is gone, it's gone forever".

Never say that, because on October 25th, 2022, just not too many months later, new cases of cholera showed up in Port-au-Prince. And the question then was where did they come from? Were they a point source? Were there multiple strains which suddenly reappeared? Did the strains come from outside of Haiti? Did another visitor bring them into Haiti? Were they low-level, asymptomatic carriage in Haitian citizens? Did it come from the Haitian environment? And these actually were important questions for Haiti, but I think they are also important for our overall understanding of the disease, in trying to understand why one gets these recurrent epidemics after you think you're through with it. Why do these recurrent epidemics occur?

And so, what we did—and again, we were working closely with GHESKIO, which is a major research institute in Haiti. We, again, collected lots of isolates, used molecular epidemiologic techniques, sequenced strains, and we were able to show that what seemed to be happening is that things seemed to originate from a shanty town area along the harbor area of Port-au-Prince, which had been a major hotbed of cholera back in the first epidemic, and we could actually show very nicely the spread of those strains as it went through Port-au-Prince and then across multiple areas of the country.

And again, the question then was where did it come from? And we looked at isolates from all over the world at this point in time, and said, "Could any of those isolates suddenly have appeared in Haiti?". And we also looked at our past environmental isolates and the past clinical isolates, trying to figure out, again, where did it come from? Because if we knew where it came from, it would help us not only manage the current epidemic, but potentially help us better manage cholera epidemics in other parts of the world.

[Sarah Gregory] Did you have any other conclusions you wanted to mention that you found?

[J. Glenn Morris] Yeah. Well, I mean, that was the question. So the answer was that, no, the new strain in Haiti did not match anything else anywhere else in the world. This was a Haitian strain. It was very closely linked with the earlier Haitian strains based on molecular analysis. But what was interesting was when we went back and looked at our prior strains—and again, we had seen evolution of the major clinical strain within Haiti over a period of years—what we found was that the closest match actually was from an environmental strain from 2018. This strain was in an area...a place called Jacmel, which actually was a... sort of a resort town on the beach on the southern coastline of Haiti. And we could actually see that strain...that the strain had been living in the environment there for several years.

And so, what appears to have happened, you know, at the time that this epidemic occurred, a hurricane had gone through. There was also further breakdown of the public health water system. What seems to have happened is that with flooding associated with the hurricane, strains that were in the environment may have gotten into potable water sources—the water systems were breaking down, the water drainage ditches that were going through Port-au-Prince may well have been carrying cholera—and this, in turn, may have been the trigger for the outbreak.

And so...I mean, this is really the first time there has been a very tight, clear documentation that these recurrent outbreaks years later—in this case, more than three years later—really are coming from environmental reservoirs of the microorganism. And I think in Haiti...and the reason this paper is important, is that what it does is clearly document the importance of the environmental reservoirs. And what it also does is emphasize, for one thing, the importance of public health infrastructure. It says that this organism can live for extended periods of time in the environment. One needs to have good sewage. One needs to have good water systems. One needs to have a high-level of immunity within the community. A recent paper published shows that the levels of immunity within the population at the time the new epidemic started were very low, had rapidly dropped after the end of the last of the first epidemic. And so, it also makes a strong case for the importance of ongoing vaccination within a community, even if you're not seeing active cases, because you know that the organism is out there in the environment and has the potential for coming back years later and again causing epidemic disease.

[Sarah Gregory] So there is a vaccine for it?

[J. Glenn Morris] There is a vaccine. The vaccine is actually pretty good. It is a killed whole-cell vaccine (oral vaccine), and it works. The immunity elicited by the vaccine also tends to wane after a couple of years. And so, this is one of these instances where one can't get immunized and be protected for life. One needs to think about development of a public health strategy that includes both, you know, optimizing your water system to minimize the chance of spread from the environment, but also to consider a regular program of community immunization to try to minimize the risk that if a strain does get into a human, that there is a significantly reduced likelihood that it's going to cause a problem. And so, again, this was an instance where we had a... not totally unexpected but concerning episode with recurrence of disease more than three years later after the supposedly last case. But it gave us an opportunity to try to understand why these epidemics reoccur and think about strategies to minimize the risk of these reoccurrences.

[Sarah Gregory] Was there anything that you found surprising?

[J. Glenn Morris] Not so much surprising. It was actually...you know, sort of...in science, there are occasionally these 'aha' moments where, in this case, using the very sophisticated sequencing technologies and a variety of other molecular approaches, we were able to clearly demonstrate that the strain causing the new epidemic came from an original environmental source. And so, it was sort of...not so much a surprise as saying, "Ah, we think we've figured it out, at least this time". And it's nice to see how the science can be applied and how it can help us understand basic disease transmission, which in turn can help us better develop public health programs.

[Sarah Gregory] Go back over here a little bit for us. Why are outbreak studies important?

[J. Glenn Morris] Well, I think what outbreaks let us do, and again, they are important at several levels, one is that outbreaks are not good. Outbreaks basically represent the occurrence of large numbers of cases, or more cases than expected within a population. And so, by studying outbreaks, one can get a better idea of how diseases are transmitted. There are certain diseases that in particular tend to be prone to cause outbreaks—as I said, the great pandemic diseases of mankind, of which cholera is one. And so, in this instance, by carefully monitoring this outbreak in Haiti, what it gave us was further confirmation of exactly what's going on in terms of why the outbreak potentially stopped (which we're still working on), but then also why we got recurrence of the outbreak, what the sources were. And then in turn, it allows you to put in place preventive efforts so that you hopefully will not get more outbreaks in the future, or at least you'll minimize the chance that those outbreaks will occur.

[Sarah Gregory] This study has a lot of important public health implications. You want to give us a quick recap of the most important ones?

[J. Glenn Morris] I think a key element here, at least for *Vibrios* is the importance of the environmental reservoir. I think that the outbreak has demonstrated how important it is to monitor the reservoir, to know what's going on within those reservoirs. And in turn, what it does is raise questions about how we can best prevent recurrent disease. Again, for John Snow, it was removing the pump handle from the pump. Not quite so simple these days. But what it does emphasize is the importance of public health infrastructure, the importance of water systems (of good water systems) and, as I said...as I've already said, the importance of immunization to try to minimize the risk that subsequent outbreaks will occur. So it's an interesting scientific example, but it also has some very real, direct public health impact that will influence the way that we approach trying to prevent cholera outbreaks in the future.

Now again, we're still going to get the cholera outbreaks where somebody drops into a country, or a peacekeeping team drops into a country and brings in a cholera strain and it starts spreading rapidly within human populations. And again, there are multiple recent examples. In fact, we're in the midst of a major global surge in cholera cases, and we're not quite sure why. Part of it is, you know, there's a lot of humanitarian disasters underway right now which set the stage for cholera outbreaks. There are, as well, environmental disasters which are occurring. And we see explosive outbreaks in places all over the world, particularly in parts of Africa we are seeing major problems with cholera. And so, the more we learn about cholera, the better we understand its transmission, we can better try to control the specific outbreak. But again, our focus has really been more on trying to understand how to make sure that once an outbreak is over, it's over, and that you're not or you're going to minimize the risk that you will then set up a situation where you will get recurrent outbreaks, as we seem to be seeing in Haiti. I would mention the current outbreak in Haiti, we are now estimating there are over 64,000 cholera cases since last September (basically, within a year's time period). That's a lot of cholera. And there are probably a whole lot more cases than that. It really would have been great if we had been able to prevent a second epidemic occurring.

[Sarah Gregory] You have a second paper in the October issue of the EID journal on *Vibrio mimicus.* How is it different?

[J. Glenn Morris] It's actually interesting that both of these papers ended up in the same issue of the journal. The *Vibrio mimicus* paper is on...actually describes a much smaller outbreak, which was due to a strain. And we had an outbreak here in Florida associated with a seafood restaurant where we had six cases. And we had actually some fairly sick people—four people, you know, ended up getting hospitalized and one ended up in the ICU with severe volume depletion. And again, we were able to control it. But what it does is say that, you know, we focus on cholera and there's sort of the sense that cholera...well, that's a disease that occurs somewhere else, you know, that occurs out where there's something going on in Africa or in some far, distant country.

The reality is *Vibrios* are in the water here, around us here in the United States, and there have now been several publications (including ours on *mimicus*) that have noted the increasing occurrence of outbreaks of other *Vibrio*-related diseases, particularly *Vibrio vulnificus*, the number of cases seems to be rapidly increasing; *Vibrio mimicus*, our report of an outbreak here in Florida. And what this comes back to is the fact that, as I said, *Vibrios* are an environmental organism. But they are extremely temperature sensitive. They are in many ways sort of the poster child for global warming.

And as we are seeing increases in sea surface temperature, we are seeing increasing outbreaks due to a variety of different *Vibrio* species which are clearly of concern. Now I had mentioned earlier that we are in the midst of a global significant increase in cholera, and the question that is asked is, "Well, is that global warming?". And sort of the stock answer is, "Oh no, you know there's so many other factors that drive emergence of cholera". But it's also clear from our studies and studies of others that, you know, the environment is very important for cholera as well. And so, I think there may well be some impact on the global increase in cholera related to global warming. But overall, what it does is make us step back a step and think that...and realize that when we're dealing with pathogens, particularly pathogens that may have a temperature-dependent component, that we really need to begin to be concerned about rising global temperatures.

[Sarah Gregory] I think you touched on this earlier while we were talking, but how did you get involved in this study?

[J. Glenn Morris] See, the study in Haiti, we became involved because our particular research group has actually worked with cholera for decades. In fact, my first experience with cholera was when I was a child growing up in Bangkok, Thailand, and we watched the epidemics of El Tor variant *Vibrio cholerae* coming through southeast Asia. And so, for me this has been a disease that has always been one that has been of great interest. And so, we have looked at cholera and other *Vibrios* in Bangladesh, in India, in Africa in multiple countries. We're currently doing studies in Goma in the Democratic Republic of the Congo. And for us, having the cases occur in Haiti provided an excellent opportunity to better understand this particular pathogen and try to get a better handle on how we could put in place appropriate public health interventions.

And again, as the *Vibrio mimicus* cases reflect, we're probably talking about a larger picture, which is how do you prevent expansion of diseases that are environmentally-based where we know we're undergoing nature global environmental change, and how might these diseases, and again, for us it was cholera in Haiti, but it was also *Vibrio vulnificus* in Gainesville, Florida that allowed us to try to begin to understand what's going on and to recognize the fact that many of these pathogens may be increasing in frequency.

[Sarah Gregory] With all of these increasing *Vibrio* pathogens, are there guidelines that people should know about in order to protect themselves? Or interventions they can do themselves (like you talked about oral hydration)? What can people do?

[J. Glenn Morris] Well, I think for cholera—and again, cholera is one of the great pandemic diseases of mankind—prevention at an individual level basically is focused on vaccination, and for travelers who are going into an area where cholera is known to be causing epidemics, carrying along packets of oral rehydration solution is not unreasonable because the basic treatment is oral rehydration. I think there simply needs to be an awareness of where the risks are and, as I said, the need for vaccination. I think that for some of the other *Vibrios*, and I mentioned in particular *Vibrio vulnificus*, which has been attracting a lot of attention recently, but also for other *Vibrios* such as *Vibrio mimicus*, I think there needs to be an awareness that these other environmental *Vibrios* may be occurring with greater frequency. There needs to be caution, particularly in consuming undercooked or raw seafood, such as oysters, or where there may be cross-contamination of seafood within kitchens between live animals that may be carrying the organism and cooked food.

And there's also an awareness that these diseases could be occurring. As I said, the *Vibrio mimicus* cases we had here in Gainesville probably would not have been diagnosed had we not had very sophisticated diagnostic capabilities here at the University of Florida. So I think there needs to be an awareness that these other infections are occurring. I think for people who are at high risk for serious infections due to some of these other agents such as *Vibrio vulnificus*, people who are immunosuppressed with underlying liver disease, there should be real caution about seafood consumption, particularly during warm summer months when these microorganisms are at their highest levels. And we've also been seeing a lot of issues with wound infections with some of these microorganisms. And again, potentially if you are immunosuppressed or at high risk for infection, maybe not going swimming in this really warm bathwater temperature water we have along the coast here in Florida that is showing up with increasing frequency in the coastal United States.

[Sarah Gregory] Good luck with that. Gosh.

On that same note, emerging infectious diseases seem to be piling up faster and faster—a non-travel related dengue case in California, leprosy in Florida again, leishmaniasis in the US. What's going on?

[J. Glenn Morris] I think there are probably two factors. One is better diagnostics. I think that our *Vibrio cholerae* studies in Haiti were really enabled by, you know, excellent molecular diagnostics capabilities and including the ability to very rapidly sequence strains and use sequence data to allow one to trace and monitor spread of an epidemic. And for some of these other pathogens, again, there is a tendency if you come to your doctor with a fever or diarrhea or some other symptom, they say, "Oh, you know, it's just a virus" or "Oh, yeah it's just something you ate". Increasingly, however, we have the molecular capabilities to really make these diagnoses. And so, we are identifying more cases.

But I do think the other side, I think one has to come back to this idea of a changing global climate, and that pathogens where their environment is modified by climate change or the environment in which vectors...their vectors live (for some of the vectorborne diseases) may impact where these particular diseases are occurring. And so, diseases that we always thought were, "Nah, it's not going to happen here in the States", it's starting to happen here in the States because, again, our climate is changing. I think as an infectious disease specialist, there's an importance to be able to recognize a disease and make its diagnosis, but also an importance of understanding that diseases that we used to write off of a differential list because it never happens here, may actually start to happen here.

[Sarah Gregory] You are an associate editor for the EID journal. Tell us about what's involved in that and how long have you been doing it.

[J. Glenn Morris] I've been doing it for a long time. I was actually trying to figure out exactly how many years. It's probably an excess of 20 years. Basically, as an associate editor, I have the responsibility of looking at papers, manuscripts that are submitted to the journal, and making an initial judgement on whether they should go out for review or, you know, what should happen to them and then basically guiding—for papers that are solid papers—guiding them through the review and revision process.

And for me, it's an important and exciting part of being a physician/infectious disease specialist/epidemiologist in terms of hearing about what's going on at a global level, but also really helping people to think about some of the implications of what their papers are finding and how this impacts us both in terms of management of specific diseases (specific emerging diseases), but again, coming back to this idea of how do we understand why diseases occur in the first place, how diseases are transmitted. Our cholera paper basically was looking at why did this disease suddenly appear again three years later. Our *mimicus* paper was why are we suddenly starting to see these organisms appearing where we really hadn't seen them before? And I think part of the excitement of being an editor is helping writers to pull some of these pieces together and to see how things link together as we really try to understand and have a global impact on occurrence of outbreaks and on emergence of pathogens.

[Sarah Gregory] Well, thank you for being an editor, and we really appreciate what you do. I've been at the journal 13 years now but hadn't realized you'd been there for so long. And also thank you so much for taking the time to talk with me today, Dr. Morris.

[J. Glenn Morris] It's my pleasure.

[Sarah Gregory] And thanks for joining me out there. You can read the October 2023 article, Ancestral Origin and Dissemination Dynamics of Reemerging Toxigenic *Vibrio cholerae*, Haiti, online at cdc.gov/eid.

I'm Sarah Gregory for *Emerging Infectious Diseases*.

[Announcer] For the most accurate health information, visit cdc.gov or call 1-800-CDC-INFO.