

Ebola Virus in Southern Mali

[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. Heinz Feldmann, chief of the Laboratory of Virology at NIAID at NIH in Rocky Mountain Laboratories in Montana. We'll be discussing Ebola virus prevalence in southern Mali.

Welcome, Dr. Feldmann.

[Heinz Feldmann] Hi.

[Sarah Gregory] Everyone has heard of Ebola by now but may not know what it actually does to a person. Tell us how it affects someone, from initial symptoms to the outcome.

[Heinz Feldmann] Well, Ebola is on everybody's mind these days and that's largely due to that big outbreak in West Africa from 2013–2016. Even so, Ebola goes back to its discovery in '76 in what was Zaire at that time—and what is now southern Sudan—a part of Sudan in '76. And when people get Ebola, the first symptoms are very unspecific. It starts with fever, you can have aches and pains, headache, muscle and joint pain. You feel fatigue, weakness, sore throat, loss of appetite, and then you may develop gastrointestinal symptoms including abdominal pain, diarrhea, and vomiting. And then you can develop hemorrhagic bleeding and bruising. And that's actually one of the more characteristic signs of Ebola hemorrhagic fever. But in that big outbreak (and also in outbreaks before, that were smaller), it was described that a lot of people don't develop these obvious hemorrhagic signs, and that's when the community decided to call it Ebola virus disease rather than Ebola hemorrhagic fever (which was the older term), to just reflect that not all Ebola cases have obvious signs of kinds of hemorrhaging.

Then when you go through the disease progression, we know now that people can survive due to their own immune system response. There's also treatment, and I think we talk later about that. And there's also vaccines. So, we do have survivors these days. But usually in a lethal or in a very severe and lethal case, around day 7–10 people start develop more systemic, whole-body symptoms. They do develop the hemorrhaging in this time, and it's at the end it comes to like a multiorgan failure and people die in that stage of the disease. So, it's a very dramatic picture in the second week of disease symptoms.

[Sarah Gregory] And it's extremely contagious, right? How exactly is it spread?

[Heinz Feldmann] Well, Ebola is contagious but it is not transmitted through the air and by aerosols, at least that there's no good evidence, and it's transmitted largely through direct contact with body fluids from an infected individual. And the initial case usually has contact to an animal reservoir or an animal amplifying host. We believe today (or at least that the most common hypothesis) is that Ebola comes from bats and is transmitted from bats either directly into the human species or goes through what we call amplifying hosts. Those could be, for example, a primate or a nonhuman primate, it could be an antelope type of species. And then from that amplifying host gets into the human species. But what we all know about Ebola is actually the human-to-human transmission. So once a case comes into a hospital setting and gets treated under low hygiene standards in resource-poor areas, then human-to-human transmission through direct contact with body fluids is the main way of transmission. So if you look at the overall cases, this is really the vast majority of cases just by human-to-human contact and human-to-human body fluid contact.

[Sarah Gregory] I think people think of it as basically a death sentence, if you catch it. But you were just saying that the outlook has improved—there's vaccine and better treatment now. You want to elaborate a little bit more on that?

[Heinz Feldmann] Yes. I mean the term of a death trap associated with the so-called Ebola treatment centers is...it is a common thing in outbreaks (at least in past outbreaks). And you can understand that people are saying that because, you know, if relatives would come into the Ebola treatment centers, particularly if we talk Ebola Zaire virus (which is the one that everybody thinks about when we talk Ebola), but there is more than that. That had a case-fatality rate of up to 90%. So almost everybody that ended up in these Ebola treatment centers would not come out alive. So that's, I think, where the term comes from. But particularly since that big West African outbreak, we know that we have survivors. Even up to 50% of people survive. And that has multiple reasons. First of all, there could be changes in the virus that could cause a higher survival rate (it could be the species of Ebola that may have a higher survival rate). But we also have better treatment centers and better means, just in terms of the infrastructure, in terms of the basic care—fluid substitution, antibiotic treatment of secondary infections, and drugs that are just used to cope with the symptoms people have such as vomiting and diarrhea. And then since a few years we now have even specific treatments which are basically monoclonal antibodies. So these are those proteins made in cell culture systems (and) that a human would produce when a human is infected and tries to fight the Ebola infection. So, these are highly specific to the Ebola virus—to the specific species of Ebola virus—and they can directly attack that virus and prevent it from entering the cells in an infected individual. So we have specific treatment today. And this altogether with the vaccine that we also have today increases, of course, the chances of survival.

[Sarah Gregory] Your study is about Ebola virus in southern Mali and testing for seroprevalence. What is seroprevalence and how is it used as an indicator of disease and infection?

[Heinz Feldmann] Well, this is coming more from the epidemiology side of things. So for many infectious diseases, we do these so-called seroprevalence studies, which is basically detecting the immune response of an individual to certain pathogens that the individual may have encountered. Viral infections in general can lead to asymptomatic infections. So you get infected, the virus replicates to a certain degree, but you never get sick. And then your body makes these proteins to defend the incoming virus or pathogens, which are called antibodies. And what seroprevalence studies detect are these antibodies. So what is said is if you find a positive person, that indicates that this person has seen this particular pathogen (in this case, Ebola virus) and either was mildly ill, was severely ill and survived, or wasn't ill at all and made these antibodies. And that's what you're detecting. So it's an indication that an individual has seen this virus (in this case, Ebola) and in that way it gives you a good idea of where Ebola might be hiding, where Ebola exposure can happen, and this is usually one of the first studies that you do. You want to see—you want to get an overview of what you're looking at in a population in a special geographic region in terms of a specific pathogen, or in terms of multiple pathogens—we have nowadays multiplex assays that detect these types of antibodies for many pathogens. So we have very advanced technology these days. But our study was specific for Ebola, and we just tested for Ebola virus.

[Sarah Gregory] And is there a specific type of test that's used to determine if somebody has Ebola antibodies?

[Heinz Feldmann] If you want to determine Ebola virus antibodies, there is multiple tests available. But the most commonly used test is the so-called enzyme-linked immunosorbent

assay. What these tests all do is they all detect these antibodies. And so, you have an antigen that comes from the virus. This could be the virus itself (inactivated of course, noninfectious) or it could be just a recombinant protein of the virus that we know has a strong antibody response. And so what these tests are doing is you're laying out a bait (so to speak) with these antigens from the virus, and then you're testing—you take human serum or plasma (which is the liquid part of the blood) —in two different ways (mainly serum) and then test for the antibodies. So, the antibodies go then find and bind these antigens that you lay out as the bait, and then you get an antibody-antigen interaction and there is a color reaction associated with this. And by this way, you can determine the concentration and titer of the antibodies. And the concentration and titer of the antibodies—titer basically means how diluted the serum can be in order to have this interaction. So the more you can dilute the serum, as higher the antibody titer is, that will tell you that this person has these type of antibodies. And of course these type of antibodies might be protective against future infection.

[Sarah Gregory] Yes, that's what I was wondering about. So we do know that these antibodies do work to protect people from getting Ebola again, yes?

[Heinz Feldmann] Yes. This is not very specific for Ebola. So, one of the mechanisms (and there is many others) that our body has is to make these antibodies that are then fighting the incoming pathogen. And what you particularly want is the so-called neutralizing antibodies. The neutralizing antibodies, they—as the word says, neutralize the virus. So, they bind to the virus that comes into the body and basically prevents that the virus can infect the cell. A virus is not livable without infecting a cell. So if Ebola cannot infect the cells, it cannot start replicating, it cannot start producing disease and causing disease. And so, these so-called neutralizing antibodies (which is only a portion of the antibodies that can be made), they're very important to protect you from infection. But also the other antibodies can protect you by different, other mechanisms, but the most or the main part are these so-called neutralizing antibodies. And most of the antibodies that are recombinantly made, or in test tissue culture as we use for therapy, are based on these so-called neutralizing antibodies.

[Sarah Gregory] Do all people who recover from Ebola develop antibodies of one sort or another?

[Heinz Feldmann] I would say the vast majority that recover would make these antibodies. We have, of course, immunocompromised people. These days—not just these days, but we have a lot of immunocompromised people these days due to treatment, due to genetic disorder, whatever, you name it. So those people may have problems making proper antibodies. But in general, we assume that an individual that survives Ebola is going to have antibodies to Ebola.

[Sarah Gregory] Have there been cases of people getting reinfected with Ebola?

[Heinz Feldmann] There is some reports, and it of course depends on the timeframe and the timeline you're looking at. So, when you go through an infection and survive it, you're going to have these antibody response and other immune responses. But they fade out over time. If you get another infection, that's similar to just taking a vaccine (if you take a booster vaccination). So this whole response will be reactivated in a much faster way. So if you are infected and make antibodies to Ebola, you may have good protection, let's say, for 10 years—I'm just picking a number, this is not very defined for Ebola. But if you would get reinfected 20 years after the first infection, these antibodies or your system may not be that well-primed any longer and you could

get reinfected. And the same is due to age. As older as we get, as less potent is our immune system. So, age and time between first and reinfection are very, very important.

Another thing that is important—at least you have to consider—a lot of people when they talk about Ebola, they think that there's only one Ebola. These antibodies are very, very specific. So you can get reinfected with a different variant or a different strain of Ebola. So if you have your primary infection with the so-called Ebola Zaire virus, you can get reinfected (likely reinfected) with an Ebola Sudan virus or the Ebola Bundibugyo virus. So, those things have to be taken into consideration. But a classic reinfection with exactly the same virus is prevented through these antibodies, but this is a time-dependent process.

[Sarah Gregory] So, the vaccine—is that something that now will be given to everybody in regions that are affected by Ebola? Or is it still used very sparingly?

[Heinz Feldmann] No. So, the general public is not getting Ebola vaccine, it's being given to potentially exposed workgroups such as foreign aid workers (for example, Médecins Sans Frontières staff that runs the Ebola treatment centers during outbreaks), other healthcare workers may get vaccinated. But the main use of the Ebola vaccine (the one provided through Merck) is used in a so-called ring vaccination approach. So what they do is if there's an outbreak or if there's a case of Ebola that a laboratory confirms, they will go and visit all of the potential contacts of this particular person and then they will give them the vaccination. It is known that this vaccine (Ervebo is the brand name), that this acts very, very quickly. Within 10 days, people are protected, based on the study results. And so what you are trying to do is to build a ring around an individual case to protect all those people, and by this they stop the spread of Ebola. There's no plan at this point to really go with a population-based vaccination approach as we have for influenza, for measles, and other diseases. That is not appropriate for Ebola. So, it will be the ring vaccination approach during outbreaks, and then vaccination of specific groups of highly or potentially highly exposed people (such as healthcare workers) that will benefit from the vaccine.

[Sarah Gregory] You already talked about this a little bit, but do you have any more to add about where the main outbreaks of Ebola have been?

[Heinz Feldmann] The main outbreak sites for Ebola over the years and decades since discovery in '76 is literally what we call Central Africa—countries like the Democratic Republic of the Congo (the Republic of the Congo). Our main sites of smaller outbreaks, they occur infrequently in the region (I think the Democratic Republic of the Congo had like 12 or whatever outbreaks since reporting). But the biggest (or far biggest outbreak was in West Africa in terms of the sites and the expansion of the outbreak. So, Ebola is spread into the east and to the west, a little bit to the north and maybe a little bit to the south, but it's all around and about Central Africa.

[Sarah Gregory] So, where is Mali in Africa, geographically? And how did Ebola get there?

[Heinz Feldmann] Well, Mali belongs (or at least the southern part of Mali) belongs to West Africa. And West Africa had not been an Ebola site until the 2013–2016 outbreak. That outbreak affected mainly Guinea, Liberia, and Sierra Leone. But there were two introductions into Mali during that outbreak period, and there were introductions into some other neighboring and other countries, as well as there were introductions into Europe and the U.S. So, Mali got affected through its close proximity and through its border to Guinea, and both of Mali's introductions came through Guinea. The first one was a child that did not lead to any further infections. The

second one was an imam (a religious leader) that went into Bamako (the capital) and caused subsequent infections. But the outbreak in Mali could be stopped very, very quickly in fact due to the preparation of Mali in terms of diagnostics and Ebola treatment centers. And other than that, Mali has not been involved in Ebola. And the ecological system or the ecozones in southern Mali are pretty much the same than the other West African countries, such as Guinea, Sierra Leone, parts of Burkina Faso. And so we believe if Ebola is present in the wildlife in this ecozone, it will also be present in southern Mali, and that's the basis for our study—to look for Ebola there.

[Sarah Gregory] So how were these cases detected in southern Mali?

[Heinz Feldmann] The cases were detected through increased contact tracing—through increased tracing of people returning from the outbreak site into Mali—and then laboratory response. The main task system is a molecular system where you detect the genome of the virus. Those tests are very sensitive, and when a patient is symptomatic, you do these tests. And when the test comes positive and Ebola symptoms fit with the case definition, then you have a confirmed case.

[Sarah Gregory] Were there a lot of people affected? And how many cases were fatal?

[Heinz Feldmann] In Mali itself, there were only eight or nine people that are known so far. But of course in Guinea, Liberia, and Sierra Leone we had, I think about 30,000 people infected. So it was a big thing for Ebola, which is normally very, very small. But this West African outbreak was by far the biggest and the most frightening outbreak going across borders, and that is largely due to the high mobility of the population and also due to the smaller sizes of the countries. If you look at the Democratic Republic of the Congo, that's a very huge country, less likely that outbreaks cross borders. But in West Africa, that was very easy from the geographic point of view, and that was also the reason how Mali got infected. The big question now is, is there continuous exposure to wildlife or perhaps through survivors of Ebola that may be persistently infected with the virus and not show any symptoms? So, these are all study questions that are being looked into at the moment by multiple institutions worldwide.

[Sarah Gregory] So you've talked about how Ebola virus is more treatable now, and there's certain medications to help people recover. Do you have anything else you want to say about it?

[Heinz Feldmann] Yeah, I think we have good news. This big outbreak in West Africa was a real game changer for the people, the communities, and also for the infectious disease community that deals with more rare, neglected infectious diseases. We came up with two vaccines, at least (we have more than two), but two that got licensed and went into human use. And we came up with three preparations of antibody treatment, and then also a drug treatment with lower efficacy. I think the real big news from that big outbreak—so nowadays, at least the one vaccine is part of any Ebola response activity, and the antibody treatment are also part of response activities. So we have a prophylaxis, we have the diagnostics, and we can even do something for the individual that comes into the Ebola treatment centers. And I think this is a real great success, and this is real good news for Ebola.

[Sarah Gregory] Indeed. And the rest of the world. Are there any ways to prevent the spread of Ebola from one country to another?

[Heinz Feldmann] Well, there's always ways and I think good outbreak response is very, very important. Make sure that you still do good contact tracing, isolate people, isolate cases, reduce the movement of people from country to country, and do testing if people are moving. I think

these are very, very important aspects. But this is only the aspect—or this is only the spread—during an outbreak. What we still don't well-understand, first of all, there is no definite proof that Ebola is carried by bats. It's what most people think and hypothesize, but it needs to be proven. And then we need a better picture where those potentially positive bats are located, which would then help us to hopefully predict (or at least to get an idea) where Ebola infections can start. There's a lot of work still to be done, and that would of course help once we know which bat species are carrying Ebola, we will also know the distribution. Then we can better inform the population where the risk factors are. I think this will be key for the next decade to study, and that will help to prevent Ebola.

[Sarah Gregory] And what prompted you to do this study in the first place?

[Heinz Feldmann] Mali, for us, is a site for Lassa fever. And Lassa fever is another hemorrhagic disease. In a way, it's similar to Ebola but also very different. West Africa is the site of Lassa fever, and West Africa has been also the study site of Lassa fever. So, that Ebola moved into West Africa was new and it's a complicating factor. So, we have a long-lasting effort in southern Mali to look for Lassa fever, and with the new situation that Ebola came into West Africa, we just used our site to extend knowledge and to also look for Ebola. We're not just looking for Ebola, we also look for other diseases that may at least start the similar clinical symptoms. So we have a broader project there, but it all started with Lassa and has now been broadened into other neglected infectious diseases.

[Sarah Gregory] You want to give us some highlights of your study?

[Heinz Feldmann] For Mali, this work I think is extremely important, as well as it would be for some neighboring countries. Everybody works out of Guinea, Sierra Leone, and Liberia, but these other neighboring countries are not well-studied. So, the public health system in Mali is not set up, not even for Lassa. We're trying to implement this, and this is a great chance for the country as well as for us to study disease. We know that Lassa is a rodentborne disease, so we know the reservoir species. It's a very frequent rodent that lives very close with the humans, and we know that in certain areas in southern Mali, these rodents are carrying the virus up to 50% in certain villages. But we don't get reports of human disease. We know that the humans are exposed due to these seroprevalence studies, in this case for Lassa fever, and so we know that they have seen the virus and that they have responded to the virus. So, the big question is, why are they not causing more clinical disease? And I think this is a very interesting question, and where we might be learning something from it. How can you survive—how can you survive these actually very threatening (life-threatening) diseases such as Ebola and Lassa? And that's where we see the most benefit of this study site is to understand (trying to understand) why these people get exposed but don't show major clinical symptoms, whereas if someone else comes in and might get exposed may even die of the infection. So there's a lot of knowledge to gain to study these type of sites that are adjacent to the main Lassa study site, as well as to the main Ebola outbreak site in those three West African countries.

[Sarah Gregory] So how was the study conducted?

[Heinz Feldmann] Well, what you do is you have the ecology teams that go out and catch animal species, whether it is rodents or bats or even ticks and mosquitoes. And so you get an idea of prevalence of diseases. And then the next step is usually to do a human serosurvey (coming back to the seroprevalence). Then once you have established that certain pathogens are in animal species, you want to know, are humans getting exposed to these pathogens? And once you know

that, then you can determine your exact studies to look into different aspects of the diseases. So, it's a long process. We are in Mali since 13 years now. I have covered the ecology part reasonably well. I've started with the human seroprevalence studies and have interesting results, and now we're starting to look into what actually is going on in the humans in terms of this disease. But that's just starting. So, it's a long-lasting commitment. And aside of it, of course we help the public health system (the local public health system) to be prepared for these types of diseases.

[Sarah Gregory] So, were there any particular findings you want to mention?

[Heinz Feldmann] Well as I said, the ecology studies are highly interesting. We're finding the presence of multiple so-called neglected tropical diseases—finding Lassa, finding Ebola (evidence for Ebola), finding evidence for Crimean-Congo hemorrhagic fever (another disease that is tickborne that causes similar symptoms than Ebola and Lassa fever), we have Rift Valley fever there. So, we're finding more and more evidence. What we now need to determine is how big is the impact on human health through these diseases. And for that we need to define better diagnostics, we need to define or prepare the public health system, and we need to get also the cases because if people are only suffering milder diseases, they are not showing up in the healthcare system. So, there's multiple factors to look into. So from a public health point of view—from an infectious disease point of view—this is a very interesting area to look for these types of infectious diseases.

[Sarah Gregory] So what was the most challenging aspect of doing this study—or ongoing doing this study?

[Heinz Feldmann] I mean, the logistics are often the most challenging part of these types of studies. Southern Mali is very rural, very resource-poor, the same as with the neighboring West African countries, same as with Central Africa. So to get your equipment and to get your—even just your test systems in, to deal with a lack of refrigeration, lack of freezer capacity, to deal with the infrastructure, bad roads, you know all kinds of things. And then of course in Mali, we're dealing since years with the political situation. There have been attacks, though we are dependent on the Embassy to tell us when it's safe to go to certain places in Mali. So in Mali it's particularly at the moment, the most challenging issue is security and safety in regards to potential attacks.

[Sarah Gregory] How do you hope your findings are going to be used going forward?

[Heinz Feldmann] Well, I will say I think—we have approach that we call from field-to-lab and back. So what we do is we're trying to get partners in these overseas communities. We're trying to work with them, we're trying to educate their people and to make them real partners on the research site. Diseases or pathogens like Ebola and Lassa—if we want to do more laboratory work, we need specific high-containment labs which are not in these countries. So, we bring this back to the U.S. or Europe to work things up in these high-containment labs, and then develop diagnostics, vaccine candidates, and therapies. That then hopefully goes back to the country of origin, and by this way closes the circle. By doing all of the different steps, we always try to make sure that we include our partners from overseas in training as well as collaborative work. And so, I think the research benefits from it, and public health and individual health all benefit from these types of studies and from this type of work. So it benefits local, regional, and to a certain degree, global health, and also animal health, depending on the pathogen. So, I think it

provides a little piece to the big picture. But I think these are all important pieces to become a better—to get a better global health situation and system going.

[Sarah Gregory] So on that note, what additional research do you think is needed on this subject?

[Heinz Feldmann] Well, I mean we still don't—I mean, one of the key aspects that we're looking into is now what is the immune response in an individual to better understand why someone is getting a mild disease, or why someone is more likely to die of one of these diseases. We also would like to look into genetic differences in the population, whether there might be a predisposition to severe disease versus milder disease. I think these are all studies that are very, very important from the human side. From the animal side (a reservoir point of view), we need to better understand how the virus is maintained in these different animal species and why most of these species do not get sick. So, why don't they get sick? What system or what responses do they have that a human or certain humans don't have? So, we can learn a lot by this and then would have data to better define treatment and prophylaxis for these types of diseases. I think these are the next steps, at least for our work, that we are very excited about and looking into.

[Sarah Gregory] So Dr. Feldmann, tell us about your job, where you work, and what you find most exciting about it.

[Heinz Feldmann] Well, I'm an M.D. by training, but I'm also a virologist. So, I started off as a molecular virologist because it was the time during my early career stage to do this type of work. I spent several years at the CDC in Atlanta where I got exposed—first of all, where I got trained and then exposed to epidemiology and public health. I don't have a degree in public health. I do not have a degree in epidemiology. But I found it extremely interesting that what you do, even in basic research in infectious diseases, should be directed towards public health and individual health. And that has driven me in my career development. I focused on, or I still focus on, high-containment lab work with viruses such as Lassa fever, Ebola virus, and you name it—all viruses that are classified as the so-called Biosafety Level 4 pathogens. So that's what I do. And our fieldwork is, of course, connected to that. We're looking for these types of viruses in their endemic regions where these diseases and these viruses circulate in nature, and that excites me. The excitement is to contribute to a better public health, to a better animal health, to better individual health. And you know the little pieces that you gain over the years and the little success, such as now with Ebola where we nowadays can say we have a treatment, we have a vaccine, and we have good diagnostics but we still don't control Ebola. That needs much more, but this is exciting, and this is really good news. Unfortunately, Ebola is one of the very few good examples. For other diseases, we still have a long way in front ahead of us.

[Sarah Gregory] Were there any changes to your life during the pandemic that you'll continue doing? Like remote working, new hobbies, anything like that?

[Heinz Feldmann] I'm assuming you're referring to the COVID pandemic.

[Sarah Gregory] Yes sir.

[Heinz Feldmann] Of course, that had, you know, big impact on everybody's life. We're talking work-life, you know, this is one of our missions here to respond to emerging infectious diseases. So, we immediately switched to work on the causative agent of COVID, which is SARS-coronavirus-2. So it changed all our work. All our projects overseas, all our projects on Ebola and Lassa fever, were stopped at the beginning. We were focusing on SARS coronavirus,

developing animal models, testing therapies, testing vaccine candidates, understanding how the virus kills in an animal model. So, this all changed. We're getting slowly back into other work.

And well, in terms of nonwork-related, you know living here in the Rocky Mountains in a rural area, I think it might be to a certain degree easier to deal with a pandemic like this. You know, hiking, cross-country skiing, and these types of things are still possible. You can go out and don't see anybody or very rarely, so you can do social distancing much easier. So, yeah, I guess during the epidemic I really increased, you know, these types of hobbies and activities (hiking, biking, mountaineering, and cross-country skiing), all activities where you really can avoid meeting the big crowds. And that was actually a positive thing of the pandemic, because this gives a lot of joy and a lot of fun to do these types of activities. But the pandemic is affecting everybody, as you know, of course differently. People in the main metro areas of course have much different problems with this pandemic than people that living in rural areas.

[Sarah Gregory] Sounds like you were able to stay quite healthy then during the whole process.

[Heinz Feldmann] I can't complain. I'm glad when this is all over and I hope we're not going to have a pandemic anytime soon again. But I think we need to be prepared for it. And you know, this pandemic taught us a lot and taught us again that nature seems to be still unbeatable for us. And not a big surprise, but I think despite all our technologies these days and communication advances, it's still going to be tough to fight a virus such as SARS-CoV-2 that has a very different mechanism of spread and transmission than Ebola has. So, every pathogen has its special tools to attack humans and defect human life, and I think we'll learn from every single episode and it will hopefully prepare us better for the next thing even though it could be something very different.

[Sarah Gregory] Well on that sobering note, I want to thank you for taking the time to talk with me today, Dr. Feldmann.

[Heinz Feldmann] Well, it's my pleasure. Thanks for having me and talking about our study in Mali, a little piece to hopefully a better public health world and future.

[Sarah Gregory] And thanks for joining me out there. You can read the June 2021 article, Ebola Virus IgG Seroprevalence in Southern Mali, online at [cdc.gov/eid](https://www.cdc.gov/eid).

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

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