

Sequestration and Destruction of Rinderpest Virus-Containing Material 10 Years after Eradication

[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. Christine Budke, a professor of epidemiology at Texas A&M University and a senior lead scientist in risk prevention for the Institute for Infectious Animal Diseases. We'll be discussing the sequestration and destruction of rinderpest virus-containing material 10 years after eradication.

Welcome, Dr. Budke.

[Christine Budke] Thank you. It's nice to be here today.

[Sarah Gregory] Rinderpest has been eradicated but I don't think many people know what it is. So what is rinderpest virus?

[Christine Budke] Rinderpest was a viral disease. It affected predominantly cattle, buffalo, and other cloven hoofed or two-toed animals. Infected animals would get really very sick and would often die. So clinical signs associated with rinderpest in livestock included febrile (or have a fever), they have mouth lesions, they could have discharge from their eyes and nose, they could have diarrhea. People even referred to the clinical signs associated with rinderpest as the four D's—so depression, discharge, diarrhea, and death. So the virus is shed in many of these secretions, then transmitted directly between animals. So as you can imagine, in the past, rinderpest had a really huge economic impact on affected areas, including regions in Africa, Asia, and in even Europe. And it was such an important livestock disease that it is largely responsible for the establishment of the World Organization for Animal Health, now known as WOAHA, but previously referred to as the OIE.

[Sarah Gregory] Would you define eradication for us as opposed to elimination?

[Christine Budke] Sure. So when we talk about elimination, we're usually focusing on getting rid of a pathogen or disease from a specific area, zone, or region. When we're talking eradication, we're really referring to completely getting rid of a disease on a global scale to the point where the pathogen (so in this case, a virus) is no longer even maintained in wildlife populations—so no natural transmission or circulation of the virus in either domestic or wildlife animals.

[Sarah Gregory] What is significant about 2021 in relation to this eradication?

[Christine Budke] 2021 was a significant year because it marked the 10-year anniversary of the eradication of rinderpest. And it was also a good time to evaluate the progress made by the world to sequester or to securely store and eliminate any remaining rinderpest stocks.

[Sarah Gregory] Rinderpest virus's eradication is unique in that it and smallpox are the only two eradicated infectious diseases. So clearly eradication is not an easy task. How was this accomplished?

[Christine Budke] So it was definitely not a short process. So I would say that the first real large-scale coordinated international control program for rinderpest started in the 1960s with a focus on mass vaccination and movement control of cattle. These programs actually did a really good job at limiting transmission, maybe to the point where they did too good of a job. So by the 1980s, some of the countries involved in these control programs were probably no longer

adequately vaccinating their animals, which resulted unfortunately in a resurgence of disease, especially in remote pastoralist areas of Africa. So as you can imagine, this resurgence or increased number of cases caused some substantial alarm, and governments, donors, international organizations decided to again come together to work with veterinarians as well as community-based animal health workers to again work towards control of the disease.

So in around 1989, the World Organization for Animal Health created what they called the OIE (at that time) Pathway, which was a three-stage pathway to allow countries to officially be recognized as free from the disease. Then in (I think) 1992, the Food and Agriculture Organization of the United Nations (or the FAO) launched the Global Rinderpest Eradication program, which was that final push or final goal for eradication of this disease.

[Sarah Gregory] I believe smallpox is only stored in two places. How many stockpiles of rinderpest are there and where are they?

[Christine Budke] There's a list of WOA (or World Organization for Animal Health) and FAO (Food and Agriculture Organization of the United Nations) designated repositories for rinderpest virus-containing materials, and those are available on the WOA website. So in addition to these officially designated repositories, there are currently five non-official locations located in countries in Africa, Asia, Europe, and the Middle East.

[Sarah Gregory] How long have rinderpest virus samples been stockpiled?

[Christine Budke] That actually is not a very easy question to answer, so I can't really put a length of time on how long rinderpest virus-containing material has been stored.

[Sarah Gregory] What materials comprise the rinderpest stocks?

[Christine Budke] It really depends on the type of facility holding the material. So for example, some facilities are designated to hold vaccine. But the long-term goal is to get to the point where only materials for diagnostics, vaccines, and materials for vaccine production are actually kept in facilities.

[Sarah Gregory] So that was the original reason why any of it was stockpiled in the first place?

[Christine Budke] Yeah. So most of the materials that are currently held in these facilities were collected during various eradication campaigns as well as used in diagnostics and in vaccine production. So except for the vaccines themselves, these materials were not really intentionally stockpiled. So stockpiled may be a bit of a misnomer there.

[Sarah Gregory] Now what kinds of facilities are these samples stored in? I know CDC stockpiles or whatever they have diseases are way, way underground. Do they all have the same level of safety?

[Christine Budke] On materials that are stored in the officially designated rinderpest holding facilities are kept in bio-secure facilities that are regularly inspected and subject to mandate. So there are five additional facilities that keep material, and they do have varying levels of biosecurity associated with them.

[Sarah Gregory] Your article is about actually getting rid of the stockpiles. Now why is that important and what are the dangers if they are kept?

[Christine Budke] The goal is to continue to reduce the risk of either reemergence or reintroduction of this virus, especially at a time when awareness about rinderpest is waning or

rapidly decreasing because it's no longer transmitting in nature. So the greater the number of labs storing viruses, the greater the risk that virus will somehow be reintroduced into animal populations. So while the risk is very low, the more facilities that actually store the virus, the greater the risk. So it's better to have a small number of labs keeping virus under high biosecurity conditions. And that is the ultimate goal.

[Sarah Gregory] Who is responsible for overseeing the reduction of these stockpiles, and actually how is it accomplished?

[Christine Budke] The destruction is overseen by the World Organization for Animal Health (or WOA) and the Food and Agricultural Organization of the United Nations. So they work with existing facilities to safely destroy existing materials.

[Sarah Gregory] As I mentioned, your study is about getting rid of these stockpiles. You want to tell us more in depth what your study is about?

[Christine Budke] Sure. So this project was conducted in partnership with colleagues from the Royal Veterinary College in addition to partners from the Animal and Plant Health Agency and City University of Hong Kong, and with the support of WOA and the FAO. So the goal of this study was to evaluate the progress made in securely storing and destroying any remaining stocks of rinderpest virus-containing material ten years post eradication in nature.

[Sarah Gregory] Not to be redundant here, but is there something in particular you were looking for?

[Christine Budke] Yes. So the study basically had two parts to it. So the first was a literature review to make sure that published scientific work on rinderpest virus was only coming out of facilities known to hold rinderpest virus-containing material. And the second part was to first review available WOA documents as well as conduct interviews with facilities known to hold rinderpest virus-containing material so that we could obtain really the most current information about their facilities and holdings.

[Sarah Gregory] What did you find?

[Christine Budke] The number of known institutes with rinderpest virus-containing material is now actually 12, down from 14 when the paper was published just a short time ago. So obviously progress is still being made. But you have to realize that this is a substantial decrease from the 44 laboratories that reported keeping rinderpest virus-containing material ten years ago in 2011. Based on that literature review, we did confirm that all published work was coming out of institutes that were known to hold rinderpest virus-containing material. So it was good that there were no surprises there. We also confirmed that there are three official rinderpest holding facilities that are actively contributing to the global rinderpest vaccine reserve. And in terms of biosecurity, we did note that some institutes still do not meet all biosecurity recommendations for holding rinderpest virus-containing material. So there is still definitely some work to be done.

As part of the study, we also did report on one case where a designated rinderpest holding facility reported a sample of a different virus that was found to be contaminated with rinderpest virus. But through traceback investigations, this probably occurred many decades beforehand when the two different viruses were being concurrently or at the same time worked on in this laboratory. But the good thing was that all contaminated samples were safely destroyed and there

was no potential release of the virus from the facility, which was a good indication that the current processes to secure stocks are working well.

[Sarah Gregory] Why do we need to keep some of these samples for vaccination purpose, as I think your article states? If it has been eradicated, why do we need any?

[Christine Budke] Having vaccine reserves gives countries some level of assurance that we would be able to respond to a reemergence of rinderpest virus if that were to occur. Unfortunately, there is also some worry that with advances in synthetic biology, eradicated viruses could potentially be recreated in a laboratory. Therefore, we want to be prepared for an outbreak of whatever its origin may be.

[Sarah Gregory] Can you go into a little bit more detail about what kind of work remains to be done about these stockpiles?

[Christine Budke] Yes. Again, the goal is to remove the virus from the five remaining non-officially designated institutes, as well as reduce the holdings at the designated institutes to really the minimum needed to guarantee preparedness.

[Sarah Gregory] What's the most important impact of your study do you think?

[Christine Budke] I think it's important to celebrate the progress that has been made, while at the same time realize that we are not at the finish line yet and we can't let our guard down at this late stage. So this study was also accompanied by a risk assessment (that will soon hopefully be published) that will indicate in a little bit more detail what the current risks related to remaining rinderpest virus-containing material stocks really are.

[Sarah Gregory] Well, tell us about where you work and what kind of work you do and what you like most about it.

[Christine Budke] I am a professor of epidemiology at the Texas A&M School of Veterinary Medicine and Biomedical Sciences. I also devote a proportion of my time working with the Institute for Infectious Animal Diseases, which is also a World Organization for Animal Health collaborating center, in the specialty of biological threat reduction. So as a veterinarian working in an academic environment, I really enjoy being surrounded by other individuals where I can share my research passions with colleagues as well as students.

[Sarah Gregory] What do you personally think is the most significant public health issue facing the world right now and why?

[Christine Budke] That's a tough one. I don't think that COVID will be the last pandemic that we see. I really think we need to start thinking more in terms of One Health, where the human health, animal health, wildlife health, and environment factors work together to tackle current global health issues and prepare for what is around the corner.

[Sarah Gregory] Thank you so much for taking the time to talk with me today, Dr. Budke.

[Christine Budke] Well, thank you. I really enjoyed our discussion.

[Sarah Gregory] And thanks for joining me out there. You can read the September 2022 article, *Sequestration and Destruction of Rinderpest Virus-Containing Material 10 Years after Eradication*, online at [cdc.gov/eid](https://www.cdc.gov/eid).

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

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