

Anthrax, People, and Dead Hippos

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

[Sarah Gregory] Today, I'm talking with Dr. Melissa Marx about how people get anthrax from eating hippopotamus meat. Dr. Marx is an epidemiologist and assistant professor at the Johns Hopkins Bloomberg School of Public Health. Welcome Dr. Marx.

[Melissa Marx] Thank you. I'm pleased to be with you today.

[Sarah Gregory] Your study is about people who got anthrax from eating hippopotamus meat. Specifically from hippopotamus that had anthrax. So tell us first, how did the hippos get the anthrax?

[Melissa Marx] I should start by acknowledging that some people think of anthrax as a terrorist agent because letters with anthrax were sent to harm and scare people back in 2001. But anthrax is naturally occurring and is found in the soil in many places around the world. Because it can form hardy spores, it can stay underground for years without causing illness or bothering anyone. The problems start when animals forage deeper into the soil than usual looking for food. They dig it up, the spores activate, and the hippos ingest and get infected with the deadly bacteria. In the outbreak we investigated, over 85 hippos were reported to have died because of anthrax. There is a very big population of hippos on the Zambezi River where this happened. In 2011 was quite dry and there was particularly stiff competition for food, so they had to dig deeper than usual to find it. That's why we think so many hippos got anthrax that year.

[Sarah Gregory] Where did this happen?

[Melissa Marx] This happened in a remote area of eastern Zambia, just west of the border with Malawi. The outbreak occurred in a game management area along the Zambezi River, where food is scarce for both animals and humans in the dry season. The nearest town is Chama, which is in what is now known as Muchinga province.

[Sarah Gregory] What happened when people ate the dead hippos?

[Melissa Marx] In general, humans can be infected when they come into contact with the carcasses of infected animals. Over 500 people living in that area got sick and five died from handling the meat in 2011.

[Sarah Gregory] Has this happened before?

[Melissa Marx] Anthrax outbreaks have been known to occur among wildlife in Zambia before and since this outbreak, as recently as last year, at this time.

These outbreaks occur globally, including recently documented outbreaks in Italy, Russia, Spain, South Africa, and just a few weeks ago in Namibia. Large human outbreaks are thought to be rare, although because they occur in rural areas, human cases are also likely under-reported.

[Sarah Gregory] Why would people eat a dead hippo? Tell us about food insecurity in these regions.

[Melissa Marx] The Zambian outbreak occurred in the middle of dry season. We were told that at the time of the outbreak many residents had already exhausted their grain reserves for the season. In the game reserve area, residents are prohibited from hunting and protecting crops from the animals. Even though public health officials say that they routinely warn residents to avoid eating animals found dead, it was likely hard for them to pass up free and available meat when their families were hungry.

[Sarah Gregory] What was done to help stop the outbreak?

[Melissa Marx] By the time we got involved, the Zambian Ministry of Health had already conducted a rapid assessment and posted warnings to the population not to handle the hippo meat. We think transmission had slowed or even stopped already.

CDC joined the Ministry of Health in a more comprehensive investigation to understand specifically which exposures were linked to human infection so we could guide prevention efforts for the longer term. We also wanted to know why exposures were occurring in the first place. To meet these objectives, we conducted a community-based household survey to understand symptoms, treatments, and exposures. We also traveled to the sites where hippos had died to observe and document evidence of contact between people and the dead hippos.

[Sarah Gregory] And what did your investigation find?

[Melissa Marx] We found that 11 percent of residents had been diagnosed with anthrax. More than three times more of those infected reported carrying, eating, and preparing the meat compared to those who were not infected.

Most people who got sick described having skin lesions, known as cutaneous anthrax. They sought care in the local clinics and were given antibiotics that cured the infection.

About a fifth of survey respondents said they would eat meat from a dead hippo again, even knowing it might cause anthrax infection because they lacked protein, meat, or were hungry.

We found animal remains by the side of the river that had clearly been handled by the people previously, but seemed to have been left untouched for a few weeks when we saw them, coinciding with the release of educational messages.

[Sarah Gregory] Is there a vaccination for anthrax in animals?

[Melissa Marx] Yes, there is a vaccine, but it's impractical to vaccinate large roaming wildlife populations in remote areas. In fact, preventing anthrax outbreaks among wildlife is difficult. Unless outbreaks occur in areas with large human populations or include endangered species, they're usually left to run their course.

For outbreaks in people, which are more concerning, we think it's important for local authorities to be attuned to the need to diagnose and treat possible cases quickly in those areas. Most anthrax infections can be cured with prompt administration of antibiotics, but people can die without the proper treatment.

[Sarah Gregory] What kinds of educational materials did you develop to reach the affected populations and are these messages you can use in the future?

[Melissa Marx] Well, the local health office had already developed some general guidelines around avoiding animals found dead, which were posted at the clinics and spread by word-of-mouth. These messages seemed to be working, so were not revised after the outbreak.

We provided the local, district, and national Ministry of Health offices with a report with the most commonly reported clinical presentations, exposures, respondents' intention around avoiding carcasses, and the reasons why they would not avoid them. The report also included specific guidelines for treating and removing infected hippo carcasses.

This outbreak shows having health providers who recognize the signs of illness and residents who know where to go for treatment can keep deaths rare, even in large outbreaks. Early identification of cases of anthrax in wildlife, prompt notification of the health office, and annual and well-timed educational campaigns can prevent or reduce zoonotic transmission. But this strategy requires good collaboration between wildlife and public health authorities.

The thing is, animal anthrax outbreaks are predictable and seasonal in Zambia—they happen during dry season. Authorities can pinpoint areas prone to outbreaks and remind people living there to avoid contact with animals that die of unknown causes. But people have to be reminded annually, early in dry season, before it gets so dry that animals die. The local health office found that spreading the word was relatively easy through health providers and the word-of-mouth.

[Sarah Gregory] In addition to these educational materials and outreach, are there practical subsistence farming solutions that could be employed?

[Melissa Marx] Our study did not address strategies or policies around food availability and game management. But we know that it can be hard for governments to balance protecting their wildlife and human residents. We feel that active collaboration between wildlife and public health officials could reduce the risk of zoonotic transmission of anthrax. It could even result in some creative ways to balance food insecurity and animal welfare.

At the very least, we should find ways to improve food security for residents of game management areas so they don't feel like they have to risk getting anthrax to avoid hunger.

[Sarah Gregory] Thank you, Dr. Marx, for taking the time to talk with me today. Listeners can read Dr. Melissa Marx's September 2017 article, *The Role of Food Insecurity in an Outbreak of Anthrax among Humans and Hippopotamuses Living in a Game Reserve Area, Rural Zambia*, 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.