

Plague in Uganda

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

[Sarah Gregory] Today, I have Dr. Paul Mead calling from Fort Collins, Colorado. Dr. Mead is a medical officer at CDC and we'll be talking about plague. Welcome Dr. Mead.

[Paul Mead] Thank you. It's good to be with you.

[Sarah Gregory] What is plague and are there different kinds?

[Paul Mead] Plague is a life-threatening disease caused by *Yersinia pestis*, a bacterium that normally cycles among rodents and their fleas, though there are three main forms of the disease in humans. The most common form is called bubonic plague, named for the tender swelling, or bubo, that develops in a patient's armpit, groin, or neck. This is typically accompanied by high fever and profound sudden fatigue. The less common forms are pneumonic plague, in which patients develop a severe pneumonia with bloody sputum, and septicemic plague, in which patients lack a localizing symptom but develop low blood pressure and organ failure. Now all three forms can be cured with antibiotics, but they need to be given promptly.

[Sarah Gregory] So how do doctors differentiate between regular pneumonia and pneumonic plague?

[Paul Mead] The key features that distinguish pneumonic plague are that it has a very rapid onset and it's a very fulminant pneumonia that often progresses to the production of bloody sputum, so patients become ill very very quickly and that is a little bit different than most other forms of pneumonia.

[Sarah Gregory] Where are the most contemporary cases of plague found?

[Paul Mead] So, plague foci exist in discrete regions of Asia, Africa, and the Americas, including the western United States. Currently, the majority of human cases are reported from sub-Saharan Africa, in particular, Madagascar; the Democratic Republic of Congo, or DRC; and Uganda.

[Sarah Gregory] And why does plague occur mostly in these regions?

[Paul Mead] Humans acquire plague most often through the bite of infected rodent fleas. Globally, the risk is greatest in endemic areas of the developing world where flea-infested commensal rats, such as the black rat, *Rattus rattus*, live in close proximity to humans.

[Sarah Gregory] Your recent study in the EID journal is about plague in Uganda. What kinds of plague did you find there?

[Paul Mead] Well, we had patients with all three major clinical forms of plague. Among 78 patients with laboratory-confirmed plague, about 85 percent had bubonic plague, with the remainder split evenly between the pneumonic and septicemic forms of plague.

[Sarah Gregory] What was the focus of your study and what time period did it cover?

[Paul Mead] The work was conducted in two districts, Arua district and Zombo district, which are both located in the far northwestern portion of Uganda, close to the borders of the Democratic Republic of Congo and South Sudan. This is the only area in Uganda where plague is currently found.

[Sarah Gregory] And how did you perform this study?

[Paul Mead] Well, it's not so much a study as it is an enhancement of standard surveillance practices. We trained health care providers at 10 clinics and two hospitals on how to recognize, diagnose, and treat plague, and we equipped and trained staff at allat a local laboratory to be able to conduct laboratory testing for plague. And finally, we train—ed thousands of village health teams to recognize when to suspect plague in their village and how to notify the appropriate authorities.

[Sarah Gregory] Did you find anything that surprised you?

[Paul Mead] Well, I'm not sure it's surprising, but I think one of the more useful observations was the association between laboratory confirmation of a case and a history of a "rat-fall" in the village around the time of the patient's illness. A rat-fall is a sudden, unusual die-off of rats that can be so dramatic that sometimes rats literally fall dead from the rafters. We found that patients whose illness was associated with a rat-fall in their village were more than twice as likely to be confirmed as having plague.

[Sarah Gregory] Why did you do this what you termed "enhancement to surveillance"?

[Paul Mead] The first step in controlling a problem is understanding it—who gets the disease, when, where, and under what circumstances. This information is essential for developing control programs, especially in areas with limited public health resources. So for example, we found that nearly all of the cases were in the western parts of the districts and that most occurred during the months October through January. So that would be a—these would be the obvious areas and times to target education campaigns.

[Sarah Gregory] Tell us about the historical ramifications of plague in Uganda and what led to it coming to Uganda.

[Paul Mead] Plague is thought to have circulated in Africa for well over 1,000 years. Nevertheless, some have suggested a correlation between its recognition in Uganda and construction of the Uganda railway in the late 1800s. This development may have helped bring the infection in from neighboring areas.

[Sarah Gregory] Who's most likely to get plague in the West Nile region?

[Paul Mead] Plague is pretty indiscriminant; it strikes young and old, male and female alike. The majority of cases in our area of Uganda were occurring among persons aged five to 30 years, but this is also, of course, the majority of the population. There was a trend among adults, for most cases among adults, to be among women, although the reasons for this are not clear.

[Sarah Gregory] It seems that some cases of reported plague in Uganda are possibly not actually plague. Tell us about that.

[Paul Mead] Despite laboratory testing by both culture and antibody testing, only about a third of the patients in our surveillance investigation who had suspected plague were confirmed to have the infection. It's important to remember that there are other causes—or other diseases—that can be mistaken for plague. This is especially likely in the setting of an outbreak, where there can be a lot of fear, and the fear of the disease and its consequences may lead to over diagnosis, looking purely at clinical features.

[Sarah Gregory] I know there are still cases of plague in the U.S. In 2015, two people were infected in Yosemite National Park. Is the plague in the U.S. the same strains as in Uganda?

[Paul Mead] We generally have somewhere between one and 15 human cases of plague in the United States each year, all typically in the western states. The strains in the U.S. are slightly different lineage than those in Uganda, but clinically they cause the same disease as those in Africa.

[Sarah Gregory] Is there a public health approach that would eliminate plague?

[Paul Mead] Because it's a disease that circulates in nature, we're unlikely to ever eliminate plague completely. We can, however, reduce how many people become infected and the consequence of infection for those who do. Much of this comes down to educating populations at risk on how to reduce exposure to fleas, and when and where and how to seek health care if they develop symptoms of plague.

[Sarah Gregory] Thank you so much for being with me today, Dr. Mead. Listeners can read Dr. Paul Mead's article, Patterns of Human Plague in Uganda, 2008-2016, 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.