

# Detection of Hantavirus during the COVID-19 Pandemic, Arizona, USA, 2020

[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. Ariella Dale, a public health scientist at the Maricopa County Department of Public Health. We'll be discussing two cases of people infected with hantavirus in Arizona.

Welcome, Dr. Dale.

[Ariella Dale] Thank you for having me.

[Sarah Gregory] What is hantavirus?

[Ariella Dale] Hantaviruses are a genre of viruses belonging to the *Bunyavirus* family that cause hantavirus pulmonary syndrome or HPS. Hantaviruses are made up of negative-sensed, single-stranded RNA viruses, and there are many known hantaviruses throughout the world. In the United States and Canada, the Sin Nombre hantavirus is responsible for a majority of the cases.

[Sarah Gregory] When was it first discovered? It's pretty new, I think.

[Ariella Dale] Hantavirus was first discovered in 1993 in the Four Corners region of the United States, an area that's shared by Arizona, New Mexico, Colorado, and Utah.

[Sarah Gregory] And where now is it mostly found in the United States?

[Ariella Dale] A majority of the cases are found in the western United States, particularly in the Four Corners region where it was initially discovered. Some cases do occur in the northeast and the southeast of the United States as well.

[Sarah Gregory] Is it a global problem or is it just in the United States?

[Ariella Dale] Hantaviruses are a global problem. Cases of hantavirus pulmonary syndrome or HPS have been confirmed throughout the Americas, including the United States but also Canada, Argentina, Bolivia, Chile, Panama, Paraguay, and Uruguay. So it's definitely a global problem.

[Sarah Gregory] How many cases of hantavirus are reported each year in the United States?

[Ariella Dale] So hantavirus cases are rare. Approximately 20 to 30 cases are reported each year in the United States. To date, from 1993 to 2021, approximately 850 hantavirus cases were reported. Thinking about Arizona specifically, in the last 10 years, there have been 28 reported cases with a median of three cases per year.

[Sarah Gregory] And has this incidence increased?

[Ariella Dale] Recent years—so from 2018 to 2021—have seen about 20 cases each year reported in the United States, which is a slight decrease from about 30 cases per year. Every year is really different though due to the changes in the rodent abundance and other factors.

[Sarah Gregory] Do all rodents carry it, or is it just a specific kind?

[Ariella Dale] Not all rodents carry hantaviruses. In the southwest, hantavirus is primarily found in the deer mouse, which has approximately a two- to three-inch-long body and a two- to three-

inch-long tail. They range from gray to reddish-brown in color with a white underbelly and clearly defined white sides on their tail. There's also the white-footed mouse, which is a reservoir found in the United States and throughout a majority of the United States and Mexico. Other rodents that carry hantavirus in the United States include the cotton rat and the rice rat. There are specific rodents that could carry hantaviruses that we know about.

[Sarah Gregory] And how do people get it?

[Ariella Dale] There are several ways a rodent could spread hantavirus to people. Primarily we see folks infected with hantavirus by inhaling or, less commonly, touching something that is contaminated with rodent urine, droppings, or saliva and then touching their nose or mouth. You can also be bit by a rodent with the virus (this is a lot more rare). And finally, you could eat food contaminated with urine, droppings, or saliva from an infected rodent.

[Sarah Gregory] I had a five-pound bag of organic sugar in the garage, and I went to open it recently and it had little tooth marks in the bottom. So probably a good move I threw it out, right?

[Ariella Dale] Absolutely. That is a good move to throw it out just in case it was contaminated by an infected rodent.

[Sarah Gregory] Can it be passed from person to person?

[Ariella Dale] Hantaviruses primarily found in the United States cause human illnesses but cannot be transmitted from one person to another. However, in other parts of the world such as Chile and Argentina, there have been rare cases of person-to-person transmission among close contact with people with Andes virus (a type of hantavirus).

[Sarah Gregory] Rats and mice are very popular pets. Can pet rodents get hantavirus and pass it onto their owners?

[Ariella Dale] I know this is something of great interest to folks who own pets and rats. They definitely are popular pets. It is rare for owners to get hantaviruses from pet rodents, but it can happen. We do know that some hantaviruses (specifically Seoul virus) have been found in pet rats and have been linked to outbreaks among pet owners. In general, a pet rodent would become infected when comingling, fighting, or mating with infected rats or through contaminated materials such as their bedding. Specifically related to Seoul virus, rats will show no signs or symptoms and can shed the virus chronically for several months. Through these documented outbreaks of Seoul virus in humans who own pet rats, it has been exceedingly rare, and we recommend that anyone who becomes ill ensure that their physician knows about any contact with wild or pet rodents.

[Sarah Gregory] How would a pet rodent get it in the first place? You said comingling with an infected rodent, but how would the infected rodent get it?

[Ariella Dale] In previous outbreaks, they have noted that pet rodents have become ill while in their rattery or habitat where the rats are being raised and bred to become pets. Since the rats themselves were asymptomatic, they then were given to the owners and the owners were unaware that the rat was ill. So it's possible that you may purchase a rat (a pet rat) that could be ill from a breeder and just not know.

[Sarah Gregory] Interesting. What are the signs and symptoms that someone is infected?

[Ariella Dale] Symptoms can occur within one to eight weeks of exposure and usually begin with fatigue, fever and muscle aches, particularly in large muscle groups. About half of patients will experience dizziness, chills, nausea, diarrhea, or vomiting in these early stages. Within four to 10 days of the initial phase of illness, a person will develop cough, shortness of breath, difficulty breathing, or pneumonia.

[Sarah Gregory] Is it treatable and, if so, how?

[Ariella Dale] Unfortunately, there is no specific treatment, cure, or vaccine for hantaviruses—only supportive care. We do know that if infected individuals are recognized early and receive medical care in an intensive care unit, they may be better.

[Sarah Gregory] Since there's no actual real treatment, what are the long-term consequences if someone doesn't get this supportive care?

[Ariella Dale] HPS can be fatal and has a mortality rate of 38%. If an individual begins experiencing those symptoms such as fever, fatigue, and shortness of breath, they should see their physician immediately and mention any rodent exposure to prevent those severe consequences.

[Sarah Gregory] Your study is about two cases of hantavirus during the COVID-19 pandemic. Where in the United States did they take place?

[Ariella Dale] Our report detailed two cases of hantavirus that occurred during the COVID-19 pandemic among patients in Arizona.

[Sarah Gregory] Okay, well tell us more about these cases and your study and what exactly happened.

[Ariella Dale] Patient 1 was a 25-year-old Native American woman with an unremarkable medical history. She primarily resided in a fourplex apartment on the White Mountain Apache Reservation. She often visited her extended family at a different residence, a single-family home approximately 120 miles away, in eastern Arizona. She stayed at a casino from March 13th to 17th and cleaned her apartment March 17th to 18th.

On March 18th, she was transported by EMS to the hospital, reporting shortness of breath, abdominal pain, and coughing up blood. She had a fever, was hypoxic and tachypneic, and was intubated. Initially, clinicians suspected asphyxiation from mixing cleaning chemicals. She received a chest x-ray and the clinician noted that it looked suspicious for hantavirus, COVID-19, or diffuse bacterial pneumonia. She was transferred to another hospital for a higher level of care and was placed on ECMO. She died on March 19th.

Patient 2 was the 11-year-old Native American son of patient 1 and split his time between the two residences. On the morning of March 20th, patient 2 had reported feeling unwell for two days and was warm but without a fever. He was given an aspirin and vomited later in the day. He reported difficulty sleeping and was given two tablets. He awoke during the night because of difficulty breathing and collapsed out of his bed. EMS transported him to the ED, and he was pronounced dead on March 21st. Sadly, both patients died within a few days of each other. Our report details the multiagency public health response after identification that those patients had passed away from hantavirus. Partners in this included the White Mountain Apache Tribe, Indian Health Service, CDC's Viral Special Pathogens and Infectious Disease Pathology Branches, medical examiners, and the Arizona Department of Health Services.

[Sarah Gregory] How long did it take to diagnose them with hantavirus?

[Ariella Dale] Based on the epidemiologic link between the two cases and the unknown cause of death of the mother, tissues were submitted to CDC and were received on July 28th. Six months after the patient had passed away, a pathologist within the Infectious Disease Pathology Branch at CDC examined the liver and kidney tissues of the mother, confirming hantavirus on immunohistochemical assay.

[Sarah Gregory] Okay. So they weren't diagnosed while they were still alive because it was a very short period. Six months, is that a long time or a short time? It seems like kind of a long time to figure it out, but maybe not?

[Ariella Dale] Remember, these were the early days of the COVID-19 pandemic in 2020. Symptoms of hantavirus do overlap with COVID-19 and influenza, making it more difficult to differentiate. Hantavirus suspicion was noted within the medical record of patient 1, but unfortunately no testing was ordered at either hospital for patient 1. Testing delays may have resulted from the CDC requirement for diagnostic testing on all confirmed or suspected COVID-19 deaths. Also, it took time for the medical examiner to be able to examine each person and then forward the tissues to CDC. So a combination of factors contributed to why it took so long.

[Sarah Gregory] COVID impacted so many health outcomes. If it weren't for COVID and the pandemic, do you think they would have been diagnosed sooner and could have had a better outcome?

[Ariella Dale] It's difficult to know because diagnosing hantavirus is very challenging given its overlapping symptoms with so many respiratory diseases such as COVID-19 and influenza.

[Sarah Gregory] The boy apparently had both hantavirus and COVID, that was my understanding. Did COVID make him more susceptible to other viruses, do you think?

[Ariella Dale] We're not sure. We do not know at this time if he was first infected with SARS-CoV-2 (the virus that causes COVID-19) or with hantavirus. Therefore, we're not sure how the susceptibility to infections were affected for him.

[Sarah Gregory] An environmental investigation of the patients' residence was done. What did this investigation entail? Especially since it...was it done the six months later? When was it done?

[Ariella Dale] We conducted an environmental investigation because both residences displayed potential for deer mice habitats, and we wanted to ensure there was not an ongoing risk to current residents. Our investigation entailed a review of patient 1's apartment for any signs of rodents, including droppings. Rodents were found in four of six snap traps placed in the residence, but all were house mice, which are not a known reservoir for hantaviruses. Unfortunately, we could not conduct an environmental investigation at the second family residence. Without the full environmental investigation at both residences, we were unable to verify the exact source of hantavirus that infected these two patients. We were also unable to interview the patients, and the extended period of time between their passing and identification of hantavirus made it difficult to identify the potential source. We do know from genetic sequencing that the genomes from both cases were very closely related, indicating a common source of exposure.

[Sarah Gregory] What can public health learn from this case study?

[Ariella Dale] Public health can support hantavirus education in healthcare facilities and communities and disease-endemic regions. Additionally, public health can educate physicians on the 5-point hantavirus screening tool, even in areas outside the Four Corners region, such as in this case, and really emphasize that clinicians should inquire about rodent exposure in folks that they suspect have hantavirus.

[Sarah Gregory] What needs to be done to ensure other viruses aren't missed during other pandemics?

[Ariella Dale] That's a great question. Even during pandemic response, our public health partners need to ensure there are timely investigations and coordination, particularly for high-consequence pathogens such as hantavirus to ensure that there's appropriate follow-up and timely follow-up.

[Sarah Gregory] And I guess this is the million-dollar question. How can people protect themselves from getting hantavirus infection?

[Ariella Dale] Since hantaviruses are carried by rodents, people should minimize contact with rodents in and around their home. This includes sealing up properties to prevent rodent contamination, trapping rodents inside homes, and safely cleaning up rodent droppings and nests with disinfectant. For additional information on rodent control, please visit the CDC website at [www.cdc.gov](http://www.cdc.gov).

[Sarah Gregory] Tell us about where you work and what you like most about it. And also, I believe you were an EIS officer, or as they are also known as a disease detective, at CDC. Tell us about that.

[Ariella Dale] I'd be happy to. At the time of this investigation, I was a CDC Epidemic Intelligence Service or EIS officer assigned to the Arizona Department of Health Services and the Maricopa County Department of Public Health. As an EIS officer, I spent two years with these agencies learning about applied public health and how we protect the health of our residents. As a disease detective, I assisted and led investigations such as the one detailed in our report and many more. This fellowship is a great opportunity for those with a terminal degree. You can check out more at [cdc.gov/eis](http://cdc.gov/eis).

Now, I'm a public health scientist at the Maricopa County Department of Public Health. In my current position, I support the county health department across the majority of reportable conditions, including infectious diseases, substance use, injury, climate and heat, and much more. What I like most about working at a local health department is the ability to rapidly respond to needs of our community. We have the opportunity to be creative and flexible to adjust to the public health threats our residents are facing.

[Sarah Gregory] I would imagine it's hard to pick, but with all of the emerging infectious diseases out there, is there anything particular that worries you the most?

[Ariella Dale] That is a tough question to answer. There are many emerging infectious diseases to be concerned about, and the risk to the public depends a lot on the epidemiology depending on where you live, recreate, your personal characteristics like your job, your chronic conditions, things like that. Working out here in the southwest, I think a lot about vectorborne diseases such as West Nile virus when thinking about things that worry me the most and the threat of mosquitoes and those diseases that they cause.

[Sarah Gregory] Well, thank you so much for taking the time to talk with me today, Dr. Dale.

[Ariella Dale] Thank you for having me. It was a pleasure.

[Sarah Gregory] And thanks for joining me out there. You can read the August 2023 article, Detection of Hantavirus during the COVID-19 Pandemic, Arizona, USA, 2020, online at [cdc.gov/eid](https://cdc.gov/eid).

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

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