

Macacine Herpesvirus 1 among Invasive Rhesus Macaques, Florida

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

[Sarah Gregory] I'm talking today with Dr. Samantha Wisely, an associate professor in the Department of Wildlife Ecology and Conservation at the University of Florida. Welcome Dr. Wisely.

[Samantha Wisely] Hi, Sarah.

[Sarah Gregory] Your study is about invasive monkeys in Florida that have herpesvirus 1. This is a serious situation. First of all, tell us about herpesvirus 1.

[Samantha Wisely] The full name of the virus is macacine herpesvirus 1 or herpes B, for short, and it's a virus that infects rhesus macaques monkeys. So, herpesviruses are characterized by infecting their hosts for life. Once the primary infection is resolved, that virus hides in neural tissue, typically in a latent state, and the host is no longer infectious. But when the host gets stressed and its immune system has been depressed, the virus then begins to circulate again, and the host becomes infectious once again. And this cycle can continue throughout the life of the animal.

[Sarah Gregory] Do we know how these monkeys came to be in this state park in Florida?

[Samantha Wisely] Yeah. The park was originally privately owned and hosted boat tours of the springs that are common in Florida. And in the 1930s, one of the boat captains that piloted these tours released six monkeys in order to increase tourism for that private park. The population has really grown ever since then and animals can be found far outside the park boundaries now.

[Sarah Gregory] So, why do they have this virus?

[Samantha Wisely] So, the virus is actually endemic to this species and it causes little clinical illness in healthy animals. Most captive populations of rhesus macaques actually have a high prevalence of the virus. But our study was really one of the first to understand what's going on in the wild.

[Sarah Gregory] How were you alerted to the fact that the monkeys were carrying this virus?

[Samantha Wisely] So, there was a trapper who was permitted to trap monkeys in the 1980s and 1990s, and he had those animals tested for antibodies to the virus. And many of the animals turned out to be positive for antibodies, suggesting that they were being exposed to the virus.

[Sarah Gregory] Tell us why somebody was trapping monkeys in the first place, and why he knew to have them tested.

[Samantha Wisely] Well, so, the trapper was permitted by Florida Fish and Wildlife Commission. I think Florida Fish and Wildlife Commission recognized that this population was growing and was trying to find a solution early on. This trapper was selling animals, live, to biomedical research, and those researchers wanted to ensure that they were only getting negative

animals. But animal rights groups came in and stopped him from selling it, and that's why we've had such a huge explosion of animals today. There is no control of animals currently.

[Sarah Gregory] Okay. So, tell us about your study.

[Samantha Wisely] So, one of the mysteries about this virus is that humans have contracted the virus in a laboratory setting, but there's no documented human case coming from wild animals. And what's odd about this is that humans come into contact with wild macaques regularly. These are the temple monkeys of Southeast Asia that are fed by people on a daily basis. So, these wild animals come into contact with people much more frequently than humans in a captive setting do with captive animals. So, why is there this conundrum? Why is the virus being transmitted more regularly to humans from laboratory animals, and we've never seen it being transmitted from wild animals.

So, there's several hypotheses for this conundrum and that's what we set out to test in this paper. So, the first hypothesis is that there could be more virulent strains of herpes B in captive versus wild animals that affect humans more virulently in the captive setting. And so to answer this, we sequenced the virulence gene of the virus in wild monkeys, but it looked identical to that same gene in the captive population. So, that didn't appear to be an explanation. To follow up on that, we're now sequencing the whole genome, to compare whole genomes between the virus in captive and wild animals, to see if there's differences in other genes.

But the second hypothesis is that, because stress influences whether or not an animal is infectious for herpesvirus, whether or not they're actually shedding the virus, we hypothesized that animals in captivity, which is a pretty stressful environment—their social system is disrupted and they're handled by humans pretty regularly—that may make them shed more frequently than wild animals. And actually, this turned out to be the case. We found that approximately between four and 14 percent of animals in Silver Springs State Park were shedding virus, but some laboratory studies report up to 75 percent of animals shedding virus at any one time.

[Sarah Gregory] Okay. This seems like a huge public health concern. What's being done? Are the monkeys being removed? And, if not, what can people do to protect themselves?

[Samantha Wisely] I think it is a public health concern. I mean, to reiterate, we have never seen a human infected by a wild macaque, but the potential is there. To give it some context, I think we should consider classifying herpes B in wild monkeys as a low-risk, high-consequence pathogen, which is very similar to what we do with rabies virus.

To answer your question about management, Florida Fish and Wildlife Commission has indicated that they will manage for monkeys, but they have not given us any details of that plan. And so, in the interim and in general, to protect yourselves from wild animals, people should steer clear of the monkeys. Don't provoke the monkeys. Never feed the monkeys. And that really goes true for any wildlife. Wildlife shouldn't be fed. It makes them aggressive and always has the potential to transmit diseases then.

[Sarah Gregory] Since this virus can be deadly, even though no one has died in Silver Springs, so far, there have been deaths in lab settings?

[Samantha Wisely] Yeah, there have. Approximately 50 people have died from the virus, that's about 70 percent of the people who've been infected in a laboratory setting. But as I reiterated before, no one worldwide has been identified as becoming infected from a wild animal.

Sort of the third hypothesis, one that we weren't prepared to test in our paper, but it could be due to differences in surveillance and reporting, as well. So, I mean laboratory safety practices monitor human health when people work with infectious animals, but certainly nobody does that out in the wild, so the story is much less clear outside of the laboratory setting. And you know, millions of people a year die from undiagnosed encephalitis, which is how herpes B manifests itself in humans. Therefore, the disease really could go undiagnosed and unreported outside of the laboratory setting.

[Sarah Gregory] Would you tell us a little bit about your job—what you do and how you became involved in this study?

[Samantha Wisely] I'm an ecologist who studies wildlife diseases, and I'm particularly interested in how invasive species create what we call "pathogen pollution," this idea that invasive species can bring invasive pathogens with them. These pathogens can impact the biodiversity of the ecosystem, they can impact livestock health, and of course, they can impact human health, as well. And we collaborated with a graduate student who was working on the environmental impacts of these macaques in Silver Springs State Park, to try to better understand if this virus was present and if there was a public health concern.

[Sarah Gregory] Thank you so much for taking the time to talk with me today, Dr. Wisely. Listeners can read the entire February 2018 article, "Macacine Herpesvirus 1 Antibody Prevalence and DNA Shedding among Invasive Rhesus Macaques, Silver Springs State Park, Florida, USA," online at cdc.gov/eid.

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

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