

# The Spread of Canine Flu

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

[Sarah Gregory] Today, I'm talking with Dr. Colin Parrish, a Professor of Virology in the College of Veterinary Medicine at Cornell University, about canine flu. Welcome, Dr. Parrish.

[Colin Parrish] Welcome. It's great to talk to you.

[Sarah Gregory] How is canine, or dog, flu different from the kind people get?

[Colin Parrish] So, the canine influenza is a different strain from the virus that infects humans. There's actual two canine flus, or there have been two canine flus. There was an H3N8 virus that was circulating for about 20 years, and died out last year. And then the most recent one is a virus called H3N2 genotype, and that's been circulating in dogs since about 2005. And the canine flus are quite distinct. The H3N2 has got the same name as the human H3N2, but in fact, the virus has a different origin. The canine virus was almost certainly derived from a virus of birds or an avian influenza virus and it didn't derive from the human influenza strain.

[Sarah Gregory] When did it develop and how did it come into existence?

[Colin Parrish] The canine influenza, the H3N2 strain, arose in China or in Korea sometime around 2005. It's not exactly clear which country it arose in. It was seen very soon after 2005 in both China and in Korea. It spread in dogs into many parts of China and also throughout South Korea, and it was also reported in Thailand, although we're not sure if the virus has persisted in Thailand. However, it's been in both China and South Korea up until today, so since 2005. The influenza viruses are mostly found in aquatic birds, in this case it's probably ducks or geese or something. And, although the virus that's the direct ancestor of the canine influenza hasn't actually been detected so far, there are a number of viruses that have been seen in birds that have similar sequences that might be related to the virus that gave rise to canine flu. And then the virus, the influenza viruses have a genome that's made up of eight segments of viral RNA, and so, you know, related segments of each of the eight strands of the canine influenza viruses have been found in different avian viruses. The virus was introduced into the United States in early 2015, and it's thought that it was probably brought in with dogs that were being rescued from meat farms in South Korea. And so, genetically, the viruses that we first saw in the United States were very closely related to viruses that had been seen in Korea the same year.

[Sarah Gregory] So, how did it spread?

[Colin Parrish] So, the virus is like human influenza virus, it has a very similar disease. And it's thought that the virus is spread through direct dog-to-dog contact. The epidemiological evidence suggests that you actually have to have dogs pretty much in direct contact with each other to get transmission. And there doesn't seem to be very much indirect transmission, for example through contaminated materials, or what are called fomites, or other indirect routes. So, it spreads very readily when dogs come in contact with each other, but otherwise, it doesn't seem to be very effective at spreading from dog-to-dog.

[Sarah Gregory] And where is it most prevalent?

[Colin Parrish] So obviously, as I said, it's in China and in South Korea. In the United States, it was introduced into the Chicago area, and it's been seen primarily in the area around Chicago

and the upper Midwest. And that virus has actually continued to circulate since it was introduced in February 2015, up until today. There have been a couple of other outbreaks that arose from that introduction, what we call the sort of Chicago virus. And there was one in the southeastern states, around Georgia and Alabama that occurred in the middle of 2015. There was a second outbreak, and it was actually due to a second introduction of the virus, and that occurred possibly from a virus that was introduced into Los Angeles. But the virus was seen in Georgia and Florida initially, then it spread to Texas, it spread to Kentucky, and it's also been seen in Minneapolis and Minnesota. So, although generally they're sort of localized and you have these localized outbreaks, you know, in certain occasions the viruses can spread long distances.

[Sarah Gregory] And what are the symptoms in dogs?

[Colin Parrish] The symptoms, as I mentioned, are very similar to those seen for human influenza virus. So it's almost entirely respiratory disease, you get a fever, the dogs have a very characteristic cough, and sometimes the cough may be prolonged. And you actually, even after the dogs has recovered, basically, from the infection, the dogs can keep coughing for a few more days. The virus is shed, starting at about day two after the dog is infected, and they shed for about a period of five to six days. And after that, they generally recover, although as I said, they can continue to cough. Occasionally, you get a severe disease. Occasionally, the virus spreads to the lungs and you get either a direct viral pneumonia or you can get secondary bacterial infections, but those seem to be relatively uncommon.

[Sarah Gregory] There are tests for people to find out if they actually have the flu. Is there a test for this dog flu?

[Colin Parrish] There are direct tests that can be used, but in the veterinary clinic. But most times, people would send a swab—a nasal swab is what's most effective—and that needs to be sent to a diagnostic lab. And then the primary test is the test for the viral RNA, using a procedure called reverse transcriptase PCR. And it's very sensitive and very specific, so if you do have a question about your dog being infected, then, you know, having it tested is a very quick way to find out—it takes about two or three days—a relatively quick way to find out if your dog is really infected or not.

[Sarah Gregory] Can people get it from their dogs?

[Colin Parrish] No, there's no evidence for human infection by any of the influenza viruses in dogs. And people have been tested who are in contact with infected dogs, and so far there haven't been any, there's no evidence of people being infected. It is true, in fact, that dogs can sometimes be infected by human influenza viruses. And so, occasionally, a few percent of dogs in the population actually have antibodies that suggest that they've been exposed to human flu and have actually been infected and, presumably, recovered.

[Sarah Gregory] How about cats? Can cats get it from dogs?

[Colin Parrish] Yes, there's evidence that cats can be infected by the canine viruses, particularly the H3N2 virus. And there was an outbreak, a couple of outbreaks reported from Korea, and in the United States there was an outbreak reported in an animal shelter in Indiana, where the dogs were infected, and then the virus spread to the cats. And it actually spread among the cats and caused disease in a relatively large number of the cats. And it died out in the cats and, so, it isn't widespread in cats, but the cats, in fact, can be infected.

[Sarah Gregory] Should dogs get vaccines? And will there be different strains of it each year like there are for people with flu strains?

[Colin Parrish] There is a vaccine for the H3N2 canine influenza virus. It's a very safe vaccine and it's reasonably effective. It's similar in its ability to protect as we see for the human influenza vaccines. In other words, they protect about 60 to 70 percent of the animals that get vaccinated. It's made from an inactivated virus and, you know, protects against the current strains of canine influenza virus. It's not being widely used, it's not at the moment generally recommended for vaccination of dogs, but it is being used in populations that have greatest risk. So, if you're taking your dog to dog shows, it's often recommended. If you're putting your dog in a boarding kennel, it may be actually required by the kennel owners. And dogs in animal shelters may benefit from being vaccinated. Those are the main populations where the vaccine is being used right now. So, at the moment, there's only one strain of vaccine out there and, as far as we know, that's still quite effective. There aren't new vaccines being developed every year, as there are for human influenza vaccines. The main reason is that there doesn't seem to be very much variation in the canine virus, so that the vaccine that was developed a couple of years ago is still quite effective against the currently circulating strains of virus. It may be that in the future there will be changes in the virus, and people are monitoring it. We're, for example, sequencing the virus on a regular basis. And the vaccine companies are also looking at the virus to see whether or not it might be necessary to update the vaccine. But right at the moment, the current vaccine is quite effective and it probably won't be changed for another year or two, at least.

[Sarah Gregory] Just for clarification, does that mean that they don't need to be revaccinated every year, or they just get the same vaccine each year?

[Colin Parrish] So, the current recommendation for vaccines is that an annual update would be useful in terms of boosting the immunity of a dog. However, that's because, you know, these are inactivated vaccines, and they don't give a very high-level and a very long-lived immunity. It's not, in the case of human vaccines, we get revaccinated because the strain is changing from year-to-year, and so the vaccines are changed, you know, to keep up with the changing virus. In the case of the canine viruses, we don't need to change the vaccine because of antigenic change, but revaccination, particularly of a heavily exposed dog, would be useful in terms of, you know, maintaining high levels of immunity.

[Sarah Gregory] Will this affect other wild canines, such as wolves, foxes, and coyotes? And if they become infected, will that further the spread and make it harder to contain?

[Colin Parrish] As far as we know, wolves and coyotes are probably susceptible to the virus. They're genetically, you know, almost identical to domestic dogs. But we don't expect that wolves or coyotes will be exposed to infected dogs. If they do, then it's unlikely to spread much further. The main reason is that, you know, wolves and coyotes are generally, well wolves may live in a pack, but the virus is unlikely to spread much beyond sort of immediate contacts. And then coyotes are relatively solitary and, again, in, you know, the two or three days that they're going to be shedding the virus, they probably won't infect, you know, more than one or two other animals. So, we don't see, you know, we don't see there being a big problem in wild animals and we don't expect them to contribute to the epidemiology of the virus.

[Sarah Gregory] Well, what should be the next steps, and will it be possible to contain this and stop the spread?

[Colin Parrish] So, the spread of the canine flu is different from what we see for human flu. So, humans have a very dense and highly connected population, and viruses spread very quickly and are very hard to control. Dogs are a little bit different. Their population is much more structured. They don't have as many sort of social interactions as we do. So, therefore, what seems to happen with the dogs is that, outside of animal shelters and kennels, and maybe some of the dog show circuit, the virus doesn't transmit very well. And so, it may infect a certain number of dogs, but then it doesn't get transmitted because those dogs don't come in contact with a lot of additional dogs. And so, it tends to die out relatively quickly outside of kennels and animal shelters and, perhaps, the meat farms that are present in Asia. So we think that the virus actually, pretty much, is sort of, you know, just holding its own at the moment and, you know, with relatively simple quarantine and infection control procedures, it will probably, we could probably cause it to die out, just on its own. That was actually what was seen for the H3N8 canine influenza virus, which was a different virus that was spreading in dogs, and that died out last year after circulating in dogs for something like 15 or 16 years. It pretty much died out on its own, just by sort of normal infection control procedures.

[Sarah Gregory] So Dr. Parrish, would you like to tell us about your job and your area of expertise and how you became interested in this topic and study?

[Colin Parrish] I'm a Professor of Virology at the College of Veterinary Medicine at Cornell University, and I've been here, actually on the faculty, since 1988, so a pretty long time now. And my laboratory has been interested in cases of viral emergence, and in particular, we've been studying viruses that jump from one host to another to cause outbreaks or epidemics of disease. And one of those examples, for example, the one we've been studying most, has been the canine parvovirus, which emerged in the late 1970s and caused a pandemic of disease in dogs. It was a host-variant of a feline virus or a virus related to a feline virus that transferred into dogs, then gained the canine host range. We also have studied the H3N8 canine influenza virus, and then when the H3N2 canine influenza virus arose, we started studying that, as well. So, we sort of regard these as, you know, good models for understanding how viruses jump into new hosts and cause epidemics. And they're relatively easy to study. They're widespread. They're relatively safe to study and, so, you know, it gives us a lot of information about, you know, how viruses change, how they change their host ranges, and how they can emerge and can cause epidemics or even pandemics in some cases.

[Sarah Gregory] Thank you for talking with me, Dr. Parrish. I've been talking with Dr. Colin Parrish about his article, Spread of Canine Influenza A (H3N2) Virus, United States. Listeners can read the article at [cdc.gov/eid](http://cdc.gov/eid).

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

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