# Rabies Elimination in Dogs in the United States

*[Announcer] This podcast is presented by the Centers for Disease Control and Prevention. CDC – safer, healthier people.*

[Ted Pestorius] Hello. I'm Ted Pestorius. And today, we're talking with Dr. Charles Rupprecht, chief of CDC's rabies program. And we're here to discuss a paper he co-authored in the December 2008 issue of CDC's journal Emerging Infectious Diseases. The paper discusses rabies elimination from dogs in the United States and its re-emergence in wild animals. So, Dr. Rupprecht, welcome.

[Dr. Rupprecht] Thank you, Ted.

[Ted Pestorius] Your recent publication provides proof of the elimination of canine rabies in the United States. What criteria has to be met in order to call a country "canine-rabies free"?

[Dr. Rupprecht] Generally, there are some global guidelines that provide for active surveillance for a given disease or state. And when one's been looking for at least two years with active, appropriate surveillance, if one hasn't found that disease, it can be considered eliminated.

[Ted Pestorius] Your research has shown that rabies has taken hold in several wild animal species, such as coyotes, foxes, skunks. How have rabies viruses spilled over into these other species and how is it maintained?

[Dr. Rupprecht] There are many different kinds of rabies viruses. And so, for example, we can talk about viruses in bats. And if an animal like a raccoon or a fox were to eat a rabid bat, this is a case of spillover. That is, the rabid bat could infect the animal that's eating it and that particular virus, in this case a bat virus, would be found in that carnivore. So we can also differentiate or we can tell different rabies viruses apart - dog viruses from skunk viruses from raccoon viruses. And when we're talking specifically about the elimination of rabies in dogs, we're talking about eliminating rabies viruses specifically adapted to dogs that go from dog-to-dog-to-dog, or enzootic transmission of dog rabies viruses, as opposed to viruses that are adapted to wildlife.

[Ted Pestorius] So when these spillover events occur, how do you detect them?

[Dr. Rupprecht] Generally in the late 1970s, we were able to detect different changes on these virus on their proteins, or antigenic changes, what we call antigenic variance. Today, when we find different variants of rabies virus, with an eloquent degree of certainty we can look at different genetic variants through genetic sequencing. Hence, we can differentiate viruses that we find adapted to go dog-to-dog-to-dog or raccoon-to-raccoon-to-raccoon that we can refer to as dog rabies virus variants or skunk rabies virus variants or bat rabies virus variants, etcetera.

[Ted Pestorius] So what mechanisms does CDC have in place for the prevention and control of rabies in wildlife species?

[Dr. Rupprecht] One of the most important mechanisms that we have is surveillance, working with our eyes and ears out there, individuals in the local and state health departments. It really starts with the suspicion of an animal rabies case because we can't control and prevent what we don't know about. So surveillance is one of the very first key facets in trying to control a disease in wild animals.

CDC came up with the concept of oral vaccination where you can put the vaccine inside a bait and strategically distribute it in different areas. So if a raccoon or a fox were to eat that bait, they would vaccinate themselves against rabies. So one of the first major public health considerations was vaccination by routine method – the same way of taking your dog to the veterinarian for routine rabies vaccinations. It's really that herd immunity that first controlled and eliminated rabies virus in dogs. And more importantly, the application of this new strategy - oral vaccination by the strategic distribution of vaccine-laden baits in aircraft and by partnering with one of our greatest collaborators, the United States Department of Agriculture Wildlife Services - we've been able to come up with a national program for the distribution of vaccines for wildlife species.

[Ted Pestorius] Your team also looked at rabies from the global and historical perspective. So what are some of the factors that have led to the spread and evolution of rabies in various species?

[Dr. Rupprecht] One of things our investigations have shown is that you cannot rely upon success in a single species of prevention and control of rabies. This is a virus that's adapted to many different species of mammals. And what we've been able to demonstrate is that when we talk about dog viruses there were many different dog viruses historically. Some of them went extinct naturally; they found bottlenecks in dogs. Some of them were eliminated by traditional veterinary applications of vaccine - the way when you take your dog to its routine vaccination every year.

Importantly, some of these viruses from dogs spilled over into closely related mammals. For example, if we're talking about dog viruses spilling over into coyotes, which are closely related. This virus then became adapted to coyotes and it was the application of oral vaccination that allowed the second significant elimination of dog rabies-like variants adapted to wildlife that maintained that transmission coyote-to-coyote, coyote-to-dog, dog-to-dog, and dog-to-coyote. So it was really the combination of two methods, a historical one from the intramuscular vaccination of dogs, domestic dogs or pets, and more importantly, the application of ways of vaccinating free-ranging wildlife to help eliminate these newly emergent variants in wildlife species.

[Ted Pestorius] And that brings the conversation back to prevention. So, specifically, what does the elimination of canine rabies and movement of rabies into other animals mean for the average American?

[Dr. Rupprecht] That's a very good question, Ted. We have to recognize that, although the elimination of a canine rabies virus variant has occurred, that is there's no more dog-to-dog-to-dog transmission in the United States, that does not mean that rabies isn't here anymore or that you don't have to have your pets vaccinated. All of the rabies viruses that we have in the United

States can still infect your dogs and cats and so routine veterinary examination is still critical. And moreover when people visit other parts of the world, they have to recognize that rabies in dogs there is still very important. Just because we've eliminated one rabies virus here, does not mean that other rabies viruses still don't pose as problems in the United States and abroad.

[Ted Pestorius] Thank you, Dr. Rupprecht, for taking time to speak with us today.

We've been speaking with Dr. Charles Rupprecht, chief of CDC's rabies program, who was talking about the study which appears in the December 2008 issue of CDC's journal, Emerging Infectious Diseases. We'd also like to acknowledge Dr. Andres Velasco, the primary author and our collaborators with the Texas Department of Health for making this study possible. You can see the whole article online at www.cdc.gov/eid. And, if you'd like to comment on this podcast, please send an email to eideditor@cdc.gov. That's e-i-d-editor, all one word. As always, thanks for listening.

*[Announcer] For the most accurate health information, visit www.cdc.gov or call 1-800-CDC-INFO, 24/7.*