U.S. Senate Committee on Environment and Public Works

Hearing Title:
"Examining the Impacts of Diseases on Wildlife Conservation and Management"

Testimony of

Walter E. Cook, DVM, PhD, DACVPM
Clinical Associate Professor
Wildlife Population Health Veterinarian
Texas A&M University

October 16, 2019

Chairman Barrasso, Ranking Member Carper, and Members of the Committee, thank you for the opportunity to provide a subject matter expert's perspective on disease challenges to wildlife conservation and management. My name is Dr. Walter Cook, and I am a clinical associate professor for Veterinary Pathobiology at Texas A&M University College of Veterinary Medicine and Biomedical Sciences. For more than 100 years, the Texas A&M College of Veterinary Medicine & Biomedical Sciences has been improving animal, human, and environmental health through teaching, research, veterinary care, service, and outreach.

Today I will highlight some of the lessons I've learned over the last 25 years dealing with many animal diseases. I will review five different wildlife diseases. Please note that there are many other diseases I could have chosen to review but I chose these five because I have particular concern and experience.

Chronic Wasting Disease (CWD) is a prion disease that affects the cervid or deer family (deer, elk, moose, caribou). Although it is related to Bovine Spongiform Encephalopathy (BSE) it is a distinct disease. Prions are infectious proteins that convert normal proteins found in the brain and other tissues into the abnormal prion configuration. When enough conversion occurs in the brain, microscopic holes appear and changes in behavior and body condition develop. As with other prion diseases, CWD is believed to be invariably fatal. Chronic Wasting Disease can be transmitted to other cervids directly via saliva, urine or feces, or indirectly when the environment gets sufficiently contaminated with these secretions or by decomposed tissue (particularly brain and spinal cord).

The disease was first recognized in a research facility in Colorado and quickly spread to a similar facility in Wyoming because the facilities traded animals back and forth. Since then it has been reported in 24 states, two Canadian provinces, South Korea and Norway, Finland and Sweden. The disease has caused declines in some populations in Colorado and Wyoming, but has not been associated with population declines in other areas. No one knows if this discrepancy is due to environmental factors, or if the unaffected populations just haven't had CWD long enough to be impacted. Still, CWD remains a major concern because once an environment gets sufficiently contaminated with CWD prions it is impossible to decontaminate; thus, long-term consequences could be severe.

As the name suggests, CWD causes animals to slowly deteriorate. In addition, it causes behavior changes and predisposes animals to early death due to predators, automobile accidents and other diseases. Chronic Wasting Disease is slow in all aspects, it slowly invades the animal's brain, is slowly transmitted and slowly spreads across the landscape (at least naturally).

Figure 1. A wild elk with CWD. Notice the extreme emaciation, yet relatively nice antlers. This elk died 15 minutes after this photo was taken. It is rare that animals reach this late stage of CWD in the wild as they are easy prey long before the disease is this pronounced. Photo courtesy of Dr. Melia DeVivo.

Due to the fact that CWD is the same category of disease as BSE, there have been concerns that like BSE it could spread to humans. To date there is no evidence to suggest that CWD is a significant human health threat. One should realize that there are many animal prion diseases and that, so far, only BSE has been shown to be transmissible to humans. Indeed, data collected by the Wyoming and Colorado Health Departments indicate that the risk of neurologic disease in those who have hunted in CWD endemic areas is no higher than the public at large. Dr. Christina Sigurdson of UC San Diego has developed an explanation for the low risk of transmission of CWD to humans (and most other non-cervids) referred to as the Steric Zipper Hypothesis. The idea is that much like how the teeth of a jacket or sleeping bag zipper must line up correctly for the zipper to work, so must the amino acid side chains of the prion and normal protein line up for conversion to occur. With unrelated species, the "teeth" of the zipper of these proteins do not line up so efficient conversion cannot occur. Despite the low risk of human disease, it is always prudent advice not to consume meat from any animal that is sick, regardless of the cause.

There is also concern that CWD could be transmitted to livestock. While many studies have shown that CWD can be transmitted to non-cervid or deer species via intracerebral inoculation (i.e. direct injection into the brain), no studies have shown that CWD can be naturally transmitted to livestock. Indeed, a recent study initiated by Dr. Elizabeth Williams (deceased) and completed

by her colleagues at the Department of Veterinary Science at the University of Wyoming indicates that natural CWD transmission to cattle is highly unlikely.

The public remains confused and concerned about CWD. There are several causes for this. First, there is a lack of understanding about the potential impacts of the disease. Secondly, there is the feeling among some interest groups that regulations regarding CWD are overly stringent. Third is the fact that different states manage CWD differently. While I support a state's right to manage the disease in a manner most consistent with that state's needs and values, it does lead to public confusion and distrust when they see states managing the disease in different ways. Fourth, there are a multitude of different messages concerning CWD. For example, one "authority" will claim that CWD is an imminent public health threat while another claims CWD is no threat at all. Similar mixed messages are also heard regarding population impacts on deer species. It would be ideal if an group of respected CWD authorities could determine common management needs and an overall public message

Lesson Learned: There are a lot of misconceptions about the impacts of CMD. A consistent avenue and reliable avenue for information dissemination is needed.

Bighorn Sheep Respiratory Disease Complex (BHSRDC). Bighorn sheep (BHS) are extremely susceptible to pathogens of the lungs. Huge outbreaks, often caused by a complex set of pathogens and stressors, have occurred and cause major impacts on BHS populations, in some cases eradicating entire populations. A typical scenario is that initially there is an "all age die-off" affecting a large proportion of the population. Typically, some adults will survive the initial outbreak. However, subsequently, the population fails to recruit young animals despite the fact that lambs are born. It is believed that the surviving adults have developed resistance to the pathogens but continue to harbor and shed them. Subsequently these pathogens get passed on to newborn lambs which die as they have no resistance.

While clearly not absolute, there is an association with domestic sheep having close contact with BHS prior to an outbreak. This has caused a great deal of contention between domestic sheep producers and wildlife managers and enthusiasts. Wyoming was the first state to resolve this conflict. This occurred when State Veterinarian, Jim Logan and State Wildlife Veterinarian Tom Thorne brought all the various interest groups together (The Wyoming State-wide Bighorn/Domestic Sheep Interaction Working Group) to resolve this conflict. They invited representatives of state and federal wildlife and livestock agencies, producers' groups, wildlife Non-Government Organizations and enthusiasts. Initially there was a great deal of enmity and resentment among the various interest groups. But by working from a set of ground rules and common goals the group became very effective. What I found inspiring is that people that previously difficulty working together became friends and colleagues. While the working group has not solved all disease issues, it has achieved great progress on resolving conflict.

Lesson Learned: When stakeholders from disparate groups come together in a good faith effort to resolve issues, disagreement can be reduced and progress can be made.

White-Nose Syndrome (WNS) of bats was first detected in New York (2006) and is caused by the fungus *Pseudogymnoascus destructans*. Today the disease is most common in the northeastern and Mid-Atlantic States and the fungus (but not the disease) has been found in a scattering of states further west. It kills by invading the skin of hibernating bats (seen as a white powdery growth on nose, ears and wings) and leads to emaciation which causes the bats to emerge from hibernation abnormally early in search of food. Because insects are rare in winter, food sources are scarce and the bats succumb to starvation, cold exposure or both.
The fungus responsible for WNS grows well in cold, dark and humid environments, the exact environment hibernating bats choose as hibernacula. White-Nose Syndrome has wiped out over 90% of the common little brown bat (*Myotis lucifugus*) colonies in the northeast, has led to the Northern Long-Eared Bat (*Myotis septentrionalis*) being listed as threatened, and has had a significant impact on 2 other related species. It is believed that WNS may significantly impact 25 or more species of bat and threaten many of them with extinction.

Interesting research conducted by Dr. Joseph Hoyt of Virginia Tech in Blacksburg shows some promise in preventing the disease. He found that probiotic bacteria (*Pseudomonas flourescens*) occasionally found on healthy bat skin inhibits the growth of the WNS fungus. When Dr. Hoyt and his team sprayed bats with a solution containing these beneficial bacteria, the chances of the bats surviving WNS was greatly increased.

Bats are important in controlling insects including mosquitoes and those that prey on crops and forests. Economic impacts on agriculture are estimated to be $22.9 Billion per year with some estimates as high as $53 Billion per year. Thus, even though many people dislike or even fear bats, they serve important roles in the ecosystem and benefit humans.

Lesson Learned: Wildlife Diseases can be important economically even when they affect species we may not normally appreciate.

Chytrid fungus (*Batrachochytrium dendrobatidis*) {Bd} of amphibians is probably the single most devastating disease agent for wildlife species in North America and across the globe. It has caused, "The most spectacular loss of vertebrate biodiversity due to disease in recorded history"[1] according to Dr. Lee Skerratt of James Cook University in Queensland, Australia. Estimates are that chytrid may already have led to the extinction of over 100 species and threatens populations of over 200 more. The chytrid fungus has spread around the world primarily by the trade in frogs (especially the Africa Clawed Frog) for food, pets, and research. Many of the traded species are carriers of the fungus and remain unaffected but can transmit chytrid to other species. When susceptible species are infected with Bd it causes reddening and thickening of the skin thus disrupting the normal function of the skin. This disrupts water and electrolyte balance and ultimately leads to death.

The chytrid fungus is quite sensitive to environmental conditions; it prefers moist environments and temperatures between 17 to 25^0 C and will not survive below freezing or above 29^0C. In fact, one can often save infected amphibians by placing them in warm environments. The fungus is also susceptible to most standard disinfectants. This is important as humans can transmit the organism from one water source to another if they fail to properly clean and disinfect nets, boots or other equipment that contacts amphibians or water.

Lesson learned: Trade in exotic amphibians led to the establishment of this fungus in the USA. We should be very careful about artificially moving wild animals. We also need to practice good biosecurity in wild places.

Anthrax. This disease, caused by the bacterium, *Bacillus anthracis*, is well known to anyone who remembers the terrorist letters of 2001. What most people do not realize is that anthrax is a major source of livestock and wildlife mortality across the globe. Animals typically ingest anthrax spores on vegetation or soil. When the spores invade the blood stream they replicate as vegetative cells and release toxins that can kill the animal in a matter of days. When the tissues or blood from the carcass is exposed to air, the vegetative cells sporulate- go back into the spore form. These spores are extremely hardy and can survive in harsh environments for hundreds of years. Endemic areas in the USA (the Edward's Plateau of Texas, the upper Midwest of Montana, South and North Dakota) will commonly experience a few deaths due to anthrax in wildlife or unvaccinated livestock every year. However, when conditions are right (typically a wet spring followed by a hot, dry summer) huge outbreaks can occur. This past summer was such a year in Texas and it is estimated that over 10,000 animals died of anthrax. The economic impact of this outbreak exceeds $15,000,000; this is remarkable considering the outbreak was limited to a 5-county area and most deaths occurred in a 2-month period. Not only is this an economic travesty but it is an environmental and humane issue as well. Amazingly, there was only one human case associated with this outbreak. Were it not for extensive public health education by the Texas Animal Health Commission, the Texas Parks and Wildlife Department and the Texas Department of State Health Services, there could have been many more human cases.

There is a very safe vaccine available to livestock that provides effective, but short-lived immunity (less than a year); most livestock producers in endemic areas vaccinate annually for the disease. However, it is impractical to capture and restrain thousands of wild animals every year to vaccinate them. This is why researchers at Texas A&M University are working on an oral vaccine that can be delivered to wildlife via a food bait.

Figure 2. Carcass pile of remains from wild animals that died of anthrax on a ranch in Uvalde, Texas. Photo courtesy of Glenn Staack.

Lesson Learned: Being proactive in educating the public can prevent catastrophic animal and human disease.

Finally, let me state that it is important that funding be made available to address wildlife disease management. I'm particularly concerned with the lack of federal funds available for research aimed at real world management dilemmas. There are federal funds supporting basic disease issues (like understanding what receptors are involved in certain pathogen invasion processes). However, there is a paucity of federal funds dedicated for research directed toward actual disease control which can also lead to increased human transmission.

References

1. Kurt. T.D., & Sigurdson, C. J. (2016). Cross-species transmission of CWD prions. Prion 10:83-91.
2. Skerratt, L. F., Berger, L., Speare, R., Cashins, S., McDonald, K. R., Phillott, A. D., ... & Kenyon, N. (2007). Spread of chytridiomycosis has caused the rapid global decline and extinction of frogs. *EcoHealth*, *4*(2), 125.