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Preventing Pandemics through US Wildlife-borne Disease Surveillance

Thank you, Chair Porter and the subcommittee for calling this hearing an inviting me to testify. I am currently employed by the University of Georgia (UGA) as a professor and Director of the Southeastern Cooperative Wildlife Disease Study (SCWDS). I am giving this testimony not as a representative or UGA or SCWDS but as an individual with over 40 years of experience conducting surveillance and research related to diseases affecting wildlife, domestic animal and human health. Much of this work has centered on zoonotic pathogens (Lyme Disease, West-Nile virus, SARS-Cov-2, Eurasian highly pathogenic H5 influenza A virus) that were not present in North America or known to exist when I began my career. All of these involve wildlife.

Wildlife are important reservoirs for zoonotic diseases. This holds for both endemic and emerging zoonoses as well as zoonotic diseases with pandemic potential. It is also important from a natural-resources perspective to recognize that wildlife populations can also be adversely affected by these same diseases. Discussions related to wildlife and pandemic prevention require perspective. To provide this, I will address three questions: Can pandemics be prevented? How can wildlife health professionals and infrastructure contribute to pandemic prevention and preparedness? What is needed to improve our existing wildlife health infrastructure related to pandemic prevention and preparedness.

Can pandemics be prevented? I have lived through at least five pandemics in my lifetime and all of them have involved viruses that originated from wildlife. These include three influenza pandemics (1957-H2N2; 1968-H3N2, 2009-pH1N1) originating from wild birds and domestic animals, HIV (1981) from old-world primates, and Covid-19 (2019) presumed to originate from bats. There have also been two possible near misses, Ebola (2014-2016) from bats and SARS (2003) from bats. Unfortunately, while we know that such events will continue, our current predictive abilities and capabilities to react are not sufficient to assure prevention. Prevention

is dependent on eliminating human exposure to known or potential zoonotic agents, eliminating or reducing risk factors that lead to infection or increased virulence, early detection of human cases, and actions designed to break transmission cycles. With known human pathogens and defined drivers of disease emergence, pandemic prevention can be possible. Influenza and Ebola are examples. However, with an unknown inventory of perhaps millions of potential and ever-changing pathogens that are present in nature and in human-impacted ecosystems, pandemic prevention in many cases might be as futile as attempting to prevent a hurricane. However, like a hurricane, there is much that can be accomplished with preparedness to better protect the public and reduce impacts. Prevention should be the ultimate goal, but preparedness is probably a more realistic and practical approach for the near future.

How can wildlife health professionals and infrastructure contribute to pandemic prevention and preparedness? Currently, a basic infrastructure to conduct surveillance and supporting research related to the role of wildlife species in zoonotic diseases is in place; however, there are significant gaps that need to be filled related to building more effective, inclusive, and comprehensive capacity. The existing and basic infrastructure includes a loose network of Federal, State, and academic professionals and laboratories. On the Federal side, the USDA and USGS carry much of the responsibility with diseases that involve wildlife. However, state involvement in this network includes state veterinary diagnostic labs, state Fish and Wildlife Agencies, and regional wildlife disease labs such as ours (SCWDS) that provides wildlife disease expertise to multiple state and Federal agencies. Collaborative expertise and resource support also are often provided by others agencies and institutions such as USFWS, Centers for Disease Control, National Institutes for Health, state departments of agriculture, public health, and natural resources, and public and private academic institutions. The involvement and inclusion of this vast array of expertise and jurisdictions are justified and needed for many reasons; wildlife and wildlife disease professionals play an important part in this team effort.
Zoonotic diseases and impacts are shared between wildlife, domestic animals, and humans and prevention needs to be addressed at all of these levels. Pandemic prevention and preparedness are dependent on a comprehensive understanding of wildlife reservoirs, vectors, and risk factors that provide an avenue for potential human or interspecies infection. Understanding basic wildlife biology and the human/wildlife interactions that may enhance zoonotic pathogen transmission are critical components of zoonotic disease prevention and both fall within the expertise and jurisdiction of wildlife-health professionals. Effective surveillance and research for zoonotic diseases also require a specialized and high level of technical and scientific skills that needs to be in place when needed. These skill sets not only relate to the collection of relevant data but also to providing a comprehensive and realistic interpretation of these data and the development of practical mitigation practices or policies. Finally, laboratory and

diagnostic capabilities needed to conduct wildlife-related zoonotic disease surveillance and research also need to be in place when needed not after a problem is encountered. In emergency situations, these diagnostic capabilities can easily be redirected to other new or emerging problems. Wildlife health professionals are on the front line related to discovery of new pathogens and diseases in wildlife and provide invaluable expertise related to understanding these potential pathogens in these populations and at the human/wildlife interface.

What is needed to improve our existing wildlife health infrastructure to contribute to zoonotic and pandemic preparedness?

A broader wildlife health perspective is needed: We tend to compartmentalize wildlife disease to those that affect wildlife, diseases that are maintained in wildlife but can spillover from wildlife to domestic animals, and to those affecting humans. These can be further compartmentalized to diseases that are established and well known, diseases that are "new", and diseases and potential pathogens yet to be discovered. Those of us involved in wildlife health recognize these different perspectives, but also recognize that extensive overlap between these "compartments" occurs. For example, West Nile Virus (WNV) was a well- known zoonotic pathogen originally described in Africa. It gained "new status" when introduced into North America in 1999. It was initially recognized as something new when it affected American crows. Although not considered a pandemic its global range expanded rapidly and included the entire Western Hemisphere in 4-5 years. This is a zoonotic disease, a domestic animal disease and a disease responsible for significant wildlife mortality. Federal investment for WNV surveillance was primarily justified by this virus's zoonotic potential but the information gained also was applicable to domestic animal and wildlife health. Effective national WNV surveillance was made possible by including a network of human, domestic animal and wildlife health laboratories. Our lab was involved in these efforts and very quickly mobilized to provide WNV diagnostic support related to detecting infections in wilds bird and mosquitos for Georgia and several southeastern states; we are still doing some of this work today. The information gained not only helped to inform public health, but also informed wildlife health and domestic health professionals as related to wild bird mortality and equine disease. It also resulted in the local detection of other viruses such as equine encephalitis and other vector-borne zoonotic viruses. In addition, isolates of WNV were shared with other labs to provide research material to understand how the virus was evolving and potentially changing. With proper planning and creativity, the value of surveillance can far exceed any immediate objectives. SARS-CoV-2 and Eurasian HP H5N1 both are examples of viruses with known or potential pandemic capabilities where impacts to wildlife, domestic animals, and humans are shared and where an efficient response includes all of these perspectives and expertise. It is important to understand that

many of the processes that allow a pathogen or diseases to emerge are similar between diseases affecting wildlife and those that can expand their host range to domestic animals and humans. Knowledge can often be translatable related to disease epidemiology regardless of host populations and such existing knowledge can be invaluable in quickly addressing "new" problems. For example, our abilities to identify new pathogens and to quickly develop and validate diagnostic tools are greatly enhanced by the wealth of genetic sequences and biological collections of both pathogenic and non-pathogenic viruses and microorganisms from wildlife species.

Support for both surveillance and research is needed; problems cannot be understood or solved without both: Effective surveillance needs to be science based and should always be improved with time, additional data, and a better understanding of the epidemiology of the target pathogen or disease. It is important that surveillance efforts be supported by state-of-the-art diagnostics. These technologies are rapidly changing and require research to develop and validate. Surveillance technologies also should not stagnate and goals and approaches need to be constantly modified and improved relative to new information and increased understanding provided by supportive research. Wild bird surveillance for WNV provides a relevant example. One year after the detection of WNV, an improved understanding of pathogenesis provided a scientific basis to support a more streamline and safe wild bird sampling and testing protocol. After four years of wild bird surveillance in Georgia, a very consistent and predictable pattern of when WNV transmission occurred was identified. Based on this, the "early warning" provided by testing birds was no longer needed and preventive measures by public health could be safely and less expensively be scheduled on a calendar year. Though supportive research, we and others identified specific avian and mosquito species that were important amplifying hosts for this virus. This allowed for develop of efficient and better targeted surveillance and field research designs to better understand local risk factors, mitigate risk, and determine the effectiveness of preventive measures. With influenza, basic knowledge on the epidemiology of our North American low pathogenic influenza a viruses (IAV) is providing a foundation to better understanding the impacts, risk factors, and prevention and mitigation possibilities associated with the current Eurasian HP H5N1 outbreak in the United States.

Sustainable funding and recognition that success often requires a long-haul approach are needed: Funding for wildlife health often follows a "boom and bust" trajectory, however, pandemics may take years to evolve. Short-term funding to build infrastructure and capacity can certainly be used effectively to reinforce our ability to detect, understand, and respond to zoonotic disease treats. Such funding also is needed in emergency situations such as outbreaks and pandemics. However, we all recognize that these threats and the discovery of future

threats are often unpredictable and require continuous vigilance. In addition, an effective response to a disease emergency requires work-ready facilities, equipment, and most importantly skilled people. Our regional lab is very fortunate to have a business model that includes reliable annual support from state fish and wildlife agencies. This is something that we have benefitted from for more than 60 years and our member states willingness to support us over these decades speaks loudly relative to the success of this model. It is important to note that this invaluable base support ($750K/year) is modest considering that it provides wildlife disease detection capabilities and support for 17 states. The advantages provided by such base funding are significant not only in relation to completing our day-to day work but also by providing a foundation for a rapid response to address the next disease issue and to fill gaps and maintain a work force of skilled biologist and scientists during unpredictable funding cycles. It also promotes discovery-based science as new clinical syndromes can be investigated immediately and not be dependent on obtaining new funding for every new pathogen, disease, or problem encountered.

Within state infrastructure and professional resources are vital to functional network:
Surveillance is dependent on professional ground troops, and with wildlife, these are the wildlife biologist and wildlife veterinarians that work in our fifty states, tribal lands, and Federal lands. These professionals are the ones who initially detect wildlife disease problems, who gather the samples and data needed to support surveillance, who submit the data, who provide the biological and local expertise to understand the natural history of these pathogens in wildlife populations, who understand and can identify local risks, who are responsible for developing and implementing response plans, who understand what research is needed to deal with local situations, who provide field and collaborative support for research, and who are the ones who communicate face to face with the public and deal with any local issues that occur. Unfortunately, the level of wildlife expertise within individual states is highly variable, but even under the best circumstances is probably grossly inadequate to meet current needs. Dealing with chronic wasting disease which is at present only a potential zoonotic issue is a timely example of the intense personnel and financial demands that a disease may create. Personnel support for wildlife health professionals is needed, and infrastructure support to develop even simple field laboratories are essential to developing an effective network. Almost all of our work at SCWDS is done in collaboration with state wildlife health professionals who are the ones who detect and submit all of our clinical cases from which we diagnose zoonotic pathogens such as rabies, tularemia, Salmonella, zoonotic helminths, assorted encephalitis related viruses, and antimicrobial resistant bacteria. Finally, our surveillance and research with such potential and existing zoonotic and pandemic pathogens such as influenza and SARS-CoV-2 viruses are dependent on support, samples, and data provided by our state partners.

In summary, zoonotic prevention and preparedness require a network of skilled scientists, laboratories, and health practitioners across many disciplines. Wildlife health professionals can and are contributing to these efforts and are a necessary and valuable part of this network. However, improvements need to be made to more sustainably support these efforts, especially at the state level. From a “One Health” perspective, investment will not only improve our capabilities related to zoonotic and pandemic diseases prevention and preparedness but also will serve to improve our overall capabilities related to wildlife and domestic animal health.