OP-ED

“BAA BAA Black Sheep Have You Any Prions? Yes Sir -Yes Sir, and My Friend Crow Will Bring Them!”

by Brian Kanke, President of Zoo Pharma Dynamics, Inc.

Remembering my childhood from the past, but more importantly, my life on the sheep farm evokes a mixture of nostalgia and reflection. You might think I don’t like sheep, but quite the opposite is true. Sheep are like any other farmed animal and deserve the same respect as the rest of the animals. I blame no animal for anything it does or has; it had no choice. Remember, it’s dependent upon humans.

The past is cemented in history, and in my opinion, history is often overlooked in the scientific world. History doesn’t lie, nor can it be changed; it has already occurred, whether good or bad. We have a lot to learn from history, but we often don’t. I believe the reason for this is that we weren’t there to experience it, and we are always looking to the future. However, the future can be dangerous if the history of the past is overlooked.

Our research at Zoo Pharma Dynamics concentrates heavily on the past, especially origins. What changed in the past to bring us to this point now? Historical data is often more valuable than new data; historical data has a beginning and an end, while new data only has a beginning. Combining historical data and applying it to new data presents an enormous opportunity for providing solutions. We utilize this process at ZPD daily, and it has afforded us the means to solve significant problems.

I am not a rocket scientist, but I am well-versed in prion disease. Follow me in this op-ed as I lay out my opinions and verifiable facts about prion disease based on over 12 years of research and centuries of historical data.

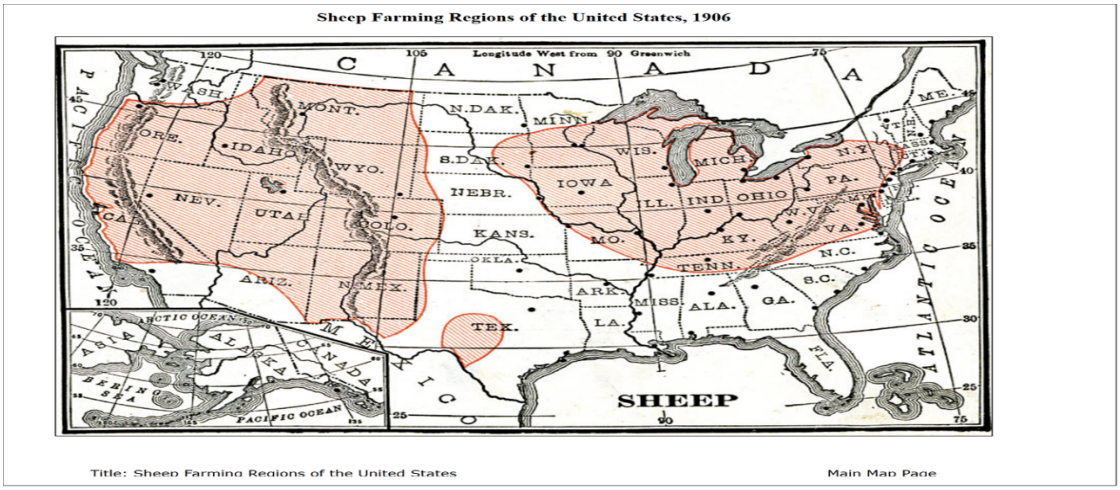
Science states that the origin of prion disease, especially Chronic Wasting Disease (CWD), is unknown, which is partially true. However, we can trace its origins back to a specific location in the United States. In the 1400s, the Spaniards brought the first sheep to the United States; these sheep are now known as Navajo-Churro. Sheep have been raised in Europe for centuries, and in the early days of settlement, England was the largest importer of sheep to the United States.

In the 1730s, the prion disease known as “Scrapie” was discovered in English sheep. There was no testing of the imported sheep before or after this period, to my knowledge. Thousands of sheep were sent to the United States, and by the early 1800s, the sheep population had reached 7 million, peaking at 56 million in 1945 before declining to about 6 million today. The United States had 56 million sheep with English origins. Therefore, I believe the origin of prion disease in the United States stems from the importation of sheep. The origin of prion disease in England remains unknown, and while there is always the possibility that the prion disease was already present, there is no scientific evidence to support that claim.

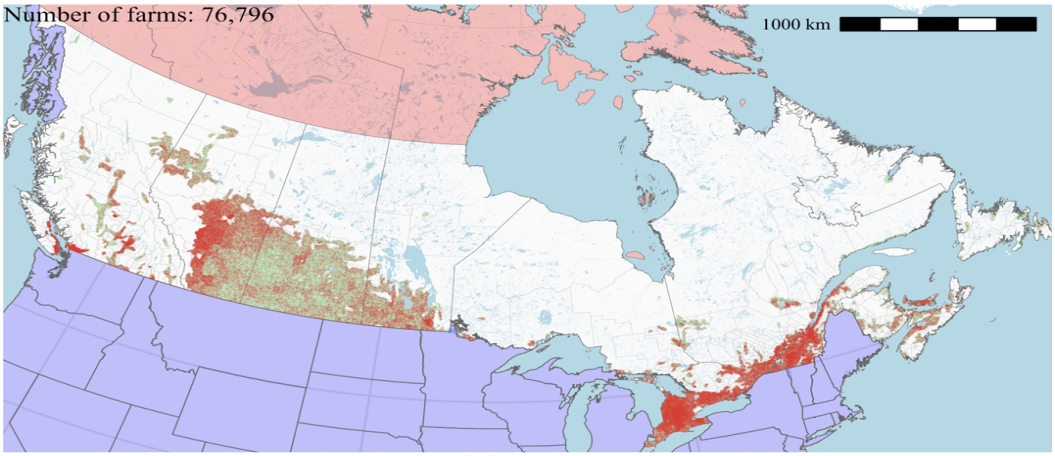
In our research, we reviewed historical data from Indian tribes across the United States to see if there were any mentions of animal behavior that could provide clues about prion disease, but we found none. Growing up on a sheep farm, I witnessed numerous sheep dying on the landscape, typically gathered and discarded in designated areas to allow predators to scavenge. In the early days of settlement, the majority of dead sheep were left where they fell across the landscape. If a sheep was infected, its carcass would be scavenged while decaying, allowing prions to enter the soil or be carried off by scavengers, likely to be found again by unsuspecting animals.

In our research, we examined historical maps from the early days of settlement, particularly in areas where heavy sheep farming occurred, including Canada. As we mentioned, history doesn’t lie; it provides a roadmap to a beginning and an end. We took particular interest in two maps: “Sheep Farming Regions of the United States, 1906” and “Number of Livestock Farms in Canada from the Mid-1900s.” After reviewing these two maps, we overlaid them onto the USGS National Wildlife Health Center Distribution of Chronic Wasting Disease in North America, 2018. The data from the three maps revealed almost identical geographic regions. The CWD hot zones in the United States and Canada are in the same area of high concentrations of sheep farms.

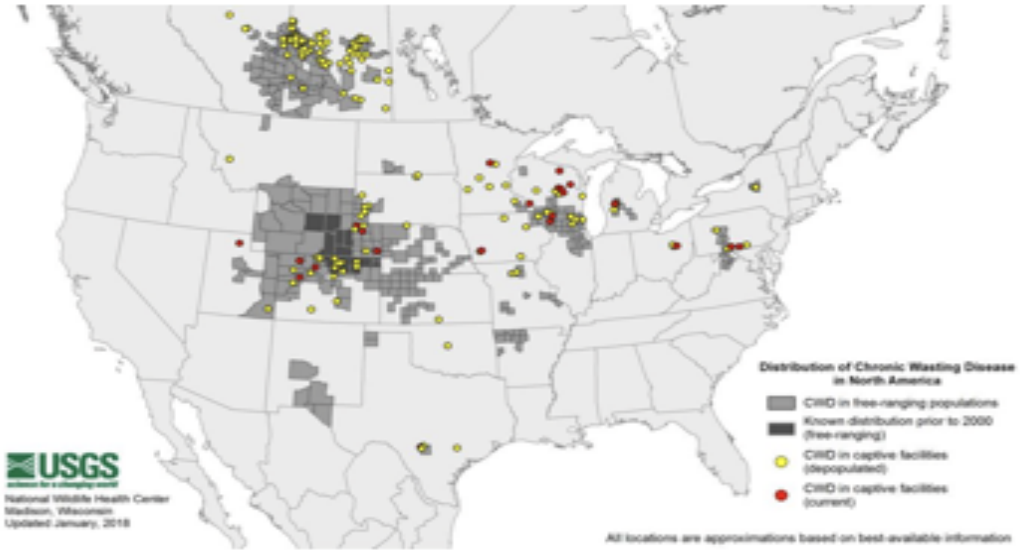
One of the densest areas was Colorado where the first CWD case “1960’s” appeared in Mule Deer which were later discovered in free ranging Elk. Please review the maps below.



Livestock



Notes: Each dot represents the approximate location of a farm. The green area is the agricultural ecumene.



As you can see, the maps provide factual evidence and show significant data regarding the origin of prion disease in the United States. If we reflect on the late 1800s, mid-1900s, and today, is prion disease the reason for a potential epidemic? Given that the prion disease is so devastating, why are Cervid populations higher than they have ever been? Why are Cervids healthy and thriving? Could it be that Mother Nature is in control and that prion disease in Cervids serves as a control measure?

Chronic Wasting Disease (CWD) is a late-life disease of Cervids, and most Cervids do not live long enough in the wild to show signs of CWD. The symptoms of CWD are broad and overlap with those of other diseases. For instance, a severe antler infection or inner ear infection shares many of the same signs as CWD. CWD isn't the number one killer of deer; in fact, it ranks low on the list. Epizootic Hemorrhagic Disease (EHD) is, by far, the leading cause of death, caused by the midge fly that enters the nostrils of a Cervid and infects them through biting. I would place death by automobile next, followed by all other diseases.

As with all diseases, if a cure or preventative can be found, it should be utilized. It's our duty as humans to protect animals when we can, but not at the expense of those who farm them. Zoo Pharma Dynamics (ZPD) has been at the forefront of finding a preventative and cure for CWD. We have conducted successful field trials that indicate CWD can be prevented, and further trials have shown promise in curing it.

Once again, we look back at historical data to understand the causes, as we know the origin of the disease. What changed that resulted in an uptick in CWD-positive deer? Science tells us there are only two organisms on this planet capable of destroying prions. Interestingly, these organisms have been part of the Cervid diet for centuries. However, studies of the forest floor by the U.S. government have discovered that these two organisms are disappearing for various reasons. Colorado was one of the first states to show signs of this disappearance. The loss of these organisms from the landscape has altered the healthy diet of Cervids, potentially limiting Mother Nature's ability to control prion disease.

ZPD has been able to extract these two organisms along with other key ingredients and formulate them into a digestible additive to be fed to Cervids to prevent CWD. There are Cervids whose diet consists primarily of these organisms, and this sub-species has never tested positive for CWD. Do I believe these organisms can cure or prevent CWD in all wild Cervids? No, that would be unrealistic. However, I do believe they play a significant role, and ZPD has amplified their effectiveness.

No vaccine is 100%, just as no medicine is completely effective, but high preventative and cure percentages are the goal. We believe that ZPD has broken new ground and that high cure percentages are indeed possible. ZPD is continuously conducting field trials to improve solutions in the fight against CWD.

Now, let's shift the focus to deer farms. Farmed deer don't have the same luxury as wild deer to seek out what they need. They reside in confined facilities and are usually fed a very good diet. Some may argue that they live a stress-free life with gourmet food, while others may contend that they are imprisoned with limited access to a varied diet. As a deer farmer, I love my deer,

and they receive the best care. In the wild, a deer is fortunate to reach age six; in a deer facility, does can live past the 17-year mark.

A wild deer is much more likely to encounter prion disease than a farmed deer. Wild deer roam and can come into contact with various substances, whether beneficial or harmful. In contrast, a farmed deer has limited interactions with its environment. When I refer to a deer “sticking its nose in,” I mean that, like most animals, deer consume dirt to aid digestion and obtain minerals. A wild deer has a vast territory in which to consume dirt, making it more susceptible to encountering prions in the soil.

Farmed deer do not have the same access to extensive territory and soil. Additionally, the sensitivity of a deer’s sense of smell means the chances of encountering a prion in decayed carcasses are relatively low. Deer are curious and will investigate, but my observations using cameras on decaying carcasses over various lengths of time show that they typically avoid such smells. Deer are very particular in their habits, and their keen sense of smell keeps them out of trouble, leading me to believe they stay away from areas where decayed carcasses have been, regardless of how long the carcass has been gone.

Prions have no odor, so any scent remaining from the carrier must not trigger the deer’s sense of smell. There is a possibility that rain and drainage could move and distribute the prion from the area of a decayed carcass, but it would also transport the foul odor of the decaying remains, which could deter deer from entering the area.

Most dirt in the deer pens is consumed by fawns, who are constantly eating dirt to help their digestive systems function properly. If prions were readily available in the soil of the pens, and if deer farming propagated the prion disease, it shouldn’t take several years before a CWD-positive case emerges, especially with all the required CWD surveillance and testing being conducted. The source of infection must be direct and immediate to the deer farm. Prion transmission, particularly in natural settings like deer populations, is a complex process, and understanding its mechanisms is vital for preventing disease spread. While prions are not generally transmissible through direct contact, they can spread via environmental contamination.

Deer in pens typically receive high-quality diets rich in essential vitamins and minerals, as well as probiotics, which they consume daily. Further research is needed to understand the full effects of certain minerals, as they may enable farmed deer to break down prions. It is noteworthy that in a controlled environment, a CWD-positive case is often limited to a small number of deer. You could test the remaining deer in the same pen, moving those that tested negative to a separate location, akin to Scrapie surveillance. We need to be able to work in real-time situations to effectively manage the disease without jeopardizing both the deer and the deer farmer.

We know that deer in facilities have a limited range and cannot seek out what they require. So how is it that farmed deer are testing positive for CWD at a higher rate than wild deer? All farmed deer are required to undergo testing, whereas free-ranging deer are only tested in most states on a voluntary basis. It is likely that the prion is being introduced to the deer facility by an unsuspecting carrier.

Most deer facilities contain multiple pens, allowing deer to be rotated through them. This practice enables farmers to rest a pen and perform housekeeping measures. The resting pen is

given time to regenerate natural forage and allow the plants to help cleanse the soil. The real question is: How does a deer farm test positive for CWD after many years, especially when all deer have been in the same facility? Any deaths occurring within the facility must be tested postmortem, and a percentage of live tests is conducted annually, yet nothing has tested positive for CWD throughout that time. Did it take years for the deer to find the prion in the soil of the pen? I don't think so. Something must have introduced it there.

You might conclude that another deer was transferred from a different facility, bringing the prion along. However, the transfer facility operates under the same strict testing requirements and has never tested positive for CWD. It is possible that a latent case slipped through the necessary testing. I believe that the deer farmer is adhering to all testing protocols and that the carrier introduced the prion to the facility, likely just days before the transfer. If the introduction had occurred weeks or months earlier, it would have likely been detected in the transfer facility.

The question remains: What could carry the prion and leave it at a deer facility without triggering the deer's sense of smell? I am particularly concerned about human foot traffic in and out of the pens, especially if those entering have recently visited other deer facilities while wearing the same boots. Protective measures must be implemented for visitors to the deer pens, and strict biosecurity protocols must be followed diligently.

Let's investigate who might have brought the prion to the deer facility. We cannot rule out human foot traffic, and I have witnessed very poor biosecurity practices in some facilities. ZPD has conducted field trials at various deer facilities, and during my visits to several of them, including those testing positive for CWD, I conducted investigative research to determine the origin of the disease. We inquired: When, how, and why did they get a CWD-positive deer?

After several weeks of observation, we discovered a common factor: the presence of crows in and around the facilities. While we did not completely dismiss other possibilities, the crows visiting the feeders and waterers in the pens caught our attention. The crows were not there in large numbers, but their presence at various times of the day was noticeable. They did not appear to affect the deer's behavior.

Crows are known to travel up to 50 miles a day and defecate every 17 minutes. They are scavengers and cannot digest prions; instead, the prion passes through the crow's system and can be deposited on any surface they encounter. Interestingly, bird feces do not seem to deter deer from eating from feeders, while the feces of other scavengers—such as opossums, skunks, and raccoons—do deter deer, highlighting the sensitivity of their sense of smell.

Prion remains infectious after passage through digestive system of American crows (Corvus Brachyrhynchos)

https://pubmed.ncbi.nlm.nih.gov/23082115/#:~:text=Our%20results%20suggest%20a%20large,geographic%20spread%20of%20TSE%20diseases.

"Mechanisms for the spread of transmissible spongiform encephalopathy diseases, including chronic wasting disease (CWD) in North American cervids, are incompletely understood, but

primary routes include horizontal and environmental transmission. Birds have been identified as potential vectors for a number of diseases, where they ingest or are exposed to infected material and later shed the disease agent in new areas after flying substantial distances. We recently identified American crows (Corvus brachyrhynchos) as having the potential to translocate infectious prions in their feces. Our results suggest that this common, migratory North American scavenger is capable of translocating infectious prions to disease-free areas, potentially seeding CWD infection where no other initial source of pathogen establishment is forthcoming. Here we speculate on the role avian scavengers, like American crows, might play in the spatial dissemination of CWD."

https://pubmed.ncbi.nlm.nih.gov/23822910/

Texas Parks and Wildlife Code Chapter 43.021

A permit is not required to control grackles; cowbirds; yellow-headed, red-winged, rusty or Brewer's blackbirds; **crows or magpies** when these birds are considered a nuisance or causing a public health hazard. No birds may be controlled by any means considered illegal by local city or county ordinance.

*Crow populations have grown by nearly 20 percent each decade for the past 40 years.

*Crows are some of the smartest animals in the world.

*The Crows total breeding population of the species is currently estimated to be 27 million.

ZPD had one deer farm that agreed to harvest 2 crows from around the facility for our research. One of the crows tested positive for the prion disease. Since the detection of the prion positive crow at the deer facility another deer facility within 20 miles of the CWD positive facility has now tested positive for CWD. We are continuing research on crows at other deer facilities.

We have not ruled out other scavengers as spreaders but the crow's ability to travel long distances in the day gives it the opportunity to be a super spreader.

As part of our investigative process, we find out what other operations are within a 20-mile radius of the CWD positive facility. We do our diligence at gathering as much information as we can. There is a CWD positive facility in the Hill Country of Texas that has an issue with crows and there are 3 sheep farms within 13 miles of the deer facility. This facility has not transferred a deer in for several years and current with all CWD testing. Could the crow of found a sheep carcass that had scrapie's or a wild deer carcass with CWD and scavenged from it and flew

over to the feeders at the deer facility and left fluid on and around the feeders? I wouldn't rule it out and further research and investigation is being done. There may be truth in nursery rhymes.

The deer farmer operates the same as any other livestock operation except with very difficult rules and regulations with little to no support. Some states allow the deer farmers to continue to operate their farm under similar protocols for Sheep Farmers regarding Scrapie Surveillance Programs. There is live testing that can be done verse the kill order, just think of all the deer farmers and deer that could have been saved by live testing. The deer farmer did nothing to propagate the disease but the deer farmer is financially devastated because of a disease first discovered in the 1730's and later discovered in the 1960's. I am confident this disease has been active on the landscape since the 1800's if not much sooner, but not until 1997 when the first CWD surveillance programs were being supported and later collaborated in 2002 which has resulted in more testing. I do not believe CWD is any more prevalent now than before all the surveillance and testing began. We just happen to be looking for it now, where in the past it was limited. The Cervid populations are thriving and healthy. The current population of whitetail deer is estimated at 30 million which is a significant increase since the 1900's. The Cervid population has been living with CWD for a very long time? The prion disease is a wasting disease. I relate the prion disease to Alzheimer's and Dementia for the reason of cachexia. All three involve the brain and the ability to function deteriorates. All three diseases are from a contact source associated with our nutritional habits or activities. Amyloid may spread from person to person similarly to prions, but further research is needed to determine whether this could cause Alzheimer's. I do not believe it's a high probability genetic trait due to the fact of all the chemicals and toxins we put in our human bodies daily. The same can be applied to deer. We have changed the landscape, the deer's territory has shrunk, and we use herbicides, pesticides and a lot of genetically modified seeds for food sources whether for humans or animals. Our wastewater treatment systems in geographic locations are on the low end of the scale when it comes to tolerable levels of toxins. Our chemical usage has grown over the last centuries. Could it be that the deer are slowly absorbing these toxins into their bodies making them more susceptible to diseases as time goes by? It sure seems to be the case for humans. We have altered the landscape in some cases to where it's totally unrecognizable looking back to the 1800's. There have been many changes to the ecosystem in North America and it usually comes with a punishing outcome from Mother Nature. As a society we need to have the ability to grow and expand. I am not against expansion. I do believe we can take a better approach in

turning farmland into subdivisions. There is usually an argument over high fence verse low fence when it comes to ranches or farms. I believe the high fence is more suitable to the wildlife today compared to 50 years ago. We keep expanding into the area of wildlife habitat and making the animals adapt to interactions with humans and the toxins that come with us. Wildlife will likely not remain in a low fenced area when territory is invaded unless they have no choice, or they figure out they can get handouts. The feeding of wildlife in an urban setting is not wise. You are conditioning the animal to not hunt for food and what happens if you decide not to feed them anymore. I believe the high fence is becoming the preferred habitat for wildlife, they for the most part don't have to interact with humans and their territory is protected from unwanted interference. The high fence protects most wildlife from death by automobiles and prevents injury to humans. I would consider the high fence ranch or farm as a protected sanctuary for wildlife. The land is managed, the forage is available, predators are kept under control and the need to travel a large area to survive is gone.

ZPD will continue to fight for the deer farmer and find solutions to stop the madness affecting deer farms. We are confident in the research and development we have done to date and are continuing the improvement of the formulas for our additive Cervid Prion Preventative, "CPP". ZPD and its strategic partners have another promising round of field trials in 2025 to fight against CWD. Please visit our website at www.zoopharmadynamics.com and sign up for our monthly newsletter to keep track of our progress.