

Chronic Wasting Disease:

Starving for Answers

by Hal Herring

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There is no way to test live animals for it. No cure. No vaccine. Nobody knows how it is transmitted from one animal to another. It is always fatal.

In the spring of 1997, the Kesler Game Farm, near Phillipsburg, Montana, shipped a herd of 84 elk to a rancher in Oklahoma who planned to start his own commercial game farm for breeding stock and meat. The Kesler farm had been back in business for only two years following a five-year quarantine for bovine tuberculosis, and the Oklahoma elk shipment would prove to be yet another stroke of very bad luck. Twenty-two months after the herd arrived at the ranch near Oklahoma City, one of the cow elk suffered an ugly illness that began with sudden bouts of agitation and progressed to staggering, slobbering, severe emaciation and death.

Shortly afterward, an apparently healthy bull elk was gored to death in a brawl with other bulls on the ranch. The cow and the dead bull were thoroughly autopsied at diagnostic laboratories in Oklahoma. In the brain tissue of both animals, pathologists found a strange sponge-like degeneration that is the trademark of the mysterious family of diseases known as TSE's, or transmissible spongiform encephalopathies. In elk and deer, scientists call the infection chronic wasting disease.

Until recently it had been found only in a small part of north-central Colorado and southeast Wyoming. It was not supposed to be present in Montana. No one had ever seen it before in Oklahoma. There is no way to test live animals for it. No cure. No vaccine. Nobody knows how it is transmitted from one animal to another. It is always fatal.

The Kesler farm and the Oklahoma ranch have been placed under five-year quarantines, and the incident has turned a spotlight on the rapidly expanding game farm industry and its brisk trade in elk breeding stock and trophy bulls for fenced shoots. Chronic wasting disease has also been found on game farms in Saskatchewan, South Dakota and Nebraska. Researchers, wildlife managers and conservationists are all trying to figure out what this will mean to the game farm industry, and whether or not this disease has the potential to move beyond the fences of game farms and infect elk, deer and other wildlife across North America.

Beginning in the late 1960s and continuing through the '70s, captive mule deer being used in a study of deer feeding habits at research facilities near Fort Collins, Colorado and Wheatland, Wyoming, contracted a fatal illness that the researchers had never seen before. The disease was prolonged and gruesome, with bizarre symptoms. In the early stages of infection, animals that had been captive all their lives would suddenly show a pronounced fear of doorways or fences. Later, they would alternate between agitation and listlessness, and show little interest in food, but would drink as much water as they could hold, salivating excessively all the while. Death came from starvation or

from a kind of pneumonia caused by inhaling the excessive saliva as the animal struggled for breath. Researchers called it chronic wasting disease, but it would take several years of study before they understood, in even the most basic way, the nature of what they had found. Most of the questions concerning the disease remain unanswered.

Analysis of the brain and nervous system tissues of the dead mule deer led pathologists to conclude that what they were dealing with was a transmissible spongiform encephalopathy (TSE), similar to scrapie, a disease that has periodically devastated domestic sheep herds for centuries. It is also similar to the so-called “mad cow disease” that emerged in England during the early 1990s and wreaked havoc on the British beef industry. During the “mad cow” epidemic, a variant of the disease showed up in human beings, killing 24 people. This variant, known as Creutzfeldt-Jacob disease, has been known for many years, but was extremely rare, affecting no more than one out of a million people every year. Clearly, the TSE that caused the cattle epidemic had made what scientists call “an interspecies shift,” to infect humans who ate beef during that time. At some point, chronic wasting disease has made a similar, but less dramatic shift, from mule deer to whitetails and elk.

The “mad cow” epidemic was found to have been caused by livestock producers fattening their cattle on commercial feeds derived from ground-up and rendered animals—among them sheep, some of which, it is believed, had been infected with scrapie. Interestingly, another TSE that has affected humans was found in New Guinea, where tribal people indulged in a ritualistic bit of cannibalism to honor their deceased relatives by eating a portion of their dried brains. The illness caused by this human TSE was called kuru, or the “laughing death,” and it has disappeared with the abandonment of the ritual. The feeding of animal proteins to cattle has been banned in Europe, and there have been no new instances of TSE outbreaks in humans, leading most researchers to believe that the worst of that storm has passed. Because no one is positive how long the disease takes to incubate, though, future outbreaks remain a possibility.

By 1986, chronic wasting disease had been found in wild elk, mule deer and whitetails in the portions of Colorado and Wyoming around the research facilities. Questions persist as to how it got there, and where it came from. Veterinary pathologist Beth Williams, now based in Laramie, has worked with the disease since its discovery and says there is no way to pin down its origins.

“It’s a chicken-or-the-egg question,” she says. “We don’t know if it has been present in the wild in that area forever, just holding its own, and it passed into the research animals, or if it went out from the research animals into the wild.”

Canadian wildlife researcher Valerius Geist offers an intriguing theory.

“Deer and elk will nibble bones for calcium, especially when they are developing their antlers,” Geist says. “What could have happened is that they ate some pieces of skull from domestic sheep that winter-killed or died from scrapie. According to the facts we have, the disease could be transmitted and make the interspecies shift that way. It is notable that antelope, which live in that area but do not eat bones, have no TSE diseases that we know of.”

However it got into the captive mule deer at the research facilities, the disease proved to be frighteningly resilient. At the Fort Collins facility, all the deer and elk were killed and buried, the ground in the pens was plowed almost a foot deep, and then the entire area was sprayed with a powerful chlorine solution. Twelve wild elk calves taken

from an area believed to be free of the disease were brought into the pens a year later. Over the following five years, two of those elk died from chronic wasting disease.

Such endurance, and such an extended incubation period, is not characteristic of any normal bacteria or virus. Among researchers, there is an ongoing and heated controversy over the causes and origins of all TSE diseases. One theory, developed by Dr. Stanley Prusiner, who received the Nobel Prize in medicine for his research on the subject, says that the diseases are caused by an abnormal type of protein called a prion that acts upon normal proteins in the brain and causes them to change and form toxic aggregates that destroy brain cells and tissue. The prions may be transmitted from animal to animal by ingestion or other means as yet undiscovered. The second major theory is that the diseases are caused by a very small and hardy unknown virus which acts on the normal proteins in the brain and causes them to change their structure, with the same deadly results.

The unanswered questions hold center stage in attempts by wildlife managers and livestock officials to deal with the spread of chronic wasting disease. Because it is not a conventional infection, it triggers no telltale response from an animal's immune system, making a live test very difficult. Currently the only way to look for it is to examine brain or spinal tissue from dead animals under a microscope. This fact has made it difficult for livestock officials, who attempt to monitor the trade in game farm animals, to establish guidelines for controlling the spread of the disease. In South Dakota, 300 of the state's 2,000 captive elk are under quarantine for chronic wasting disease. Tom Cline, a veterinarian with the South Dakota Animal Industry Board, puts it this way. "Without a live test, there is no way to tell what we are facing. Our level of infection could be zero, could be 100 percent. Nobody knows how it is passed or how long it takes to show up."

In Montana, the Department of Livestock requires that imported game animals come from a herd that has been certified by a state veterinarian to be free of the disease for 12 months—far less than the known incubation period. Elk imports from Colorado, South Dakota and Nebraska are temporarily banned. Regulations also require that game farm owners report every animal that dies within their fences, and provide tissue samples to state diagnostic laboratories. There are currently two game farms in Montana under quarantine for chronic wasting disease: the Kesler farm and the Elk Valley game farm, near Hardin, which, like the Kesler farm, has also endured a long quarantine for bovine tuberculosis.

Nebraska, where two captive herds are under quarantine for chronic wasting disease, has similar regulations and is considering additional monitoring requirements as the industry expands in that state. Two new elk slaughter plants have recently opened there.

"As long as we have producer support, we can control this," says Dr. Murray Williams of the Nebraska State Veterinary Office. But they face some problems. "We don't have a good handle yet on how much interstate traffic in elk is going on. I think there is quite a bit more than we have known about."

Many wildlife managers and conservationists believe that all of that traffic has the potential to infect wild big game across the West. They point out that many of the game farms, especially in Montana and Colorado, occupy lands that were once used by wild herds, and where wild herds still drift along just outside the fences.

“The area where we have chronic wasting disease in the wild is very insignificant as far as mule deer and elk populations go,” said Mike Miller, a wildlife veterinarian for the Colorado Department of Wildlife, who, along with Beth Williams, is one of the pioneers and current leaders of research on the disease. “And it has probably been slow to spread for that reason. If it were brought into western Colorado, where our big game herds are larger and more concentrated, it would be disastrous.”

Miller describes chronic wasting disease in the wild as “a management nightmare: hell if you do, hell if you don’t. This is not like the bison/brucellosis problem in Montana, where you have vaccines and tests to help you. About the only real management tool we have for this disease is to go and depopulate the areas where it is found, which basically means clobbering the native wildlife.”

He notes that chronic wasting disease has been found to be “explosive” in whitetails, sometimes killing them in days rather than the weeks it takes to kill mule deer and elk.

“It is a management mess in northeast Colorado,” Miller says, “and we don’t want to see it spread to other states.”

The Colorado Division of Wildlife has asked for a moratorium on new game farms in the area where the disease is known to exist in wild herds, but the Department of Livestock—which in a controversial ruling was recently awarded sole control over the game farming industry—continues to license them there.

“Certainly, the game farm industry has presented some real threats to wildlife management in our state,” says Miller, “but in northern Colorado, at least, it could be said that the infected native wildlife threatens the game farm industry more than vice versa. I’m not sure what we’re supposed to do about that.”

“In an ideal world, we’d have double fencing anywhere wild game might come into nose-to-nose contact with game farm animals,” says Keith Aune, the Wildlife Lab Supervisor for the Montana Fish, Wildlife, and Parks Department in Bozeman. “But right now we don’t think that kind of contact will transmit this disease. It seems to require close contact, like confinement, to transmit successfully. The transportation of captive game animals certainly heightens all our concerns, but we just don’t have the scientific evidence to impose ultra-conservative measures on the game farm industry.”

Aune says that the department checked brain tissue from 620 hunter-killed wild elk and mule deer in Montana last fall, and no chronic wasting disease was found.

“Effective monitoring of game farms is the answer for keeping it out of wild herds,” he says, “and we are working with the Department of Livestock on that. It has been problematic so far. We put together the system as best we can and hope the industry will cooperate and comply.”

The game farm industry has proved difficult to monitor in the past. A 1992 investigation by Montana game wardens resulted in charges being filed against eight Montana game farmers for making false statements, failing to keep true records and theft of public wildlife.

“We went in expecting to see a few inconsistencies in game farm reports and censuses,” says Warden Steve Vinnedge, of Great Falls. “What we found were reports of large numbers of animals that did not exist. We found tagged elk that had died twice,

others that had made it across the state and back in one day, several that had changed sex. One game farm owner had over a hundred more elk than he'd reported."

Vinnedge says that overall, monitoring and compliance are better now. "Reporting requirements are better, and we are getting less reports of wild elk capture, less reports of ear tagged elk being shot by hunters." He says that monitoring for bovine tuberculosis is also more reliable, but "given the facts of chronic wasting disease, I don't see that we've protected ourselves from it at all."

The search is on for an effective way to test live animals for the disease. At the National Animal Disease Center in Ames, Iowa, research chemist Mary Jo Schmerr has found the prion protein in blood tests done on both elk infected with chronic wasting disease and sheep infected with scrapie before the animals have shown any symptoms of the infection. The test is still in the experimental stages. Beth Williams, at the Wyoming Department of Agriculture, is among those researchers addressing concerns of cattle ranchers that chronic wasting disease could be passed from elk and deer to cattle. So far, all the tests have been negative, and the data suggests that the disease will not make that particular interspecies shift. Dr. Williams cautions that it is still too early in the research to be certain, however.

The Elk Research Council, a group sponsored by the North American Elk Breeders Association, is conducting research on various aspects of the disease, including the search for a live test. The council, under the direction of veterinarian and game farm owner Glen Zearth, has so far spent more than \$180,000 to establish a research herd of elk exposed to the disease in a double-fenced enclosure in Minnesota. They have also initiated a herd monitoring and inventory service for game farms around the country. Steve Wolcott, another Elk Research Council member based in Paonia, Colorado, told a reporter for High Country News, "We will bear some cost and pain to get rid of this disease. At the same time, we are not going to put ourselves out of business."

The area of northcentral Colorado and southeast Wyoming where chronic wasting disease is found in the wild has never experienced anything resembling an epidemic. There has never been a massive die-off, and though it is believed that the disease is spreading very slowly, it has not presented a major threat to big game numbers. Experts believe that about 6 percent of the mule deer and 1 percent of the elk in the area are infected and die every year. Since 1986, nearly 100 cases of the disease have been confirmed in wild elk and deer by examining found carcasses and animals brought through hunter check stations.

What does all this mean to hunters? Can chronic wasting disease affect people who eat deer and elk meat? So far, the news is good. The TSE diseases seem to require extraordinary circumstances before they can make the shift to affect human beings. In England, a population of 50 million people was exposed to a human-error caused epidemic of TSE and only 24 people have contracted Creutzfeldt-Jacob disease, the human variant. So far. Just about everything written about the TSE diseases has to be qualified with those two words, because our knowledge about them, though it has come far since the 1970s, is still in its infancy.

Beth Williams and her husband, Wyoming Fish and Game Department biologist Tom Thorne, have been hunting and eating game from southeast Wyoming for 20 years.

Thousands of Colorado hunters have killed and eaten deer and elk from the Fort Collins area since the late 1960s, and there has been no outbreak of Creutzfeldt-Jacob among them. Valerius Geist says that although he eats plenty of wild game, he has given up making any recipes that include brain or spinal tissue (one of Geist's favorite dishes used to be elk brains and black butter), and other researchers consulted for this story say the same thing.

All evidence so far suggests that TSE diseases are not moving in any significant way without man's assistance. It was only with man's assistance that these diseases produced a catastrophic effect in England, and it was only with public outcry and stiff regulation that the situation was brought under control. Groups like the Montana Wildlife Federation have been following this situation closely for years, and have repeatedly asked for a moratorium on transporting elk and deer until a live test can be found. Continued pressure from hunters, outfitters and other conservationists may eventually convince state livestock departments to regulate the transport and confinement of captive big game animals to protect wild herds.

"When I first brought chronic wasting disease to the table as a major concern, I was kind of hooted down," says Keith Aune of the Montana Department of Fish, Wildlife and Parks. "When I first proposed that we ban the movement of captive elk and deer from Colorado and Wyoming, I was just about hooted out of there. Now the industry cannot deny that this is a problem—both for them and for the wildlife resource. Now everybody is paying closer attention, and we have a mutual goal: to stop its spread. But right now we are in kind of an uncoordinated phase. We need uniform regulations from state to state."

Aune says that, even if there proves to be no significant health threat to humans or livestock, the introduction of this disease to wild herds in Montana would seriously affect the state's mule deer.

"We are talking about losing 5, 10, even 20 percent of our mule deer," Aune says. "You know, we are a highly mobile society, and we test Mother Nature all the time, and there is a price for that. We are seeing it right now with the movement of these pathogens."

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Moving Elk, Reducing Risk

Any time animals are moved from place to place there is risk of spreading disease. So when wildlife managers capture and move wild elk for translocation and reintroduction efforts, they take every precaution to reduce risk. The most crucial safeguard is thorough knowledge of the "source herd" from which elk are being captured, says Beth Williams, a veterinarian pathologist in Laramie, Wyoming.

“When you’re dealing with wild animals, and moving them around, it’s not easy to test individual animals. So it’s important to establish a monitoring program in the herd of origin.”

Once biologists determine that there are no known, dangerous diseases within the herd, moving them is relatively risk free. In addition, wildlife officials take blood and tissue samples from captured animals to test for various disease. When transported elk die either enroute or after being released, the animals are tested as soon as possible to determine the cause of death and detect any possible existence of disease. Since testing for and detecting chronic wasting disease is difficult, no elk are moved from areas where the disease is known to exist.

“The only place in the world where chronic wasting disease has been known to occur in wild elk and deer is in the mountains around Cheyenne, along the Wyoming and Colorado border,” Williams says. “So there is a moratorium on moving any wild cervids from the endemic area.”

Searching

For Answers

For every answer about chronic wasting disease, there are at least a dozen hard questions. It’s difficult, if not impossible, to control or eradicate a disease about which so little is known. That is why the Elk Foundation is funding ongoing research to boost knowledge of chronic wasting disease and help develop better methods for detecting and tracking it. The Foundation has partnered with the University of Wyoming, the Wyoming Game and Fish Department, the Colorado Division of Wildlife and the Agriculture Research Service in the search for answers.

The Elk Foundation has also helped the South Dakota Department of Game, Fish and Parks and the North Dakota Game and Fish Department to collect and test brain tissue from dead elk and deer, wild and captive, to determine the occurrence and distribution of the disease—knowledge necessary to limit the spread of, and help eradicate, the disease.

In addition, the Elk Foundation contributed to a collaborative effort by the Kansas Department of Wildlife and Parks, Nebraska Game and Parks Commission and the Kansas Cooperative Fish and Wildlife Research Unit to hold a Chronic Wasting Disease Symposium and Workshop, planned for the year 2000, to inform people about the implications of the disease and improve interagency coordination, monitoring and cooperation.

Playing

It Safe

For hunters who are worried about chronic wasting disease and other pathogens, here are a few basic guidelines:

- Don't shoot an animal that looks sick.
- Wear rubber gloves when field-dressing animals.

- Minimize your contact with brains and spinal cord, and wash your hands after contact.
- Don't eat deer or elk brains or spinal cords.
- Try to minimize the use of a bone saw on wild game.
- Bone out your meat and discard brain, spinal cord, eyes, spleen and lymph nodes.