



# *Chronic Wasting Disease (CWD) Background*

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Chronic wasting disease (CWD) is an infectious, neurologic disease of cervids, which includes North American deer, elk, and moose. A member of the family of diseases known as transmissible spongiform encephalopathies (TSEs), CWD has been diagnosed in free-ranging and captive cervids. Other TSEs include bovine spongiform encephalopathy (BSE, sometimes called "mad cow disease"), scrapie in sheep, and Creutzfeldt-Jakob disease (CJD) in humans.

## Causative agent

Chronic wasting belongs to the family of diseases known as the transmissible spongiform encephalopathies. The causative agent of CWD has not been fully characterized, but three possibilities have been proposed: an unconventional virus, a prion (a self-replicating protein), or a virino (incomplete virus) comprising naked nucleic acid protected by host proteins. The CWD agent does not invoke a detectable immune response or inflammatory reaction in its host. On the basis of what is known about other TSEs such as bovine spongiform encephalopathy and scrapie, it is assumed the causative agent of CWD is extremely resistant to sterilization processes.

## Natural distribution

An infectious, neurologic disease, CWD develops naturally in North American deer and elk. Species found to be affected include Rocky Mountain elk, mule deer, white-tailed deer, and black-tailed deer. Chronic wasting disease was first diagnosed in a Colorado captive elk research facility in 1967, and was identified as a TSE in 1978. It was found in the mid 1980s in free-ranging deer and elk in adjoining areas of Colorado and Wyoming. As of January 2009, CWD has been identified in free-ranging cervids in Nebraska, Illinois, Kansas, New Mexico, New York, South Dakota, Utah, West Virginia, Wisconsin, and the Canadian provinces of Saskatchewan and Alberta. The first infected farmed herd was discovered in South Dakota in 1996. CWD has also been diagnosed in captive cervids in Colorado, Kansas, Minnesota, Montana, Nebraska, New York, Oklahoma, Wisconsin and the Canadian provinces of Alberta and Saskatchewan. According to the United States Department of Agriculture (USDA), the species known to be susceptible to CWD are Rocky Mountain elk (*Cervus elaphus*), Mule deer (*Odocoileus hemionus*) and Black-Tailed deer (*Odocoileus hemionus*) and White-Tailed deer (*Odocoileus virginianus*). Because Red deer (*Cervus elaphus*) are genetically very similar to Rocky Mountain elk, it is likely that they are also susceptible to CWD.

## Transmission

Although many years of research have been conducted, the exact mechanism of transmission of CWD is still unknown. Currently transmission is believed to be lateral (animal to animal) and to take place through contact with or exchange of bodily fluids such as saliva, urine, feces, or placental tissue. Evidence exists suggesting that vertical (mother to offspring) and environmental transmission is possible. According to the Centers for Disease Control and Prevention (CDC), evidence also supports the possibility that the disease is spread as a result of indirect exposure to prions in the environment (e.g., in contaminated feed and water sources). CWD can be highly transmissible within deer and elk populations. Several epidemiologic studies provide evidence that, to date, CWD has not been transmitted to humans.

### Clinical signs of CWD in cervids

Most cases of CWD develop in adult animals. Chronic wasting disease causes progressive degeneration of the central nervous system. The most obvious and consistent clinical sign is progressive weight loss and dehydration. Other clinical signs include changes in temperament (e.g., loss of fear of humans, nervousness, or hyperexcitability), changes in behavior (teeth grinding, walking in repetitive patterns in pens), incoordination, polydipsia (increased drinking), polyuria (increased urination), drooping of the head and ears, and excessive salivation. Incubation period is typically 18 to 24 months, but can range up to 36 months. The health of affected animals typically deteriorates over a period of 12 months after infection. Chronic wasting disease is uniformly fatal.

### Diagnosis

At the present time, CWD is diagnosed by postmortem microscopic examination of brain stem (particularly the obex portion) and lymphoid (lymph nodes and tonsils) tissues. Lesions of CWD resemble those of other spongiform encephalopathies. Immunohistochemistry (IHC) is very sensitive and specific to CWD and is used to confirm diagnosis by measuring accumulations of proteinase-resistant prion protein (PRP<sup>res</sup>) in brain tissues of infected deer and elk. Accumulations of proteinase-resistant prion protein have not been found in uninfected cervids. Positive test results are not detected until at least 3 months after infection so negative results cannot confirm the absence of disease (it is possible that the animal is infected, but the stage of the disease is so early that the prion is not detectable).

Colorado researchers have developed an antemortem (live animal) tonsillar biopsy test for CWD, which appears to work well for mule deer, but not for elk.

### Prevention

Because transmission mechanisms are still not well understood, it is difficult to recommend measures to prevent spread of the disease. Surveillance, culling, and testing are performed in areas where cases of CWD have been identified in an attempt to contain the disease within that endemic area. Unfortunately, no vaccine or preventatives exist and there is no evidence that immunity to CWD develops.

### Treatment

No treatment currently exists for cervids with CWD. The disease is uniformly fatal.

### Infection control

The United States Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) provides assistance to state officials in diagnosing CWD and in monitoring international and interstate movements of captive animals to help prevent its spread. Several state and national appropriations bills have been passed to provide funding for much needed research on CWD. In an effort to contain and eventually eradicate CWD, state and federal agricultural and wildlife agencies are taking action including regulating and/or banning interstate movement of captive cervids, enforcing more stringent hunting policies, creating joint task forces, and developing state-specific guidelines.

Members of the general public, hunters, and owners of cervid game farms must be informed of the dangers CWD poses to deer and elk populations, and take precautions necessary to reduce transmission. Animals appearing to be ill should be reported to wildlife officials. Deer feeding and baiting should be limited as this is an activity that brings deer into close contact with one another. Double fencing of captive herds will lessen contact with wild animals, and vigilant surveillance and testing of these herds is recommended. Hunters should avoid harvesting deer or elk that appear sick; should wear rubber gloves while field dressing animals; should remove all bone and fatty tissue from the meat of the animals; should minimize handling of the brain, spinal cord, spleen, tonsils, lymph nodes, or eyes; should avoid consuming any animal with positive test results for CWD; and should not remove anything but pure meat (muscle) from endemic sites.

### Transmissible Spongiform Encephalopathies in Other Animals

The family of transmissible spongiform encephalopathies (TSE) in animals includes scrapie, affecting sheep and goats; transmissible mink encephalopathy; bovine spongiform encephalopathy (BSE), commonly referred to as "mad cow disease," affecting cattle; and, in humans, kuru, classic and variant Creutzfeldt-Jakob disease (CJD), Gerstmann-Straussler syndrome, and fatal familial insomnia.

At the present time there is no evidence that CWD is easily transmittable to livestock or other ruminants such as sheep, cattle, or goats under natural conditions. Livestock housed with infected deer or elk, or those having ingested brain tissue of infected animals, have not developed the disease. Chronic wasting disease has been experimentally transmitted to mice, ferrets, mink, goats, squirrel monkeys, and calves.

#### Implications of CWD for Humans

There is currently no evidence that CWD is naturally transmitted to humans, either through contact with affected animals or by eating meat from infected animals. The CDC, however, has issued the following statement:

***It is generally prudent to avoid consuming food derived from any animal with evidence of a TSE. To date, there is no evidence that CWD has been transmitted or can be transmitted to humans under natural conditions. However, there is not yet strong evidence that such transmissions could not occur. To further assess the possibility that the CWD agent might occasionally cause disease in humans, additional epidemiologic and laboratory studies could be helpful. Such studies include molecular characterization and strain typing of the agents causing CWD in deer and elk and CJD in potentially exposed patients. Ongoing national surveillance for CJD and other neurologic cases will remain important for continuing to assess the risk, if any, of CWD transmission to humans.***

Routine precautions should be taken when handling carcasses of animals that may be infected.

#### Links to More Information about CWD

AVMA

[What you should know about chronic wasting disease](#)

CDC

[Chronic wasting disease \(CWD\)](#)

USDA Animal Health

[Chronic Wasting Disease](#)