Adenovirus Hemorrhagic Disease (AHD)

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What is Echinococcus granulosus?

*Echinococcus granulosus* is a parasitic tapeworm that requires two hosts to complete its life cycle. Ungulates (deer, elk, moose, domestic sheep, and domestic cattle) are intermediate hosts for larval tapeworms. Canids (dogs, wolves, coyotes, foxes) are definitive hosts where larval tapeworms mature and live in the small intestine. Definitive hosts are exposed to larval tapeworms when ingesting infected ungulates. Adult tapeworms, 3-5 mm long, produce eggs which canids pass in their feces. Intermediate hosts ingest the eggs while grazing, where the eggs hatch and develop into larvae.

Where is Echinococcus granulosus found? Is it found in Wyoming?

*Echinococcus granulosus* has a worldwide distribution with two recognized biotypes. The northern biotype above 45˚ latitude circulates between canids (wolf, coyote, dog) and cervids (moose, elk, deer, caribou, reindeer). This is thought to be the biotype seen in Wyoming wildlife and does not typically infect domestic livestock. The southern or domestic biotype circulates between dogs and domestic ungulates, especially sheep. It is endemic in most sheep raising areas of the world.

In the United States, the northern biotype of *Echinococcus granulosus* has been found in several states including Wyoming. Only a few cases have been documented in Wyoming elk, moose and one mule deer, but the definitive host origin is unknown.

Can humans get infected with Echinococcus granulosus?

Yes, humans are not a natural host for the parasite but can be infected by ingesting eggs which are passed with the feces from an infected canine. These can be ingested after handling contaminated soil or contaminated canid scat or fur and then touching the face or eating before washing hands. Humans cannot be infected by ingesting larval tapeworms from ungulates. Where the parasite is found in wild canids and wild ungulates, most public health agencies consider the public health risk to be very low.

In humans, larval tapeworms usually develop into cysts in the liver or lungs. Cysts can develop over long periods of time before any symptoms are evident. Treatment may involve administration of drugs and/or surgery to remove the cysts. Throughout the world, most human cases occur in indigenous people with close contact with infected dogs. What is AHD?

AHD is caused by a virus within the Adenoviridae family. There are a variety of adenoviruses that can infect different species – both wild and domestic. AHD of deer is caused by *Odocoileus* adenovirus (OdAdV) and was first discovered in black-tailed deer in California in 1993. Cervids (mule deer, white-tailed deer, elk, moose) and
pronghorn are all susceptible to the disease; however, mule deer appear to be more severely affected. AHD is similar to other hemorrhagic diseases including Bluetongue and Epizootic Hemorrhagic Disease.

What are clinical signs in deer with AHD?

Adenovirus can manifest in both an acute systemic form and a chronic localized form. Acute clinical signs of AHD include: difficulty breathing, foaming/drooling from the mouth, diarrhea (sometimes bloody), and seizures. This disease course is often rapid and fatal. Chronic signs include ulcers and abscesses in the mouth/throat which can eventually lead to weight loss and death. Fawns are more susceptible to AHD and experience much higher mortality than adults.

How is it spread?

Adenovirus can be spread through direct contact between deer and contact with bodily fluids (saliva, feces, urine). Transmission through airborne routes, contaminated water, and contaminated equipment may also occur.

How can it affect mule deer in Wyoming?

This disease was first documented in Wyoming in 1999. Since that initial discovery, wildlife veterinarians have routinely seen a few cases most years, until a spike in the disease was seen in 2015. With the help of improved diagnostic tools, disease experts have documented 18 cases of Adenovirus in 2015 alone. It is unknown if this increase is due to improved diagnostics or the disease itself (perhaps both). AHD in Wyoming could lead to potentially significant localized mule deer losses in some areas. There is currently no data to suggest that AHD is responsible for long term mule deer declines in Wyoming; however, this disease is still poorly understood and further research is needed.

Can it be transmitted to Humans or livestock?

There is no known evidence that adenovirus can be transmitted to humans. Preliminary research suggests that OdAdv is not transmitted to cattle or domestic sheep.

What can be done for management of AHD?

There is no treatment or vaccine for AHD. We can take actions to help prevent AHD including: disposing of carcasses properly, not moving infected, live deer to new areas, and preventing aggregation of deer near artificial feeding or water sources. Additionally, individuals handling mule deer should take precautions to limit potential for disease spread (wear gloves, clean equipment between deer).

What to do if you see an animal with signs of AHD?

To help further our understanding of this disease and its distribution across the state, we request that you report cervids or pronghorn displaying any of the clinical signs listed above to your local WGFD wildlife biologist, game warden, or WGFD office. For additional information on AHD or any other wildlife disease, please contact the WGFD Wildlife Health Laboratory at 307-745-5865.