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ANIMAL AND HUMAN HEALTH PREVENTION OPPORTUNITIES

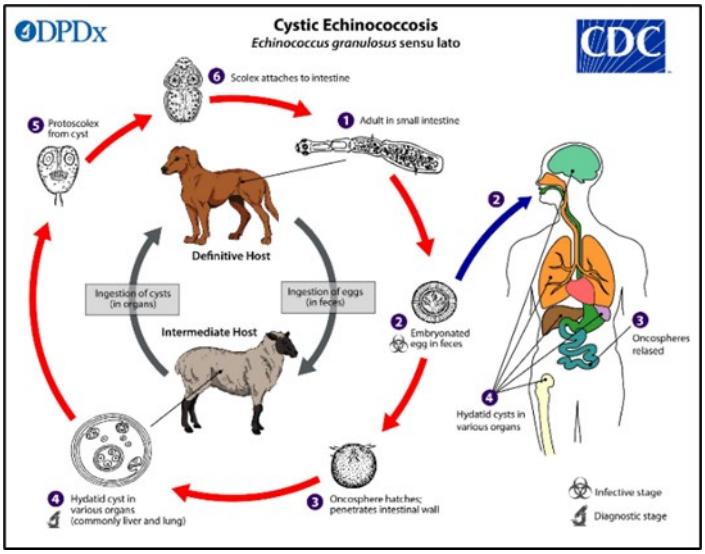
Echinococcosis

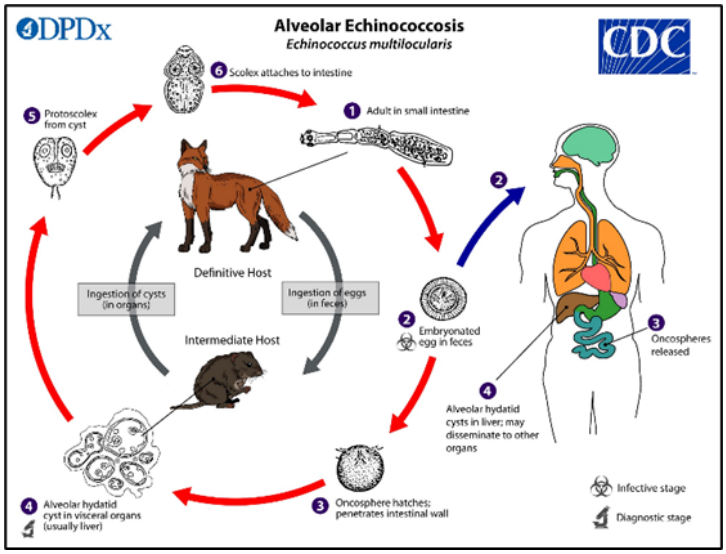
Echinococcosis is a parasitic disease caused by infection with a tapeworm of the genus *Echinococcus*. The two species of concern include *Echinococcus granulosus*, which causes cystic echinococcosis (CE), and *Echinococcus multilocularis*, which causes alveolar echinococcosis (AE). Domestic dogs are a definitive host for both species and both species are a zoonotic risk. Montana recently had 2 confirmed cases of echinococcosis infection in domestic dogs and there was concern for an associated human exposure. Both dogs presented with liver cysts, which represents an uncommon *Echinococcus* lifecycle in which the domestic dog acts as the intermediate host. In this issue of Montana One Health, we will describe human and animal echinococcosis and how to minimize risk of infection for humans and pets.

	Echinococcus granulosus	***Echinococcus multilocularis***
Classification	Cystic echinococcosis (CE)	Alveolar echinococcosis (AE)
Definitive hosts	Domestic and wild canids	Foxes, coyotes, domestic and wild canids
Intermediate hosts	Sheep, cattle, goats, and pigs	Small rodents
Distribution	Worldwide	Endemic to the northern hemisphere

Lifecycle

Echinococcus eggs hatch in the small intestine of the intermediate host (sheep or rodents). The eggs release hooked embryos that penetrate the intestinal wall, enter the blood stream, and travel to the lungs (occasionally to the liver, kidneys, brain, or bone marrow). In the lungs, the larvae form a single-chambered, fluid-filled hydatid cyst which can range from 2-30cm in diameter. Protoscolices, or larval tapeworms, are created within the cyst. When a definitive host (dog, fox, or coyote) ingests the organs of an infected intermediate host the protoscolices attach to the wall of the small intestine and mature into adults, which then lay eggs. The eggs are passed through the feces of the definitive host. Once in the environment, eggs may be transported by wind, water, or insects and contaminate vegetation or water. *Echinococcus* eggs are very resistant to environmental stressors, including freezing. They can survive for up to a year in damp, cool conditions.





Images courtesy of Center for Disease Control (CDC): Echinococcosis Webpage

Resources

Companion Animal Parasite Council, *Echinococcus spp*: https://capcvet.org/guidelines/echinococcus-spp/
CDC - Echinococcosis: https://www.cdc.gov/parasites/echinococcosis/

Animal Health

Transmission: Cystic echinococcosis (CE) disease caused by *E. granulosis* infects dogs and wild canids following ingestion of cysts in ungulate viscera. Alveolar echinococcosis (AE) disease caused *E. multilocularis* can infect dogs and cats following ingestion of rodents with multilocular hydatid cysts.

High risk groups: Free-roaming, hunting, and herding dogs have higher risk for exposure from ingesting infected viscera from intermediate hosts.

Clinical Symptoms: Adult *Echinococcus spp* in the lumen of the small intestine are not known to cause disease in the definitive host, dogs (or cats). If heavily infected, dogs may have diarrhea, changes in appetite, and a poor hair coat.

- Occasional cases have been reported in which dogs serve as the intermediate host for *E. multilocularis* and develop multilocular hydatid cysts, primarily in the liver or lungs.

Diagnosis: *Echinococcus spp.* tapeworm are small and visible observation of the adult tapeworm is unlikely. The eggs can be seen on microscopic examination; however, they cannot be distinguished from the eggs of other tapeworm species (i.e., *Taenia*). Definitive diagnosis requires feces testing with coproantigen enzyme-linked immunosorbent assay (CELISA) or PCR.

Treatment: Antiparasitic medication, such as Praziquantel, can be used to eliminate intestinal stages of adult tapeworms in dogs.

- AE has a variable to guarded prognosis. Treatment consists of surgical removal of the cysts along with a combination of antiparasitic medications, albendazole and praziquantel.

Human Health

Transmission: Humans can become infected by accidentally ingesting embryonated eggs in contaminated food or water or by hand-to-mouth transmission after handling infected canids and/or their feces. The eggs hatch in the intestinal tract and travel in the bloodstream to the liver primarily, but also to the lungs, brain, muscles, or eyes.

High risk groups: Hunters/trappers that handle wild canids are at higher risk for exposure. Wolves are known to carry *E. granulosis* and foxes and coyotes are known to carry *E. multilocularis*.

Clinical Symptoms: Patients with liver cysts may present with abdominal pain and jaundice. Patients with lung cysts may present with chest pain and coughing up blood or cyst contents. Cyst rupture may cause anaphylactic reactions.

Cystic echinococcosis (CE) disease caused by *E. granulosus*: Most infections are asymptomatic. Can cause slowly enlarging cysts in the liver, lungs, and other organs that often grow unnoticed for years.

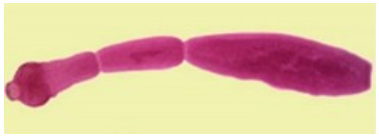
Alveolar echinococcosis (AE) disease caused by *E. multilocularis*: Human cases are rare. Can cause parasitic tumors in the liver, lungs, brain, and other organs. Can be fatal if left untreated.

Diagnosis: Imaging (CT scan, ultrasound, and MRI) that shows cysts and compatible serological testing are used to diagnose and stage the disease.

Treatment: Treatment decisions are made based on cyst type, location, size, and complications. Surgery is the most effective treatment for removal of cysts. Some patients may be successfully treated with anti-parasitic medication (i.e.: Albendazole) (CDC). Treatment of AE is more difficult and may require surgery and chemotherapy.

Prevention

- Prevent dogs from feeding on carcasses/organs of infected sheep, rodents, and other wild animals
- Do not consume food or water that may have been contaminated by dog feces
- Avoid contact with foxes, coyotes, and stray dogs
- In areas where *E. granulosus* is endemic, dogs should be dewormed with praziquantel monthly. In areas where *E. multilocularis* is known to be present, dogs and cats should be treated with praziquantel every 3 weeks.
- Do not allow wild animals around or in your home
- Wash hands with soap and water after handling dogs, and before handing food
- Teach children the importance of hand hygiene to prevent infection



Echinococcosis Key Points

* **Prevention** is key!
* Regular **deworming of dogs** and cats, **avoiding exposure to wildlife**, and **good hand hygiene** are easy ways to minimize risk of transmission.
* The risk of severe disease in Montanans is low.

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