

Echinococcus Granulosus, also called the hydatid worm, hyper tape-worm or dog tapeworm, is a cyclophyllid cestode that parasitizes the small intestine of canids as an adult, but which has important intermediate hosts such as livestock and humans, where it causes cystic echinococcosis, also known as hydatid disease. The adult tapeworm ranges in length from 3 mm to 6 mm and has three proglottids ("segments") when intact—an immature proglottid, mature proglottid and a gravid proglottid.[1] The average number of eggs per gravid proglottid is 823. Like all cyclophyllideans, *E. granulosus* has four suckers on its scolex ("head"), and *E. granulosus* also has a rostellum with hooks. Several strains of *E. granulosus* have been identified, and all but two are noted to be infective in humans.[2]

The lifecycle of *E. granulosus* involves canids and wild carnivores as a definitive host for the adult tapeworm.[3] Definitive hosts are where parasites reach maturity and reproduce. Wild or domesticated ungulates, such as sheep, elk, and deer serve as an intermediate host.[3] Transitions between life stages occur in intermediate hosts. The larval stage results in the formation of echinococcal cysts in intermediate hosts.[3] Echinococcal cysts are slow growing,[3] but can cause clinical symptoms in humans and be life-threatening.[4] Cysts may not initially cause symptoms, in some cases for many years.[3] Symptoms developed depend on location of the cyst, but most occur in the liver, lungs, or both.[4]

E. granulosus was first documented in Alaska but is distributed world-wide. It is especially prevalent in parts of Eurasia, north and east Africa, Australia, and South America.[4] Communities that practice sheep farming experience the highest risk to humans,[4] but wild animals can also serve as an avenue for transmission. For example, dingoes serve as a definitive host before larvae infect sheep in the mainland of Australia.[4] Sled dogs may expose moose or reindeer to *E. granulosus* in parts of North America and Eurasia

E. granulosus requires two host types, a definitive host and an intermediate host. The definitive host of this parasite are dogs and the intermediate host are most commonly sheep, however, cattle, horses, pigs, goats, and camels are also potential intermediate hosts.[5] Humans can also be an intermediate host for *E. granulosus*, however this is uncommon and therefore humans are considered an aberrant intermediate host.[5]

The canid serves as the main definitive host for the dangerous parasite, with eggs being shed in its stool

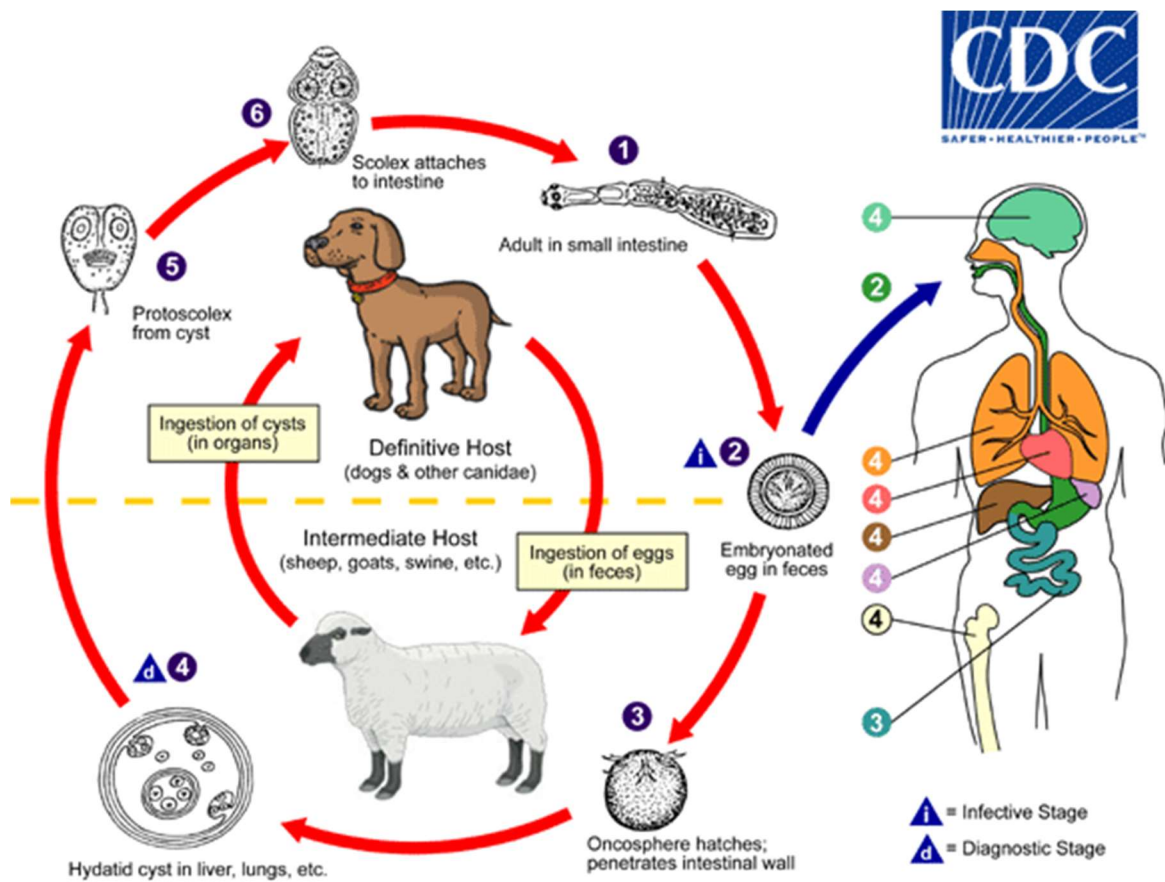
E. granulosus is ingested and attaches to the mucosa of the intestines in the definitive host and there the parasite will grow into the adult stages.[6] Adult *E. granulosus* release eggs within the intestine which will be transported out of the body via feces.[6] When contaminated waste is excreted into the environment, intermediate host has the potential to contract the parasite by grazing in contaminated pasture, perpetuating the cycle.[5][7]

E. granulosus is transmitted from the intermediate host (sheep) to the definitive host (dogs) by frequent feeding of offal, also referred to as "variety meat" or "organ meat". Consuming offal containing *E. granulosus* can lead to infection; however, infection is dependent on many factors.[4]

The frequency of offal feedings, the prevalence of the parasites within the offal, and the age of the intermediate host are factors that affect infection pressure within the definitive host.[6] The immunity of both the definitive and intermediate host plays a large role in the transmission of the parasite, as well as the contact rate between the intermediate and the definitive host (such as herding dogs and pasture animals being kept in close proximity where dogs can contaminate grazing areas with fecal matter).[4]

The life expectancy of the parasite, coupled with the frequency of anthelmintic treatments, will also play a role in the rate of infection within a host. The temperature and humidity of the environment can affect the survival of *E. granulosus*. [4]

Once sheep are infected, the infection typically remains within the sheep for life. However, in other hosts, such as dogs, treatment for annihilating the parasite is possible. However, the intermediate host is assumed to retain a greater life expectancy than the definitive host.



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Risk in Humans

Humans should avoid handling stool of dogs and avoid eating infected animals and home slaughtering animals. If a human becomes infected there are a variety of methods for treatment.[2][10] The most common treatment in the past years has been surgical removal of the hydatid cysts.[10] Cyst manipulation should be performed with caution, as spilling of cyst contents can cause anaphylactic shock. However, in recent years, less invasive treatments have been developed such as cyst puncture, aspiration of the liquids, the injection of chemicals, and then re-aspiration.[2] Benzimidazole-based chemotherapy is also a new treatment option for humans

If you live near areas inhabited by infected wolves in the West or in the Midwest, you may want to practice precautionary measures to minimize your exposure to these parasites until more specific details are known about Echinococcosis (Hydatid Disease).

1. If you take dogs to any area frequented by wolves, deworm regularly with a good dewormer that kills tapeworms: not all do!
2. If you bag any game, use rubber gloves to handle and gut it. Watch carefully for any sign of a cyst in the entrails. Do not break that cyst! DO NOT hug any animal for photos! And do not allow children to touch the hides or crawl on ground possibly contaminated with feces of wolves or foxes.
3. In dusty roads in forest areas, avoid inhaling dust and NEVER poke or disturb wolf feces if you come across any.
4. Cook wild game well before eating.
5. Do not collect or eat wild fruits or vegetables picked directly off the ground.
6. Do not allow pets to eat wild animal or livestock offal or organs.
7. Fence in your vegetable gardens from wild animals and pet dogs.
8. Use caution allowing dogs in your home who may have been in contact with carnivore feces in the woods or even in pastures with cattle or sheep.
9. It can take up to 10 years for the cysts to become life threatening in people. If you develop unusual health problems, make sure your doctor is aware that you travel in areas frequented by wolves carrying this disease
10. Use caution allowing pets in your home (any which could have had any chance of being infected).

Hopefully wildlife managers will take measures to protect the public safety and health from the dangers of these parasites, at least until more is known about the impact of Hydatid Disease. It seems irresponsible to encourage colonization of new areas by wolves which are known to come from infected areas. It would seem that everything should be done to prevent the spread of a known parasite that has historically established itself in endemic proportions in other countries.

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