

What is *Echinococcus*?

- *Echinococcus* is a group (genus) of tapeworms. Tapeworms are parasites that live in the small intestines of many different species of animals, including humans.
- *Echinococcus* spp. are quite small compared to other tapeworms. For example, *Echinococcus multilocularis* is less than 1 cm long, whereas an adult *Taenia saginata* may be up to 10 metres long!
- Except for the head, a tapeworm's body is made up entirely of small segments, called proglottids, which regularly break off from the end of the worm's tail as it grows and contain the parasite's eggs. Both intact proglottids and eggs may be passed in the feces.
- Of all the tapeworms in pets, *Echinococcus* spp. pose the greatest disease risk to people. More information about other kinds of tapeworms can be found on the general Tapeworms information sheet on the [Worms & Germs Resources – Pets](#) page.



Different Tapeworms, Different Risks

There are three main groups of tapeworms, each containing one or more species, that are a concern for most domestic animals and humans. Each group poses a different level of risk to people, and may be spread between animals and people in a different way:



Dipylidium caninum

This is the **most common** type of tapeworm found in dogs and cats in North America, and can be found in pets worldwide. It is transmitted via fleas, and although infection is common, it rarely makes pets sick. Infection in people (usually children) is rare.

Taenia spp.

Human infections with certain tapeworms in this group are a significant problem in some areas, but most of these come from livestock. The *Taenia* species that infect pets rarely cause infection of any kind in people. The biggest problem with *Taenia* infections in pets is the parasite **eggs appear identical to those of *Echinococcus* spp.**, which are a much greater concern for people.

Echinococcus spp.

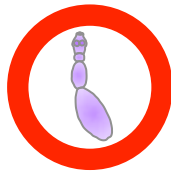
These tapeworms are very small compared to *D. caninum* and *Taenia* spp., but they can cause some of the most severe disease in people. There are **two species** of *Echinococcus* of concern in pets: *E. granulosus*, which can infect dogs (see micrograph, right), and *E. multilocularis*, which can infect both dogs and cats.

- Like other tapeworms, *Echinococcus* spp. are normally transmitted between two different groups of animals: **definitive hosts** and **intermediate hosts**.
- A definitive host is an animal that normally carries the adult tapeworms in the intestine and sheds the eggs in its feces. For *E. multilocularis*, foxes and other wild canids such as coyotes and wolves are definitive hosts, and sometimes dogs.
- An intermediate host is an animal species that typically harbours the cyst stage of the parasite in the body tissues, and is then eaten by a definitive host. Small prey animals such as voles, mice and lemmings are common intermediate hosts for *E. multilocularis*, whereas *E. granulosus* may be found in larger animals such as rabbits, sheep and moose. People and dogs can be “accidental” intermediate hosts.



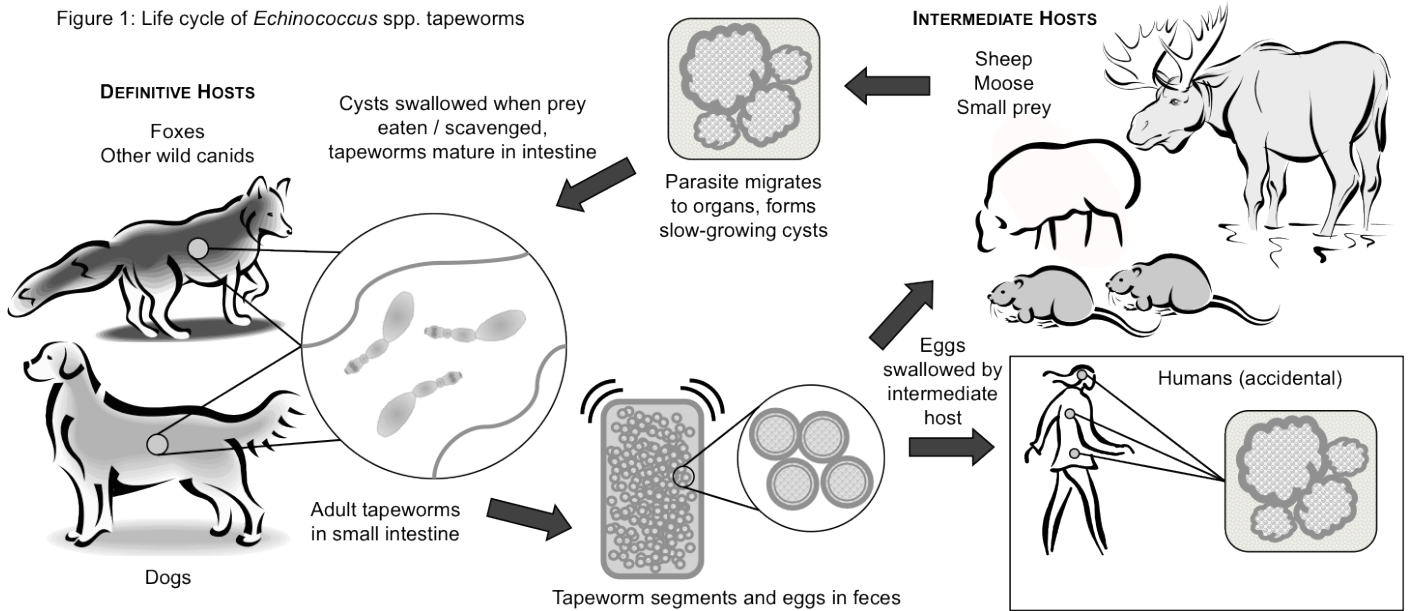
People do not get intestinal tapeworm infections with *Echinococcus*, even if they eat meat containing the cysts. However, people can be infected with the cyst form if they **swallow eggs** from the feces of an infected definitive host.

- Most people are rarely exposed to feces from wild canids. However, both domestic and feral dogs and cats can also be infected as definitive hosts, and exposure to *Echinococcus* eggs in their feces is a much higher risk to humans. **Preventing infection in pets therefore helps to prevent infection in people.**



- Unlike some parasite eggs, *Echinococcus* eggs are **immediately infective** when they are passed, so even contact with fresh feces is a risk.
- *Echinococcus* eggs also **survive very well in the environment**, and can remain infective in soil for up to a year. Individuals who work outside and have contact with soil that may be contaminated with feces from infected animals must be extra careful about washing their hands and preventing any tiny bits of soil from getting in their mouths.

Figure 1: Life cycle of *Echinococcus* spp. tapeworms



Why is *Echinococcus* such a big concern for people?

Unlike tapeworm cysts formed by *Taenia* spp, *Echinococcus* cysts can be very large. Infection in people is uncommon - even in endemic regions where the parasite is established - but it is still a concern because the disease is severe.

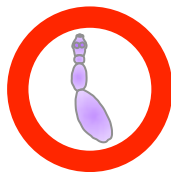
- **Cystic echinococcosis (CE)** is caused by *E. granulosus*. In most cases, a single large cyst (called a **hydatid cyst**) forms in the liver or lungs, but a cyst can form almost anywhere in the body. The cyst grows very slowly, over years or even decades. Problems arise when the cyst reaches a size at which it starts putting excessive pressure on the tissues and organs around it. If the cyst bursts (e.g. from sudden trauma), the body's reaction to the fluid released can be very severe, or even fatal, and can spread the parasite to other parts of the body, where many more cysts begin to form.
- **Alveolar echinococcosis (AE)** is caused by *E. multilocularis*. With this species there are often multiple cysts (called **alveolar hydatid cysts**) present, ranging in size from that of a sesame seed to a large melon. The cysts usually start in the liver but can form and spread elsewhere. Although the cysts grow slowly, usually for 5-15 years or more before a person becomes sick, they tend to invade nearby tissues like a cancerous tumor, making treatment very difficult. The picture to the right shows a rat infected with *E. multilocularis* - its abdomen is full of pale whitish cysts that have almost entirely obliterated its liver. **In rare cases, dogs can also develop this form of infection.**



How common is *Echinococcus* in pets and people?

Tapeworms overall are a common problem in pets worldwide, but species vary by region.

- *Echinococcus granulosus* is most common in Africa, the Middle East, southern Europe, Latin America and the southwestern US. In endemic areas (where the parasite is established in the local animal populations), between 2%-51% of dogs (feral or pet) may be infected.



- *Echinococcus multilocularis* is most common in cooler climates, such as northern Europe, Switzerland, the midwestern US, China, Japan and the Arctic. Up to 58% of stray dogs and up to 23% of pet or working dogs have been found to be infected, but this varies considerably by area, and in most regions the prevalence in pet dogs is very low. Infection in cats is extremely rare.
- Dogs that roam, hunt or are fed raw offal from potentially infected intermediate hosts (e.g. sheep, moose), and that are infrequently dewormed, are more likely to be infected with *Echinococcus* spp.

As in pets, the prevalence of *Echinococcus* infection in people varies considerably by region, and is more common in areas where infection is common in animals, as this leads to human exposure. In endemic regions, the estimated annual incidence of cystic echinococcosis ranges from less than 1 to 220 cases per 100 000 individuals, and for alveolar echinococcosis it ranges from 0.03-1.2 cases per 100 000 individuals. It is difficult to determine the true prevalence in people because hydatid cysts and alveolar hydatid cysts are often not detected for years after infection.

***Echinococcus multilocularis* may be spreading...**

Although this parasite is endemic in the Canadian arctic and the southern region of the prairie provinces (Manitoba, Saskatchewan, Alberta), in 2012 a dog in southern Ontario was diagnosed with an alveolar cyst caused by *E. multilocularis*. The dog had no history of travel outside the province, suggesting that this parasite may be present in Ontario (most likely primarily in wild animals). Because dogs can rarely develop alveolar echinococcosis, veterinarians should therefore be on the lookout for this condition, especially in animals with signs of liver disease. Veterinarians also need to promote appropriate testing and deworming of pets for tapeworms. Although the risk of infection in animals and people is still likely very low, owners should take simple precautions to decrease the risk of exposure of their pets (see below).



How do I know if my pet has tapeworms, including *Echinococcus*?

- Infection in adult animals rarely causes illness, even with large numbers of worms, but the motile proglottids may cause irritation around the anus, causing the animal to chew or rub the area or “scoot”.
- Your veterinarian can perform a fecal “float” on your pet to look for eggs of tapeworms (and other parasites) in the feces. It is important to have this done regularly.
 - ▶ It is impossible to tell *Echinococcus* eggs from the eggs of *Taenia* tapeworms based on a fecal float. The intact proglottids (egg sacs) of *Echinococcus* are distinguishable from *Taenia*, but they are very small and extremely difficult to find.
 - ▶ *Echinococcus* eggs may only be shed intermittently and in low numbers by infected pets, so a single negative fecal float cannot completely rule out intestinal infection.
 - ▶ Newer tests that look for marker molecules (e.g. antigens or DNA) for *Echinococcus* in feces may help make diagnosing infection easier and more accurate in the future.

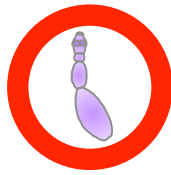
How is infection with *Echinococcus* in people diagnosed?

- *Echinococcus* cysts may grow for years, depending on their location, without causing any signs of illness in people. When signs of illness do occur, they depend on where the cyst is and what tissues or organs are being compressed or invaded. Cysts most often occur in the liver, which can lead to abdominal pain and sometimes obstruction of bile ducts and jaundice. Cysts in the lungs may cause coughing (with or without blood), chest pain and difficulty breathing. Cysts in the brain can cause neurological signs and seizures.
- Cysts, particularly *E. granulosus* cysts, are often found when tests such as radiographs, ultrasound, CT or MRI are performed for other reasons. A blood test for antibodies to the parasite is often used to help confirm the diagnosis.
- Ultrasound is sometimes used for screening individuals living in high-risk areas, because catching the infection early, typically before anyone knows the cyst is there, helps make treatment much easier and more effective.

How is infection with *Echinococcus* treated?

In pets, intestinal infections with *Echinococcus* can be treated just as easily as other tapeworm infections, using an oral dewormer such as praziquantel. Nonetheless, if your pet needs to be treated for tapeworms, it is important to also take steps to prevent your pet from being reinfected afterwards.

- Pets may shed very high numbers of parasite eggs for a few days after being treated, so be particularly diligent about removing pet feces promptly and hand washing.



In humans, treatment of cystic echinococcosis can be difficult. In the past, surgery to remove the hydatid cyst was the only option (if the cyst was in an accessible location), but there was always a risk that the cyst would burst during the procedure, resulting in a very severe, even fatal reaction in the patient to the spilled fluid. More recently, treatment with antiparasitic drugs and drainage of the fluid from the cyst using a needle has been used to treat the disease in certain cases without surgery. Drug therapy alone is usually not enough to eliminate cysts, but it can help reduce their size. With proper care, 96-98% of patients survive.

Treatment of alveolar echinococcosis is very complicated, especially because the disease is often quite advanced by the time it is diagnosed. Surgery to completely remove all the cysts is often the only “cure,” but may not be possible. Antiparasitic drugs can help prevent the cysts from growing or spreading, but usually cannot kill cysts that are already established. In untreated patients, average survival time has been reported to be 5.3 years. Early detection and treatment can significantly improve survival.

How can I prevent *Echinococcus* infection in me, my pets & my family?

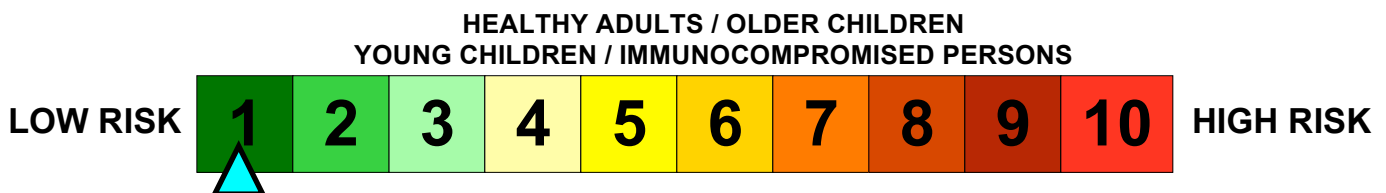
The two major components of preventing *Echinococcus* infection in people are preventing intestinal infection in pets and preventing human exposure to the parasite eggs.

- Have your veterinarian check your pet’s feces at least once a year to detect parasite eggs. In areas where *Echinococcus* has been recently reported, it is prudent to have this done several times per year. If eggs are detected, treatment with an oral dewormer is safe and usually very effective.
 - ▶ Remember: It is impossible to tell *Echinococcus* eggs from the eggs of some other tapeworms, so it is best to err on the side of caution and always treat pets that are shedding tapeworm eggs.
 - ▶ Regular deworming with praziquantel has been recommended to help control infections in endemic regions where pets are frequently at risk of being re-exposed, but by itself this may not be very effective.
- In order to prevent infection in pets, do not allow them to hunt or scavenge other animals. Keep cats indoors and prevent rodent infestations in the house. Keep dogs on a leash or at least in sight when outdoors. Do not allow hunting dogs to eat raw offal. Ensure all meat or other animal-based products are properly cooked before being fed to pets, especially if the animal source is from an area where *Echinococcus* is endemic.
- Pick up pet feces promptly and wash you hands thoroughly afterwards.
- If working with soil in an endemic region, especially where the soil may be contaminated by foxes, feral dogs or similar animals, always wear gloves and wash hands thoroughly when done.

What Is The Risk?

For **healthy adults and older children**, the risk of infection with *E. granulosus* or *E. multilocularis* from most pets is very low, but the risk is higher for individuals who live in endemic areas, whose work or recreational activities involve direct contact with soil, and whose pets are allowed to roam, hunt and eat raw tissues from potentially infected animals (e.g. rodents, rabbits, sheep, moose). In general, for those who live in non-endemic regions and who do not have these risk factors, the risk of *Echinococcus* infection from pets in these groups is:

It is unknown if people who are **immunocompromised** (e.g. HIV/AIDS patients, transplant recipients, cancer patients) are more susceptible to infection with *Echinococcus* spp., but treatment is likely to be more difficult as such individuals are more likely to develop secondary infections or other complications because their immune systems cannot fight infections as efficiently. **Young children** may be more likely to swallow parasite eggs if they have contact with contaminated soil while playing, but the disease may not be diagnosed until they are adults. For these groups, living in non-endemic regions, the risk of *Echinococcus* infection from pets is:



Additional Information:

Centers for Disease Control and Prevention (CDC). *Echinococcus* spp. (<http://www.cdc.gov/parasites/echinococcosis/>)