

ECHINOCOCCUS MULTILOCULARIS: AWARENESS AND PREVENTION

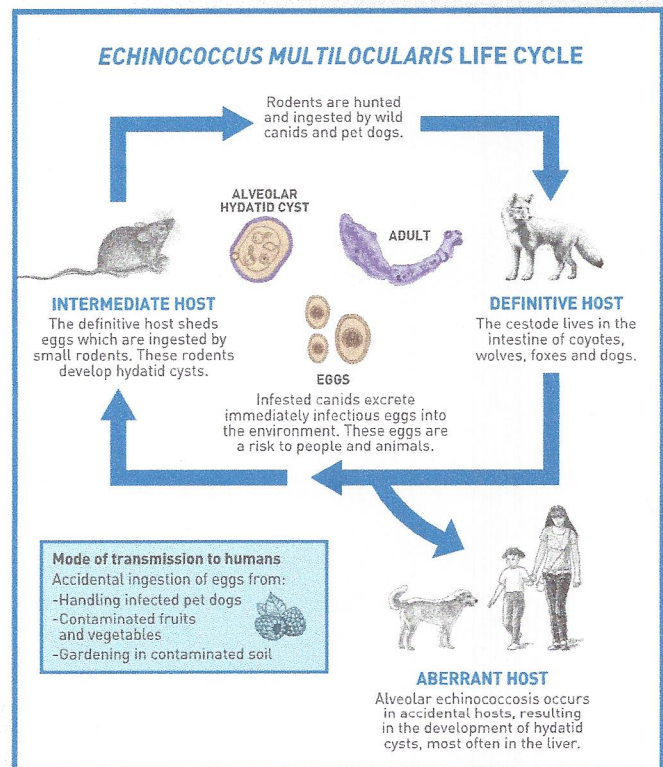
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WHY SHOULD WE DISCUSS IT?

Echinococcus spp. is the type of tapeworm found in pets which represents the most significant risk for humans. In Canada, historically, *Echinococcus multilocularis* was only found in most of the Arctic, near Alaska and along the southern parts of Alberta, Saskatchewan and Manitoba. In the recent years, the parasite has been gathering attention from medical community and the media. This is due to the detection of locally acquired cases of alveolar echinococcosis in dogs in Ontario and British Columbia, and the increasing prevalence among coyotes in the cities of Edmonton and Calgary. This apparent spread of the endemic territory raises concern as it could present an emerging public health threat.

WHAT IS IT?

- *Echinococcus multilocularis* (EM) is a parasite which belongs to the cestode (tapeworm) class and measures less than 1 cm. Its life cycle involves an intermediate host (IH) and a definitive host (DH). It has a predilection for the small intestine.
- The prepatent period ranges from 26 to 36 days in dogs.
- The DH are typically wild canids: mainly foxes and coyotes. Less frequently: dogs and cats can act as hosts.
- The DH carries the adults of EM in its intestinal tract and sheds the eggs in feces via the tapeworm segments that break off from the adult worm. The eggs are very resistant in the environment, and can persist up to a year in soil.
- Immediately infective, the eggs are ingested by an intermediate host (rodent). Inside the IH, the eggs hatch and release larvae that disperse from the intestinal tract to the liver and other organs within the body, via blood vessels. The larvae lead to the production of small hydatid cysts (metacestode stage). These cysts can grow, spread and may become particularly damaging and invasive, similarly to a slow-growing tumour. This disease called **alveolar echinococcosis (AE)** should normally only affect intermediate hosts. Though dogs usually serve as DH, in rare instances they can also present with an IH form of infection.



HOW DOES IT AFFECT DOGS? TWO FORMS OF INFECTION:

ENTERIC INFECTION: DEFINITIVE HOST FORM

- Transmission: ingestion of an intermediate host (rodent), hunting and catching prey.
- Clinical disease: usually subclinical but warrants treatment as it represents a zoonotic risk.
- Diagnosis: routine fecal floatation is insufficient as a standalone diagnostic tool, due to intermittent shedding and eggs being undistinguishable from other tapeworm eggs. Furthermore, the eggs often do not float with the solutions typically used. The adult parasite and its segments are unlikely to be seen in the feces due to its very small size. PCR and cELISA are preferred.
- Prevention: in endemic areas, monthly deworming with praziquantel is often recommended as means of reducing the zoonotic risk, along with measures of hygiene.

ALVEOLAR ECHINOCOCCOSIS: EMERGENT CONCERN BUT FEW CANINE CASES REPORTED IN CANADA

- Transmission: may result from dogs ingesting a large number of eggs from a heavily contaminated environment, or may be the consequence of an established enteric infection releasing eggs within the gut. There is no danger to humans that come in contact with affected organs/patients unless the animal is concurrently shedding eggs.
- Evidence suggests that this form of EM infection may develop without the need for an intermediate host, meaning that dogs living in endemic areas would be at risk if ingesting eggs inadvertently from a contaminated environment (e.g. urban green spaces, walking trails, off-leash areas, as well as rural areas).
- Clinical signs: can present insidiously (e.g. progressive lethargy, weight loss, vomiting, abdominal/liver enlargement, etc.), or acutely (e.g. hemoabdomen). Likely underdiagnosed due to the slow onset of clinical signs and low rates of histopathology being performed on what is presumed to be a tumour.
- Diagnosis: involves various imaging modalities. Definitive diagnosis is reached via biopsy.
- Treatment: surgical resection if possible, otherwise cases may require long-term medication (e.g.: albendazole). The prognosis is often poor due to late-stage discovery of the disease.

WHAT IS THE POTENTIAL RISK FOR HUMANS?

- Transmission: fecal-oral, by swallowing eggs from the feces of an infected definitive host DH (e.g. an infected pet).
 - Humans are considered aberrant or dead end hosts. They cannot transmit the disease but risk developing alveolar echinococcosis, a serious condition.
 - The target organ is usually the liver. Multiple cysts of variable sizes can be present at once. These cysts may also spread, thus affecting various organs.
 - The cysts grow very slowly and it can take up to 15 years before clinical signs are noted.
- Prevention: Good hygiene practices are recommended, such as prompt removal of animal feces, washing fruits and vegetables grown in potentially contaminated areas and handwashing after gardening or handling pets. Preventing pets from consuming prey is important, as well as monthly deworming of animals living in endemic areas.

PREVALENCE IN CANADA

- Given the slow onset of the disease, as the relative lack of awareness and reporting, true prevalence and incidence are difficult to assess, both in humans and animals.
- British Columbia, 2009: the first domestic canid infected with metacestodes (leading to AE) was documented in North America. Since then, several more confirmed cases have been described in Western Canada and Southern Ontario. In some of these cases, the parasite was identified to be genetically similar to the European strain, despite the patient never leaving the province of origin.
- Edmonton and Calgary, 2012: a study described EM as enzootic among the urban coyote populations in and around these cities. These findings suggest an increased likelihood of infection in local pet dogs, as well as a potential emerging zoonotic risk.
- A 2014 study demonstrated the presence of the cestode in wildlife across Canada, with more genetic diversity than previously described. This could have an impact on the pathogenicity and transmission of the parasite.
- Ontario, January 2018: Ontario's Health Protection and Promotion Act was amended to include official reporting of known or suspected animal cases of EM. Research was conducted at the University of Guelph in an attempt to determine EM prevalence, distribution and risk factors among the wild canid population in Southern Ontario. Data is soon to be published.

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