



Cysticercosis and hydatid echinococcosis, dangerous parasitic larval forms in rabbits

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Flat segmented worms or tapeworms can infest wild and domestic rabbits, as well as other leporid species such as the American cottontail or the hare.

Infestation by tapeworms is rare in rabbits living in a well maintained and protected area such as a pen, a hutch or an apartment, but not impossible ... Different species of parasitic tapeworm parasite the

digestive system of wild and domestic rabbits. Some develop into adulthood and are, therefore, able to reproduce and produce eggs. They include the leporid tapeworm *Leporidotaenia* sp., the rabbit



Figure 1: The proximity of canids infested by a tapeworm or *Echinococcus* and the presence of their feces in the grass permits the transmission of parasite eggs to the rabbit.
Picture: MediRabbit.com

tapeworm *Cittotaenia variabilis*, the tapeworm *Ctenotaenia ctenoid*, the porcupine tapeworm *Monoecocestus americanus* and the *Mosgovoyia pectinata americana* tapeworm. A healthy rabbit is rather resistant to tapeworms. Indeed, the presence of a few worms only has been observed; there is rarely an overpopulation as may be the case with roundworms, e.g. the rabbit pinworm *Passalurus ambiguus*.

Intermediary host: the rabbit

Other tapeworms remain blocked at an intermediate larval development stage in the abdomen or in the subcutaneous tissue of rabbits. The rabbit tapeworm (*Taenia pisiformis*) is a parasitic worm that infests the intestines of carnivores: dogs, foxes and sometimes cats. The development of the parasite occurs in two steps. The adult stage takes place in the definitive host, e.g. the dog. The parasite colonizes the small intestine (duodenum, jejunum and ileum)

and may become as long as 2 meters (6.6 feet). Adults segments containing the reproductive organs and mature eggs – proglottids, are shed with the feces. Before it can infest another dog, the parasite must necessarily go through the larval stage, called cysticercus. The latter occurs in rabbits. These get infested after eating fresh grass contaminated by eggs of the parasite. Cysts develop in the abdomen, the peritoneal cavity, and in the liver (Figure 2). Their size ranges between 2 and 3 cm (0.7" to 1.18"), but they can reach up to 8 cm (3.15") in diameter. The vesicles contain a clear fluid and the invaginated scolex of the larval tapeworm (protoscolex). The development of the larvae is blocked at this stage. The growth into adult parasites able to reproduce will only take place after ingestion of viscera of an infested rabbit by a fox or dog.

Once the cysticercus has reached the canid intestine, it rolls up like a sock and



Figure 2: Whitish cysts or cysticerci of *Taenia* sp. with larvae attached to the intestine wall.
Picture: Prof. R. Hoop

allows the larva to attach itself to the wall.

Another canid tapeworm uses this mode of transmission: *Taenia serialis*, with an intermediate developmental stage in hares and rabbits and an adult stage in dogs and foxes. Its incidence in the pet rabbit is rare. Cysts of this worm develop in the subcutaneous and muscle tissues.

Clinical effects of cysticercosis

Larvae emerging from the ingested eggs migrate from the intestine to the liver via the portal vein, which transports blood from the digestive organs to the liver. Their presence causes granulomatous hepatitis: inflammation, local necrosis of liver cells, infiltration of white blood cells and scarring. The structure of the liver tissue changes

and will be replaced in time by connective tissue. After 15-30 days, the larvae migrate to the liver parenchyma and cysts develop. A severe cysticerci infestation causes digestive problems such as enteritis and promotes the development of ulcers of the intestine. The rabbit becomes emaciated and is extremely weak (Figure 3). It can die suddenly.

Aberrant migration of the larvae is possible. Some tapeworm larvae have completed their migration into the peritoneal serous liquid, in the eye or lungs of a rabbit. In the latter, they may occupy the whole pulmonary cavity, causing acute respiratory distress. The presence of cysticerci and calcified cysts in the brain may cause seizures, hydrocephalus and meningitis.



Figure 3: Extreme thinness in a rabbit may indicate the presence of cysticercus in the abdomen. Picture: Anonym

Hydatid echinococcosis

Echinococcus granulosus is a parasitic cestode that infests canids and other carnivorous animals (Figure 4). It is dangerous to man too and may cause important damages to tissues. *Echinococcus granulosus* is a cosmopolite parasite but different strains have different intermediary hosts depending on continents.

The North American strain is predominant in regions with boreal forests and tundra in Eurasia and North America. It infests wolves, deer and bison. The South European strain is found in pastoral areas and infests domestic animals (dogs and ungulates) and wild animals (canids, wild ungulates and sometimes wild rabbits).

Life cycle

The development of *Echinococcus granulosus* requires an intermediate herbivorous host and a final host that belong to the canids. The adult parasite measures between 2 and 11 mm (0.08" and 0.4") and is composed of 2 to 7 proglottid segments.

Worms produce up to 1000 eggs every two weeks. The segments containing eggs are released in the intestine of the host and are eliminated in the external environment with the feces. Eggs are dispersed into the outside environment by the wind, water or flies and contaminate the vegetation eaten by herbivores.

The rabbit is an accidental intermediate host after ingestion of contaminated food or dirty water. It is affected by the larval phase called hydatid echinococcosis. Once ingested, eggs release tiny larvae with hooks in the small intestine of the host. After crossing the intestinal wall, the larvae migrate via the blood or lymphatic circulation to organs such as the lungs and liver, but also to the nervous system, brain,

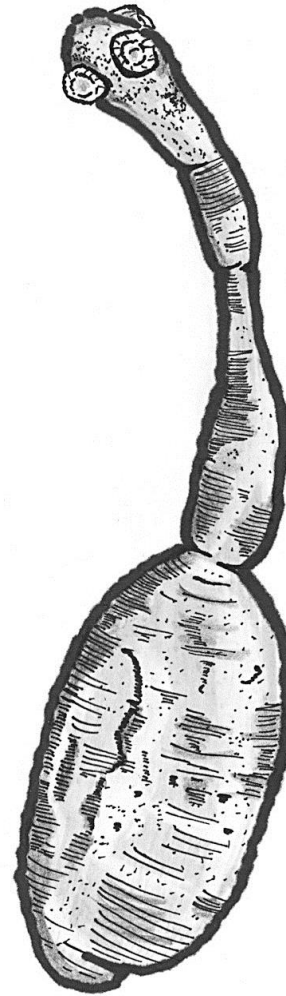


Figure 4: Adult parasitic tapeworm *Echinococcus granulosus*.

spleen, kidney or bone marrow. Each larva will form a cyst, a hydatid unilocular vesicle filled with a colorless fluid. The cysts continue to grow slowly and can reach a size of 30 cm (11.8") in some herbivores. *Echinococcus* larvae multiply and wait for the next stage of infestation inside structures adhering to the inner wall of the cysts. A rupture of the vesicle allows a secondary infestation of organs or ingestion by their definitive canid hosts.

Pathogenesis

The severity of this parasitosis depends on the size of cysts and their number. In

general, echinococcosis presents no clinical signs as cysts are small and do not damage surrounding tissues unless they develop in the tissues of the nervous system and brain, or compress organs such as lungs.

Clinical manifestations

An affected rabbit may show a decreased appetite (anorexia) and appear lethargic. Clinical signs vary according to which organs are affected.

Lungs: Respiratory distress, dyspnea;
Deep irritating cough;
Pain.

Liver: Compression of liver tissue;
Blockage of blood vessels;
Inflammation of the cystic canal of the gall bladder;
Pain.

Kidneys: Increased size of the kidney;
Proteinuria and hematuria;
Urinations anomalies;
Pain.

When a vesicle ruptures, the larvae can spread throughout the body of its host and infect further organs. The presence of free larvae in the blood can trigger a fatal

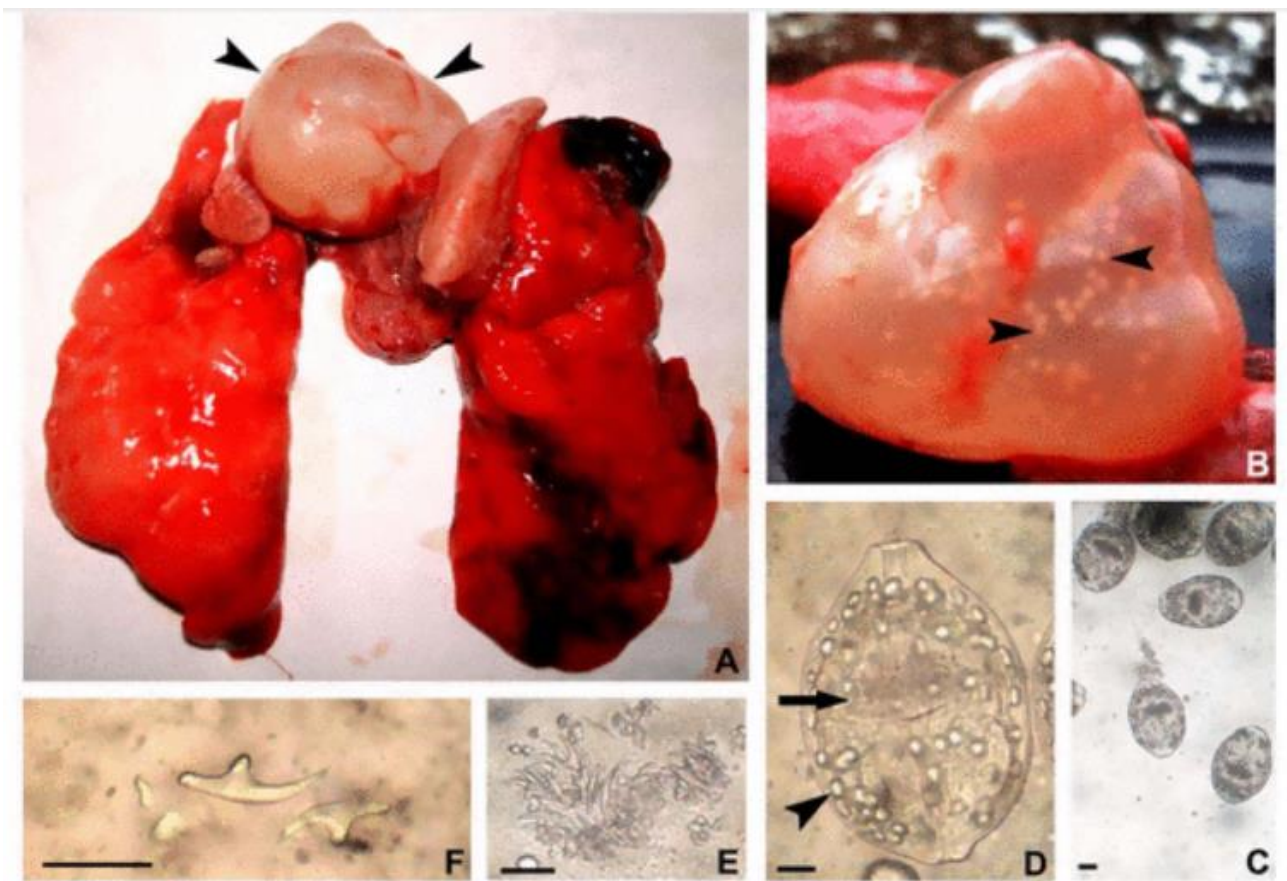


Figure 5 : A : Intrathoracic, extrapulmonary hydatid cyst (arrowheads) in the mediastinal region of the lungs of a rabbit. Diffuse consolidation of the right lung and emphysematous changes in the apical lobes of both lungs are visible. B : The roughly conical hydatid cyst with clear content and whitish « sand »(arrowheads). C : Protoscolices D : showing the calciferous corpuscles (arrowhead) and the rostellum (arrow). E : Rostellar hooks (F) consisting of the small and large hooks with the characteristic handle, guard and blade (Bars in C, D, E and F = 20 micron).

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allergic or anaphylactic reaction.

Rarely a cyst becomes sterile as a result of bacterial invasion, and calcifies.

Without treatment, the size of cysts continues to increase slowly. Compression of surrounding tissues may cause irreversible chronic or acute lesions with fibrosis of the surrounding tissue.

Diagnosis

Diagnosis is difficult. The observation of cysts and the identification of the parasite are often accidental during an autopsy. In case of suspicion of hydatid echinococcosis in a rabbit, it is important to confirm the presence of a cyst in the lung or in the abdomen by ultrasound or x-ray.

A biopsy of the cyst content can be attempted using an ultrasound-guided fine needle. It helps differentiate a hydatid cyst from an abscess or a tumor. The presence of a protoscolex or larvae in the sample helps confirm the diagnosis.

If the rabbit presents a deep irritating (dry) cough reminding a bark, it is important to differentiate hydatid echinococcosis from pneumonia.

If the cyst is calcified, detection of antibodies or PCR testing is required to confirm the diagnosis. These methods are expensive.

Treatment

The treatment of cystic echinococcosis is difficult, risky, and results are not guaranteed.

The administration of antiparasitic drugs such as mebendazole, albendazole,

niclosamide and praziquantel kills 60-85% of viable cysts. They also help to reduce their size, to eliminate parasitic larvae, to avoid a relapse with a new growth of cysts and the spread of parasitic larvae in the body of the host. This approach enables, furthermore, to reduce tissue damage and relieves pain.

The rabbit must be closely monitored after the administration of medications. Indeed, the dead larvae of the parasite can trigger an inflammation of the surrounding tissue and a reaction of the immune system.

It is also possible to aspirate the content of one or more cysts with a needle thanks to the ultrasound-guided technique and replaced it with an antiparasitic solution.

Surgical resection of the vesicles is also possible, but results are not always satisfactory. There are also risks. Indeed, if the cyst accidentally ruptures during the procedure, larvae can invade the blood circulation. A secondary invasion of organs becomes possible, which may cause the death of the animal.

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Thank you

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