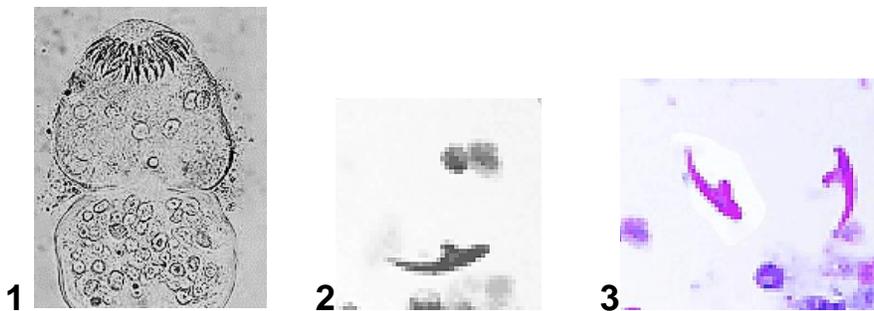


PARASITOLOGY CASE HISTORY 16 (HISTOLOGY) (Lynne S. Garcia)

A 32-year-old male from Wisconsin recently presented to a local hospital for right upper quadrant (RUQ) pain. He had no significant travel history; however, he had a long history of hunting wild animals and exposure to wild canines. He also owns three dogs that roam freely and interact with other wild animals. He was later transferred to a tertiary care facility after a liver resection procedure for RUQ pain, elevated liver enzymes and a white blood cell count, and an elevated absolute eosinophil count; he also had pleural effusion. A 7 cm liver cyst was seen on an ultrasound scan and magnetic resonance imaging. Cyst fluid was sent to the laboratory for analysis. Figures 1 and 2 show what was observed on a wet preparation from the fluid. Figure 3 is from a smear of the fluid stained with the Ryan modified trichrome stain (also used for microsporidial spores); What is your presumptive diagnosis? Based on what criteria?



Scroll Down for Answer and Discussion

Answer and Discussion of Histology Quiz #16

This was a case of echinococcosis caused by *Echinococcus granulosus*. Morphologic features seen in the images included: (1) the presence of a single protoscolex with a circular row of hooklets and (2) a single hooklet with the typical shape. Figure 3 shows two hooklets stained with the Ryan modified trichrome stain. Other diagnostic tests would include serology and PCR. Serological tests specific for *E. granulosus* will sometimes cross react with *E. multilocularis* and *E. vogeli*. In some cases, patients with active

echinococcal disease will yield false negative serologic results. PCR of cyst fluid or tissue is recommended to differentiate species; however, this requires a surgical procedure and risks cyst rupture *in situ*, with the possible risk of allergic reaction to fluid leakage and/or cyst dissemination via the released protoscolices.

Comments on the Patient:

Based on differences in the host specificity of the larval stage, at least 10 different strains of *E. granulosus* have been identified. The strains differ in their intermediate host spectrum, geographic distribution, adult and larval stage morphologies, and protoscolex production. Also, at least seven of the strains are infective for humans. The northern form is found in the holarctic zones of the tundra and boreal forest of North America and Eurasia. The larval stage occurs primarily in moose, elk, and reindeer, while the adult worm is found in wolves and sometimes in dogs and other wild canids. This patient was exposed to dogs and other canids on a routine basis, and had accidentally come in contact with/ingested infective eggs shed from the worms in the canid intestine. Instead of causing developing hydatid cysts in other intermediate hosts, the cyst developed in the human liver (normal site in the human intermediate host).

Histology

The majority of hydatid cysts occur in the liver, causing symptoms that may include chronic abdominal discomfort, occasionally with a palpable or visible abdominal mass. Liver cysts tend to occur more frequently in the right lobe. Symptoms can include pain, hepatomegaly, cholestasis, biliary cirrhosis, portal hypertension, and ascites. If a cyst becomes infected with bacteria, it resembles an abscess. Severe symptoms can occur if the cyst ruptures spontaneously, from trauma, or during surgery. In addition to the spread of tissue from which additional hydatid cysts can grow, there may be serious allergic reactions, including rash, anaphylactic shock, or death. Cyst rupture can also lead to cholangitis and cholestasis. Morbidity and mortality rates associated with perforated hydatid cysts are higher than those associated with nonperforated cysts. Some unilocular cysts may remain undetected for many years until they become large enough to crowd other organs.

Diagnosis

Echinococcus granulosus (Cystic Disease)

1. Presumptive diagnosis may be based on history, radiographic studies, or scans.
2. Additional supportive data may be acquired from immunologic tests.
3. Microscopic examination of hydatid cyst fluid may reveal the hydatid sand (protoscolices) or, under certain circumstances, just the hooklets.
4. If the cyst fluid is thick or purulent, it may have to be subjected to a digestion procedure prior to examination; the hooklets survive this treatment and can then be seen and identified.
5. Light, fluorescence, and epifluorescence microscopy can be used to visualize the hooklets; some approaches require staining, and some do not. The Ryan modified trichrome is recommended.

Epidemiology and Prevention

The percentage of infected hosts varies throughout the world, but human infection is still much less common than infection of any of the reservoir hosts. Areas of endemicity of growing concern are the sheep- and cattle-raising areas of Argentina, Uruguay, southern Brazil, and Chile (8) (Table 14.7). There are two life cycles of *E. granulosus*, the first of which can be domestic, - involving the domestic dog as the definitive host and various species of domestic ungulates as intermediate hosts. The second type of life cycle is sylvatic, in which wild carnivores serve as definitive hosts and wild ungulates serve as intermediate hosts. The dog-sheep strain is the most common and important throughout the world. There are often overlapping domestic and sylvatic cycles, all of which present special situations and challenges related to disease control.

Most human hydatid cysts are probably acquired in childhood and may continue to grow undetected for many years. Several preventive measures are considered mandatory if the incidence is to decrease. First, all infected viscera from slaughtered animals (intermediate hosts containing hydatid cysts) must be disposed of so that dogs do not have access to this material.

Also, personal hygiene must be emphasized to prevent accidental ingestion of the infective eggs from soil contaminated with dog feces, particularly since the eggs are very resistant to disinfectants. In many areas, extensive control measures have also been taken to reduce hydatid disease. Certainly, educational programs are also very important.

References:

1. **Garcia, L.S.** 2016. *Diagnostic Medical Parasitology*, 6th Ed., ASM Press, Washington, D.C.
2. **Garcia, L.S.** 2009. *Practical Guide to Diagnostic Parasitology*, 2nd Ed., ASM Press, Washington, D.C.
3. **Babba, H., A. Messedi, S. Masmoudi, M. Zribi, R. Grillot, P. Ambriose-Thomas, I. Beyrouiti, and Y. Sahnoun.** 1994. Diagnosis of human hydatidosis: comparison between imagery and six serologic techniques. *Am. J. Trop. Med. Hyg.* 50:64–68.
4. **Balik, A. A., M. Basoglu, F. Celebi, D. Oren, K. Y. Polat, S. S. Atamanalp, and M. N. Akcay.** 1999. Surgical treatment of hydatid disease of the liver—review of 304 cases. *Arch. Surg.* 134:166–169.
5. **Ryan, N. J., G. Sutherland, K. Coughlan, M. Globan, J. Doultree, J. Marshall, R. W. Baird, J. Pedersen, and B. Dwyer.** 1993. A new trichrome-blue stain for detection of microsporidial species in urine, stool, and nasopharyngeal specimens. *J. Clin. Microbiol.* **31**:3264–3269.