



Hydatid Disease

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Overview

- Organism
- History
- Epidemiology
- Transmission
- Disease in Humans
- Disease in Animals
- Prevention and Control



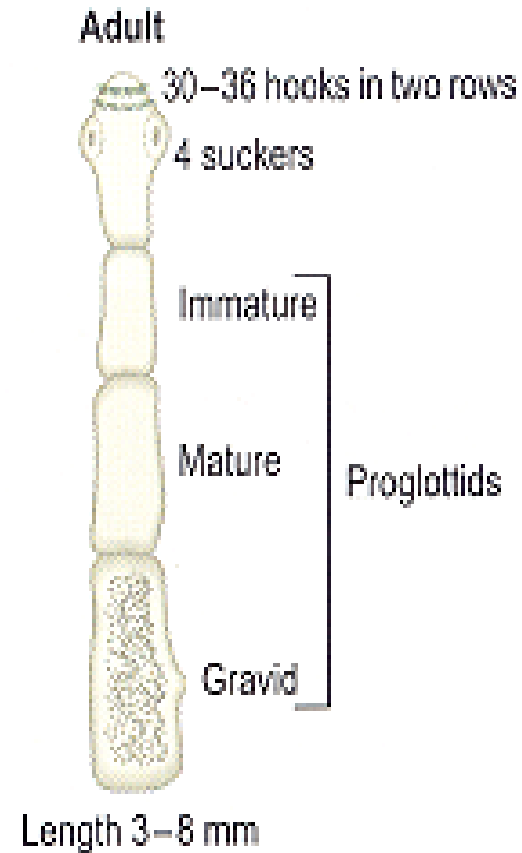
The Organism

- Cestode parasites
- Currently recognized
 - *Echinococcus granulosus*
 - *Echinococcus multilocularis*
 - *Echinococcus vogeli*
 - *Echinococcus oligarthrus*
 - *Echinococcus shiguicus*



Morphology

- Only 3-8 mm long
- Usually comprises of:
 - Scolex
 - immature proglottid
 - mature proglottid
 - gravid proglottid





Hydatid disease

- It is a worldwide zoonosis produced by the larval stage of the Echinococcus tapeworm.
- Main types
 - E granulosus: the most frequent
 - E multilocularis
- E granulosus is commonly seen in the great grazing regions of the world:
 - the Mediterranean region
 - Africa
 - South America
 - Australia and New Zealand





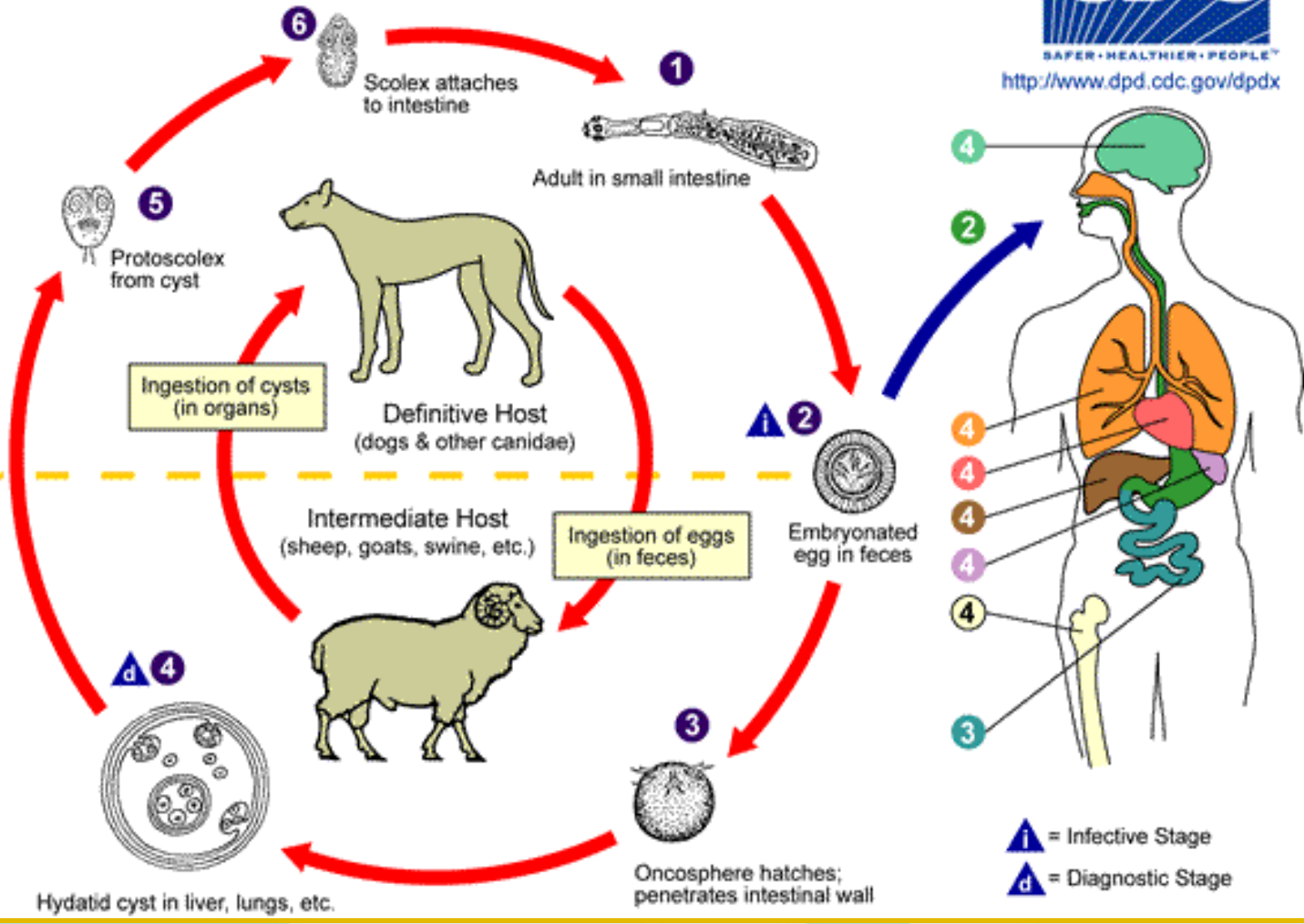
Transmission

- Indirect life cycle
 - Definitive hosts ingest cysts (metacestodes) in tissues of intermediate hosts
 - Cysts develop into tapeworms in the host's small intestine
 - Gravid proglottids or eggs shed in feces by definitive host
 - Eggs ingested by intermediate hosts, larvae are released, penetrate the intestinal wall, and are carried in blood or lymph to the target organs.





<http://www.dpd.cdc.gov/dpdx>

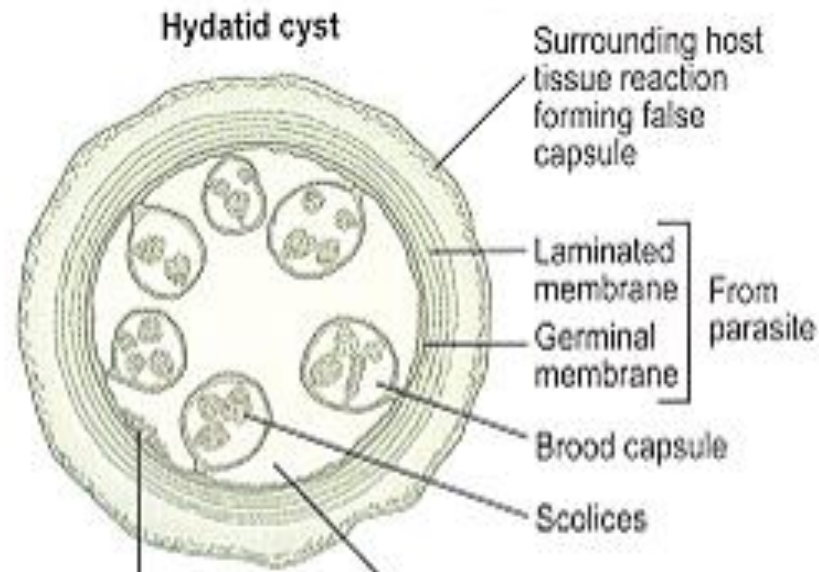




Hydatid Cyst Layers

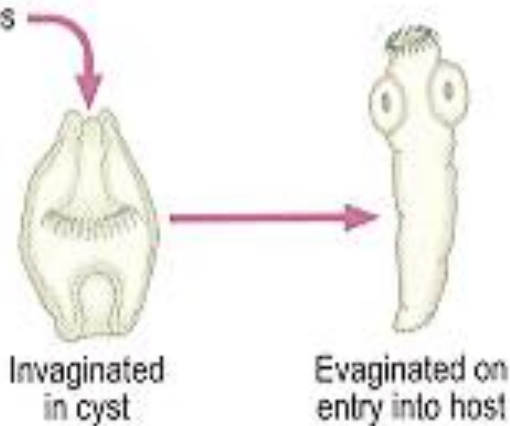
1. The outer pericyst:
 - composed of modified host cells that form a dense and fibrous protective zone
2. The middle laminated membrane
 - which is acellular and allows the passage of nutrients
3. The inner germinal layer
 - where the scolices (the larval stage of the parasite) and the laminated membrane are produced.

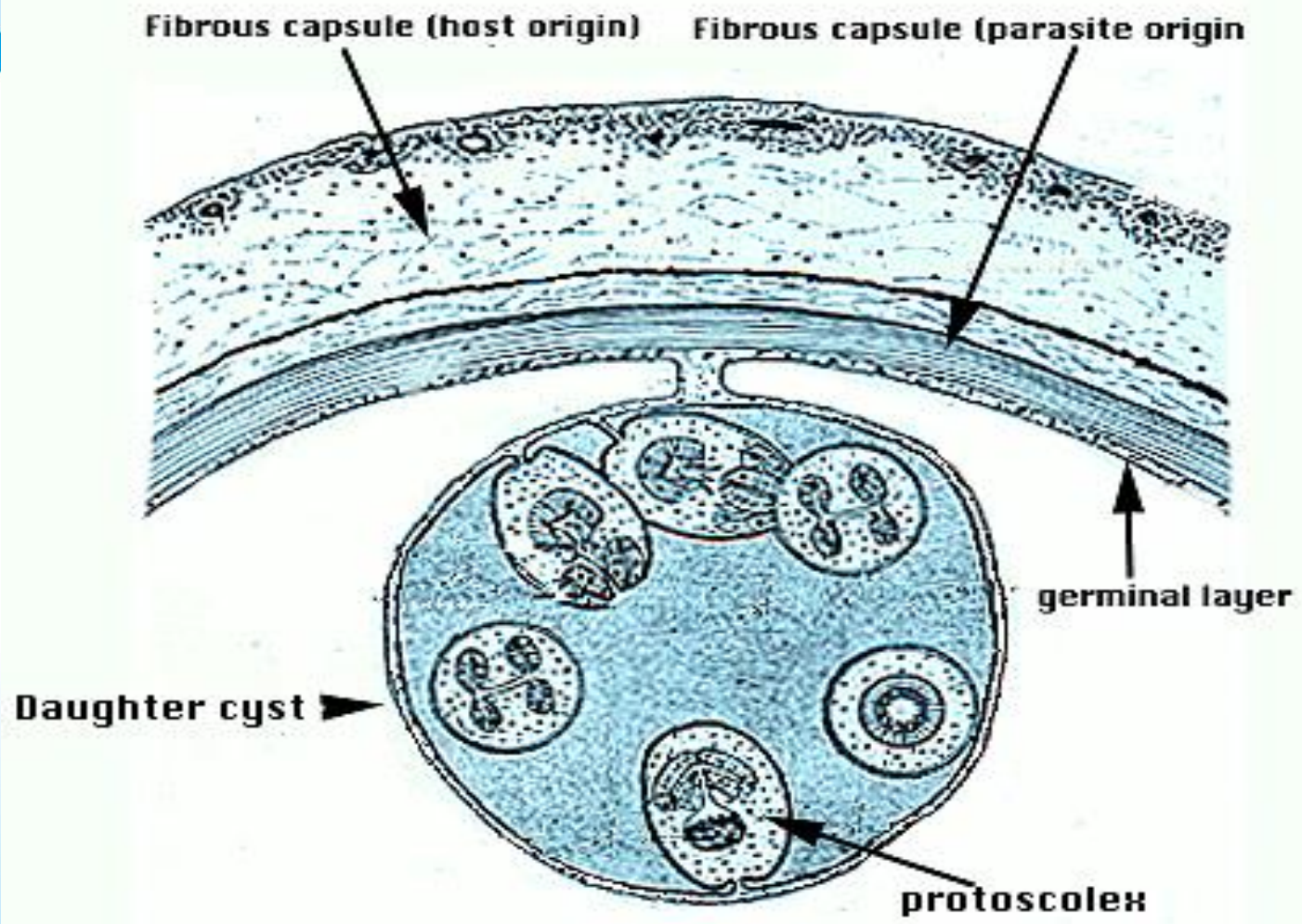




Hydatid sand
Remains of germinal epithelium
Brood capsules
Protoscolices

Cyst fluid
Salts
Enzymes





Hydatid cyst

Daughter vesicles

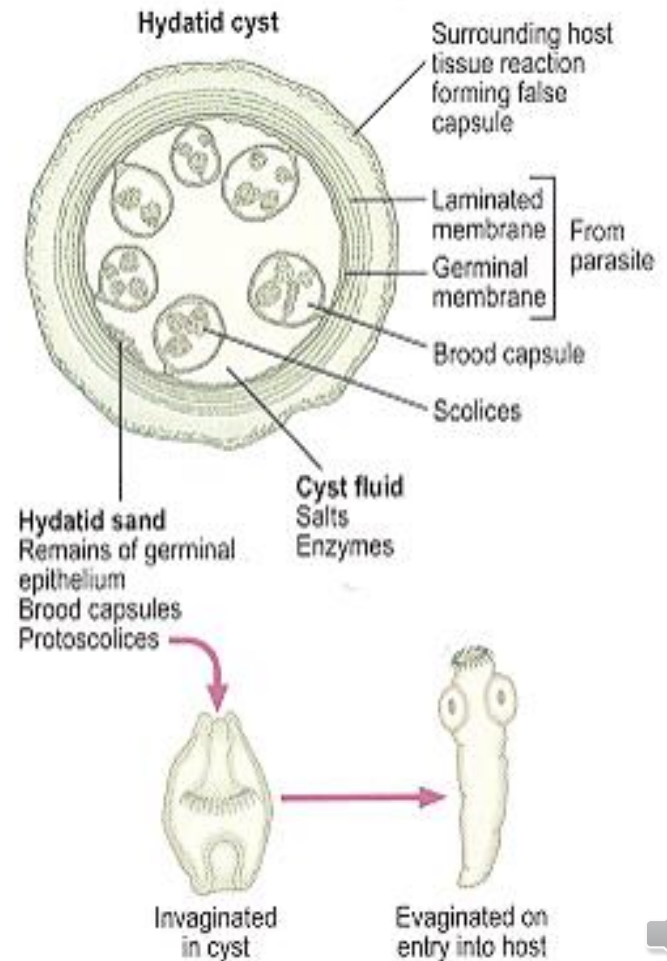


- Or brood capsules are small spheres that contain the protoscolices
- formed from rests of the germinal layer.
- Later they form daughter cysts



Hydatid Sand

- Brood capsules and freed protoscoleces are released into the fluid of the original cyst and together with calcareous bodies, form hydatid sand.
- Hydatid sand is made up of around 400,000 scoleces per milliliter of fluid.



Protoscolex



- **Can differentiate in two directions**
 - ❑ **In the definitive host**, the scolex becomes an adult tapeworm.
 - ❑ **In the intermediate host**, including humans, each of the released protoscoleces is capable of differentiating into a new Hydatid cyst.





Transmission

- Definitive hosts
 - dogs
 - cats
 - Wild carnivores (e.g., fox)
- Intermediate hosts
 - Herbivores
 - Small mammals (rodents)
 - Humans





Disease in Humans

- Incubation period
 - Month to years
 - 20 to 30 years documented for cysts that grow slowly and are not in a critical location
 - Can be asymptomatic: calcified
- Clinical signs
 - Depend on size, number and location of metacestodes





Clinical manifestations

- **Asymptomatic: 75%**
- **Pressure:**
 - as cyst grows: mass effect and dysfunction of liver, lung or nervous system
 - Abdo pain: 20%
 - Jaundice: 10%
- **Allergy:**
 - due to rupture of cyst → anaphylactic shock
 - Eosinophilia: 35%
- **Regeneration:**
 - due to rupture of cyst, intracystic protoscolex or germinal layer may be transplanted and result in multiple daughter cysts.
- **secondary infection**



E. granulosus

- May be asymptomatic
- Usually one cyst present
- Cyst location
 - 60 - 70% in liver: right lobe 80%
 - 20 - 25% in lungs
 - found almost anywhere in the body including the bones, kidneys, spleen, muscles, CNS and behind the eye
- Symptoms dependent on cyst location
- Leakage of the cyst fluid can also cause allergic reactions



E. multilocularis

- Cysts usually found in liver
- Cysts not enclosed within membrane
 - Invade surrounding tissues
 - Disease is progressive and malignant
- May be asymptomatic
cyst dies early in
development

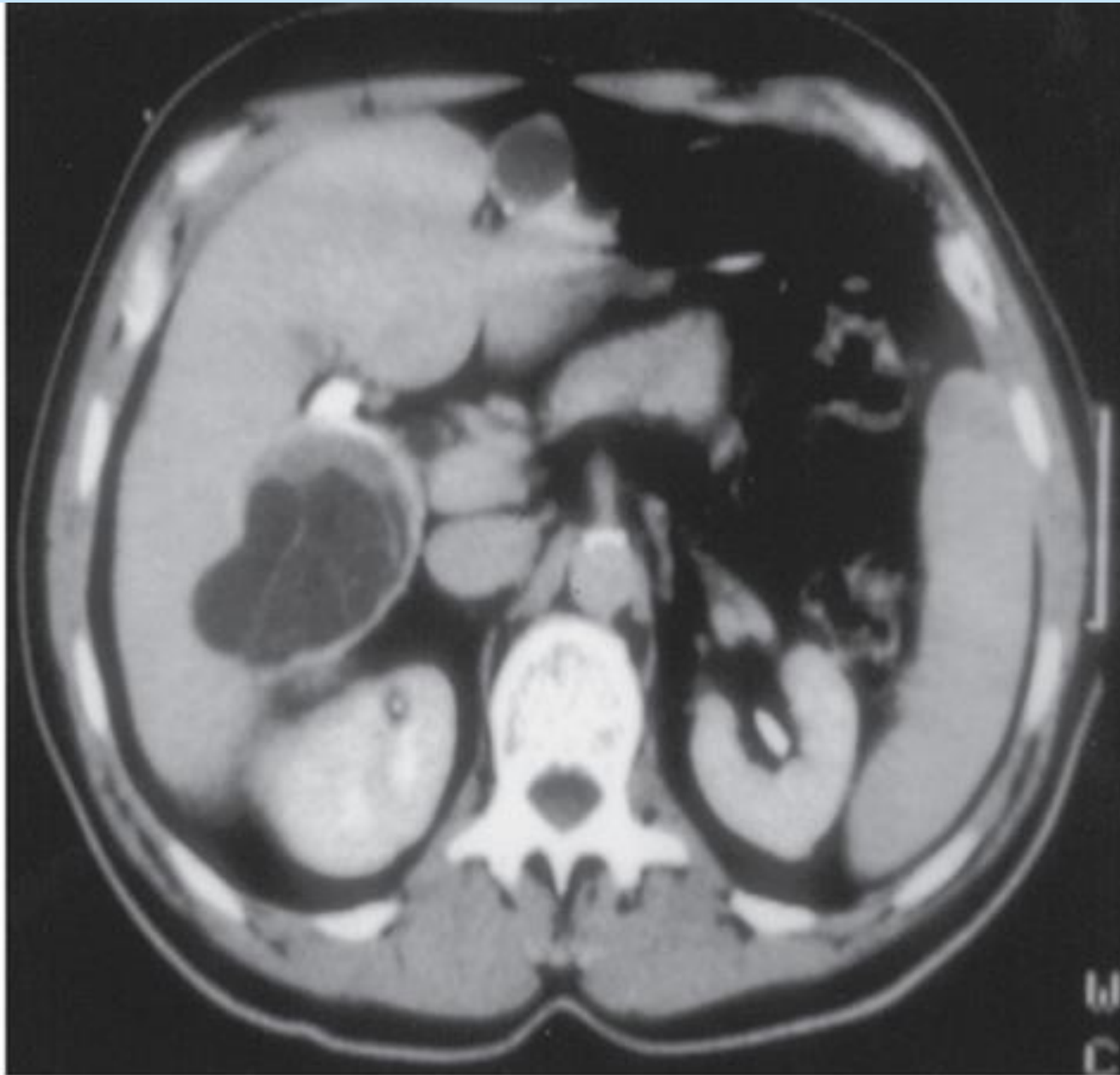




Diagnosis

- Imaging techniques
 - Ultrasound, CT scan, MRI
- Serology
 - enzyme-linked immunosorbent assays (ELISAs), indirect immunofluorescence, indirect hemagglutination etc
- Biopsy ?







Liver cyst differential imaging

	Pyogenic	Amebic	Hydatid	Congenital	Cystadenoma
Number	Single or multiple	One or few	Usually single	Single or multiple	Single with loculations
Wall thickness	thick	thick	thick	thin	variable
Wall character	Uniform or multiloculated	Usually uniform	Uniform, daughter cysts; 50% calcified	Uniform	Septations common may be irregular
Cyst contents	Usually pus with blood	Red-brown; like anchovy paste	Clear or bilious; gelatinous	Usually clear water density	Usually green-brown mucinous





Treatment options

- Wait-and-see
 - Small cysts (<4 cm)
 - located deep the liver,
 - Uncomplicated
- Medical
- Percutaneous
- Surgical





Medical Treatment

- Anthelmintics (Anti-parasitics)
 - 30% successful
 - albendazole
 - DoC
 - readily absorbed from the intestine and metabolized by the liver
 - 10 mg/kg or 400mg BID
 - at least 3 months preoperatively + 1 month postop
 - mebendazole
 - poorly absorbed and is inactivated by the liver





Medical Treatment

- Medical therapy used alone results in recurrence rates of 70–80%
- Indication
 - in combination with surgery
 - in combination with a drainage procedure
 - patients who are not surgical candidates.





PAIR Treatment

- = puncture, aspiration, injection scolical agent, and re-aspiration
- scolical agents
 - ethanol 70-95%
 - hypertonic saline 15-20%
 - cetrimide solution 0.5%
 - chlorhexidine gluconate 0.04%
- PAIR + albendazole
 - 70% success rates
 - low rate of recurrence





Principles of surgical treatment

1. Eradication of the parasite within the cyst
2. Protection of the host against spillage of scoleces
3. Eliminate all viable elements of the cyst
4. Manage the residual cavity of the cyst.
5. Manage complications



Surgery

- It is considered the treatment of choice for uncomplicated Hydatid disease of the liver
- Surgical options:
 - Surgical removal of cysts (Pericystectomy)
 - May not be possible to remove entire cyst depending on size and location
 - Open vs. lap
 - cyst evacuation
 - Open vs. Laparoscopic
 - Liver resection
 - Liver transplant





Surgery outcome

- recurrence rates 10%.
- morbidity rates between 15% and 30%.
- Mortality: 5%
 - Due to
 - Septic shock
 - peritoneal rupture
 - Co-morbid conditions (i.e., malnutrition)





Prevention in Humans

- Minimize risk of egg ingestion
 - Wash fruits and vegetables
 - Wash hands frequently
 - Avoid untreated water sources
 - Do not handle wild carnivores or their carcasses
 - Thoroughly cook meat before eating
- No vaccine





Prevention in Animals

- Regular surveillance
- Treat infected animals (dogs)
 - Praziquantel
 - Multiple doses required
- elimination of farm slaughter of sheep
- Sheep Vaccination

