**HYDATID TAPEWORM**

<table>
<thead>
<tr>
<th></th>
<th><strong>ECHINOCOCCUS GRANULOSUS</strong></th>
<th><strong>ECHINOCOCCUS MULTICULARIS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Geo Distribution</strong></td>
<td>cosmopolitan esp in sheep (cattle) raising countries</td>
<td>North America, Siberia &amp; Eskimos (south &amp; central Europe)</td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>5 mm in length (small)</td>
<td>1.2-3.7 mm in length. (smaller in size)</td>
</tr>
<tr>
<td><strong>Segments</strong></td>
<td>3-4 only</td>
<td>3-5 segments.</td>
</tr>
<tr>
<td><strong>Habitat</strong></td>
<td>Small intestine of Definitive Host</td>
<td>Fox &amp; wolves, Rodents and man.</td>
</tr>
<tr>
<td><strong>Definitive H</strong></td>
<td>Dogs &amp; carnivorous animals (cats &amp; wolves)</td>
<td>Fox &amp; wolves</td>
</tr>
<tr>
<td><strong>Intermediate H</strong></td>
<td>Herbivorous animals (sheep, cattle, camels, pigs)</td>
<td>Rodents and man.</td>
</tr>
<tr>
<td><strong>Infective stage</strong></td>
<td>Eggs in feces of canines</td>
<td>E. multilocularis eggs</td>
</tr>
<tr>
<td><strong>Diagnostic stage</strong></td>
<td>Unilocular hydatid cyst</td>
<td>Alveolar (multilocular) thin-walled hydatid cyst.</td>
</tr>
</tbody>
</table>
| **Mode of infection**| • Contaminated food/ water with feces of infected dogs | Man is infected with the alveolar cyst :  
  1. During the skinning of foxes to make fur.  
  2. From collecting strawberries polluted with fox’s feces.  
  3. Drinking water from melted ice. |
| **Fav site in man**  | LIVER (66%)                 | LIVER (90%)                   |
| **Stages in life cycle** | 1. Eggs pass out from feces of dogs & other canines  
  2. Eaten by IH (pig, cattle, sheep) or man  
  3. Hatch in intestine into hexacanth embryo  
  4. Penetrates the mucosa into portal vein  
  5. Liver sinusoids (1st capillary filter) forming hydatid cyst (liver commonest side: 70%)  
  6. Some embryo leave the liver  
  7. Pulmonary capillaries (2nd capillary filter) forming hydatid cyst (20%)  
  8. Some embryos pass the pulmonary filter  
  9. Left side of the heart  
  10. Different body organs (10%) of cases as brain, bone, kidney, spleen, muscles, heart & eyes  
  11. When cyst ingested by canines, it becomes adult worm  
  12. In man, the life cycle is blind as dogs don’t feed on human viscera | • There is no laminated layer  
• Cyst has no regular shape & not defined from the surrounding tissue.  
• The germinal layer infiltrates the tissue.  
• There is no free fluid, but a jelly-like substance in irregular cavities separated by fibrous strands.  
• The central area of the cyst undergoes necrosis while growth continues at the periphery.  
• In man the cyst is usually sterile or produces only few scolices and brood capsules |

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### SCOLEX

<table>
<thead>
<tr>
<th>Shape</th>
<th>globular</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suckers</td>
<td>4 muscular suckers armed with 2 rings of taenoid hooks</td>
</tr>
<tr>
<td>STROBILA</td>
<td>1 immature, 1 mature &amp; 2 (terminal) gravid.</td>
</tr>
</tbody>
</table>

### Mature

- **Shape**: longer than broad  
- **Testes**: Few (40-60)  
- **Ovary**: Horse shoe (posterior)  
- **Vitelline glands**: Compact mass behind ovary  
- **Uterus**: Vertical blind tube (in median plate)  
- **Vagina**: Pass laterally to CGP  
- **Common GP**: (marginal) Lateral  

### Gravid

- ✔ longer than broad  
- ✔ 1/2 the worm length.  
- ✔ The uterus with lateral pouches filled with eggs.
MORPHOLOGY OF HYDATID CYSTS

<table>
<thead>
<tr>
<th>UNILOCULAR</th>
<th>OSSEOUS</th>
<th>ALVEOLAR (MULTILOCULAR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Larval stage of</td>
<td>Echinococcus Granulosus (commonest)</td>
<td>Echinococcus multilocularis</td>
</tr>
<tr>
<td>Shape</td>
<td>Spherical</td>
<td>Spherical</td>
</tr>
<tr>
<td>Size</td>
<td>1-10 cm in diamtr (may 20cm)</td>
<td>Small</td>
</tr>
<tr>
<td>Contents</td>
<td>Surrounded by fibrous capsule formed by host tissue reaction.</td>
<td>Only gelatinous material No scolices</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td>Site in bones</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hydatid Fluid</th>
<th>Germinal layers</th>
<th>Hydatid Sand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellowish ↑ protein, phosphates &amp; sodium salts</td>
<td>Solitary scolices Invaginated/evaginated</td>
<td>Daughter cysts - Endogenous (surrounded by laminated &amp; germinal) - Exogenous (germinal only) - may gv scolices - may remain attach to mother cyst/ fall in fluid</td>
</tr>
<tr>
<td></td>
<td>Broad capsule</td>
<td>Germinallayer only May give scolices</td>
</tr>
</tbody>
</table>


Unilocular cyst of Echinococcus granulosus characterized:  
- only 1 bladder/ many completely isolated bladders  
- each enclosed in its own well-developed envelope.  
- Inside which develop thousands of larvae/protoscoleces  
- the whole being suspended in a hydatid fluid.  
- Cysts in man give rise to unilocular hydatid disease.

TREATMENT

SURGICAL REMOVAL
1. PAIR Technique  
   - Percutaneous  
   - Aspiration  
   - Injection  
   - Reaspiration  
   Done under sonographic/CT guidance.
2. Medical treatment  
   Albendazole  
   Praziquantel

MEDICAL TREATMENT
Mebendazole  
orally in high dose for long period (3 months-up to one year). it stop proliferation and spread of the cyst.  
STERILIZATION
- If surgery is impossible  
- Performed by repeated aspiration of some of the hydatid fluid and it is replaced by 10% formalin for 5 minutes.  
- Finally, wash with saline/ethanol to destroy the germinal layer, scolices and brood capsules.

PREVENTION AND CONTROL
- Strict personal hygiene as washing hands after playing with or feeding the dogs.
- Avoidance of unnecessary contact with infected dogs.
- Elimination and control of stray dogs.
- Periodic de-worming of domestic dogs.
- Prevention of dogs from eating infected viscera of herbivorous animals at slaughter houses.
- Hydatid cysts removed from slaughtered animals should be destroyed.
HYDATIDOSIS
It is the presence of hydatid cyst, larval stage of E. granulosus in the human tissues

PATHOGENESIS AND CLINICAL PICTURE

Liver: Hepatic Cyst (About 66%)
1. No symptoms
2. Obstructive jaundice
3. Rupture:
   - 2ry new cysts: Hydatid sand/ bites of germinal layer are seeded in the peritoneal cavity.
   - Opens into bile ducts: Intermittent jaundice, fever & eosinophilia
   - Allergic manifestations: Anaphylactic shock occurs with sudden rupture of cyst

Lung: Pulmonary Cyst (About 22%)
Cyst transforms into chronic pulmonary abscess:
- Sudden attack of cough with sputum containing frothy blood, mucus & hydatid material.
Cyst present within lung tissue cause:
- Transient thoracic pain
- Haemoptysis
- Shortness of breath

OTHERS

In the brain: Brain cyst (about 1%)
- Increased intracranial tension
- Headache
- up to epilepsy

In the kidney: Renal cyst (about 3%)
- Intermittent pain & haematuria
- Hydatid sand may be present in urine.

In the bones: Osseous cyst (about 2%)
- Normally hydatid cyst wall is 3 layered
- Osseous cyst wall is one layered
- Growth of osseous cyst may cause:
  - Bone Erosion
  - Trabeculae Destruction
  - Spontaneous Fracture

DIAGNOSIS

CLINICAL DIAGNOSIS
slowly growing cyst (space occupying and pressure effects) with hydatid thrill in case of large abdominal cyst.
History of contact with dogs.

1. X ray imaging
2. Ultrasonography
3. Computerized tomography
4. Aspiration cytology
5. Finding hydatid material: after surgical removal

INDIRECT

Intra-dermal allergic test, Casoni test:
0.2 ml of sterile hydatid fluid is injected intradermally. In positive cases an erythematous wheel is formed within 20 min and a delayed reaction appears after 24 hours.

6- Intradermal test of Casoni
- May give false positive results in 18%
- May give allergic reactions

7- Serological tests
- By IHA to detect anti-hydatid antibodies in patient’s serum
- By ELISA to detect hydatid antigen

8- Molecular diagnosis
Detection of parasite DNA in patient’s serum