PARASITIC INFECTIONS OF THE LUNG

- Parasitic infections of the lung occur worldwide
- among both immunocompetent & immunocompromised patients
- cause parasitic pneumonia in immunocompromised patient
- The clinical presentations and radiographic findings of several of these diseases may mimic tuberculosis and malignancy.
- It is important to consider parasitic infections in the differential diagnosis of such lung diseases.
- If identified early, most parasitic diseases that affect the lung are curable with medical or surgical treatments.

<table>
<thead>
<tr>
<th>1. Protozoa</th>
<th>2. Helminthes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entamoeba histolytica</td>
<td>Paragonimus westermanii</td>
</tr>
<tr>
<td>Schistosomes</td>
<td>Hydatid disease</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Geographical distribution:</th>
<th>Adult morphology:</th>
<th>Treatment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>primarily in Far East especially</td>
<td>- Ovoid in shape</td>
<td>- Praziquantel is the drug of choice.</td>
</tr>
<tr>
<td>Japan</td>
<td>- Thick</td>
<td>- Bithionol is an alternative drug.</td>
</tr>
<tr>
<td>Korea</td>
<td>- reddish brown</td>
<td>Prevention and control:</td>
</tr>
<tr>
<td>Taiwan</td>
<td>- rounded anteriorly</td>
<td>- Avoid eating raw, inadequately cooked or</td>
</tr>
<tr>
<td>South America</td>
<td>- tapering posteriorly.</td>
<td>freshly salted crabs / crayfish.</td>
</tr>
<tr>
<td>Central Africa.</td>
<td></td>
<td>- Treatment of cases.</td>
</tr>
<tr>
<td>Size: 0.5 – 1.5 cm in length.</td>
<td></td>
<td>- Snail control.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Habitat</th>
<th>worms generally live in pairs encapsulated in pockets of the lungs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definitive host</td>
<td>man.</td>
</tr>
<tr>
<td>1st Intermediate Host</td>
<td>snail Melania (Semisulcospira).</td>
</tr>
<tr>
<td>2nd Intermediate Host</td>
<td>crabs and crayfish.</td>
</tr>
<tr>
<td>Reservoir host</td>
<td>carnivores as dog, fox, wolf, tiger and pig.</td>
</tr>
<tr>
<td>Stages in the life cycle</td>
<td>egg → miracidium (in water) → sporocysts → rediae → cercariae (in snail 1st I.H.) → metacercariae in 2nd I.H.</td>
</tr>
<tr>
<td>Infective stage</td>
<td>metacercariae in muscles, gills, legs and viscera of crabs and crayfish.</td>
</tr>
</tbody>
</table>
METHOD OF INFECTION

1. The definitive host infection occurs by eating raw/insufficiently cooked infected crabs or crayfish.
2. Metacercariae excyst in the small intestine pass through the intestinal wall.
3. Grow for about one week into young flukes.
4. Penetrate the diaphragm and pleural cavity and come to rest in the lung, forming cystic cavities then get mature.
5. The life cycle is completed in 6-8 months.
6. The eggs escape from the pulmonary pockets through the bronchioles and are coughed out with sputum, or swallowed and pass immature with feces.
7. Eggs require from 15 days to several weeks in water to complete embryonation then hatch and miracidia escape.
8. Miracidium enters the snail first I.H. then develops into sporocysts → rediae → cercariae in 3-5 months.
9. The released cercariae penetrate the crustaceans second I.H then develop into metacercariae, which require 6-8 weeks to become infective.

DIAGNOSIS

1-Clinical signs & diet history in endemic area.
   • Chest pain
   • Chronic cough
   • Brownish sputum may show eggs
   • Pleural effusion
   • Life threatening haemoptysis if eroding into adjacent bronchi
2-Characteristic immature eggs in sputum, feces or in aspirated pleural effusion.
3-Plain x-ray chest and computerized tomography show nodular shadows & cavities
   (Radiographic features of paragonimiasis include patchy air space consolidation, cystic changes and ring shadows. Pleural effusions and pneumothoraces may occur.)
4-Immunodiagnostic tests as ELISA to detect early, chronic and extra-pulmonary infection.
5- Eosinophilia.

Blood Flukes

*Schistosoma*

Stage of migration: By schistosomula

In the lung:
   • verminous pneumonitis
   • minute haemorrhage
   • cough
   • haemoptysis.

The body of cercaria enters the skin or mucous membrane leaving the tail where it is transformed into schistosomulum. It is carried after 2 days by the blood
   → Rt side of heart
   → lung → Lt side of the heart → systemic circulation
   → intestinal capillary bed
   → via mesentric-portal vessels
   → intrahepatic branches of the portal vein where it matures in 7 weeks.
**Ingestion of eggs of Echinococcus granulosus through:**
- Hand to mouth from fur of dogs while playing with them.
- Contaminated food or drink with faeces of infected dogs

### CESTODES (HYDATID DISEASE)

#### CLINICAL MANIFESTATIONS

- Hydatid Cysts may cause symptoms by compression of adjacent structures, and lung cysts may present with chest pain, cough, haemoptysis or pneumothorax.
- Symptoms may also occur if antigenic material is released from the cyst, causing a hypersensitivity reaction with fever, wheeze and urticaria and, rarely, anaphylaxis.
- Cysts may become secondarily infected causing empyema or lung abscess formation.

### NEMATODES

#### FILARIA

*Wuchereria bancrofti* and *Brugia malayi*

- found in endemic regions of south east Asia, India, China and Africa.

#### MIGRATING LARVAE OF

*Ascaris, Hook worm, Toxocara*

It cause Löffler's syndrome

- **Löffler's syndrome** or **Loeffler's syndrome** is a disease in which eosinophils accumulate in the lung
- **Loeffler's syndrome** is caused by larval migration into the alveoli
- which triggers an allergic response leading to respiratory symptoms including
  1. cough, wheeze, dyspnoea,
  2. chest pain
  3. fever and haemoptysis.
- The illness usually resolves spontaneously after several weeks.

### AMOEBIASIS

- Amoebiasis is caused by *Entamoeba histolytica*, a protozoan found worldwide.
- *E histolytica* is the causative agent of invasive amoebiasis
- Pleuropulmonary amoebiasis may also occur following haematogenous spread of organisms to the lungs or lymphatic spread from the liver to the diaphragm

  **Pulmonary amoebiasis**

  1. Chest pain
  2. Cough
  3. Fever
  4. Chills
  5. Leucocytosis and pulmonary consolidation

#### PATHOGENESIS

- The motile trophozoite forms of the parasite live in the lumen of the large intestine where they multiply and differentiate into the cyst forms.
- In most infections the organism does not invade the gut mucosa.
- Blood-borne spread of the parasite may lead to the formation of an amoebic liver abscess and amoebic pulmonary abscess.
Development of *Schistosoma* inside the body of infected human

- Cercariae penetrates human skin
- Schistosomula
- Venous circulation
- Portal circulation
- Liver
- Systemic circulation

Development of *Hydatid Cyst* inside human body

- Hydatid cysts (from 1-10 cm)
- Blood vessel
- Lumen of small intestine
- Liver
- Lymph vessel

Larval migration of *Ascaris*

- Larva is swallowed
- Egg is swallowed
- Rhabditiform larva
- Venous circulation
- Adult worm in small intestine

Larval migration of *Ancylostoma duodenale*

- Egg is swallowed
- 3rd moult
- Venous blood
- Adult Ancylostoma

Conclusion:

- Direct identification of the causative organisms may be achieved definitively through microscopic examination of stool or respiratory tract samples, or indirectly via serological testing.
- If identified early, most parasitic lung diseases are curable with medical treatment.