LARVAL CESTODE INFECTIONS

1. Cysticercosis

2. Hydatid disease

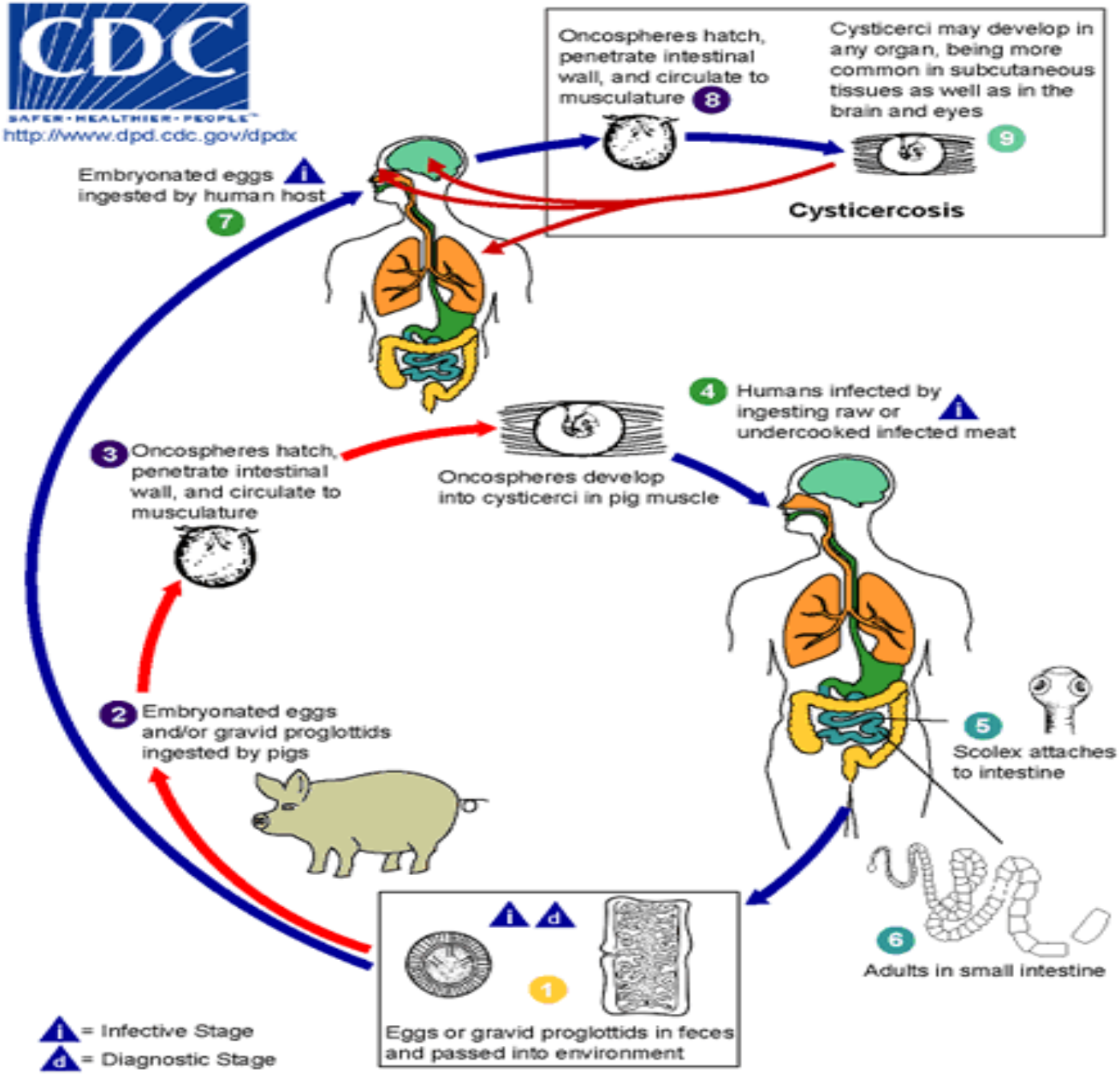
Cysticercosis

- Human infection with the larval stage of *Taenia solium*
- The larval stage – *Cysticercus cellulosae*
- Found in all areas where adult *T. solium* infections are common (Eastern Europe, Mexico, China, Indonesia etc.)
- Few cases reported in Sri Lanka

Transmission

- Infection follows ingestion of eggs
  - Has to be of human origin
  - Man is the only known definitive host

- Infection is acquired from
  - an external source (contaminated food or water)
  - one's own tapeworm (autoinfection)
    - External auto-infection
    - Internal auto-infection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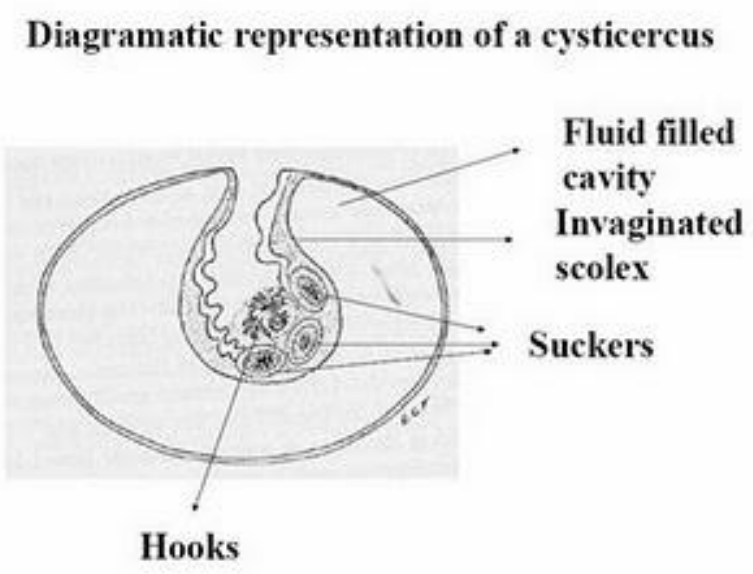
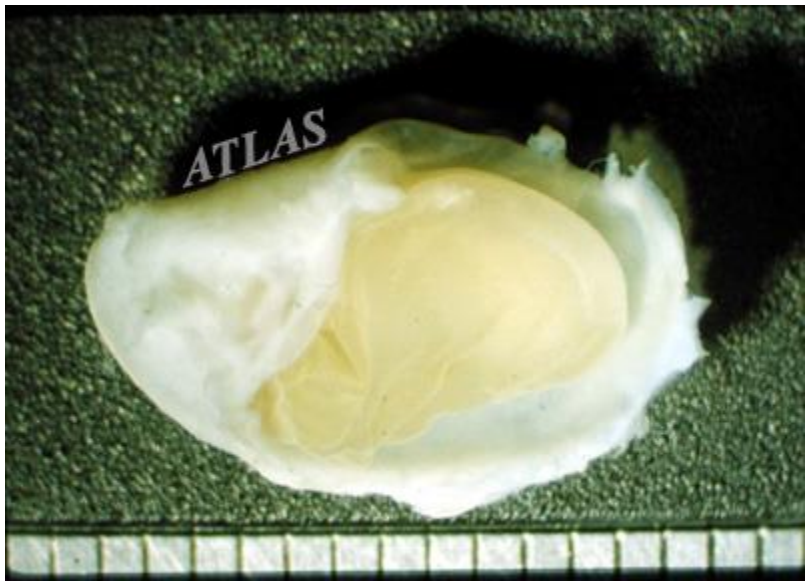
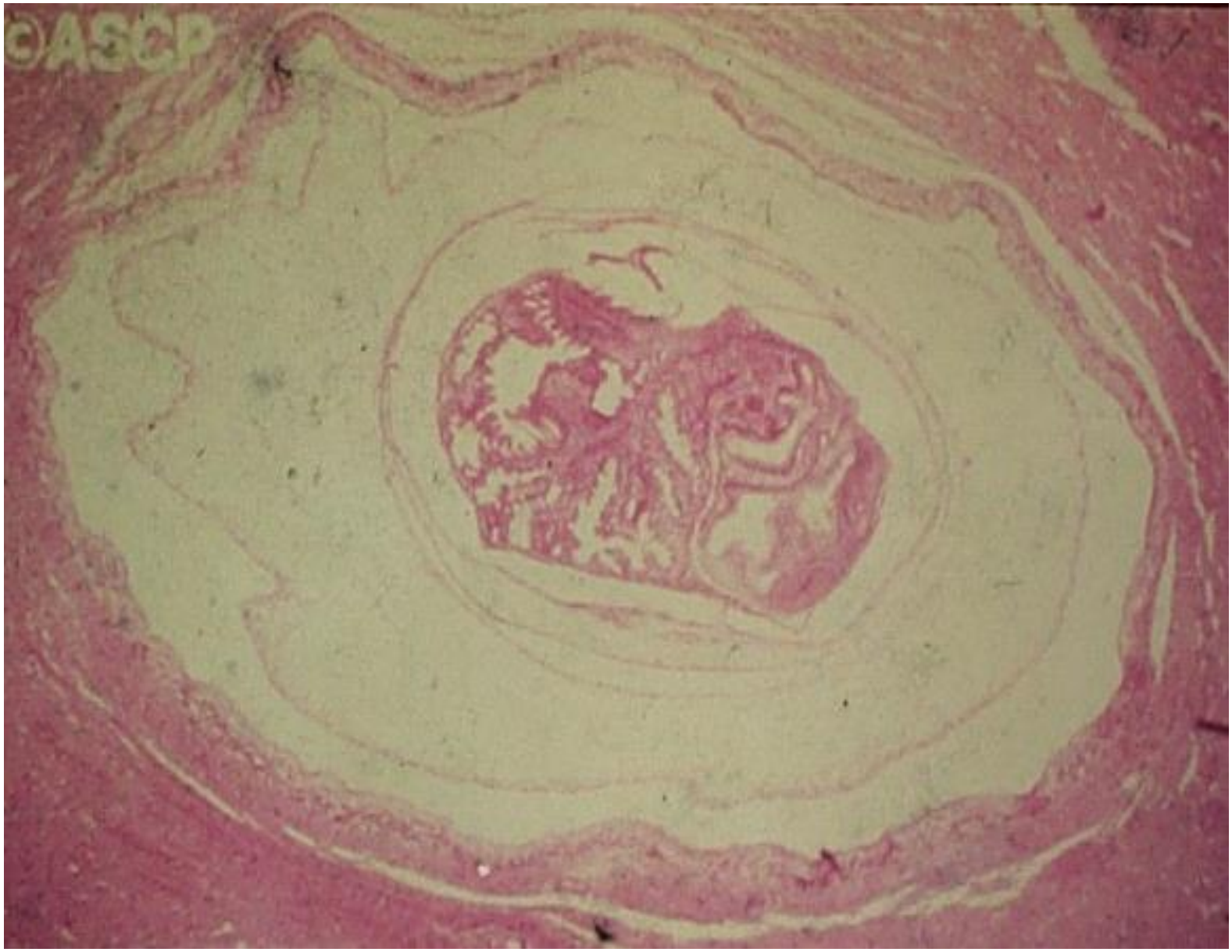
Oncospheres hatch, penetrate intestinal wall, and circulate to musculature 8
Cysticerci may develop in any organ, being more common in subcutaneous tissues as well as in the brain and eyes 9
Cysticercosis
Embryonated eggs ingested by human host 7
4 Humans infected by ingesting raw or undercooked infected meat
3 Oncospheres hatch, penetrate intestinal wall, and circulate to musculature
Oncospheres develop into cysticerci in pig muscle
2 Embryonated eggs and/or gravid proglottids ingested by pigs
5 Scolex attaches to intestine
6 Adults in small intestine
1
Eggs or gravid proglottids in feces and passed into environment
= Infective Stage
= Diagnostic Stage

Morphology

- Oval in shape
- Translucent cyst
- Opaque invaginated scolex with 4 suckers & a circle of hooks
- May or may not be encapsulated in a host tissue capsule







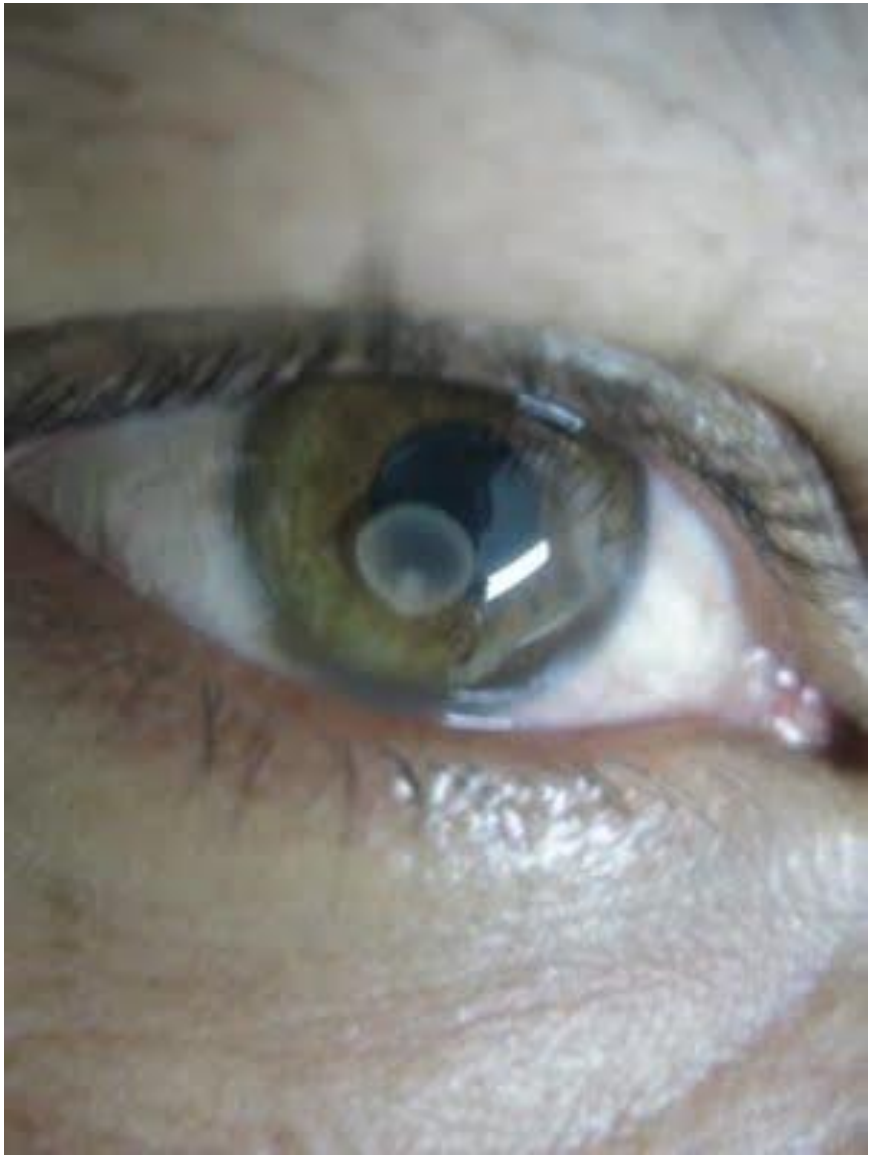
***Cysticercus cellulosae* - tissue section**

Pathology

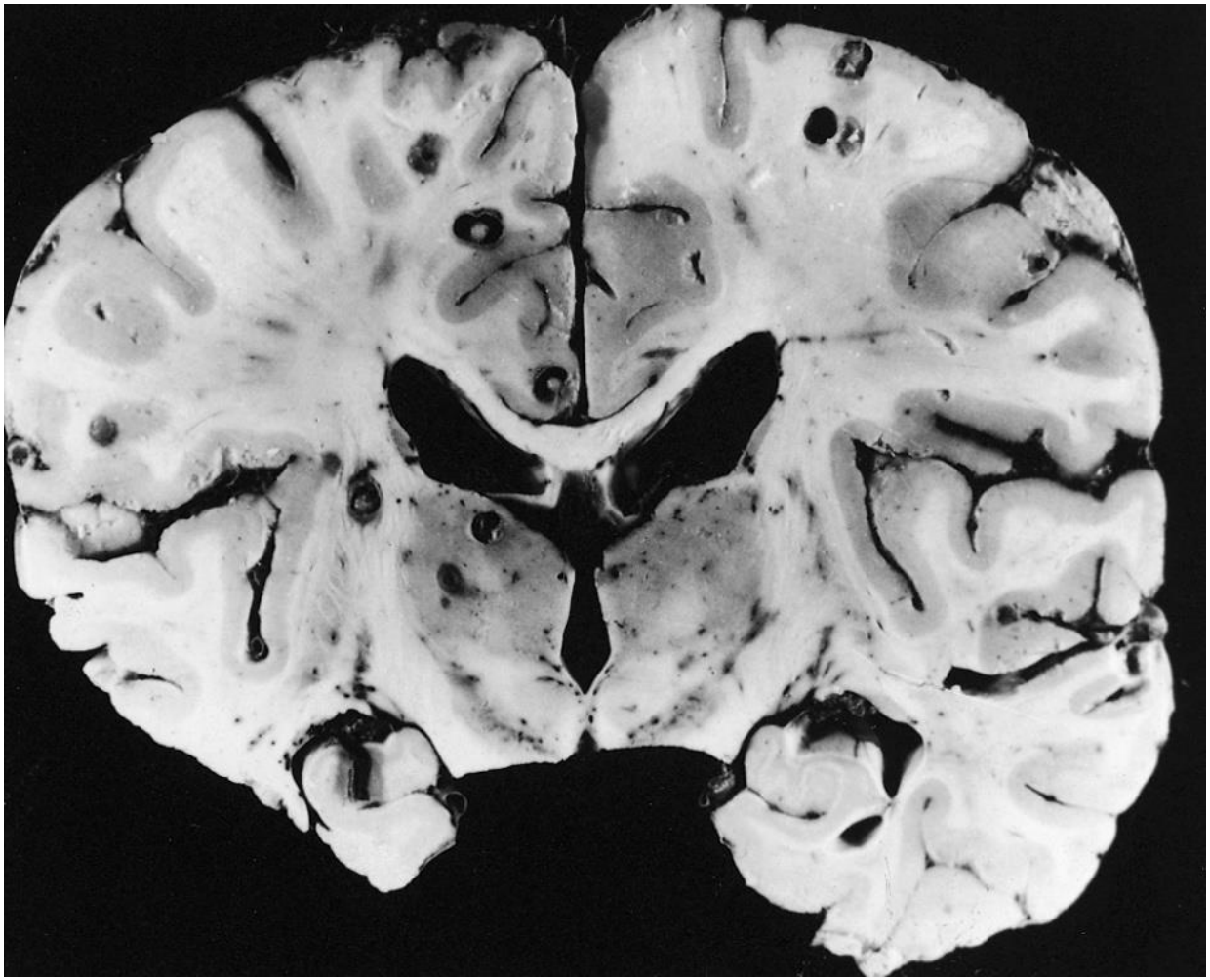
- Cysticerci form 60-70 days after ingestion of *T. solium* eggs
- May occur in almost any organ or tissue, most commonly
  - Subcutaneous tissue
  - Muscles of tongue
  - Neck, ribs, eye
  - Brain (neurocysticercosis)

- Cysticercus is usually enclosed in a tough, host-tissue capsule
- Parasite dies after a variable period of time
- Calcifies in 2-3 years

Cysticercosis in anterior chamber of eye



In Brain



Subcutaneous Cysticercosis

Clinical features

- Infection is usually harmless unless the cyst forms in the brain (cerebral cysticercosis) or eye (ocular cysticercosis)
- Patient will notice it as a small subcutaneous nodule or an intramuscular swelling
- Cerebral cysticercosis - commonest manifestation- convulsions, may be focal (Jacksonian) or general (grandmal or petit mal)
- Transient hemiplegia or psychiatric disturbances
- Ocular cysticercosis – intra-orbital pain, flashes of light, blurring & loss of vision

Diagnosis

- Clinically – subcutaneous nodules may be suggestive
- Biopsy and histological examination of nodule/s
- Stools should be examined for evidence for an adult *T. solium* – may or may not be present
- Radiography – useful for identifying calcified cysticerci (X-ray, CT, MRI)
- Serodiagnosis – used widely but not always reliable (ELISA tests are best)

Treatment

- Praziquantel orally daily for 1-2/52
- Albendazole for 1/12
- With a steroid for anti-inflammatory effects

Prevention

- Sanitary disposal of human faeces
- Good personal hygiene
- Treat all cases of *T. solium* infection

Hydatid disease

- Human infection with the larval stage of *Echinococcus granulosus*
- The adult stage is a parasite of the small intestine of dogs and wild carnivores (Jackal in Sri Lanka)
- The larval stage is found in herbivores (sheep, cattle, horse, deer, occasionally in man)

Echinococcus granulosus (dog tapeworm)

Geographical distribution

- Commonest in sheep & cattle raising countries
  - Australia
  - New Zealand
  - Parts of Africa (esp. East African countries)
  - South America
  - Europe
  - China

- Few cases reported from other countries including Sri Lanka

Morphology

Adult

- Very small (< 1 cm in length)
- 3-5 proglottids
- Scolex- 4 suckers & rostellum with 2 rows of hooks

Eggs

- Identical to other taeniid eggs

Life cycle

- Definitive hosts: wild and domestic dogs (jackals in Sri Lanka)

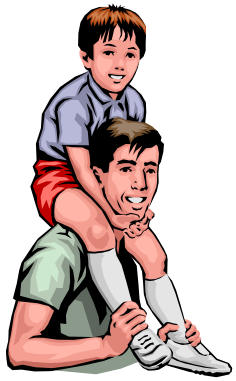
- Intermediate hosts: herbivores such as sheep, cattle, horse and deer (Sambhur in Sri Lanka)

Life cycle

Adults in small intestine of dog

DOG

Eggs in faeces



MAN

Swallowed by man

Liberated oncosphere migrates to organs

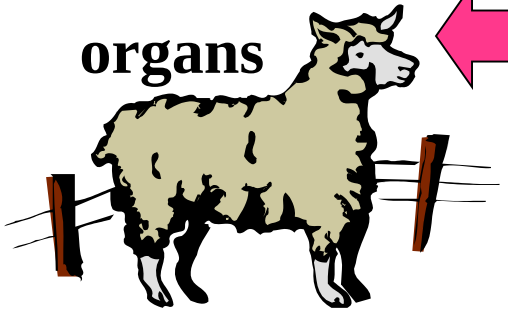
Cyst forms

Swallowed by herbivore

SHEEP

Oncosphere penetrates intestinal wall

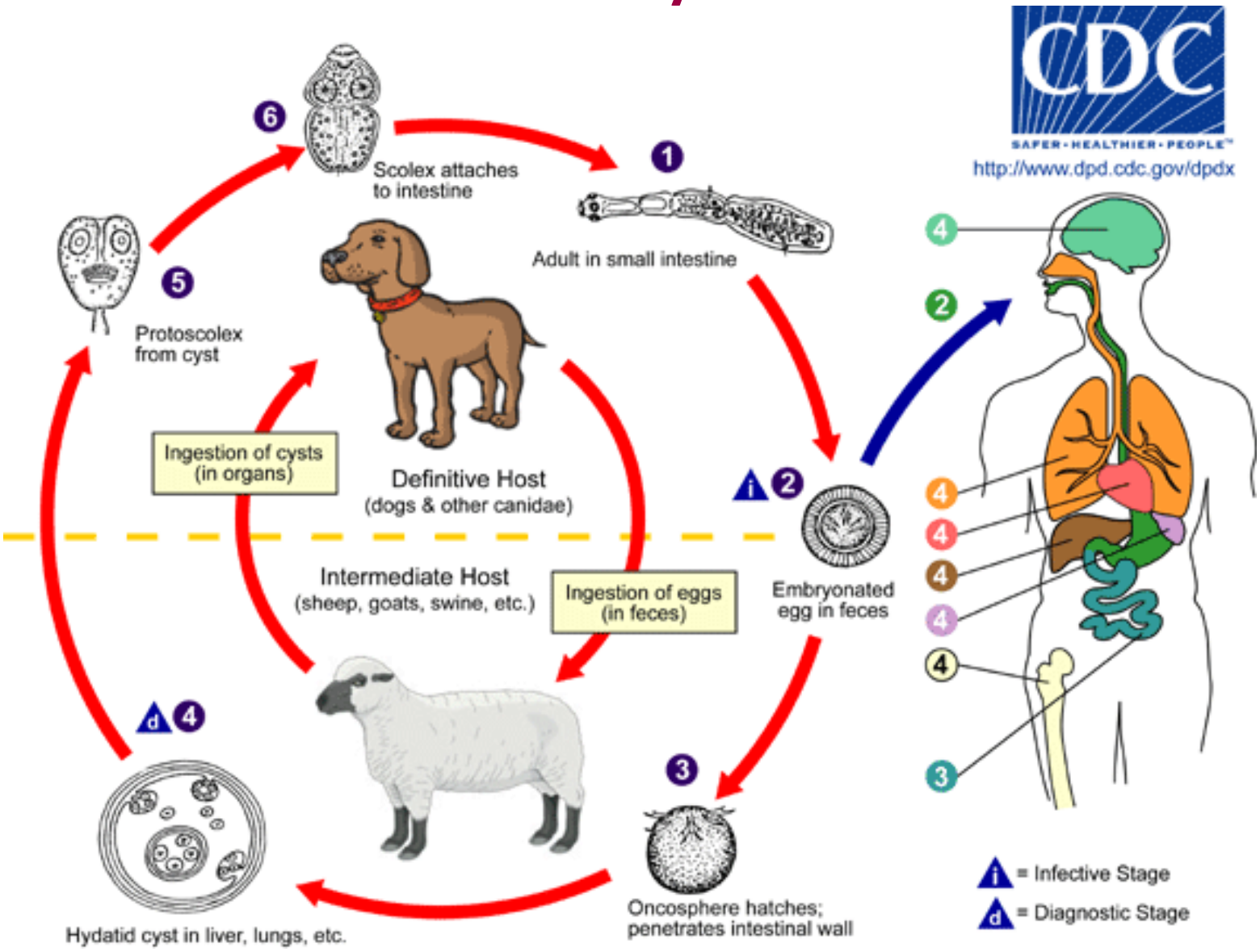
Carried to various organs



Cyst formation

Infected meat ingested by dog

Life cycle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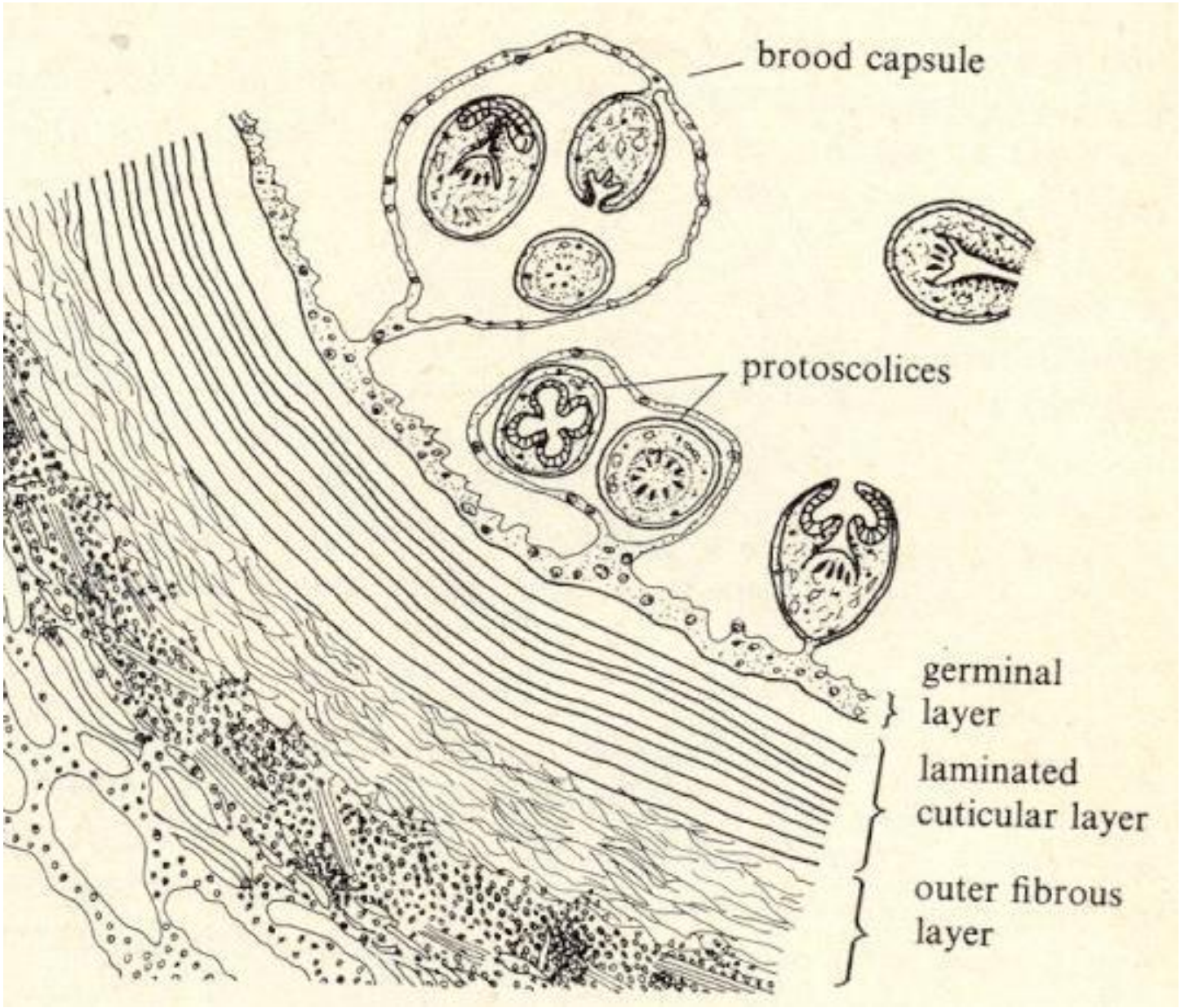
6
Scolex attaches to intestine
1
Adult in small intestine
5
Protoscolex from cyst
Ingestion of cysts (in organs)
Definitive Host
(dogs & other canidae)
i 2
Embryonated egg in feces
Intermediate Host
(sheep, goats, swine, etc.)
Ingestion of eggs (in feces)
d 4
Hydatid cyst in liver, lungs, etc.
3
Oncosphere hatches; penetrates intestinal wall
4
2
4
4
4
4
4
3
i = Infective Stage
d = Diagnostic Stage

Transmission

- Man can acquire the infection only by ingestion of eggs excreted in dog faeces
- More common in communities that have close contact between dogs & man
- Dogs acquire infection by eating infected organs in carcasses of sheep etc.
- The ungulates acquire the infection by swallowing eggs in contaminated pastures

Pathology

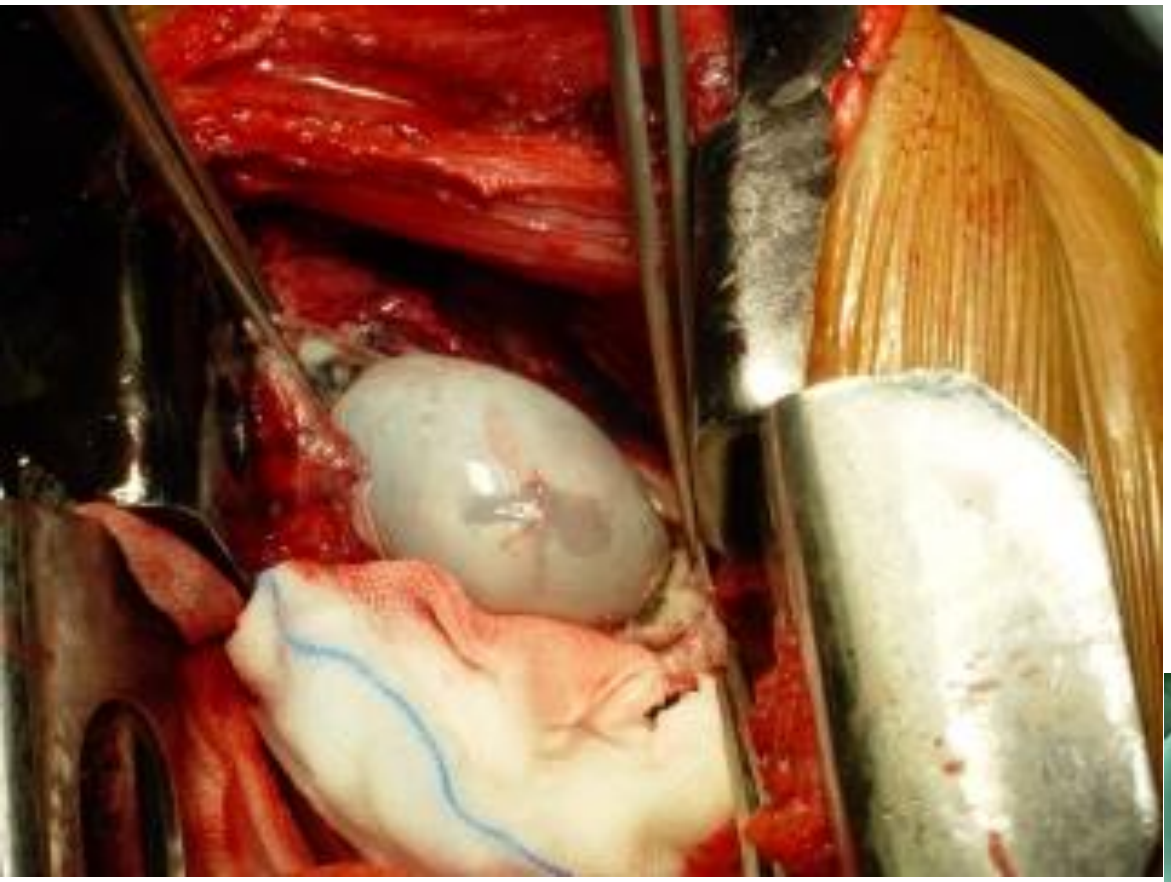
- Common sites – liver (70%), lung (20%)
- Other sites – brain, bone, omentum, peritoneum, skin & subcutaneous tissue etc.
- The cyst grows slowly (about 1cm diameter after 5 months)
- Cyst wall consists of 3 layers
  - Germinal layer – proliferates inwards towards cavity of cyst and gives rise to protoscolices, brood capsules & daughter cysts
  - Laminated layer – several layers of parasite origin
  - Outermost fibrous tissue of host origin

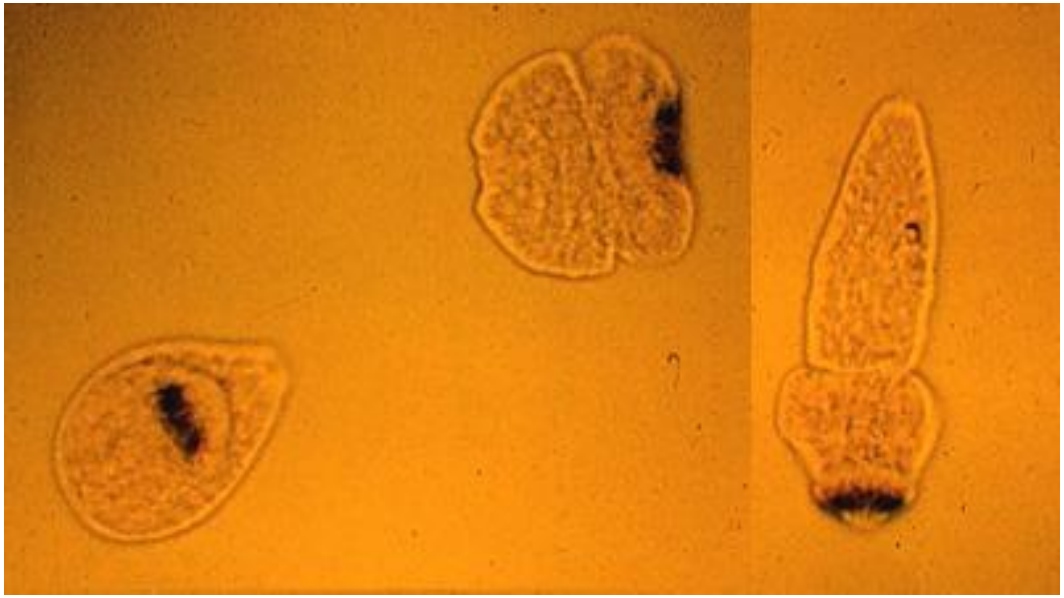


Structure of a hydatid cyst

- Brood capsules become detached and float around
- More protoscolices develop inside brood capsules
- Fluid in the cyst is rich in protein & highly allergenic
- Protoscolices if inoculated into muscle and other viscera can give rise to fresh cysts (can happen at surgery)
- They die after some time and become calcified

Hydatid cysts





"Hydatid sand"- Fluid aspirated from a hydatid cyst will show multiple protoscolices (size approximately 100 µm), each of which has typical hooklets

The protoscolices are normally invaginated (left), and evaginate (middle, then right) when put in saline.

Clinical features

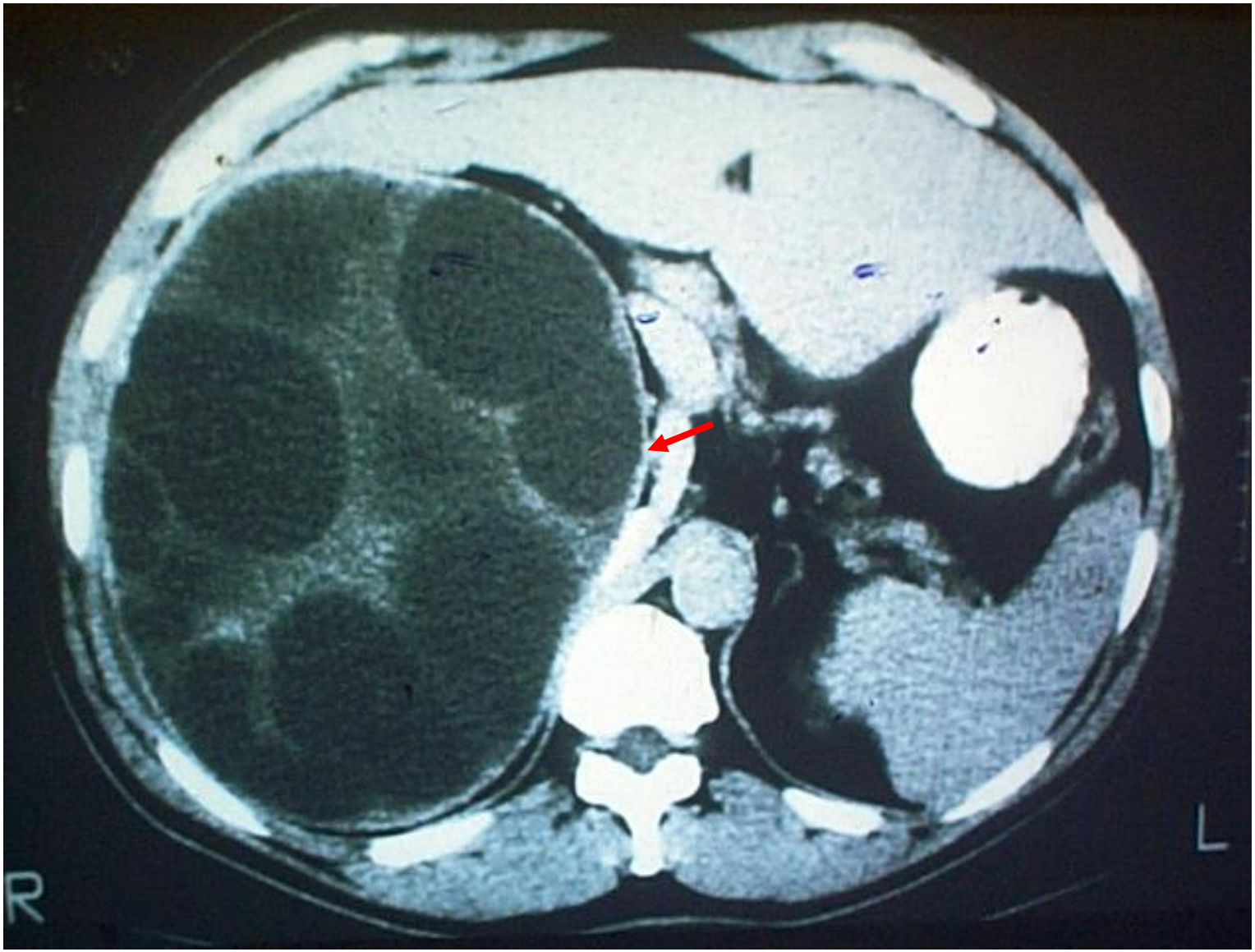
- Symptoms related to expansive growth
- Incubation period – 10 to 30 yrs except when brain or eye is involved
- Even if infected in childhood, may not become apparent before adolescence
- Cysts in liver – hepatomegaly, cholestatic jaundice, portal hypertension

Clinical features…….

- Lung – chronic cough, haemoptysis, chest pain
- Brain/spinal cord – raised intracranial pressure, paralysis
- Slow leakage of cyst fluid – urticaria
- Cyst rupture → anaphylactic shock
- Eosinophilia in 20 – 25% of cases

Diagnosis

- High degree of suspicion in endemic areas
  - Symptoms of a slowly growing tumour + eosinophilia is suggestive
- Radiology – ultrasound and CT scan very useful
- Immunodiagnosis
  - Demonstration of antibodies (sensitivity 50-80%)
  - Antigen detection (less sensitive)
- Molecular techniques – DNA probes, PCR



CAT scan showing Hydatid cyst replacing right lobe of the liver

Treatment

- Surgical
  - Single cysts may be excised, care must be taken not to spill contents ➞ risk of dissemination of protoscolices/ anaphylactic shock
  - PAIR

    Puncture (US guided)

    Aspirate (as much as possible)

    Inject (scolicidal)

    Reaspirate (after 15 minutes)
- Medical
  - Albendazole for 1-3 months is the most effective
  - May combine with Praziquantel

Epidemiology

Two types of cycles

Wild (Sylvatic)

Involving canids (jackals) & ungulates (deer/sambhur)

in Sri Lanka

East Africa

Domestic

involving sheep / camel

and dogs

Iceland, Australia

New Zealand,

South America

Prevention

- Personal hygiene in relation to contact with dogs
- Regular anthelminthic treatment of dogs (with praziquantel)
- Prevent dogs from eating carcasses of infected sheep, goat and cattle

Thank You!