

# Angiostrongylus cantonensis / Eosinophilic meningitis

## Epidemiology

### SOURCE OF INFECTION

- Humans accidentally acquire infection by consuming
  - Raw tissues of infected mollusks,
  - Ingesting improperly cooked intermediate hosts (snails and slugs),
  - Food (salad greens) contaminated by slug or snail slime or containing minute slugs,
  - Raw paratenic hosts (freshwater shrimp, land crabs, frogs) that have eaten infected mollusks.
- NOT Person-to-person

**Incubation**  
1 to 3 weeks

**Asymptomatic** rare

Not transmissible person-to-person

- Severe headache** main complaint. The headache is intermittent, intractable, bimodal, or occipital and continues throughout the clinical illness.
- Nausea, vomiting, and moderate stiffness of the neck and/or back are frequent during the early stage of disease.
- Paresthesias** of trunk and extremities commonly manifest as exaggerated sensitivity to touch and may persist for several weeks or months.
- Altered consciousness, generalized weakness and flaccid paralysis are rare. Low-grade or no fever is usual.
- Cranial nerves are rarely affected, particularly the optic and facial nerves.

Humans are incidental hosts. Passage of larvae in humans has never been documented. Larvae reach the spinal fluid and perish there.

*A. Cantonensis* causes eosinophilic meningitis characterized by eosinophils in the CSF

*A. Costa Ricensis* causes an enteritis with eosinophilic inflammation of the mesenteric arterioles of the ileocecal region of the GI tract



In humans, the third-stage larvae (approximately 500 μm in length) are transported via the bloodstream to the central nervous system where they burrow into the neural tissue, inciting an inflammatory response that eventually kills the parasites.

Eggs hatch in the lungs, then first stage larvae migrate via the trachea, then through the gastrointestinal tract to finally be passed in the rodent feces

Third stage larvae ingested by the rat

Eggs hatch in the ileum, then first stage larvae are passed in the rodent feces

First stage larvae are ingested by snails or slugs

Humans become infected through food containing third stage larvae in uncooked snails or slugs or mollusk secretions

**Paratenic hosts** that have eaten snails or slugs may carry the larvae. freshwater shrimp, land crabs, frogs) that have eaten infected mollusks.

Snails and slugs are intermediate hosts. After 2 months, the larvae reach the infective stage

A **paratenic host** a potential or substitute intermediate host that serves until the appropriate definitive host is reached, and in which no development of the parasite occurs; it may or may not be necessary to the completion of the parasite's life cycle



## Diagnosis

### LABORATORY TESTING

- Elevation of the initial CSF pressure above 200 mm of water
- Grossly opalescent or turbid (rice water), but not purulent, fluid.
- CSF contains between 500 and 2000 leucocytes/mm<sup>3</sup>
- High percentage of **eosinophils, typically 25% to 75%**. The eosinophilic pleocytosis reaches a peak around one or two week of illness and gradually resolves over several months.
- CSF **protein is elevated**
- CSF **glucose is usually normal.**
- **Peripheral eosinophilia** ranging from 15% to 50% persists for about 3 months.
- No correlation between the degree of eosinophilia in the peripheral blood and the percentage of eosinophils in the CSF.
- Serum biochemistry, electroencephalography, and cerebral angiography results are usually normal.

### DIFFERENTIAL DIAGNOSIS

- Invasion of the central nervous system by **helminthic parasites is the most common** cause, but other diseases may cause eosinophilic meningitis
- *Coccidioides immitis* disseminated disease present with eosinophilic meningitis.
- Cryptococcosis is much less common.
- Neurosyphilis, tuberculous meningitis
- Rocky Mountain spotted fever
- Viral meningitis due to acute coxsackie B4 virus or chronic lymphocytic Gnathostomiasis, baylisascariasis.
- In endemic areas, *Schistosoma japonicum*, *Paragonimus westermani*, *P. heterotrema*, *Taenia solium* cysticerci.
- Malignancies, Hodgkin's disease, non-Hodgkin's lymphoma, and eosinophilic leukemia
- Medications, ciprofloxacin, ibuprofen, intraventricular vancomycin, gentamicin, iophendylate dye used in myelography,
- Ventriculo-peritoneal shunts due to an allergic reaction to the shunt material.
- Sarcoidosis neurologic
- Idiopathic hypereosinophilic

## Treatment

### TREATMENT

- **Analgesics and sedatives** give only minimal relief. Headache usually subsides dramatically, but temporarily, following lumbar puncture.
- **Careful removal of CSF** at intervals of 3 to 7 days is therefore recommended until there is definite clinical and laboratory improvement. In more critical cases, corticosteroids may be employed to reduce cerebral pressure or to treat those with cranial nerve involvement.
- Corticosteroids do not appear to benefit mild cases.
- *A. cantonensis* is susceptible to **broad-spectrum anthelmintics**, e.g., thiabendazole, mebendazole, albendazole, and ivermectin. However, these drugs should not be used—clinical deterioration or death can result from a reaction to dead or dying worms in the brain.

### PREVENTION

Proper cooking of mollusks or paratenic hosts, and proper washing of vegetables.  
Freezing of mollusks and crustaceans at -15°C for 12 hours will destroy infective larvae of *A. cantonensis*

## Geographical Distribution

### OCCURRENCE IN LOUISIANA: EARLY DAYS

- First reported in the United States in 1985
- Probable introduction by infected rats from ships docking in **New Orleans**, Louisiana, during the mid-1980s.
- Reported in nonhuman primates and a boy from New Orleans, and in a horse from Picayune, Mississippi, a distance of 87 km from New Orleans.
- *Parastrongylus cantonensis* reported in a lemur (*Varencia variegata rubra*) from New Iberia,
- Wood rat (*Neotoma floridanus*) and 4 opossums (*Didelphis virginiana*) from Baton Rouge

### HUMAN CASE IN LOUISIANA

In March 2006, a 22 year-old living in Lafourche Parish had eaten, on a dare, two raw legs from a green tree frog. He was hospitalized suspected of having meningitis for muscle, neck and back aches and hypersensitivity to touch. The CSF showed 304 WBC / $\mu$ L with 36% eosinophils, high protein and low glucose. He was diagnosed as having eosinophilic meningitis.

### RODENT SURVEY OF NEW ORLEANS

- Study done in May 2015– February 2017;
- 696 rats trapped, 265 infected = 38%, 36% in roof rats and 44% in Norway rats
- Significant differences by neighborhood (low in French quarters, high in Bywater)
- Average intensity of infection range from 3 to 42 lung worms per rat infected

