

# Paragonimiasis

## BASIC EPIDEMIOLOGY

### Infectious Agent

*Paragonimus* species, a parasitic lung fluke (flat worm). More than 30 species of trematodes (flukes) of the genus *Paragonimus* have been reported which infect animals and humans; the most important is *P. westermani*, which occurs primarily in Asia. Although rare, human paragonimiasis from *P. kellicotti* has been acquired in the United States.

### Transmission

Transmission occurs through consumption of raw, salted, pickled, or partially cooked freshwater crabs or crayfish (crawfish) containing infectious larvae (metacercariae). The larvae are released when the crab or crayfish are digested, and then migrate within the body, most often ending up in the lungs. Infection can also be acquired by ingestion of raw meat from other infected vertebrate hosts that contain young flukes (e.g., wild boars). Transmission has also been implicated from contaminated utensils, such as knives or cutting boards. Infection is not transmitted directly from person to person.

### Incubation Period

Variable; approximately 7-12 weeks after ingestion of the infectious larvae (when flukes mature and begin to lay eggs). The long, variable, poorly defined interval until symptoms appear depends on the organ invaded and the number of worms involved.

### Communicability

Eggs may be shed by those infected for up to 20 years. Duration of infection in mollusk and crustacean hosts is unknown. Animals, such as pigs, dogs and a variety of feline species, can also harbor *P. westermani*.

### Clinical Illness

Disease most frequently involves the lungs as adult flukes living in the lung cause lung disease. Initial signs and symptoms may be diarrhea and abdominal pain followed several days later by fever, chest pain, and fatigue. The symptoms may also include a dry cough, which later becomes productive with rusty-colored or blood-tinged sputum on exertion, and pleuritic chest pain. Extrapulmonary disease is not uncommon, with flukes found in such sites as the CNS, subcutaneous tissues, intestinal wall, peritoneal cavity, liver, lymph nodes and genitourinary tract. Infection usually lasts for years, and the infected person may be asymptomatic. The symptoms of paragonimiasis can be similar to those of tuberculosis, clinically and on chest X-rays.

## DEFINITIONS

### Clinical Case Definition

Paragonimiasis (lung fluke trematode) is transmitted by eating inadequately cooked crustaceans (primarily crayfish in the US) that are infected with the parasite. Disease most frequently involves the lungs. Initial signs and symptoms may be diarrhea and abdominal pain followed several days later by fever, chest pain, and fatigue. The symptoms may also include a dry cough, which later becomes productive with rusty-colored or blood-tinged sputum on exertion, and pleuritic chest pain. X-ray findings may include diffuse and/or segmental infiltrates, nodules, cavities, ring cysts and/or pleural effusions. Extrapulmonary disease is not uncommon, with flukes found in such sites as the CNS, subcutaneous tissues, intestinal wall, peritoneal cavity, liver, lymph nodes and genitourinary tract. Infection usually lasts for years, and the infected person may be asymptomatic. Paragonimiasis may be mistaken for tuberculosis, clinically and on chest X-rays.

### Laboratory Confirmation

- Microscopic identification of *Paragonimus* eggs in feces, sputum, pleural fluid, CSF, or pus

- Identification of worms or eggs in biopsies of pulmonary, cerebral, subcutaneous, or intra-abdominal nodules or cystic lesions

### Case Classifications

- **Confirmed:** A case that is laboratory confirmed
- **Probable:** A clinically compatible case with
  - Detection of *Paragonimus* antibodies by CF, EIA, or immunoblot, **OR**
  - Positive skin test for *Paragonimus*, **OR**
  - History of ingestion of inadequately cooked crustaceans and marked eosinophilia with total WBC count in the normal range or supportive x-ray findings

## SURVEILLANCE AND CASE INVESTIGATION

### Case Investigation

Local and regional health departments should promptly investigate all reports of paragonimiasis. Investigations should include an interview of the case or a surrogate to get a detailed exposure history. Please use the Paragonimiasis Investigation Form available on the DSHS website: <http://www.dshs.state.tx.us/idcu/investigation/>.

### Case Investigation Checklist

- Confirm laboratory results meet the case definition.
- Review medical records or speak to an infection preventionist or healthcare provider to verify case definition, identify possible risk factors and describe course of illness.
- Interview the case to get detailed exposure history and risk factor information.
  - Use the **Paragonimiasis Investigation Form** to record information from the interview.
  - If the case is not available or is a child, conduct the interview with a surrogate who would have the most reliable information on the case, such as a parent or guardian.
  - Provide education to the case or his/her surrogate about effective hand washing and food safety practices. See Prevention and Control Measures.
- Fax completed forms to DSHS EAIDU at **512-776-7616**
  - For lost to follow-up (LTF) cases, please complete as much information as possible obtained from medical/laboratory records (e.g., demographics, symptomology, onset date, etc.) on investigation form and fax/e-mail securely to DSHS EAIDU and indicate the reason for any missing information.
- If case is part of an outbreak or cluster, see Managing Special Situations section.
- All confirmed case investigations must be entered and submitted for notification in the NEDSS Base System (NBS). Please refer to the *NBS Data Entry Guidelines* for disease specific entry rules.

### Prevention and Control Measures

- Routine hand washing with soap and warm water.
- Never eat raw freshwater crabs or crayfish. Cook crabs and crayfish to at least 145°F (~63°C).
- Travelers should be advised to avoid traditional meals containing undercooked freshwater crustaceans.

### Exclusions

School/child-care: No exclusions are specified for paragonimiasis but the standard exclusion for diarrhea or fever applies:

- Children with diarrhea should be excluded from school/child-care until they are free from diarrhea for 24 hours without the use of diarrhea suppressing medications.
- Children with a fever from any infection should be excluded from school/child-care for at least 24 hours after fever has subsided without the use of fever suppressing medications.

**Food Employee:** No exclusions are specified for paragonimiasis but the standard exclusion for vomiting or diarrhea applies:

- Food employees are to be excluded if symptomatic with vomiting or diarrhea until:
  - Asymptomatic for at least 24 hours without the use of diarrhea suppressing medications OR
  - Medical documentation is provided stating that symptoms are from a noninfectious condition.

Please see Guide to Excluding and Restricting Food Employees in Appendix A.

## MANAGING SPECIAL SITUATIONS

### Outbreaks/Clusters

If an outbreak is suspected, notify the appropriate regional DSHS office or DSHS EAIDU at **(512) 776-7676**.

The local/regional health department should:

- Interview all cases suspected as being part of the outbreak or cluster.
- Request medical records for any case in your jurisdiction that died, was too ill to be interviewed, or for whom there are no appropriate surrogates to interview.
- Prepare a line list of cases in your jurisdiction. Minimal information needed for the line list might include patient name or other identifier, DSHS or laboratory specimen identification number, specimen source, date of specimen collection, date of birth, county of residence, date of onset (if known), symptoms, underlying conditions, treatments and outcome of case, and risky exposures, such as consumption of freshwater crustaceans, recreational water contact or travel to an endemic country reported by the case or surrogate.

Line list example:

ID	Name	Age	Sex	Ethnicity	Onset	Symptoms	Risks	Notes
1	NT	34	F	White/non-Hispanic	12/4/16	Diarrhea, Chest Pain, Dry cough	Ate crayfish that brother purchased at a festival	Brother ill
2	PR	4	M	Unknown	11/30/16	Blood in sputum, chest pain	Attended The Crayfish festival in October	Lost to follow up (LTF)

- If the outbreak was reported in association with an apparent common risk factor (e.g., food establishment serving freshwater crustaceans, recreational body of water or travel), contact hospitals in your jurisdiction to alert them to the possibility of additional paragonimiasis cases.
- Determine the source of infection to prevent additional cases.
- Enter outbreak into NORS at the conclusion of the outbreak investigation. See Reporting and Data Entry Requirements section.

## REPORTING AND DATA ENTRY REQUIREMENTS

### Provider, School, Child-Care Facility, and General Public Reporting Requirements

Confirmed, probable and clinically suspected cases are required to be reported **within 1 week** to the local or regional health department or the Texas Department of State Health Services (DSHS), Emerging and Acute Infectious Disease Branch (EAIDU) at **(800) 252-8239** or **(512) 776-7676**.

## Local and Regional Reporting and Follow-up Responsibilities

Local and regional health departments should:

- Enter the case into NBS and submit an NBS notification on all **confirmed and probable** cases.
  - Please refer to the *NBS Data Entry Guidelines* for disease-specific entry rules.
  - A notification can be sent as soon as the case criteria have been met. Additional information from the investigation may be entered upon completing the investigation.
- Fax completed forms to DSHS EAIDU at **512-776-7616** or email securely to an EAIDU foodborne epidemiologist [FOODBORNETEXAS@dshs.texas.gov](mailto:FOODBORNETEXAS@dshs.texas.gov).

When an outbreak is being investigated, local and regional health departments should:

- Report outbreaks within 24 hours of identification to the regional DSHS office or to EAIDU at **512-776-7676**.
- Enter outbreak information into the **National Outbreak Reporting System (NORS)** at the conclusion of the outbreak investigation.
  - For NORS reporting, the definition of an outbreak is two or more cases of similar illness associated with a common exposure.
  - The following should be reported to NORS:
    - Foodborne disease, waterborne disease, and enteric illness outbreaks with person-to-person, animal contact, environmental contact, or an indeterminate route of transmission.
    - Outbreaks as indicated above with patients in the same household.
  - Enter outbreaks into NORS online reporting system at <https://wwwn.cdc.gov/nors/login.aspx>
  - Forms, training materials, and other resources are available at <http://www.cdc.gov/nors/>
- To request a NORS account, please email [FoodborneTexas@dshs.state.tx.us](mailto:FoodborneTexas@dshs.state.tx.us)
  - Please put in Subject Line: NORS User Account Request
  - Information needed from requestor: name, email address, and agency name
  - After an account has been created a reply email will be sent with username, password, and instructions for logging in.

## LABORATORY PROCEDURES

Testing for paragonimiasis is widely available from most private laboratories. Specimens are encouraged to be submitted to the DSHS laboratory for confirmation. Contact an EAIDU foodborne epidemiologist to discuss further.

### Specimen Collection

- Submit a stool specimen in a sterile, leak-proof container.
  - Required volume: Stool 15g solid or 15mL liquid.
- Fresh stools that cannot be received by the lab in less than 5 hours should be placed in formalin and PVA immediately.
- For sputum and any other specimen types (e.g., tissue section), please contact the DSHS Parasitology Lab at **512-776-7560**.

### Submission Form

- Use DSHS Laboratory G-2B form for specimen submission.
- Make sure the patient's name, date of birth and/or other identifier match exactly what is written on the transport tubes and on the G-2B form.
- Fill in the date of collection and select the appropriate test.
- If submitting as part of an outbreak investigation, check “Outbreak association” and write in name of outbreak.

- Payor source:
  - Check “IDEAS” to avoid bill for submitter

**Specimen Shipping**

- Transport temperature: May be shipped at ambient temperature or 2-8°C.
- Ship specimens via overnight delivery.
- DO NOT mail on a Friday unless special arrangements have been pre-arranged with DSHS Laboratory.
- Ship specimens to:

Laboratory Services Section, MC-1947  
Texas Department of State Health Services  
Attn. Walter Douglass (512) 776-7569  
1100 West 49th Street  
Austin, TX 78756-3199

**Causes for Rejection:**

- Specimen not in correct transport medium.
- Missing or discrepant information on form/specimen.
- Unpreserved specimen received greater than 5 hours after collection.
- Transport media was expired.
- Specimen too old.

**REVISION HISTORY**

March 2021

- Minor Edits