



# Trichinosis (Trichinellosis) Investigation Guideline

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*Attachments can be accessed through the Adobe Reader’s navigation panel for attachments. Throughout this document attachment links are indicated by this symbol ; when the link is activated in Adobe Reader it will open the attachments navigation panel. The link may not work when using PDF readers other than Adobe.*

**Revision History:**

<b>Date</b>	<b>Replaced</b>	<b>Comments</b>
05/2018	05/2014	Updated case definition, laboratory analysis section, and web links. Notification Section modified with requirements of new reporting regulations. Surveillance indicators added to Responsibilities.
05/2014	01/2010	Added notification section. References to KS-EDSS removed in 2012.

# Trichinosis (Trichinellosis)

## Disease Management and Investigative Guidelines

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### CASE DEFINITION (CDC 2014)

#### Clinical Description for Public Health Surveillance:

A disease caused by ingestion of *Trichinella* larvae, usually through consumption of *Trichinella*-containing meat—or food contaminated with such meat—that has been inadequately cooked prior to consumption. The disease has variable clinical manifestations. Common signs and symptoms among symptomatic persons include eosinophilia, fever, myalgia, and periorbital edema.

#### Laboratory Criteria for Case Classification:

##### Human Specimens

- Demonstration of *Trichinella* larvae in tissue obtained by biopsy, **OR**
- Positive serologic test for *Trichinella*

##### Food Specimens

- Demonstration of *Trichinella* larvae in the food item (probable).

#### Epidemiologic Linkage

Persons who shared the implicated meat/meal should be investigated and considered for case status as described above.

#### Criteria to Distinguish a New Case from an Existing Case

Serial or subsequent cases of trichinellosis experienced by one individual should only be counted if there is an additional epidemiologically compatible exposure. Because the duration of antibodies to *Trichinella* spp. is not known, mere presence of antibodies without a clinically-compatible illness **AND** an epidemiologically compatible exposure may not indicate a new infection especially among persons with frequent consumption of wild game that is known to harbor the parasite.

#### Case Classification

- **Suspected**  
Instances where there is no clinically compatible illness should be reported as suspect if the person shared an epidemiologically implicated meal, or ate an epidemiologically implicated meat product, and has a positive serologic test for trichinellosis (and no known prior history of *Trichinella* infection).
- **Probable**  
A clinically compatible illness in a person who shared an epidemiologically implicated meal or ate an epidemiologically implicated meat product.  
**OR**  
A clinically compatible illness in a person who consumed a meat product in which the parasite was demonstrated.
- **Confirmed**  
A clinically compatible illness that is laboratory confirmed in the patient.

## LABORATORY ANALYSIS

The suspicion of trichinellosis (trichinosis), based on history, clinical symptoms, and eosinophilia, can be confirmed by specific diagnostic tests, including antibody detection, muscle biopsy, and microscopy.

Laboratory confirmation is commonly made by detection of *Trichinella* specific antibodies in serum drawn at least 3 weeks after infection or through the identification of *Trichinella* larvae in a skeletal muscle biopsy specimen taken at least two weeks after infection.

- Negative serologic results may not accurately reflect disease status if blood was drawn less than 3 weeks from symptom onset.
  - At least two serum specimens should be drawn and tested weeks apart to demonstrate seroconversion in patients with suspected trichinellosis whose initial results were negative or weakly positive.
  - Antibody development depends on the amount of infective *Trichinella* larvae that are consumed. Levels peak in the second or third month post-infection and then decline, but may be detectable for 10 years or more following infection.
  - Immunologic tests for *Trichinella* infection have the potential for cross-reactivity with sera from patients with other conditions, especially other parasitic infections.
  - Muscle biopsies are infrequently performed, but they allow for the molecular identification of the *Trichinella* species or genotype, which is not possible with antibody testing.
- 1) Detailed laboratory diagnosis information is available at [www.cdc.gov/dpdx/trichinellosis/index.html](http://www.cdc.gov/dpdx/trichinellosis/index.html)
  - 2) Serological testing: Not available at the Kansas Health and Environmental laboratory (KHEL) but is available through various commercial laboratories or can be arranged at special request through KHEL for testing at CDC.
    - Contact the KHEL at 785-296-1653 before sending any specimens.
  - 3) Muscle biopsy sectioned and stained slides: Testing is available from commercial laboratories, and KHEL can facilitate confirmation of the parasite by working with CDC's DPDx tediagnosis network and by referring specimens to CDC's Division of Parasitic Diseases.
    - Contact the KHEL at 785-296-3718 before sending any specimens.

## EPIDEMIOLOGY

Trichinellosis occurs worldwide affecting all age groups and is dependent upon the local customs of eating and preparing pork or wild animal meat. Pork and pork products (including ground beef to which pork has been added) are the most likely source. Up to 30% of domestic cases are related to the ingestion of wild game meat. Cases are usually sporadic and outbreaks localized.

## DISEASE OVERVIEW

### A. Agent:

Caused by the intestinal roundworm, *Trichinella spiralis* (found worldwide in many carnivorous and omnivorous animals). Other species now recognized, including *T. pseudospiralis* (mammals and birds worldwide), *T. nativa* (Arctic bears), *T. nelsoni* (African predators and scavengers), and *T. britovi* (carnivores of Europe and western Asia).

### B. Clinical Description:

Light infections may be asymptomatic. Intestinal invasion can be accompanied by gastrointestinal symptoms (diarrhea, abdominal pain, vomiting). Larval migration into muscle tissues (one week after infection) can cause periorbital and facial edema, conjunctivitis, fever, myalgia, splinter hemorrhages, rashes, and blood eosinophilia. Larval encystment in the muscles causes myalgia and weakness. Occasional life-threatening manifestations include myocarditis, central nervous system involvement, and pneumonitis.

### C. Reservoirs:

Swine, dogs, cats, horses, rats and many wild animals, including fox, wolf, bear, polar bear, wild boar and marine mammals in the Arctic.

### D. Mode(s) of Transmission:

Infection is acquired by ingesting meat containing cysts (encysted larvae) of *Trichinella*. Rats and rodents are primarily responsible for maintaining the endemicity of this infection. Carnivorous/omnivorous animals, such as pigs or bears, feed on infected rodents or meat from other animals. Humans are accidentally infected when eating improperly processed meat of these carnivorous animals (or eating food contaminated with such meat).

### E. Incubation Period:

GI symptoms: 1-2 days after ingestion. Systemic symptoms: 8-15 days, with range 5-45 days depending on the number of cysts ingested.

### F. Period of Communicability:

It is not transmissible from person-to-person. Animal hosts may remain infective for months and meat from these animals remains infective until sufficient cooking, freezing or irradiation kills the larvae.

### G. Susceptibility and Resistance:

Universal susceptibility. Infection often results in partial immunity.

### H. Treatment:

Corticosteroids may be given for severe symptoms plus albendazole or mebendazole is recommended for treatment. Neither albendazole nor mebendazole is effective for *Trichinella* larvae already in the muscles, and neither drug is approved by the US Food and Drug Administration (FDA) for trichinellosis.

[www.cdc.gov/parasites/trichinellosis/health\\_professionals/index.html#dx](http://www.cdc.gov/parasites/trichinellosis/health_professionals/index.html#dx)

## NOTIFICATION TO PUBLIC HEALTH AUTHORITIES

Suspected cases of Trichinellosis shall be reported within 24 hours, except if the reporting period ends on a weekend or state-approved holiday, the report shall be made by 5:00 p.m. on the next business day after the 24-hour period:

1. Health care providers and hospitals: report to the local public health jurisdiction or KDHE-BEPHI (see below)
2. Local public health jurisdiction: report to KDHE-BEPHI (see below)
3. Laboratories: report to KDHE-BEPHI (see below)

**Kansas Department of Health and Environment (KDHE)  
Bureau of Epidemiology and Public Health Informatics (BEPHI)  
Phone: 1-877-427-7317                      Fax: 1-877-427-7318**

### **Further responsibilities of state and local health departments to the CDC:**

*As a nationally notifiable condition, trichinellosis cases require a ROUTINELY NOTIFIABLE report to the Center of Disease Control and Prevention (CDC).*

- **Local public health jurisdiction** will report information requested on the disease reporting forms as soon as possible, completing the forms within 5 days of receiving a notification of a report.
- KDHE-BEPHI will file an electronic case report the next regularly scheduled electronic transmission. (KDHE-BEPHI files electronic reports weekly.)

## INVESTIGATOR RESPONSIBILITIES

- 1) [Report](#) all confirmed, probable and suspect cases to the KDHE-BEPHI.
- 2) Contact medical provider to collect additional information and confirm diagnosis using current [case definition](#).
  - Collect all information requested in [Step 1\)](#) of case investigation.
  - Ensure that case is aware of his/her diagnosis.
- 3) Continue the [case investigation](#) starting within 3 days of receiving a report.
  - Complete the initial case investigation within 5 days of a report.
  - Complete an interview with the case to collect information requested on the [Trichinosis Worksheet](#).
- 4) Conduct [contact investigation](#) to locate additional cases and/or contacts.
  - Only contacts at high risk of acquiring infection require follow-up.
- 5) Identify whether the source of infection is major public health concern,
- 6) Initiate control and prevention measures to prevent spread of disease.
  - Work with proper regulatory authorities for commercial food products.
  - Hold suspected food products for possible laboratory analysis.
  - Prohibit further use of the potentially contaminated product.
- 7) [Record](#) data, collected during the investigation, in the KS EpiTrax system.
- 8) As appropriate, distribute the disease [fact sheet](#).

## STANDARD CASE INVESTIGATION AND CONTROL METHODS

The [Rapid Assessment Worksheet](#) helps organize and collect important data.

### Case Investigation

- 1) Contact the medical provider who reported or ordered testing of the case to obtain the following from the patient's medical records.
  - Identify if the patient was ill with symptoms of trichinellosis.
    - If yes, record onset date of illness
    - Record symptoms.
  - Examine the laboratory testing that was done and determine if further laboratory testing is needed.
  - Collect case's demographic data and contacting information (birth date, county, sex, race/ethnicity, address, phone number(s))
  - Record hospitalizations: location and duration of stay
  - Note complications.
  - Record outcomes: survived and date of recovery or date of death
- 2) Interview the case to determine source, risk factors and transmission settings:
  - Focus on incubation period 1 to 45 days prior to symptoms.
  - Examine any exposure to pork or pork products, ground beef or wild game meat, including jerky.
    - Obtain dates of exposure.
    - Source of product.
    - Method of food preparation.
  - Examine travel history, destinations and dates of exit and entry to Kansas.
  - Determine if the case's occupation or activities may have resulted in contact with any of the at-risk food or animal tissues listed above.
  - Collect information from case for the [Contact Investigation](#). (See below).
  - For suspected food items that are still available for consumption, refer to [Environmental Measures](#) below.
- 3) Investigate epi-links among cases (clusters, household, co-workers, etc).
  - For suspected [Outbreaks](#) refer to [Managing Special Situations](#).

### Contact Investigation

**Contacts** are those exposed to the source of infection.

- 1) Identify persons who participated with the case in any of the at-risk activities listed above and contact them.
- 2) Evaluate each contact's risk of exposure to the source and determine if they are symptomatic. Symptomatic contacts should be reported as cases.

### Isolation, Work and Daycare Restrictions

Trichinellosis is not considered for quarantine or isolation under Kansas Administrative Code. All regulations or statutes pertaining to the distribution or sale of meat products are overseen by the [Kansas Department of Agriculture](#).

### Case Management

- 1) Report on any changes in patient status (i.e. dates of recovery or death).
- 2) Provide education on the basic information about the disease and prevention.

### Contact Management

- 1) Inform contacts of possible exposure, to aid in proper diagnosis and treatment.
- 2) Investigate symptomatic contacts as suspect cases.

### Environmental Measures

If the source of infection is food prepared privately for home use only, it should be disposed of properly in a manner not to allow humans or animals to eat the food.

If the source is suspected to be livestock for slaughter, a licensed or unlicensed wild game meat processor, a processing plant for pork products or a public food distributor or facility (i.e. restaurant):

- 1) Hold any suspected leftover food for possible testing. It may be necessary to test leftover product as part of the epidemiological investigation.
- 2) Notify KDHE (1-877-427-7317) who will assist with the notification and coordination with the Kansas Department of Agriculture (KDA).
- 3) Assist the KDA, as needed, on any trace backs, embargoes or product testing.

### Education

Consumers should be informed of proper storage and preparation of pork and other meats from animals possible infected with *Trichinella*. Groups whose food preferences include raw or inadequately cooked pork or wildlife are at a higher risk of trichinosis. Non-English materials may need to be prepared for certain groups.

- 1) Provide education that includes basic information about the disease and its complications and ways to treat and prevent transmission of illness.
- 2) Instruct those at risk to:
  - Cook meat products to an internal temperature of 170° F.
  - Freeze pork less than 6 inches thick for 20 days at 5° F to kill any worms.
  - Cook wild game meat thoroughly. Freezing wild game meats, unlike pork products, even for long periods of time, may not effectively kill all worms.
  - Cook all meat fed to pigs or other wild animals.
  - Do not allow hogs to eat uncooked carcasses of other animals, including rats, which may be infected with trichinosis.
  - Clean meat grinders thoroughly if you prepare your own ground meats.
  - Curing (salting), drying, smoking, or microwaving meat does not consistently kill infective worms.
  - Counsel contacts to watch for signs or symptoms occurring within 45 days of exposure. Should symptoms develop, medical care should be sought.

## MANAGING SPECIAL SITUATIONS

### A. Outbreak Investigation:

- 1) Outbreak: The investigator should consider the possibility of an outbreak when there is an unusual clustering of cases in time and/or space.
- 2) Notify KDHE immediately, 1-877-427-7317.
- 3) Hold suspected food products for possible laboratory analysis as part of the epidemiological investigation.
- 4) Case finding will be an important part of any investigation.

## DATA MANAGEMENT AND REPORTING TO THE KDHE

- A. Accept the case assigned to the LHD and record the date the LHD investigation was started on the [\[Administrative\]](#) tab.
- B. Organize and collect data, using appropriate data collection tools including:
  - The [Trichinosis Worksheet](#) can be used to collect information.
  - Alternatively, investigators can collect and enter all required information directly into EpiTrax [\[Investigation\]](#), [\[Clinical\]](#), [\[Demographics\]](#), [\[Epidemiological\]](#) tabs.
  - During outbreak investigations, refer to guidance from a KDHE epidemiologist for appropriate collection tools.
- C. Report data collected during the course of the investigation via EpiTrax.
  - Verify that all data requested on the [Trichinosis Worksheet](#) has been recorded on an appropriate EpiTrax [\[tab\]](#), or that actions are completed for a case lost to follow-up as outlined below.
  - Some data that cannot be reported on an EpiTrax [\[tab\]](#) may need to be recorded in [\[Notes\]](#) or scanned and attached to the record.
  - Paper report forms do not need to be sent to KDHE after the information is recorded and/or attached in EpiTrax. The forms should be handled as directed by local administrative practices.
- D. If a case is lost to follow-up, after the appropriate attempts to contact the case have been made:
  - Indicate 'lost to follow-up' on the [\[Investigation\]](#) tab with the number of attempts to contact the case recorded.
  - Record at least the information that was collected from the initial reporter.
  - Record a reason for 'lost to follow-up' in [\[Notes\]](#).
- E. After the requirements listed under [Case Investigation](#) have been completed, record the "Date LHD investigation completed" field located on the [\[Administrative\]](#) tab.
  - Record the date even if the local investigator's [Case](#) or [Contact Management](#) for the contact is not "Complete".
- F. Once the entire investigation is completed, the LHD investigator will click the "Complete" button on the [\[Administrative\]](#) tab. This will trigger an alert to the LHD Administrator so they can review the case before sending to the state.
  - The LHD Administrator will then "Approve" or "Reject" the CMR.
  - Once a case is "Approved" by the LHD Administrator, BEPHI staff will review and close the case after ensuring it is complete and that the case is assigned to the correct event, based on the reported symptoms reported.

## ADDITIONAL INFORMATION / REFERENCES

- A. **Treatment / Differential Diagnosis:** American Academy of Pediatrics. Red Book: 2015 Report of the Committee on Infectious Diseases. 30th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2015.
- B. **Epidemiology, Investigation and Control:** Heymann. D., ed., Control of Communicable Diseases Manual (CCDM), 20th Edition. Washington, DC, American Public Health Association, 2015.
- C. **Case Definitions:** CDC Division of Public Health Surveillance and Informatics, Available at: [www.cdc.gov/NNDSS/](http://www.cdc.gov/NNDSS/)
- D. **Kansas Regulations/Statutes Related to Infectious Disease:** [www.kdheks.gov/epi/regulations.htm](http://www.kdheks.gov/epi/regulations.htm)
- E. **Additional Information (CDC):** [www.cdc.gov/parasites/trichinellosis/](http://www.cdc.gov/parasites/trichinellosis/)

## ATTACHMENTS

- **Factsheet**

To view attachments in the electronic version:

1. Go to <View>; <Navigation Pane>; <Attachments> – OR – Click on the “Paper Clip”  icon.
2. Double click on the document to open.

**Trichinosis Rapid Assessment Worksheet for the Local Investigator**  
(Please refer to the Disease investigation Guideline for additional guidance.)

SYMPTOMS(S)	Unk.	No	Yes	Onset Date	SYMPTOMS(S)	Unk.	No	Yes	Onset Date
Eosinophilia					Diarrhea				
Fever					Abdominal Pain				
Myalgia					Vomiting				
Periorbital edema					List any other symptoms of trichinosis present:				
Facial edema									
If available, record recovery date:									

*Record the earliest symptom onset associated to trichinosis on the General Investigation Form. Describe signs and symptoms in NOTES. For GI symptoms, consider at-risk activities 1-2 days before onset. For systematic symptoms, consider at-risk activities 5-45 days before onset.*

LABORATORY TESTING	Collection Date	Results	Notes
Serological evidence of trichinosis		Positive / Negative	
Microscopy evidence of trichinosis		Positive / Negative	

*Laboratory results are entered into KS-EDSS by KDHE staff. To view go to laboratory tab. If no results are entered attempt to collect any results and fax to the KDHE for entry.*

COMPLICATIONS	Unk.	No	Yes	Date(s)	Location(s)
Hospitalized					
Myocarditis					
Central nervous system involvement					
Pneumonitis					
Died					

*Record information on hospitalization on the General Investigation Form Hospital Information Section. Record information on other complications in NOTES.*

RISK ASSESSMENT	No	Yes	NOTES
Travel outside of the state.			<i>Destination, date of departure, date of return</i>
Handled or ate raw/under-cooked pork or pork products.			<i>Type, date of exposure, brand/source, how food was prepared. and cooked</i>
Handled or ate raw/under-cooked hamburger or wild game meat including jerky.			<i>Type, date of exposure, brand/source, how food was prepared. and cooked</i>
Any of the at-risk foods above eaten or obtained from a commercial source?			<i>Location/description of source and date food obtained.</i>
At-risk occupations or hobbies.			<i>Describe, including date of exposure</i>
Anyone else ill with similar symptoms?			<i>List who, relation to case, contact info and symptoms.</i>