

- ## Transmission
- Common sources of infection include:
    - Surfaces such as bathroom fixtures, changing tables and toys contaminated with infected feces
    - Drinking water or ice made from sources contaminated with infected feces including lakes, stream or wells
    - Swallowing water from recreational sources including swimming pools, hot tubs and fountains contaminated with infected feces
    - Eating uncooked food contaminated with the parasite

- ## *Giardia lamblia*
- ### Acute Illness
- *G. lamblia* cysts are highly infectious, and as few as 10 cysts can cause an infection in an individual.
  - Average incubation period (ingestion of cysts to first symptoms): One week
  - Average duration of infection: 2-6 weeks (if left untreated)

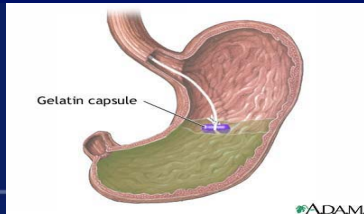
- ## *Giardia lamblia*
- Symptoms Include:
    - Gastrointestinal Symptoms:
      - Sudden onset of explosive watery diarrhea, abdominal cramps
      - Foul flatus
      - Vomiting
      - Stools become malodorous, mushy, and greasy.
      - Watery diarrhea may alternate with soft stools or even constipation
      - Stools do not contain blood or pus.
    - Upper GI symptoms including:
      - Cramping
      - Nausea
      - Anorexia
      - Bloating
      - Substernal burning
      - Acid indigestion

- ## *Giardia lamblia*
- ### Acute Illness
- Constitutional symptoms are also common including:
    - Fatigue
    - Malaise
    - Weight loss
      - Weight loss occurs in more than 50% of patients and averages 10 pounds per person
  - Chronic illness may occur with adults presenting with long-standing malabsorption syndrome and children with failure to thrive.

- ## *Giardia lamblia*
- ### Diagnosis
- Microscopically:
    - by identifying cysts in stool samples using trichrome or iron hematoxylin staining.
      - More than one sample is recommended (at least 3 stool samples with two days between each), since the presence of cysts in the stool can be highly irregular, and cysts may not be present until a week after symptoms appear.
  - An Enzyme-Linked Immunosorbent Assay (ELISA)
    - may be used to detect *Giardia* antigens in the stool, and is commercially available (highly sensitive).

## Diagnosis

- String test (used for difficult to diagnose cases)
  - A patient swallows a gelatin-coated capsule with a string attached, and when it is passed into the small intestine, trophozoites stick to the string.
  - The string is then removed and examined microscopically for the trophozoites.



Public Health Nursing Home Visit Protocol  
Home visit as necessary – a face to face interview is conducted as necessary.

Refer to "Public Health Nursing Home Visit AS NECESSARY (HVNH) Algorithm" (B-23 Part IV Public Health Nursing Home Visit Protocol).

Investigation is required for outbreaks and for single cases. (these investigations within 3 days).

**CASE:**

1. **Sensitive Occupation:** If symptomatic, remove from work or day care until asymptomatic and on therapy. Release specimens are not mandated.

For cases in day care, question operator about symptoms among staff and other children. Symptomatic children and staff should be excluded, screened, and treated if necessary. Asymptomatic persons should not be screened since treatment is not indicated for asymptomatic carriers.

2. **Non-sensitive Occupation or Situation:** Case may be closed without release specimens provided household contacts are not symptomatic and in sensitive occupations.

**CONTACTS:**  
Household members or persons who share a common-source exposure should be tested only if symptomatic; if positive, handle as a case; if negative or asymptomatic, no restrictions.

**CARRIER:**  
Refer to treatment above. Release as for case.

**PREVENTION/EDUCATION**

1. Stress hand washing and personal hygiene.
2. Dispose of feces properly.
3. Boil or disinfect water (chlorine or iodine tablets) of unknown potability, e.g., during international travel and when hiking or camping.

4. Advise about the risk of anal intercourse and oral-anal sexual practices.

5. Stress importance of proper hygiene regarding handling and disposal of pet feces.

6. Stress bathing before recreational water use, avoid accidental swallowing of recreational water.

**DIAGNOSTIC PROCEDURES**

1. **Microscopic:**
  - Container: Feces-Parasite
  - Laboratory Form: TEST REQUISITION FORM # 3921
  - Examination Requested: Giardiasis. Check appropriate boxes on laboratory form.
  - Material: Feces. Follow collection instructions provided with container.
  - Storage: Do not refrigerate; protect from overheating.
  - Remarks: Mix thoroughly with PVA preservative. Do not collect specimens for 7-10 days after defecum; mineral oil, lanolin, antibiotics, antacids, or antimicrobial preparations such as kaolin have been reported.
2. **Antigen Detection:**
  - Container: Feces-Parasite
  - Laboratory Form: TEST REQUISITION FORM # 3921
  - Examination Requested: Giardiasis. Check appropriate boxes on laboratory form.
  - Material: Feces in 10% formalin.
  - Storage: Do not refrigerate; protect from overheating.

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## Giardia lamblia Treatment

- Most infections are self-limited and will clear within 4 weeks.
- Prescription drugs available for treatment:
  - Metronidazole
  - Tinidazole
  - Nitazoxanide (has provided some encouraging results in the management of giardiasis in children)

## Giardia lamblia Epidemiology

- *Giardia* is one of the most common intestinal parasites in the world.
- There are estimates that there may be as many as 2.5 million cases each year of *Giardia lamblia* in the US alone.
- The parasite poses a serious threat in less developed countries, and exists at very high prevalence rates in places with poor water sanitation.

## Giardia lamblia Epidemiology

Commonly associated with:

- Hikers and backpackers:
  - Getting diarrhea after drinking untreated water in the wilderness.
- Daycare and Nursery settings
  - Outbreaks can be focused in these locations infecting children under 5 years old--and their caregivers--the most.
- International travelers
  - Recent immigrants have the same risk factors as international travelers
- Recreational water users

## Giardia lamblia Prevention

For an infected individual:

- Hand washing with soap and water after using the toilet, handling childrens' diapers and before handling food
- Restriction of swimming activities in recreational water while a person has diarrhea and for 1 week after diarrhea stops

## *Giardia lamblia* Prevention

To help prevent infection from occurring:

- Practice good hygiene
- Avoid food or water that might be contaminated
  - Untreated water from lakes, rivers and ponds
- If necessary to consume potentially contaminated water, boil for at least 1 minute or treat with chlorination or iodination before consumption
  - though due to the amount needed of these chemicals to properly treat, this method can be less effective

## CRYPTOSPORIDIOSIS

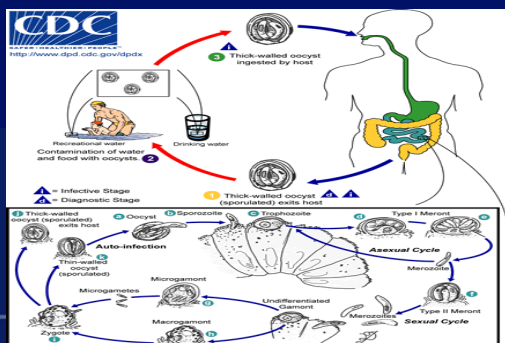
## *Cryptosporidium parvum*

- Cryptosporidiosis (aka “Crypto”) is caused by the intracellular protozoal parasite *Cryptosporidium parvum*.
- It is most commonly found in contaminated water, food, or soil.

## *Cryptosporidium parvum* Transmission

- Crypto lives in the intestine of infected humans or animals and the parasites are shed in the stool of an infected individual
- Crypto is found on surfaces or in soil, food, or water that has been contaminated with the feces from infected humans or animals
- Humans become infected upon accidental consumption of the parasite

## *Cryptosporidium parvum*



## *Cryptosporidium parvum* Acute Illness

- Average incubation period: 7 days (but can range from 1 to 12 days).
- Duration: Symptoms can last anywhere from a few days to a few weeks.

## *Cryptosporidium parvum* Acute Illness

- The most common symptom is watery diarrhea.
- Other possible symptoms include:
  - Dehydration
  - Weight loss
  - Stomach cramps or pain
  - Fever
  - Nausea
  - Vomiting
  - Coughing
  - Low-grade fever

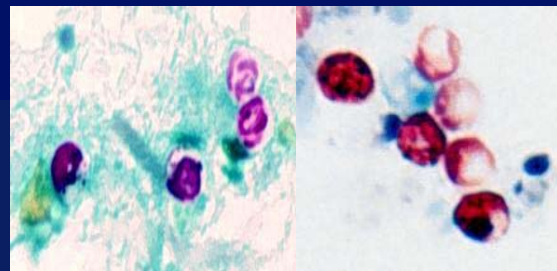
## *Cryptosporidium parvum* Acute Illness

- Although this may be the norm, there are still many patients with Cryptosporidiosis that are asymptomatic.
- It is possible that an infection caused by *Cryptosporidium* may affect respiratory, tracheal, and intestinal tracts.

## *Cryptosporidium parvum* Diagnosis

- Microscopic examination of stool after special concentration and staining
- Detection of various life cycles in intestinal biopsy
- Antigen Detection

## *Cryptosporidium parvum* Diagnosis



**Public Health Ontario Disease Control Manual (D17)**  
**Cryptosporidium parvum**

**CASE:**

1. **Respective Occupation:** Healthcare should be conducted based on cases of hygiene and severity of symptoms. If severely symptomatic, remove from SCG and diarrhea is reduced. Occupational symptoms are not restricted. Chronically immunocompromised patients are advised to avoid recreational activities from SCG may be appropriate only for cases that demonstrate poor hygiene and no ability to improve their practice.
2. **Non-sensitive Occupation or Situation:** Cases may be allowed without release requirements. Limited household contacts are not symptomatic and in sensitive occupations.

**CONTACTS:**

Household members or persons who share a common social exposure should be tested only if symptomatic. If positive, handle as a case. If negative or asymptomatic, no restrictions.

**CARRIERS:**

Immunocompromised patients remain infected indefinitely.

**PREVENTION/EDUCATION**

1. Stress hand washing and personal hygiene.
2. Advise about increased risk with genital and anal sex.
3. Change of toys in a safe, sanitary fashion.
4. Take precautions with food and water when leaving the residence area.
5. Advise regarding risk associated with aquatic recreation.
6. Protect water supply from fecal contamination.

**DIAGNOSTIC PROCEDURES**

1. **Microscopic:**
  - Container: Faeces/Faecate.
  - Laboratory Forms Test Request/Initial Form 93-3021 (Rev. 9/07) or order request form.

**EXAMINATION REQUESTED:** Cryptosporidium. Check appropriate boxes on laboratory form.

**Material:** Faeces. Follow instructions provided with container.

**Amount:** 20-30 ml liquid stool.

**Storage:** Do not refrigerate, protect from sunlight.

**Recovery:** Mix thoroughly with 10% preservation. Do not collect specimens for 2-3 days after return, except all sexually transmitted infections or enteric bacterial infections, such as those have been reported.

2. **Antigen Detection:**
  - Container: Faeces/Faecate.
  - Laboratory Forms Test Request/Initial Form 93-3021 (Rev. 9/07) or order request form.

**Examination Requested:** Cryptosporidium.

**Material:** Faeces in 10% formalin.

**Amount:** 20-30 ml.

**Storage:** Do not refrigerate, protect from sunlight.

**Public Health Ontario**

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## *Cryptosporidium parvum* Treatment

- Fluid and electrolyte replacement
  - To manage rapid fluid loss due to diarrhea
- Prescription drugs:
  - Nitazoxanide to treat diarrhea (for immunocompetent patients)
    - The effectiveness of nitazoxanide in immunosuppressed persons is unclear.
- Infection in healthy, immunocompetent persons is self-limited.
- Immunocompromised persons and those in poor health are at highest risk for severe illness.

## *Cryptosporidium parvum* Epidemiology

- Since the first reports of human cases in 1976, *Cryptosporidium* has been found worldwide.
- Outbreaks of cryptosporidiosis have been reported in several countries, the most remarkable being a waterborne outbreak in Milwaukee in 1993, that affected more than 400,000 people.



## *Cryptosporidium parvum* Epidemiology

- People at greater risk of exposure:
  - Children who attend day care centers
  - Child care workers
  - International travelers
  - Hikers and backpackers
  - Recreational water users
  - People who handle infected cattle
  - Recent immigrants
  - Those engaging in oral-anal sex
  - Those engaging in colonic irrigation



## *Cryptosporidium parvum* Prevention

- Cryptosporidiosis control involves:
  - Effectively purifying water
    - Use of water filtration systems (best method) with a pore size of 1 micron or less.
    - Use of appropriate levels of chemical treatments
  - Notifying the public when and where an outbreak is present
  - Research to develop a vaccine
    - There is no vaccine currently available for humans.



## *Cryptosporidium parvum* Prevention - Obstacles

- *Cryptosporidium* parasites are very small and resistant to many conventional purifying methods such as chlorination, ozonation, and UV exposure
- The oocysts have hard shells that are not easily damaged by chlorine.
  - This is why swimming in a contaminated recreational facility is especially dangerous.

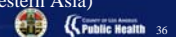


## TRICHINELLOSIS



## *Trichinella* spp.

- Trichinellosis (trichinosis) is caused by nematodes (roundworms) of the genus *Trichinella*.
- In addition to the classical agent *T. spiralis* (found worldwide in many carnivorous and omnivorous animals), several other species of *Trichinella* are now recognized, including:
  - *T. pseudospiralis* (mammals and birds worldwide)
  - *T. nativa* (Arctic bears)
  - *T. nelsoni* (African predators and scavengers)
  - *T. britovi* (carnivores of Europe and western Asia)

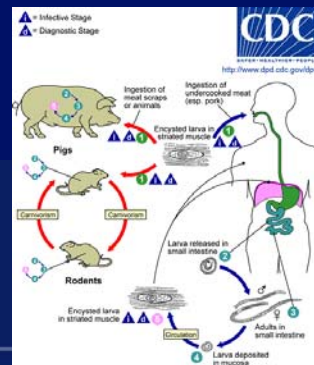




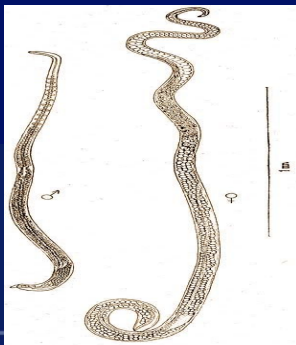
## Transmission

- Trichinellosis infection is caused by eating raw or undercooked meat of animals infected with the encysted larvae of a *Trichinella* worm
  - When a human or animal eats meat containing an infective *Trichinella* cyst, the acid in the stomach or the individual dissolves the hard covering of the cyst and releases the worm
  - The worms then pass into the small intestine and in 1-2 days become mature, at which point the females lay eggs. Eggs develop into mature worms and are transported to muscles (via arteries), where they encyst.
- Infection occurs commonly in wild carnivores but may also occur in domestic pigs

## *Trichinella* spp.



## *Trichinella* spp.



## *Trichinella* spp. Acute Illness

- Symptoms can include:
  - Headache
  - Muscle pain
  - Chills
  - Cough
  - Eye swelling
  - Aching joints
  - Itchy skin
  - Diarrhea
  - Constipation
- Many people may never be diagnosed since mild or moderate trichinosis is frequently mistaken for the flu or another common illness.

## *Trichinella* spp. Acute Illness

Additional Symptoms can include:

- Splinter hemorrhages of the fingernails, swelling and muscle pain (caused by larvae moving through tissue)
- Weakness and soreness (may last months after other symptoms have subsided)
- Central nervous system, heart and respiratory problems (in heavily infected individuals)
- Very rarely do severe cases cause death.

## *Trichinella* spp. Acute Illness



## *Trichinella* spp. Diagnosis

- Muscle biopsy
- EIA for IgG and IgM is very sensitive and specific
- Eosinophilia, skin tests and serologic tests may aid in diagnosis



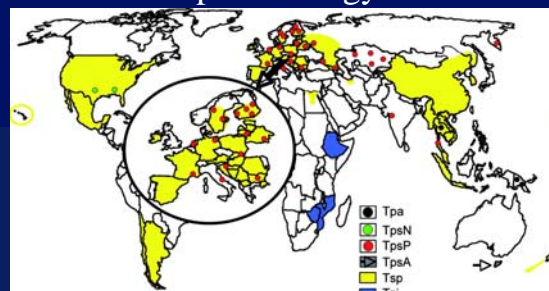
## *Trichinella* spp. Treatment

- Prescription drugs
  - Mebendazole
  - Corticosteroids are used for infections with severe symptoms,
- Treatment during the acute stage is essential since drugs can do very little once larvae have become established in the muscle.
  - The decision to treat is based upon symptoms, exposure to raw or undercooked meat, and laboratory test results.

## *Trichinella* spp. Epidemiology

- Trichinellosis is found worldwide, but it is most common in parts of Europe and the United States.
- Trichinellosis was once widespread throughout the United States, but, due to increased regulations for the meat industry, most cases in the are now limited to people who consume wild game.
- An average of 12 cases per year were reported in the US between 1997 and 2001.
  - However, most infections are never identified.

## *Trichinella* spp. Epidemiology



World map showing the distribution areas of *Trichinella spiralis* (Tsp), *Trichinella pseudospiralis* (TpsP), *T. pseudospiralis* from Europe and Asia (TpsN), *T. pseudospiralis* from Tasmania (TpsA), *Trichinella zimbabwensis* (Tzi), and *Trichinella zimbabwensis* (Tzi).

## Prevention

- Cook meat, especially pork, bear, walrus, and wild pig thoroughly (to an internal temperature of 76 °C).
  - Salting, drying, smoking or microwaving will not kill the encysted worms.
- Freeze pork less than 6 inches thick for 20 days at -15 °C.
  - Freezing is not very effective for the meat of arctic animals (eg. bears and walrus)
- Cook all meat fed to pigs and other animals and do not allow pigs to eat carcasses of rats.
- Clean all tools used to prepare meat
- Feral pig and wild game hunters should be particularly cautious since *Trichinella* is common among many scavengers and carnivores

## *Trichinella* spp. Prevention

- Many factors have contributed to the decline in *Trichinella* infection:
  - Better regulation of the meat industry has greatly reduced the incidence of trichinosis in the United States and legislation prohibits feeding uncooked garbage and meat products to pigs.
  - Increased meat inspection has also prevented contaminated pork from entering the marketplace.
  - Public awareness in encouraging people to freeze and cook pork thoroughly.

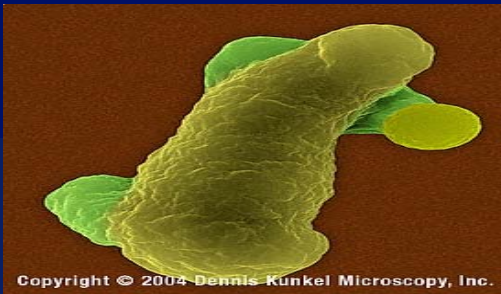


## AMEBIASIS

## *Entamoeba histolytica*

- Amebiasis or Amebic dysentery is caused by the pathogenic protozoa, *Entamoeba histolytica*, which can be associated with intestinal and extraintestinal infections.
- Several protozoan species in the genus *Entamoeba* infect humans, but not all of them are associated with disease.
  - The other species are important because they may be confused with *E. histolytica* in diagnostic investigations.

## *Entamoeba histolytica*



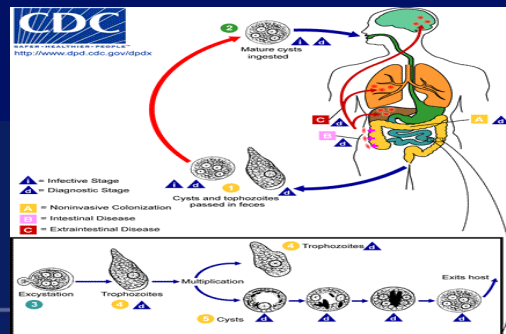
## Transmission

- People acquire *E. histolytica* through accidental consumption of mature cysts. This can occur through:
  - Accidental consumption of cysts from fecally contaminated food or water
    - Fruits and vegetables watered with contaminated water are often a source of outbreaks of amebiasis.
  - Touching and bringing to your mouth infective cysts picked up from surfaces contaminated with *E. histolytica*

## Transmission

- An infected individual sheds both the mature cysts and the trophozoite form of the parasite in their stool.
- Only the mature cyst form is infectious.
  - The trophozoite form are quickly destroyed outside of the body.
- Once a mature cyst is swallowed, trophozoites are released in the small intestine, which migrate to the large intestine and form cysts, which are then shed in stool.

## *Entamoeba histolytica*



## Acute Illness

- The infectious dose is unknown, but theoretically, one cyst is capable of causing infection.
- Incubation period: Usually 2-4 weeks after exposure (may be anywhere from a few days to a few months)
- Symptoms can include:
  - Fever
  - Chills
  - Diarrhea
    - can be bloody or contain mucus
  - Cramps
- Only about 10-20% of people infected become sick while many people only have mild abdominal discomfort. Some people carry the parasite for weeks to years, often without symptoms.

## Complications

- Rarely, trophozoites may invade the liver, lung or brain or perforate the colon causing septicemia
  - Hepatic amebiasis is the most common complication
  - Cerebral amebiasis is fatal
  - Fulminant amebic colitis has a mortality rate of more than 50%.
  - Pleuropulmonary amebiasis has a mortality rate of 15-20%
  - Amebic pericarditis has a case fatality rate of 40%.

## Entamoeba histolytica Diagnosis

- Microscopic identification of cysts and trophozoites in the stool
  - This can be accomplished using:
    - Fresh stool: wet mounts and permanently stained preparations (e.g., trichrome).
    - Concentrates from fresh stool: wet mounts, with or without iodine stain, and permanently stained preparations (e.g., trichrome).
- Serology
  - used for extra-intestinal disease only

## Entamoeba histolytica Diagnosis



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**8. Sexual orientation.**

**a. History of sexual ingestion, when and where.**

**b. Investigation from or travel to a identifying country within 6 months prior to onset. Specific dates and places.**

**c. Exposure to contact and other persons with diarrhea illness within incubation period.**

**d. Occupation of case and household members.**

**e. Residence in facility for the development of disease.**

**f. Attendance in day care.**

**CONTROL OF CASE, CONTACTS & CARRIERS**

Consult within 24 hours to determine if sensitive individual or situation (SOS) involved. Otherwise, investigate within 3 days.

**Public Health Nursing Home (PHN) Program**

Home visit as necessary -- a form to be returned is collected as necessary.

Refer to Public Health Nursing Home Visit AS NECESSARY (Priority) Algorithm (p. 72) Part IV Public Health Nursing Home Visit Protocol.

**CASE**

Presumptive. Initiate procedures until clinical recovery.

**1. Sensitive Occupation or Situation.** Advise case to limit exposures, and other SOS. Introduce hand disinfection, soap, 2 or more days apart, or regularly by soap. Hand disinfection may be later after patient is no longer infectious for 4 days. Alternatively, if an E. histolytica EIA test is negative, the patient does not have amebiasis and is no longer a case. See Diagnostic Procedures below.

**2. Non-sensitive Occupation or Situation.** Advise after clinical recovery unless household contacts are food employees.

**CONTACTS**

Isolated members of persons who share a common home.

**1. Sensitive Occupation or Situation.**

**a. Symptomatic.** Treat as a case.

**b. Asymptomatic.** Clearance not recommended.

**2. Non-Sensitive Occupation or Situation.** Clearance not recommended.

**CARRIERS**

Refer for treatment. Release as for case.

**PREVENTION/EDUCATION**

**1. Stress hand washing and personal hygiene.**

**2. Advise avoid increased risk with anal and oral sex.**

**3. Dispose of feces in a safe, sanitary fashion.**

**4. Take precautions with food and water when traveling to endemic areas.**

**5. Advise reporting risk associated with animal ingestion.**

**6. Provide water supply from local contamination.**

**DIAGNOSTIC PROCEDURES**

**1. Microbiology**

**Container:** Feces/Ferrous Laboratory Form: Test Request/Part 1 (RST) (Rev. 08/11)

**Examination Requested:** Ova & Parasites (O&P), for amebiasis. Check appropriate boxes on laboratory form.

**Method:** Feces. Follow instructions provided with container.

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**Amount:** Watery stool.

**Storage:** Do not refrigerate; protect from overexposure.

**Remarks:** Mix thoroughly with PVA preservative. Do not collect specimens for 7-10 days after surgery, mineral oil, stomach, antibiotics, anti-motility or anti-diarrheal preparations such as loperamide have been ingested. Specimen must be unrefrigerated and examined within 24 hours of passage.

**Note:** This test does not distinguish between *E. histolytica* and nonpathogenic *E. dispar*. A serum **AMEBASER** stool sample can be submitted for *E. histolytica* EIA test to distinguish between the two. Please refer to LA County Public Health Laboratory test catalog for more information.

**2. Serology:** Used for extra-intestinal disease only. To California State Department of Health.

**Container:** Sterile tube.

**Examination Requested:** Amebiasis antibody.

**Material:** Serum.

**Amount:** 2 ml.

**Storage:** Refrigerate.

**Remarks:** Consult with Public Health Laboratory for more information about serology testing. Diagnostic test: 2-12 by IFA test. Allow 2 to 4 weeks for results.

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## *Entamoeba histolytica* Treatment

- Prescription drugs:
  - For asymptomatic infections: iodoquinol, paromomycin, or diloxanide furoate (not commercially available in the U.S.)
  - For symptomatic infections: metronidazole or tinidazole, immediately followed by treatment with iodoquinol, paromomycin, or diloxanide furoate.



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## *Entamoeba histolytica* Epidemiology

- The parasite lives only in humans.
- Amebiasis is the third leading parasitic cause of death worldwide.
- On a global basis, amebiasis affects approximately 50 million people each year and results in nearly 100,000 deaths.
  - Amebiasis is found worldwide, with higher incidence in developing countries and in tropical and subtropical climates.



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## *Entamoeba histolytica* Epidemiology

- The peak incidence is in children less than 14 years old.
- In industrialized countries, risk groups include:
  - Men who have sex with men
  - International travelers
  - Recent immigrants
  - Institutionalized populations



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## *Entamoeba histolytica* Prevention

- Most amebiasis is acquired through fecal contamination of food and water so sanitation and proper hygiene is important in preventing infection.
- Eliminating the use of human feces as fertilizer (night soil)
- Treating water with iodine or boiling



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## TAENIASIS AND CYSTICERCOSIS



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## *Taenia spp.*

- The cestodes (tapeworms) *Taenia saginata* (beef tapeworm) and *T. solium* (pork tapeworm) cause an intestinal infection known as taeniasis.
- *Taenia solium* can also cause cysticercosis.



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## *Taenia saginata*

- The beef tapeworm, *Taenia saginata*, causes taeniasis in humans through the ingestion of raw or poorly cooked meat of infected cows.
  - These cows have been infected via the ingestion of human feces containing the eggs of the parasite and these cows contain viable cysticercus larvae in the muscle.
- Humans act as the host only to the adult tapeworms in the lumen of the intestine.



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## *Taenia solium*

- The pork tapeworm, *Taenia solium*, is capable of causing two distinct infections, depending on the form ingested and the route of infection:
  - Taeniasis: infection with the adult form of the tapeworm
  - Cysticercosis: infection with the larval form of the tapeworm



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## *Taenia solium* Transmission

- Taeniasis: acquired through consumption of raw or undercooked meat of an infected animal.
- Cysticercosis: acquired through consumption of *T. solium* eggs from food or hands contaminated with the feces of an individual infected with the adult form of the tapeworm.



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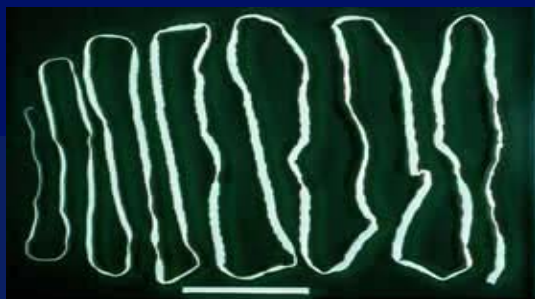
## *Taenia* spp.

- Autoinfection can also occur via the fecal-oral route once a person is infected with *T. solium* and shedding infectious eggs.
  - Eggs or gravid proglottids re-enter the body through the mouth and often travel to the central nervous system (CNS), the muscles or the eye, where they develop into cysticerci.
  - The presence of cysticerci in these locations leads to the pathogenesis of cysticercosis.



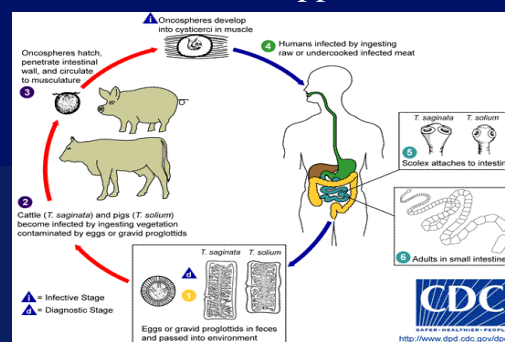
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## *Taenia* spp.

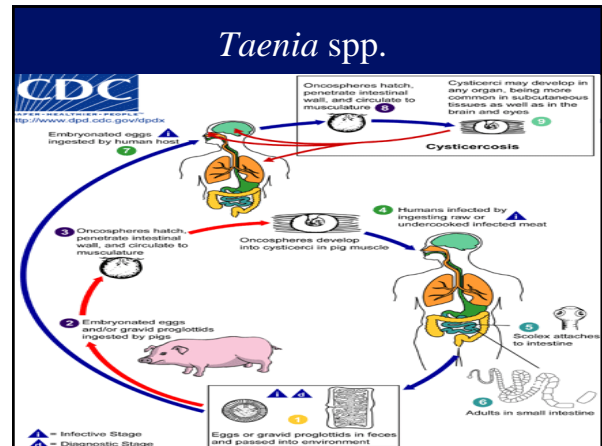


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## *Taenia* spp.



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## Taenia spp. Acute Illness

- *Taenia* spp. infection can progress to the disease state as rapidly as 10 days or as slowly as 10 years.
- Although most intestinal infections with taeniasis are asymptomatic, some patients might exhibit the following mild symptoms and/or signs:
  - Abdominal pain
  - Anorexia
  - Weight loss
  - Malaise

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## Taenia spp. Taeniasis

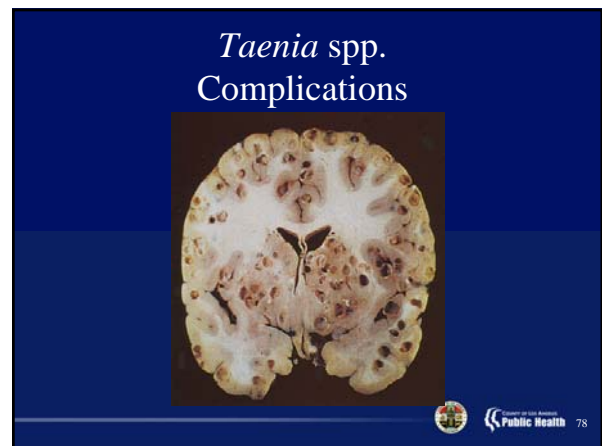
- Taeniasis has some common complications including:
  - Appendicitis
  - Obstruction of bile ducts/pancreatic ducts,
  - Ectopic tapeworm growth
  - Mild eosinophilia

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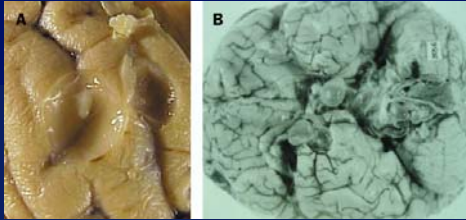
## Taenia spp. Cysticercosis

- The most common localizations are of cysticerci in humans are subcutaneous tissue, the eye, and the brain.
- Cysticerci in the brain, known as neurocysticercosis, is the most serious complication.
- There are three classic symptoms for neurocysticercosis:
  - Convulsions and/or seizures
  - Intracranial hypertension
  - Psychiatric disturbances

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## *Taenia* spp. Complications



## *Taenia* spp. Diagnosis

- Taeniasis: Microscopic identification of eggs and proglottids in feces
  - Not possible prior to development of adult tapeworms (first 3 months of infection)
  - Repeated examination and concentration techniques will increase the likelihood of detecting light infections.
  - Speciation of *Taenia* is impossible if solely based on microscopic examination of eggs, because all *Taenia* species produce eggs that are morphologically identical.
- OUR NEW TEST
- Cysticercosis: Biopsy, MRI or serologic testing

## *Taenia* spp. Diagnosis



## *Taenia* spp. Treatment

- Taeniasis:
  - Prescription drugs: Praziquantel and Niclosamide
- Cysticercosis is more complex.
  - Surgery is sometimes necessary to treat infection in the eyes, cases that are not responsive to drug treatment, or to reduce brain edema.
  - Steroids are often used to reduce the swelling due to the inflammatory response to the cysticerci.
  - Not all cases of cysticercosis are treated and the use of albendazole and praziquantel is controversial.

## *Taenia* spp. Epidemiology

- There are three different ways in which the *Taenia* spp. can be transmitted:
  - Consumption of raw and/or undercooked pork or beef products
  - Human-to-human transfer of *Taenia* spp. eggs through direct contact with feces
  - Human-to-human transfer of *Taenia* spp. eggs through consumption of food/water containing fecal matter (indirect)
- Additionally, humans can acquire cysticercosis via autoinfection.

## *Taenia* spp. Epidemiology

- Both species are worldwide in distribution.
- It is associated with areas of poor sanitation and high consumption of beef.
- Also associated with areas where humans live in close contact with pigs and cows.
- Many of the cases seen in the United States are from immigrants who came from a country that has higher rates of beef tapeworm.



## *Taenia* spp. Epidemiology

- The geographic regions with the highest concentration of endemicity are Central South America and Africa.
- Only approximately 1000 cases occur per year in the United States, with the vast majority of cases seen in the Latin American immigrant population.
- For this reason, the incidence of *T. solium* is highest in major urban centers (with large immigrant populations) - namely Chicago, Los Angeles, and New York City.



## *Taenia* spp. Prevention

- The following measures are recommended for the prevention of taeniasis or cysticercosis:
  - All beef and pork should be inspected for cysticerci, even though inspection procedures don't always detect infection.
  - All meat should be cooked thoroughly to more than 56 °C.
  - Cattle and pork should also not be allowed to graze on polluted vegetation or vegetation exposed to human sewage.

