

Soil-transmitted helminthes (STHs)

**Harambee University
August/ 2021**

Soil-transmitted helminthes (STHs)

- Are gut nematodes part of whose development takes place outside the body in the soil.
- ***The frequency of infection with STHs indicates:-***
 - ***the local level of development of hygiene and sanitation and***
 - ***socio-economic development.***
- **Hookworms, Ascaris, Trichuriasis, Strongyloides stercoralis, Enterobius are primarily among soil born human parasites.**

- **STHs** may be divided **into three groups** according to their life cycle.

Type I

Direct life cycle

□ Embryonated eggs are passed out in stool and can re-infect the host within 2 to 3 hours if introduced into the mouth.

□ They do not require a period of development in the soil.

E. g. ***E. vermicularis*** (least dependent)

STHs.....

Type II

Modified direct life cycle

□ **Non- Embryonated** eggs are passed out in the stool and require a period of embryonation in the soil.

E.g. ***Ascaris lumbricoides***

Type III

Penetration of the skin

□ Eggs laid hatch to larvae and undergo further development in the soil and become infective form (L3).

E.g. ***Hookworms and Strongyloides stercoralis***

□ **STHs** may be natural human parasites or zoonoses that accidentally infect man.

Ascariasis

- A helminthic infection of the **small intestine** generally associated with few or no symptoms.
- Ascariasis, one of the most common STH infections, affects an estimated 1 billion people worldwide.

Etiology:

Ascaris lumbricoides (round worm).

Epidemiology: The most common parasite of humans where **sanitation is poor**.

- School children (5-10 yrs) are most affected.
- **Highly prevalent in moist tropical countries.**
- **Particularly common in areas of inadequate sanitation**
- **in the area with high density of human population, and**
- **where untreated human faeces are used as fertilizer.**

Ascariasis...

Reservoir:

Humans and soil (Ascaris eggs in soil).

MOT:

- Ingestion of infective eggs from soil contaminated with human feces or uncooked food products contaminated with soil containing infective eggs **but not directly from person to person or from fresh feces.**

IP - 4-8 weeks

Period of communicability:

- As long as mature fertilized female worms live in the intestine. Usual life span of adult worms' is **12 months.**
- Life cycle- [Ascariasis.pptx](#)

Life cycle

TRANSMISSION

1. Infective eggs ingested in food or from contaminated hands

HUMAN HOST

2. Larvae hatch. Migrate through liver and lungs.
3. Pass up trachea and are swallowed
4. Become mature worms in small intestine
5. Eggs produced and passed in feces.

ENVIRONMENT

6. Eggs become infective (embryonated) in soil in 30-40 days.
7. Infective eggs contaminate the environment

Clinical Manifestation

- **The first symptoms of infection may occur when the larvae reach the lungs.**
- The patient may develop
- Chest pain
- Coughing
- Difficulty of breathing, and
- Inflammation of the lungs.
- In some cases, the patient's sputum is streaked with blood.

Clinical Manifestation

- The severity of clinical manifestations of ascariasis depends upon
 - i. Sensitization of the host
 - ii. The worm load of the intestine and
 - iii. Nutritional status of the host.

Clinical Manifestation cont..

- *Ascaris pneumonitis* is an allergic reaction caused by the hypersensitivity reaction of the host against the migrating larvae in the lung.

It is characterized by

- Low grade fever
- Cough
- Dyspnea, and
- Pulmonary infiltrates.
- These symptoms disappear 10 to 14 days after the larvae leave the lung and reach the intestine.

Cont...

- Light *A. lumbricoides* infection caused by few worms is usually asymptomatic.

Increased numbers of worms in the intestine is marked by:

- ***Stomach pain,***
- ***Cramping,***
- ***Nausea, and***
- ***Intestinal blockage in severe cases.***

Cont...

- Large number of worms in heavy infection cause
 - **vomiting,**
 - **Intussusceptions or intestinal obstruction of the small intestine in children.**
- High temperature in febrile illness, anesthesia and drugs often cause adult worms to migrate into appendix and bile duct.

Pathogenicity of adult *Ascaris* worm

It produces various pathological lesions in the following ways:

1. Mechanical action

- Adult worms produce mechanical trauma in the host tissues, during the late stage of the disease.
- In heavy infection, adult worms may cause obstruction of the intestinal tract, particularly of the terminal ileum.
- ***Migrating adult worms traveling outside their normal habitat, often produce serious consequences.***
- ***These cause obstruction and inflammation of the appendix, bile duct, pancreatic duct and less commonly of the intestine.***

Cont...

2. Malnutrition

- Affects the nutritional status of the host by robbing the host off its nutrition.
- Causes malnutrition and retardation of growth and development in the young children infected with a large number of worms.

3. Allergic reaction

- The metabolites of the living or the dead worm are toxic and immunogenic.
- Allergens produce various allergic manifestations: fever, urticaria, conjunctivitis, etc.

Cont....

Diagnosis –

- Microscopic identification of eggs in stool sample
- Adult worms pass from anus, mouth or nose.

Treatment-

- Albendazole
- Mebendazole (100 mg bid for 03 days)
- Piperazine (150 mg/kg single dose to a max of 4gm)
- Levamisole (3 tab PO stat)

Complications of Ascariasis

- Serious complications, sometimes fatal, include **bowel obstruction** by a bolus of worms, particularly in children; or
- Obstruction of a hollow viscus, such as **bile duct, pancreatic duct & appendix**, by one or more adult worms.
- **Serious, even fatal, but less common complications of ascariasis result from the infiltration of the larvae into sensitive tissues, such as *the brain, and***
- ***from the migration of the adult worms into various body structures, where they produce abscesses and toxic manifestations.***

Trichuriasis/WHIPWORM

- **Definition :** it is a nematode infection of the large intestine caused by *T. trichuria*. (Caecum & upper colon). And asymptomatic in nature.
- Etiology
 - ***Trichuris trichuria* (whip worm).**
- Epidemiology :
- It occurs worldwide especially in warm moist regions and common in children 3-11 years of age.
- **Reservoir:-** Humans

Trichuriasis cont..

- Heavy infections could lead to **short-term symptoms** such as diarrhea and anemia and
- **longer-term symptoms** such as growth retardation and impaired cognitive development.
- Co-infection with *giardia*, *Entamoeba histolytica*, *Ascaris lumbricoides*, and hookworm is common
- Whipworm infection occurs through **ingestion of whipworm eggs**, which can be found in fecally contaminated **dry goods, such as:-**
 - **Beans, rice, and**
 - **Various grains, and in crops grown in soil fertilized with sewage.**

Trichuriasis....

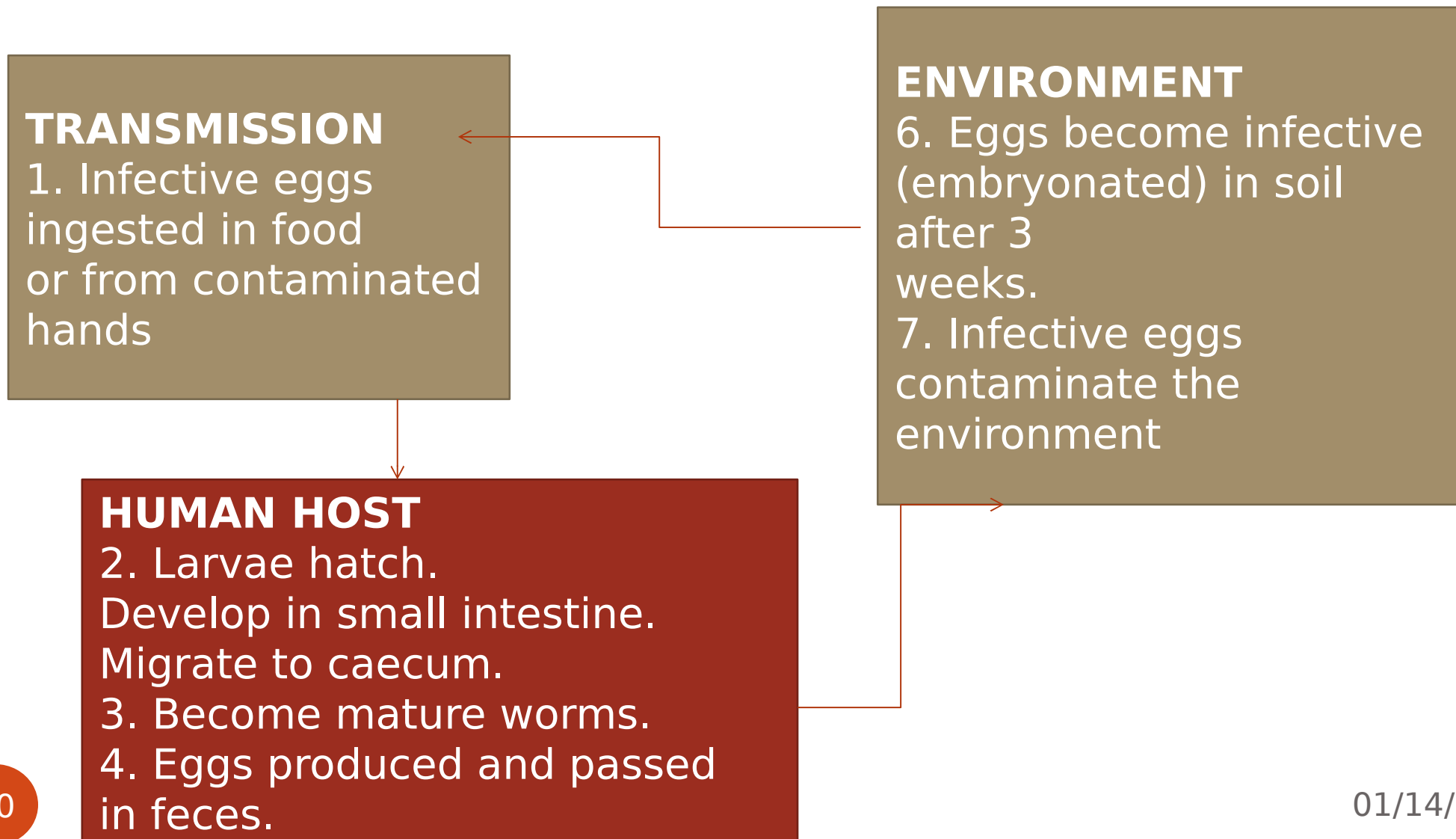
Mode of transmission:

- Indirect, particularly through ingestion of contaminated vegetables.
- Not immediately transmissible from person to person.
- **Incubation period:**
 - Indefinite

Period of communicability

- ❖ Several years in untreated carriers.
- ❖ **Susceptibility & Resistance:**
- ❖ Susceptibility is universal (general).

- Life cycle



Clinical Manifestation

- Trichuriasis symptoms range from **asymptomatic** through **vague digestive tract distress** for **light** infestations to **emaciation with dry skin and diarrhea** (usually mucoid and/or bloody) for **heavy** infestations.
- Abdominal pain
- Tiredness
- Nausea and vomiting
- Diarrhea and/or constipation are complaints by patients.

Trichuriasis....

- ***Rectal prolapse may occur in heavily infected very young children and severity is directly related to the number of infecting worms.***
- In children, heavy infections can lead to growth retardation.

Trichuriasis....

Diagnosis: demonstration of eggs in feces

Treatment: Albendazole or Mebendazole

Prevention and control

- Sanitary disposal of feces
- Maintaining good personal hygiene (i.e. washing hands and vegetables and other soil contaminated foods).
- Cutting nails especially in children
- Rx of cases.

Enterobiasis (oxyuriasis, pin worm infection)

- A common intestinal (Caecum) helminthes infection caused by *Enterobius vermicularis*.

Epidemiology:

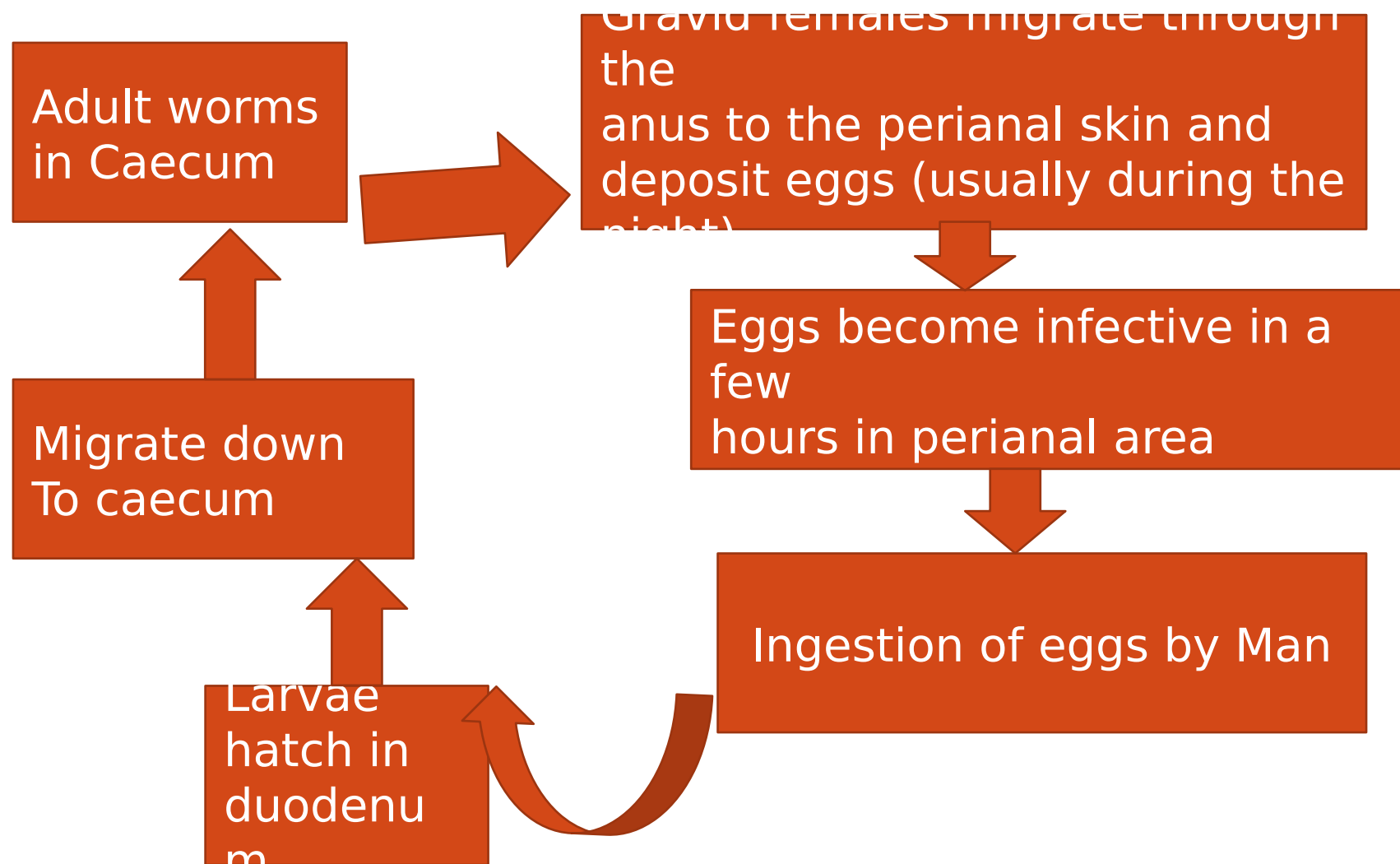
- It occurs worldwide affecting all socioeconomic classes.
- Prevalence is highest in school aged (5-10 yrs) children followed by preschools
- but is lower in adults except for **mothers of infected children**.
- Infection usually occurs in more than one family member.

Cont...

- **Reservoir**- Humans
- **MOT**: direct transfer of infective eggs by hands from anus to mouth of the same or another person or
- indirectly through clothing, bedding, food or other articles contaminated with eggs of the parasite.
- **IP**: 2-6 weeks
- **Period of communicability**: As long as gravid females are discharging eggs on perianal skin.
- Eggs remain infective in an indoor env't for about 2 weeks.

Susceptibility : Universal.

Life cycle



Cont...

C/m:

- Perianal itching disturbed sleep, irritability and sometimes secondary infection of the scratched skin.

Diagnosis:

- Stool microscopy for eggs or female worms

Treatment:

- Mebendazole (100 mg PO stat (once) or Albendazole -400mg PO stat).

Prevention and control

- Educate the public about hygiene (i.e. hand washing, before eating or preparing food, keeping nails short and discourage nail biting)
- Rx of cases
- Reduce overcrowding in living accommodations
- Provide adequate toilets

Hook worm disease (Ancylostomiasis, Necatoriasis)

- A common chronic parasitic infection with a variety of symptoms usually in proportion of the degree of **anemia**.
- It affects small intestine.
- **Mild infections with hookworm cause mild diarrhea and abdominal pain.**
- More severe infections with hookworm can create serious health problems for
 - **newborns, children, pregnant women, and persons who are malnourished.**
- ***Hookworm infection is the leading cause of anemia and protein malnutrition in developing nations, afflicting an estimated 740 million people.***

- There are two species of human hookworms.
 - **Ancylostoma duodenale** and
 - **Necator americanus**
- **N. americanus** is the most common hookworm worldwide, while
- **A. duodenale** is more geographically restricted.
- There is no known animal reservoir for **N. americanus** or **A. duodenale**.

Epidemiology:

- **Widely endemic in tropical and subtropical countries where sanitary disposal of human feces is not practiced and**
- **the soil moisture and temperature conditions favor dev't of infective larvae.**
- **Unlike other soil-transmitted helminthiasis infections, high-intensity hookworm infections frequently occur in adult populations.**
- **Reservoir:** Humans
- The life cycle, mode of transmission and disease caused by *Necator americanus* and
- its diagnosis and control are essentially the same as that of *Ancylostoma*.

MOT:

- Through skin penetration by the infective larvae.

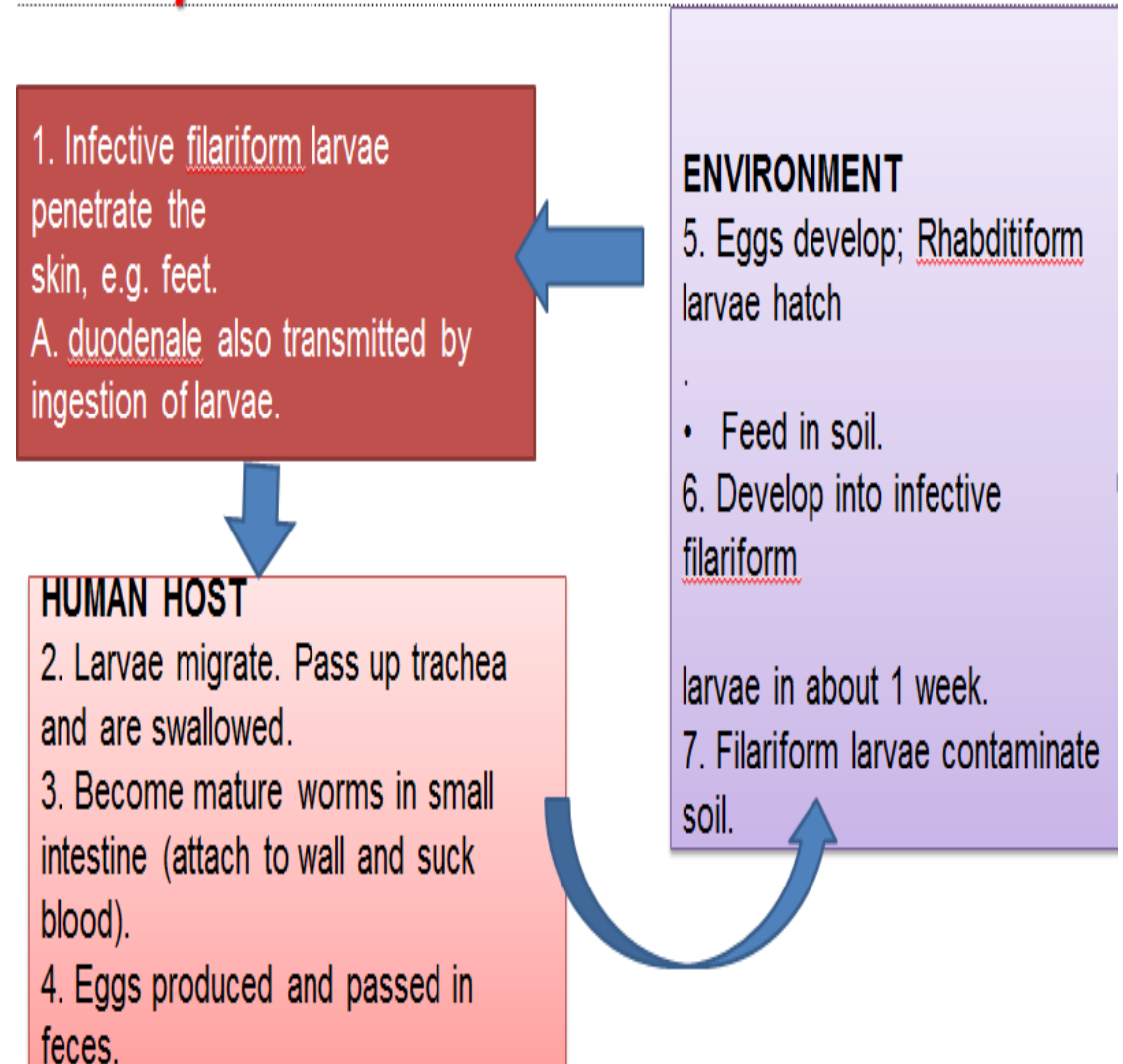
IP:

- Symptoms may develop after a few weeks to many months depending on intensity of infection and iron intake of the host.

Period of communicability:

- Infected people can contaminate the soil for several years in the absence of treatment.

Life cycle



Susceptibility & Resistance:

- susceptibility is universal. No evidence that immunity develops with infection.

Clinical Manifestations

The clinical Manifestations are related to:

- **Larval migration to the skin**
 - Produces transient (short lasting) localized maculopapular rash associated with itching called **ground itch**.

Clinical Manifestation

- **Larval migration to lungs**
 - Produces cough, wheezing and transient pneumonitis.
- **Blood sucking/ in the intestine**
 - Light infection - no symptom. Gastrointestinal symptoms like mild abdominal pain, nausea, vomiting, and anorexia may occur.
 - Heavy infection - result in symptoms of PUD like epigastric pain and tenderness.
 - Further loss of blood leads to anemia manifested by fatigue, poor concentration, and shortness of breath.
 - ***(40 to 160 adults is enough to cause anemia and malnutrition.)***

- Hookworm-associated blood loss results from the destruction of capillaries in the intestinal mucosa; however,
- the level of iron deficiency and anemia depends on three major factors:
 - **Worm burden,**
 - **Type of hookworm (*A. duodenale* ingests 4-5 times more blood each day than *N. americanus* (0.03 ml/worm/day) as well as**
 - **Overall patient nutritional status, including the person's iron reserves and diet.**
- **Increased maternal and neonatal mortality has been found to be associated with hookworm iron-deficiency anemia.**

Pathology due to hookworm infections

- **Hookworms move several times a day to different attachment sites in the upper intestinal mucosa to ingest blood &**
- **they secrete an anticoagulant which causes the old attachment sites to continue to bleed.**
- Heavy hookworm infection results in chronic haemorrhage from the duodenal and jejunal mucosa.
- The combination of constant blood loss due to hookworm infection and poor iron intake in the diet results in iron deficiency anaemia.

Diagnosis:

- Demonstration of eggs in stool specimen.

Treatment

- - Mebendazole 200 mg PO BID for 03 days
- - Albendazole 400mg PO stat
- - Levamisole

Prevention & control

- Sanitary disposal of feces
- Wearing of shoes
- Case Rx.

Strongyloidiasis

Definition

- An often asymptomatic helminthic infection of the duodenum and upper jejunum.

Infectious agent

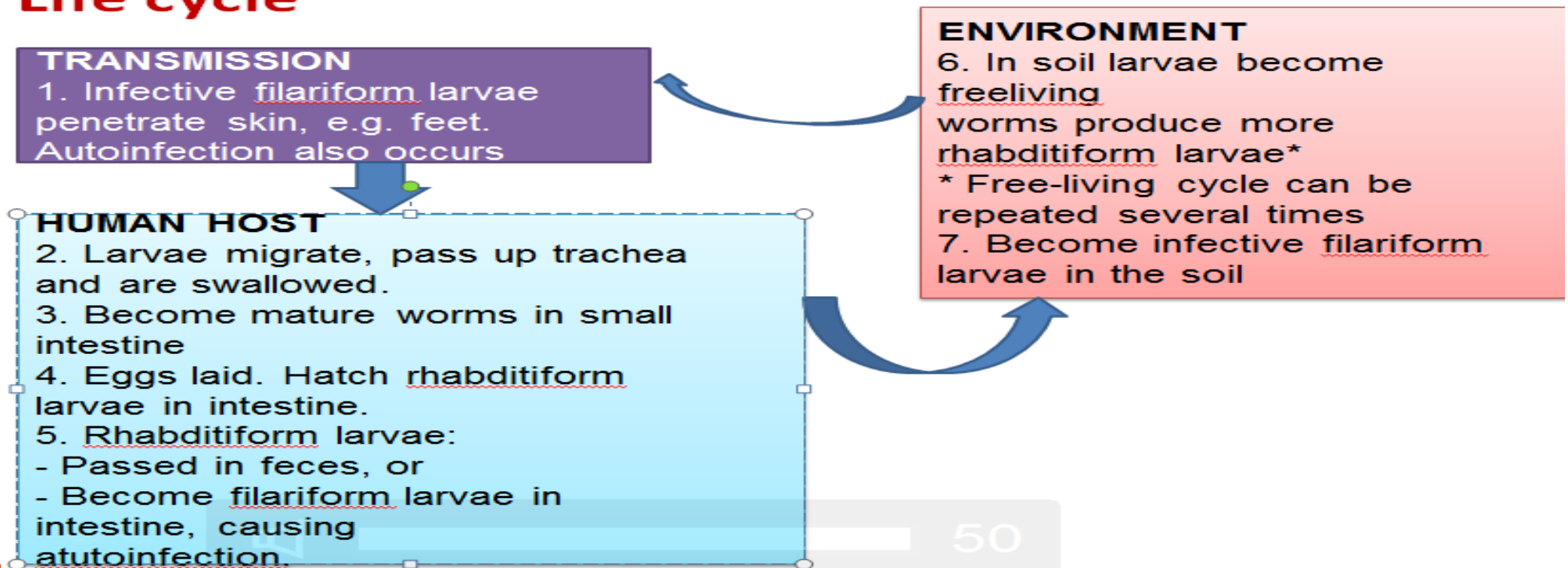
- *Strongyloides stercoralis*

Epidemiology

- **Occurrence-** In tropical and temperate areas.
- More common in warm and wet regions.
- **Reservoir-** Human
- **Mode of transmission-** Infective (filariform) larvae penetrate the skin and enter the venous circulation.
- **Incubation period-** 2-4 weeks (from skin penetration up to when rhabditi form larvae appear in the feces).

- **Period of communicability-** As long as living worms remain in the intestine; up to 35 years in cases of auto-infection.
- **Susceptibility and resistance** Susceptibility is universal.
- Patients with AIDS or on immuno-suppressive medication are at risk of dissemination.

Life cycle



Clinical Manifestation

- Pneumonia occurs during heavy larval migration.
- Mild peptic ulcer like epigastric discomfort to severe watery diarrhea.
- Heavy infection may result in malabsorption syndrome.

Diagnosis

- Identification of larvae in stool specimen.

Treatment

- 1. Albendazole or
- 2. Thiabendazole

Prevention and control

1. Proper disposal of human excreta (feces)
2. Personal hygiene including use of footwear.
3. Case treatment.

Poliomyelitis

- A viral infection most often recognized by the acute onset of flaccid paralysis.

Etiology:

- Polioviruses (type I, II and III)

Epidemiology:

- Occurs worldwide prior to the advent of immunization.
- Primarily a disease of infants and young children i.e. 70-80% of cases are less than three years of age.
- *More than 90% of infections are unapparent and flaccid paralysis occurs in less than 1 % of infections.*

Reservoir:

- humans, especially children

MOT:

- Primarily person to person, spread principally through the fecal oral route.
- In rare instances milk, food stuffs and other materials contaminated with feces have been incriminated as vehicles.

IP: -Commonly 7-14 days

Period of communicability: - As long as the virus is excreted (< 60days)

Susceptibility and resistance:

- Susceptibility is common in children but paralysis rarely occurs. Infection confers permanent immunity.

Clinical Manifestation

- **Asymptomatic (unapparent infection) - 90-95% show no signs and symptoms.**
 - S/S of URTI - fever, sore throat, myalgia
 - S/S of GI - anorexia, nausea, vomiting, loose stool, stomach upset, stomach aches.
- **If it progresses to major illness,**
 - severe muscular pain, stiff neck and
 - back with or without flaccid paralysis may occur.

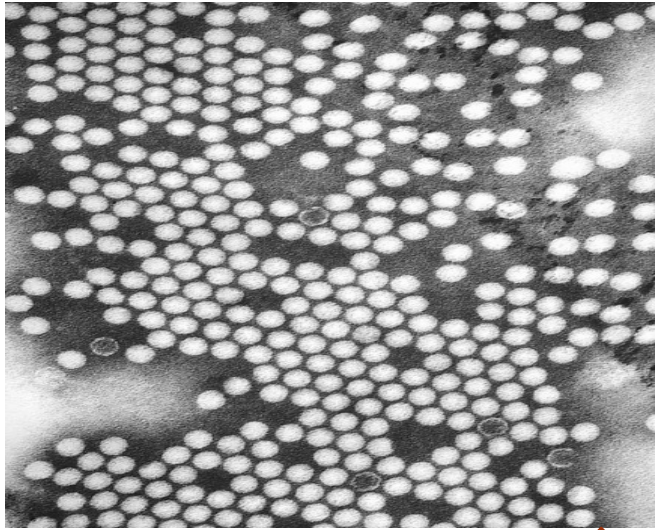
Non - paralytic poliomyelitis

- **There is involvement of CNS without signs of paralysis (aseptic meningitis- non paralytic) & subsides without sequale.**
- **Signs of meningeal irritation, headache, fever, neck rigidity.**

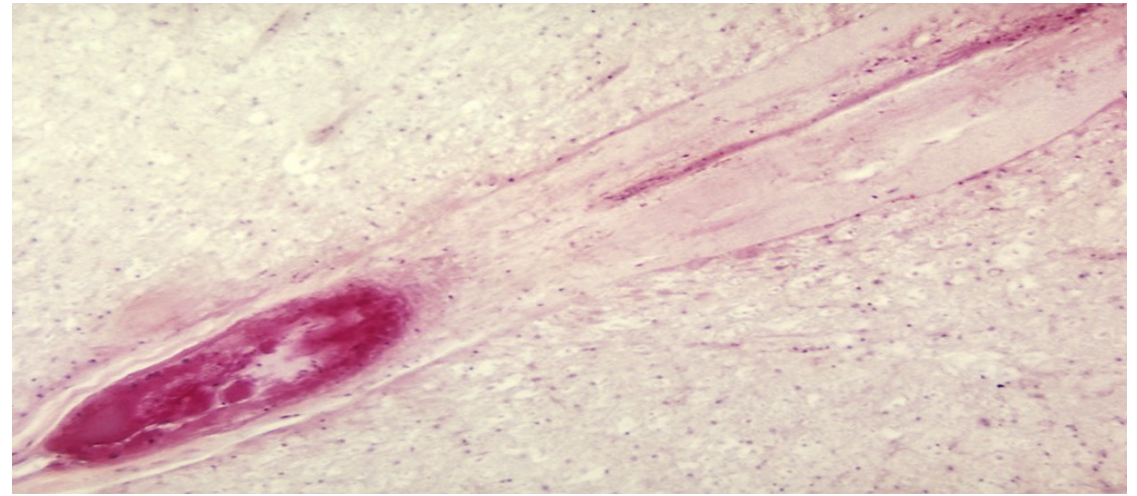
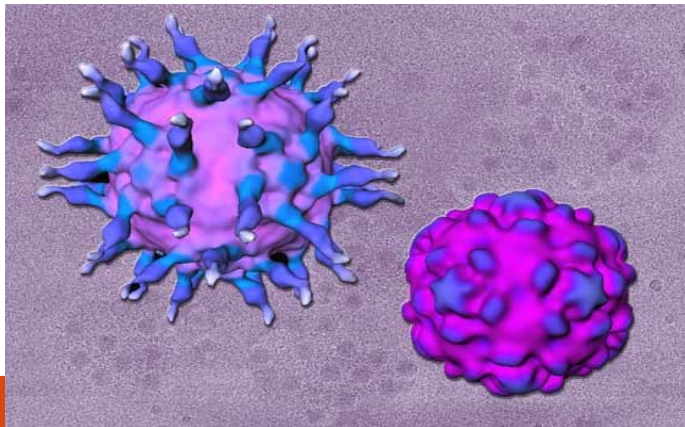
Paralytic poliomyelitis

- When non - paralytic poliomyelitis progresses to end with paralytic poliomyelitis.
- Flaccid paralysis of a group of muscles associated with fever, myalgia, neck rigidity,
- **Paralysis is asymptomatic and occurs within 3 to 4 days of illness.**
- The legs are more affected than other parts of the body.
- Paralysis of respiratory and swallowing muscle is life threatening.

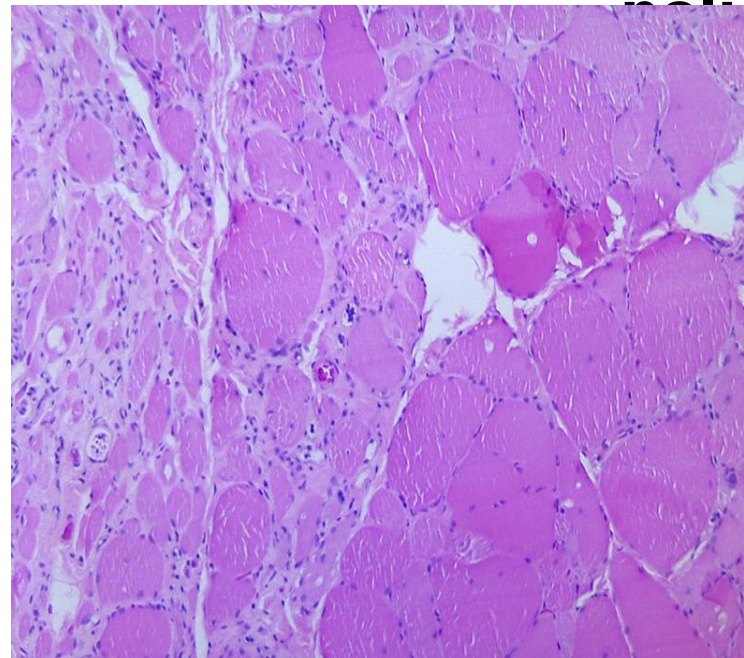
Poliomyelitis



Polio Virus



A blockage of the lumbar anterior spinal cord artery due to



Denervation of skeletal muscle tissue secondary to poliovirus infection can lead to paralysis

Clinical Manifestations of Poliomyelitis



**Adult with
Poliomyelitis**



**Children with
Poliomyelitis**



Diagnosis:

- Based on clinical and epidemiological grounds

Treatment:

- Symptomatic

Prevention and control

- Educate public about the advantage of immunization in early childhood
- Safe disposal of human excreta

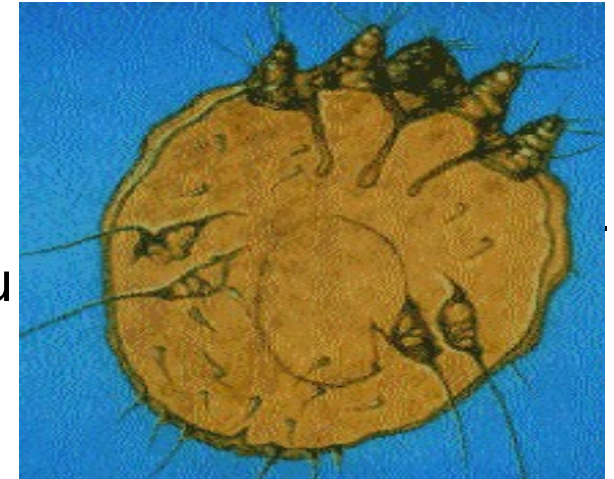
Oral Polio Vaccine



Scabies

- **Caused by:** parasitic mite called *scabiei*
 - Female mite burrows beneath skin
 - hatched egg grows into
 - Too small to be seen by naked eye
- **Prevalence:** not reported to health agencies--worldwide, estimated at ~300 million cases/yr.
- **Transmission:**
 - by close physical contact, both sexual and nonsexual
 - Can be transferred on clothing or bedding (can live away from host for up to 3 days)
 - In addition to sexually active people, school children, nursing home residents, and indigent people are at risk

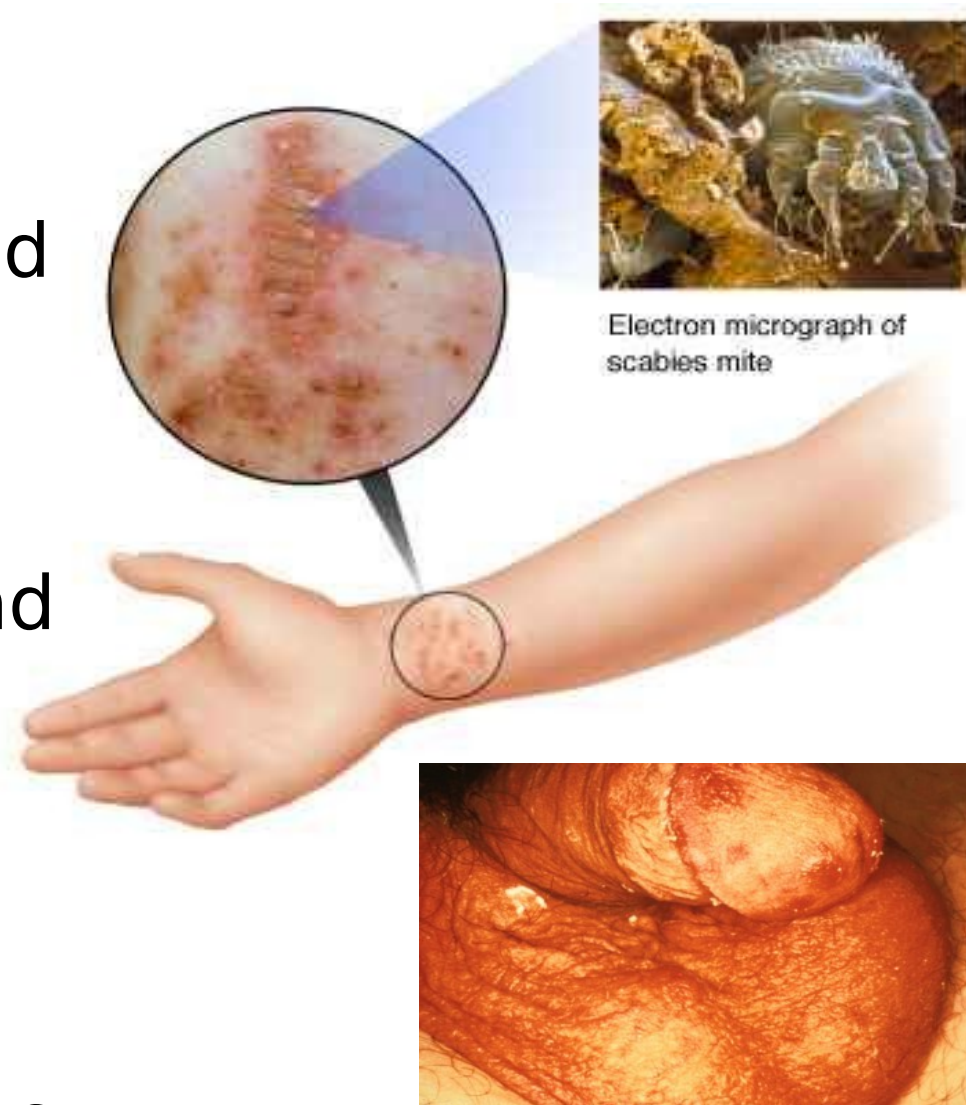
adu



Scabies (cont.)

- **Symptoms:**

- Small vesicles or pimple-like bumps, red rash
- Intense itching
- Favorite sites of infestation: webs and sides of fingers, wrists, abdomen, genitals, buttocks, and female breasts



Electron micrograph of scabies mite

- **Treatment:**

- medicinal lotion (prescription & nonprescription available) applied at bedtime, then washed off after 8 hrs
- wash all clothes and bedding that

Food Borne Diseases

(Food Poisoning, Food borne Intoxications, Food-borne infection)

Introduction

- Food-borne diseases, including food borne intoxications and food-borne infections, are terms applied to illnesses acquired by consumption of contaminated food.
- They are frequently and inaccurately referred to as food poisoning.
- While those terms would include illnesses caused by
 - chemical contaminants/heavy metals and organic compounds)
 - this bacterial growth in the food before consumption (staphylococcus aureus and botulism) and
 - a food-borne infection (salmonellosis).

- **Thank you//**

- **Food Borne Diseases**

❑ **Staphylococcal food poisoning** (Intoxication)

- It is intoxication (not infection) of abrupt and some times violent onset.
- **Infections agent (toxic agent)**
- Several enterotoxins of staphylococcus aureus,
- **MOT**- By ingestion of a food product containing staphylococcal enterotoxin.
- Foods involved are particularly those that come in with food handlers hands either with out subsequent cooking or with inadequate heating or refrigeration
 - **(e.g. salad, sandwiches, sliced meat and meat products pastries etc).**
- When these foods remain at room temperature for several hours before being eaten, toxin producing staphylococci multiply and elaborate the heat stable toxin.
- The organisms may be of human origin from purulent discharges of an infected finger or eye, abscesses, nasopharyngeal secretions.

- **I/p:** 30 minutes to 8hrs, usually 2-4 hrs

Clinical Mxs

- Sudden onset of vomiting and watery diarrhoea
- Fever and abdominal cramp
- The intensity of illness may require hospitalization

• **Diagnosis**

- ***History and physical examination***
- **Culture-** staphylococcal recovery (greater than or equal to 10 organisms per gram of food) or
- **detection of enterotoxin from an epidemiologically implicated food item confirms the diagnosis**
- ***Rx.*** Fluid and electrolyte replacement if fluid loss is significant particularly in severe cases

Botulism

- A paralytic disease that begins with cranial nerve involvement and progresses caudally to involve the extremities.

Infectious agent (Toxic agent)

- Toxin produced by clostridium botulinum (Neurotoxin)
- **MOT**- Food infection in which preformed toxin is found.
- **I/P**: Neurological symptoms of food borne botulism usually appear within 12-36 hours
 - some times several days, after eating contaminated food

- **Clinical Manifestations**

- Illness varies from a mild condition to very severe disease that can result in death within 24 hours.
- Symmetric descending paralysis is characteristic and can lead to respiratory failure and death.
- Cranial nerve involvement makes the onset of symptoms, usually produces diplopia (double vision) dysphasia (difficult in swallowing).
- Weakness progresses' often rapidly, from the head to involve the neck, arms, thorax and legs; the weakness is occasionally asymmetric.
- Nausea, vomiting, abdominal pain may proceed or follow the onset of paralysis.
- Dizziness blurred vision dry mouth, and occasionally sore throat are common.
- No fever; ptosis (abnormal dropping of upper eyelids) is frequent
- Papillary reflexes may be depressed: fixed or dilated pupils are noted in half of patients
- The gag reflex may be suppressed; deep tendon reflexes may be normal or decreased
- Paralytic ileus (a decrease in or absence of intestinal peristalsis), severe constipation and urinary retention are common.

Diagnosis

- **History and physical examination**
- **Demonstration of organisms or its toxin in vomitus, gastric fluid or stool is strongly suggestive of the diagnosis**
- **Wound culture**

Treatment

- **Hospitalize the pt and monitor closely**
- **Intubations and mechanical ventilation may be needed**
- **Antitoxin administration after hypersensitivity test to horse serum**
- **Emesis and lavage if short time after ingestion of food to decrease the toxin**

- A bacterial disease commonly manifested by an acute enterocolitis (inflammation involving both the large & small intestines)

Infectious agent

- Salmonella typhimurium and salmonella enteritidis are the two most commonly reported
- **MOT-**
 - **Ingestion of organisms in food derived from infected food animals or contaminated by faeces of an infected animal or person**
 - **Eating raw and under cooked eggs and egg products**
 - **raw milk and its products**
 - **poultry and its products consumption of raw fruits and vegetables contaminated during slicing (cutting in to pieces)**

Diagnose

- Blood culture initially
- Stool culture

Rx – Symptomatic

- If there is an underlying immunosuppressive disease (condition like AIDS, lymphoma, immunosuppressive treatment)
- treat the underlying cause

Prevention and control

- Improved animal rearing and animal marketing
- Quality testing of the known and commonly contaminated foods
- Avoid consuming raw or partially cooked ages
- Wear gowns and gloves when handling stool and urine and hand washing after patient contact.

THE END

THANK YOU