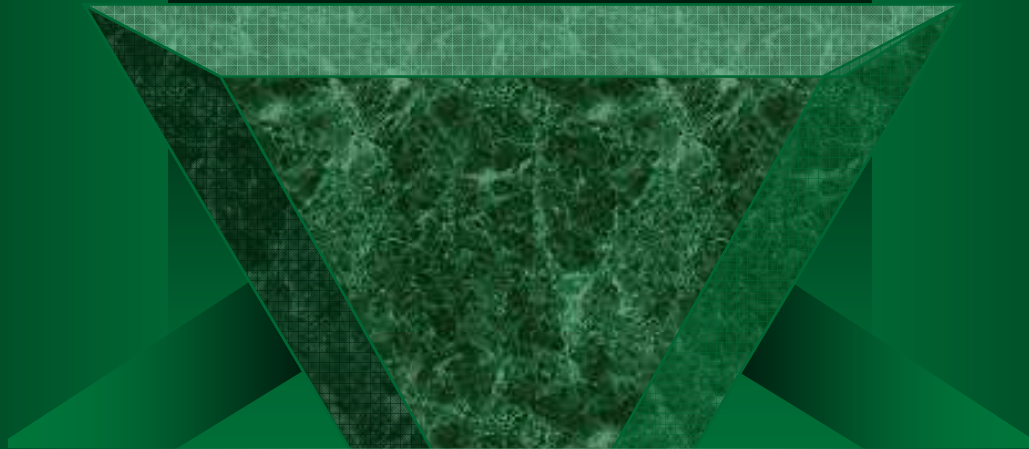




7/2014

Prof. Muhammad Akram Hossain,  
*Ascaris lumbricoides*

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# *Ascaris lumbricoides*

Prof. Md. Akram Hossain

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# Introduction

- ✔ *Ascaris lumbricoides*, also known as round worm, is the largest and most prevalent of the human nematodes, and may have been the first human parasite ever described.
- ✔ A considerable percentage of the world's population (perhaps as high as 23%) harbor roundworms and, in certain areas of the rural tropics, the incidence approaches 95%.



# Epidemiology

- ✓ **Prevalence, mortality and morbidity** : Ascariasis accounts for 60,000 deaths per year, mainly in children. It is estimated that 1 billion people are infected worldwide
- ✓ **Geographical distribution** : Occurs worldwide. It is particularly common throughout Asia, and also prevalent throughout Africa and Egypt.
- ✓ **Age distribution** : Ascariasis occurs in all ages, though children seem to be affected more severely than adults.

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# Taxonomy

**Kingdom - *Animalia*,**

– **Phylum - *Nematoda*,**

• **Class - *Secernentea*,**

– **Order - *Ascarida*,**

• **Family - *Ascarididae*,**

• **Genus - *Ascaris*,**

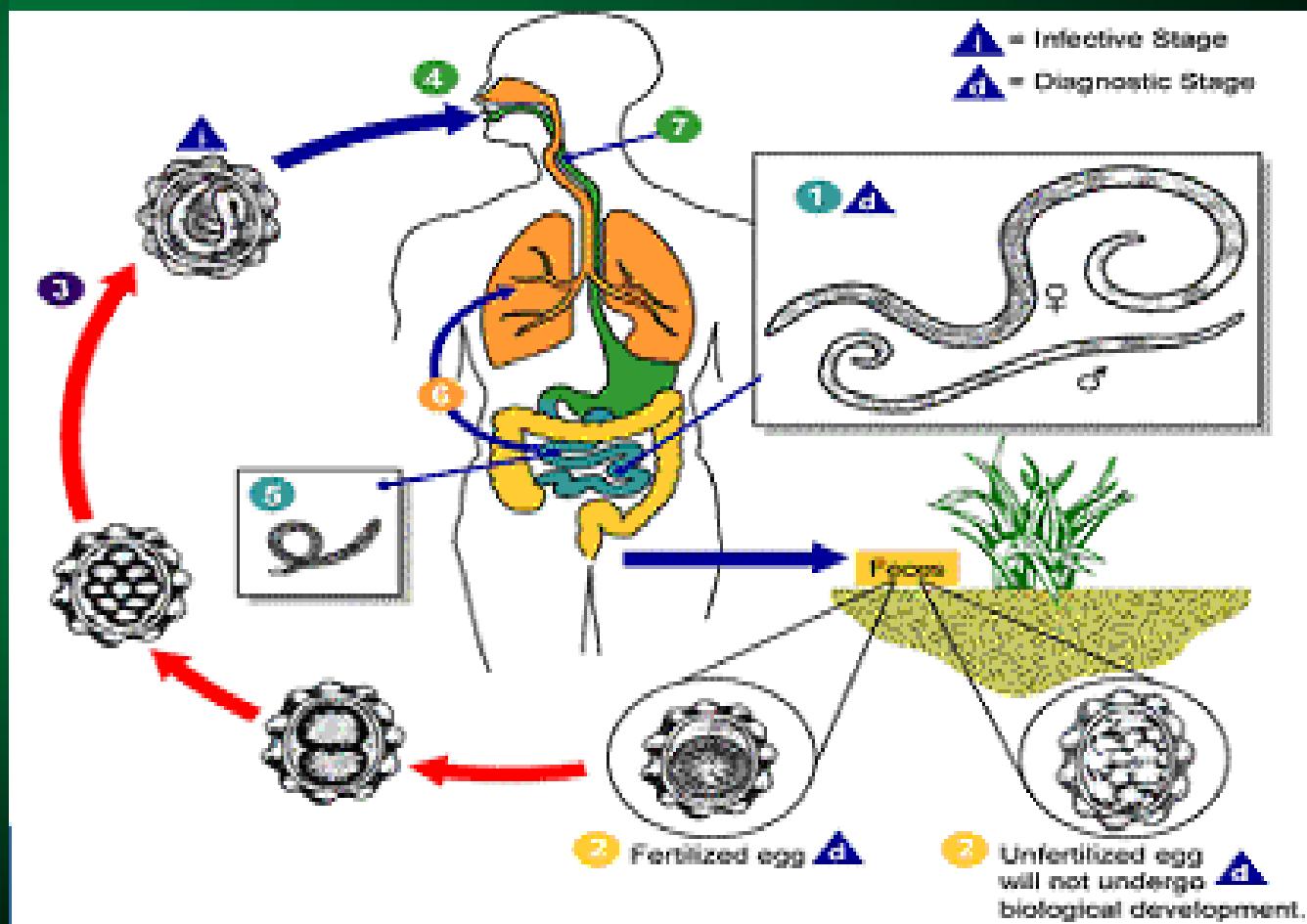
• **Species - *A. lumbricoides***



# Morphology

- ✔ *Ascaris lumbricoides* are also called round worms because of their shape.
- ✔ **Adult females are 20 to 35 cm in length, and adult males 15 to 30 cm.**
- ✔ Adult worms live in the lumen of the small intestine. A female may produce approximately 200,000 eggs per day, which are passed with the feces.
- ✔ **Adult worms can live 1 to 2 years.**







# Life cycle at a glance

- ✔ Life cycle stages : Adult, larva, ova
- ✔ Host : Single host, man (definitive)
- ✔ Infective form : *Embryonated* egg
- ✔ Pathogenic form : Adults & larva
- ✔ Route of infection : Fecal oral
- ✔ Site of localization : Small intestine
- ✔ Time required for completion of life cycle : 2-3 months
- ✔ Special feature of life cycle : Heart lung migration



# Virulence Factors

- ✓ **Mechanical effect** : Mechanical irritation caused by larval and adult stage of the worm play a role in its many clinical manifestations.
- ✓ **Toxic action** : Anaphylatoxins, neurotoxins, and endocrinotoxins are released from adult worm
- ✓ **Spoliative action** : Adult worm robs the nutrient of the host, and malnutrition of the host depends on worm burden. e.g. 20 adults consume, 2.8 gm carbohydrate & 0.7 gm protein per day.





# Pathogenesis

- ✓ Pathology of *Ascaris lumbricoides* is due its larval and adult stage. The initial pathology is associated with migrating larvae; the severity depends upon the number of invading organisms, the sensitivity of the host, and the host's nutritional status. Persons repeatedly infected become sensitized, and migrating larvae may cause tissue reactions in the liver and lungs, with eosinophilic infiltration and granuloma formation. The reactions lead to pneumonitis and a condition known as Loeffler's pneumonia.
- ✓ Adult worms may cause effects due to its spoliative, and mechanical effects. It may cause blockage of the intestines, and migrating adults may provoke severe pathology when they wander into other organs. Acute pancreatitis and biliary stones may occur. The rare fatalities usually result from intestinal obstruction or biliary ascariasis. Furthermore, the pathogenicity of the worms may vary in different regions of the world.



# Host Defenses

- ✓ The fact that children are more often infected with *A lumbricoides* than adults suggests that resistance develops with age. The mechanisms underlying this resistance are not known. IgE antibodies are present in infected persons, and some persons can develop allergic manifestations such as urticaria, asthma, fever, conjunctivitis, and eosinophilia. Some parasitologists become sensitized and subsequently develop severe reactions when exposed to *A lumbricoides* antigens.



# Clinical Manifestations of Ascariasis

## A. Due to larva

- Bronchitis or pneumonitis Loefflers syndrome

## B. Due to adults

- Asymptomatic or mild symptoms
- GI tract discomfort- anorexia, nausea, vomiting
- Protein energy malnutrition in developing countries with Vitamin A deficiency (Night blindness)
- Mechanical blockage - intestinal obstruction, intussusception,
- Hypersensitivity reaction - ascariis encephalopathy.



# Clinical Features

- ✓ The spectrum of illness in ascariasis comprised with those of larva and adults worms.
- ✓ The larval phase of ascariasis, especially in children, produces symptoms of bronchitis or pneumonitis at the time larvae are in the lungs. Thus, 5 to 6 days after ingesting infective eggs, patients may develop a fever 99°-105°F with chills, dyspnoea, paroxysmal coughing, and hemoptysis, which may worsen during the following week.
- ✓ In adults, the mature worm in the gastrointestinal tract commonly produces few or no symptoms.
  - Occasionally, nonspecific symptoms such as nausea, vomiting, anorexia, abdominal discomfort, or colicky pain, usually in the epigastric or periumbilical region, will be observed.
  - Some patients will have abdominal distention, tenderness, and constipation.
  - A few patients may exhibit hypersensitivity to the worms and present with urticaria, dyspnea, or even status asthmaticus; others will suffer idiopathic epilepsy or febrile convulsions, irritability, and
  - other central nervous system manifestations which may be caused by the release of anaphylatoxins, neurotoxins, and endocrinotoxins present in adult ascarids ("*Ascaris encephalopathy*").



# Clinical Features

- ✓ The most frequent and severe complication of ascariasis is partial or complete intestinal obstruction caused by a heavy infection; this is seen much more commonly in children than adults. Worm burdens of several hundred ascarids per individual are not uncommon in highly endemic areas, and there are case reports of 1,063 and over 2,000 worms in individual children.
- ✓ When great numbers are present, there is a tendency for these roundworms to entwine themselves around one another into a large bolus, partially or completely blocking the intestinal lumen, especially during a febrile infection or after therapy with anthelmintics.
- ✓ The most common site of obstruction is at or near the ileocecal region, although blockage by coiled ascarids can occur anywhere in the small or large bowel.



# Laboratory Diagnosis

## Principle

- ✓ The diagnosis of ascariasis depends on the identification of the adult worms passed through the rectum or from some other body orifice, or by identifying the eggs of *A. lumbricoides* in the stool, vomitus, sputum, or small bowel aspirate. Occasionally eggs, larvae, or adult worms may be identified in tissue sections. The radiological appearance of the worms in the gastrointestinal or biliary tracts is highly characteristic.
- ✓ Diagnosis during the stage of larval migration is difficult, although occasionally larvae may be found in the sputum or gastric contents. Once the fertile females within the gut begin to release eggs, the diagnosis of ascariasis can usually be made by direct fecal smears. However, concentration techniques using centrifugation (e.g., formalin-ethyl acetate method) may facilitate diagnosis.



# Treatment

- ✓ The drugs of choice for treatment of ascariasis are albendazole, mebendazole, and pyrantel pamoate. The drugs are effective and appear to have few side effects.
- ✓ Mebendazole 100 mg PO 12 hourly for 3 days, or,
- ✓ Albendazole 400 mg given as single oral dose (contraindicated during pregnancy and children under 2 years) or,
- ✓ Pyrantel pamoate 11 mg/kg not to exceed 1 g as a single dose, or, Piperazine 75 mg/kg (max 3.5 g) as a single oral dose.



# Prognosis

- ✓ Most people recover from the infection, even without treatment. However, complications may be caused by adult worms that move to certain organs or multiply and cause a blockage in the intestine.





# Control

- ✓ The most effective method to control ascariasis, as well as other soil-transmitted helminthiasis, is sanitary disposal of feces. In some areas, this requires changing centuries-old habits and educating the population. Mass treatment programs have been initiated in many parts of the world and, in some Asian countries, efforts are being made to deworm all school children.
- ✓ **Mebendazole, the drug used, is effective against numerous intestinal nematode infections and causes few side effects. Levamisole is also useful, as are pyrantel pamoate, piperazine citrate, thiabendazole and albendazole.**
- ✓ Care must be taken in treating mixed helminthic infections involving *A lumbricoides*, because an ineffective ascaricide may stimulate the parasite to migrate to another location.
- ✓ **Persons in whom asymptomatic ascariasis is detected incidentally should be treated to prevent the possibility of a future abnormal migration of these large worms into extraintestinal sites.**



# Summary

- ✓ *Ascaris lumbricoides* is an intestinal nematode, possibly the first human helminthes described in medical histories. About 1 billion people of the world are infected by it.
- ✓ *Ascaris lumbricoides* has three stages in its life cycle, *ova*, *larva* and *adult* of which embryonated ova are the infective stage and larva and adults are the pathogenic stage. It is transmitted by feco oral route.
- ✓ *Ascaris lumbricoides* causes ascariasis which is manifested by Ascaris pneumonia caused by larval stage, and asymptomatic to intestinal blockage and protein energy malnutrition by adult stage.
- ✓ Diagnosis of ascariasis is based on identification of ova or larva or adult stage of *Ascaris lumbricoides* by microscopic/macroscopic examination of stool and other specimens. Radiological examinations are helpful for demonstrating adult worm. Eosinophilia is observed in *Ascaris pneumonia*.
- ✓ Ascariasis can be effectively treated by albendazole, mebendazole, Pyrantel pamoate and piperazine citrate.



# Study Questions

- ✔ What is the mortality and morbidity of ascariasis? What is its clinical significance?
- ✔ Describe Life cycle of *Ascaris lumbricoides*.
- ✔ Write about the laboratory diagnosis of ascariasis?
- ✔ Write short notes on Loeffler's syndrome.
- ✔ Write about the pathogenesis of ascariasis.
- ✔ What are the virulence factors of *Ascaris lumbricoides*?