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Lecture 1 Summary FINAL

Microbiology of The GI (Parasitic Infections)

Entamoeba histolytica

Topic	Details
Disease	Causes Amoebiasis. Amoebic dysentery is a specific form of this disease.
Location	Found worldwide, prevalent in temperate zones and areas with poor sanitation. Resides in human large intestine.
Hosts	Mainly humans, but can also include dogs, pigs, rats, and monkeys.
Disease Indication	resence of mucus, red and white blood cells in stools.
Morphology	Trophozoite Stage: Actively feeding, motile form. Cyst Stage: Resistant stage, found outside the body to resist environmental changes.
Infection Process	Ingestion of quadrinucleate cysts through contaminated water or food. Cysts convert into trophozoites in the small bowel.
Mode of Infection	Contaminated water/food, infected food handlers, flies/cockroaches, autoinfection, homosexual transmission.
Infection Characteristics	Asymptomatic cyst passers are a problem, particularly food handlers. Symptoms include fever, abdominal pain, and dysentery.
Extra-intestinal Amoebiasis	Can affect liver, lung, brain, and skin. Usually fatal when brain is affected.
Laboratory Diagnosis	Macroscopic, microscopic, X-ray, ultrasonography, CT scan, MRI, aspiration of abscess content, serological tests, PCR, blood examination.
Treatment	Metronidazole is the treatment of choice for both intestinal and extra-intestinal amoebiasis.
Prevention	Eradicate fecal contamination of food and water. Boil water to ensure the absence of amoeba.
Special Characteristics	Entamoeba histolytica exhibits pseudopodia for locomotion. It can differentiate from nonpathogenic entamoebae by ingesting red blood cells.
Important Notes	1. Quadrinucleate cyst is usually the infective stage, but trophozoites can also be transmitted in anal-oral practices. 2. Most cases infected with Entamoeba histolytica are asymptomatic (80%). 3. Entamoeba histolytica is resistant to chlorine at concentrations used for water disinfection.

	4. Paromomycin or Diloxanide furoate is used for treatment of Asymptomatic intestinal carriers.

Giardia Duodenalis

Topic	Details
Disease	Giardia Duodenalis is a common cause of intestinal infection worldwide.
Location	Primarily infects the small bowel, particularly the upper part of the duodenum and jejunum.
Hosts	Can infect both humans and animals (like beavers).
Morphology	Has both trophozoite and cyst forms in its lifecycle. Trophozoite is heart-shaped, with four pairs of flagella, 2 nuclei with prominent central karyosomes, and 2 axostyles. Cysts don't contain RBCs and have distinct shape and compartments.
Transmission	Occurs through ingestion of viable cysts via the fecal-oral route. Outbreaks can be associated with homosexual activity.
Infection & Pathogenesis	The infective stage is a quadrinucleate cyst, ingested through contaminated water or food. Each cyst gives rise to 2 trophozoites through binary fission. These trophozoites cause malabsorption syndrome by attaching to the intestinal lining.
Clinical Presentation	Symptoms include profuse watery diarrhea that can become greasy, foul-smelling, and may float (steatorrhea), abdominal cramps, bloating, malaise, and weight loss. Vomiting and tenesmus (urge to defecate) are not common.
Epidemiology	Incidence is high in patients with immunodeficiency syndromes. Incubation period is 1-2 weeks, and infectious dose is 10 cysts.
Laboratory Diagnosis	Routine methods include stool analysis to detect cysts and sometimes trophozoites. Antigen detection is sensitive and specific for identifying G. lamblia in fecal specimens. Immunochromatographic assays are commonly used.
Treatment	Metronidazole (flagyl) or tinidazole are the recommended treatments. Tinidazole is administered as a single-dose injection.
Special Notes	Associated with travelers' diarrhea, nurseries, poor sanitation, and poor hygiene. Giardiasis often leads to malabsorption and steatorrhea. Most common presentation is watery diarrhea, with no invasion or fever.

Cryptosporidium Spp

Topic	Details
Disease	The disease caused by Cryptosporidium is called cryptosporidiosis.
Location	Cryptosporidium lives in the crypts of the villi in the small intestine.
Morphology	They move by gliding, not using locomotion organs such as pseudopods in E. histolytica or flagella in Giardia.
Life Cycle	The organism's life cycle includes sexual-asexual parts.
Infection and Pathogenesis	Most cases are asymptomatic, with watery diarrhea as the most common symptom. Cryptosporidium is an intracellular enteric parasite that infects epithelial cells of the stomach, intestine, and biliary ducts. Immunocompromised individuals, especially those with HIV, may experience severe and persistent diarrhea that is difficult to manage. Infections start with the ingestion of viable oocysts. Each oocyst releases four sporozoites, which invade the epithelial cells and develop into merozoites and then oocysts. Cryptosporidium parvum affects mammals, including humans, and Cryptosporidium hominis primarily affects humans.
Lab Diagnosis	The infective and diagnostic stage is the oocyst. It's diagnosed by modified acid-fast staining (without heating step), where they stain red. Prevalence of fecal oocyst is 3-10%.
Clinical Presentation	Patients may have copious diarrhea (3-17 liters of stool per day). Other symptoms include abdominal pain and vomiting.
Treatment	Usually self-limited with oral or intravenous rehydration. Nitazoxanide is used for immunocompromised individuals, such as HIV patients.

Ascaris Lumbricoides

Topic	Details
Overview	Helminths are divided into flat worms and round worms. Flat worms include trematodes (leaf-like worms, or flukes) and cestodes (flat ribbon-like worms or tapeworms). Round worms include nematodes. No multiplication occurs in helminths; one egg will produce one larva, which will grow into one adult. This is unlike protozoa, where multiplication occurs.
Disease	The disease caused by Ascaris Lumbricoides is known as ascaris or ascariasis.
Morphology	Nematodes have separate sexes (male & female) and they have a well-developed digestive system. Male adult worm measures 15-20 cm in length, while the female measures 20-40 cm. The posterior end of male adult worm is curved while the female adult worm is straight. The estimated prevalence is over 1 billion. Females are longer and bigger than males in all nematodes. Males have a curved posterior end called the copulatory spicule used for mating with the female.
Diagnosis	Diagnosis involves looking for eggs with a brown, papillated shell surrounded by an albuminous coat. In sputum, larva can also be found. Repeated sputum sampling may be required as larvae don't exit the lungs regularly.
Transmission	Transmitted through the fecal-oral route, with reinfection being possible. Inhabits the small intestine. The infective stage is the embryonated egg. Each female produces 200,000 eggs a day, fertilized or not. Eggs are capable of surviving harsh environmental conditions, including dry or freezing temperatures. The organism is a soil-transmitted helminth: eggs excreted with feces are not immediately infectious. They require a period of time in the soil for maturation (about 2-3 weeks) during which they develop into larvae, which is the infectious stage.
Clinical Aspects	Ascaris larvae can invade the mucosa and submucosa, gaining access to blood or portal circulation and can reach the lungs. After being expelled in sputum and swallowed again, they seed in the small intestine and grow into adults. A syndrome called Loffler's syndrome can occur as a result of larva passing through the lungs and bronchi. Most cases of ascaris are asymptomatic, which depends on the burden of the disease.
Pathogenesis	The disease caused by this organism is known as Ascariasis. Children and young adolescents have a higher infection rate. Many A. lumbricoides infections are asymptomatic.
Symptomatic Ascariasis	Pulmonary symptoms can occur during migration, known as Loeffler's syndrome, characterized by respiratory symptoms, infiltrates, and eosinophilia. GI manifestations: malnutrition, anemia, malabsorption, steatorrhea, intestinal obstruction, biliary obstruction, and jaundice.

Lab Diagnosis	Eosinophilia may be present. Microscopic examination is used to look for eggs. Direct smear (stool mixed with saline) is used to identify both fertilized and infertile eggs. Adult worms may also be identified in feces. Larvae may be found in sputum or gastric aspirates.
Treatment	The standard therapy is oral Albendazole 400MG STAT.

Enterobius Vermicularis (Pinworm)

Topic	Details
Morphology	1. Small, thin, and white worm. 2. Females measure 8 to 13 mm long with a pointed tail and can lay 11000 ova. 3. Males measure only 2 to 5 mm and die following fertilization.
Habitat	Large intestine (Caecum).
Distribution	1. Commonly identified in group settings of children aged 5 to 14 years. 2. Distributed worldwide.
Transmission	1. Fecal-oral or inhalation (autoinfection). 2. Immediate infectivity of eggs. 3. Can occur through external autoinfection (finger to mouth infection). 4. Sexual and direct transmission reported. 5. Associated with institutional crowding and families.
Life Cycle	1. Eggs deposited in the perianal region. 2. Eggs embryonate within hours. 3. Adult female worm migrates at night to the perianal area where they deposit eggs. 4. No pulmonary route.
Diagnosis	1. Diagnostic stage involves finding the eggs at the perianal region. 2. Microscopic identification of the characteristic flat-sided ovum, often using the Scotch tape method.
Clinical Aspects	1. Infections typically asymptomatic. 2. Most common complaint is perianal pruritus (itching at night). 3. Parasite may migrate to other nearby tissues, causing appendicitis, oophoritis, and ulcerative bowel lesions.
Treatment	Albendazole 400 mg stat, repeated at 2 weeks.
Special Features	1. One of the most common infections in the children population. 2. Disease is called Enterobiasis. 3. Female parasites can lay thousands of eggs per day. 4. Retrograde infection possible.

Echinococcus Granulosus (Hydatid Cysts)

Topic	Details
Morphology	1. Also known as Dog tapeworm. 2. Three-segmented tapeworms. 3. Echinococcus is the smallest of all tapeworms (3 to 9 mm long).
Habitat	Small intestine of the definitive host, the canine.
Distribution	Worldwide, but higher in areas with large populations of dogs and livestock.
Transmission	1. Infection occurs by eating contaminated food (with the feces of the definitive host containing the eggs of Echinococcus granulosus). 2. Eggs are ingested by the intermediate hosts which include a variety of mammals including sheep, cattle, and humans.
Life Cycle	1. Eggs are ingested, reach the small intestine, and hatch there, producing larvae that invade and reach the lungs, forming cysts. 2. Primary cysts formation occurs in the liver and lungs. 3. Humans are typically accidental hosts and are considered a dead-end since the life cycle of the organism cannot continue in a human host, leading to hydatid cysts.
Diagnosis	1. Often incidental through radiology or serology. 2. Diagnosis can be challenging due to slow growth and often asymptomatic nature.
Clinical Aspects	1. Hydatid disease in humans can be dangerous depending on the size and location of the cyst, predominantly found in the liver and lungs. 2. Some cysts may remain undetected for years until they grow large enough to affect other organs. 3. If these cysts leak during surgery, they can cause anaphylactic shock.
Treatment	1. Surgery is often the treatment of choice. 2. Albendazole is a pharmacological option.
Special Features	"Cyst" refers to the protective structure formed by certain parasites during specific stages of their life cycle. In the case of Echinococcus granulosus, this results in a fluid-filled cyst that is highly immunogenic.

Schistosomiasis

Topic	Details
Morphology	1. Adult male and female schistosomes possess oral and ventral suckers for attachment. 2. The male worm is flat, leaf-like, and forms a gynacophoric canal, which encloses the slender female worm. 3. Separate sexes, which is an exception among trematodes. 4. Presence of testes in males and ovary in females.
Habitat	Adult worms inhabit the portal venous system.
Distribution	Over 200 million people are infected globally, with 500-600 million exposed to infection.
Transmission	1. Eggs are passed in feces into freshwater, where they hatch into ciliated larvae, or miracidia. 2. Larvae penetrate a freshwater snail (the intermediate host) and develop into cercariae. 3. Infectious cercariae penetrate human skin, migrating through the lung and liver to reach the portal venous system.
Life Cycle	1. Egg release into freshwater. 2. Larvae penetrate snail intermediate host. 3. Larvae develop into cercariae and eventually penetrate human skin.
Diagnosis	1. Clinical signs and symptoms. 2. Hematological and biochemical tests. 3. Definitive diagnosis is through detection of schistosome eggs in stool samples or tissue biopsy.
Clinical Aspects	1. Disease can result in complications such as portal hypertension, esophageal varices, hepatosplenomegaly, and liver failure. 2. Acute systemic hypersensitivity reaction known as Katayama fever occurs in response to migrating larva. 3. Transmission through skin penetration leads to an itchy rash. 4. Schistosomes migrate via the lungs, causing respiratory symptoms.
Treatment	1. Medications include mebendazole, albendazole, ivermectin, and praziquantel. 2. Praziquantel at a dose of 40mg/kg is the treatment of choice.
Special Features	1. Pathology primarily comes from the eggs produced by schistosome parasites. 2. Presence of terminal spine in S. haematobium, curved rudimentary spine in S. japonicum, and lateral spine in S. mansoni eggs.