Cryptosporidium SPP.

Disease: cryptosporidiosis  
Phylum: apicomplexa  
Class: sporozoa

*Cryptosporidium* is a microscopic parasite that causes the diarrheal disease cryptosporidiosis. Both the parasite and the disease are commonly known as "Crypto."

The parasite is protected by an outer shell that allows it to survive outside the body for long periods of time and makes it very tolerant to chlorine disinfection.

While this parasite can be spread in several different ways, water (drinking water and recreational water) is the most common method of transmission.

Many species of cryptosporidium exist that infect humans and a wide range of animals.

*Cryptosporidium parvum* and *C.hominis* are the most prevalent species. Development of cryptosporidium occurs within the brush border of the mucus epithelial cells of the stomach & I.T.

The clinical spectrum of the disease is wide, ranging from asymptomatic carriers, a self-limited illness in immunocompetent persons, to cholera-like illness in those infected with AIDS.
Morphology:

The morphological from detectabl in faeces is the oocyst measures 4-5 \( \mu \text{m} \) in diameter, spherical or ovoidal in shape, containing four crescentic sporozoites and amylopectin like granules (1-6 large dark granules).

Life cycle:

Cryptosporidium has a complex homogenous life cycle (it is able to complete its cycle in a single host). An external period is not required for sporulation. Oocysts are excreted from the gut in infective form.

An incubation period 2-14 day follows ingestion of oocyst. The infective stage is mature oocyst containing four sporozoites. Excystation occurs in small intestine, sporozoites are released and invade the epithelial cells.

The first intracellular stage is trophozoite. The trophozoite undergoes there nuclear divisions to form a group of eight merozoites, to become first generation schizont.

The merozoite released from the schizont infect other epithelial cells and develop into second generation schizont which is composed of only 4 merozoites.

The second generation merozoites invade other epithelial cells and form microgametocytes & macrogametocytes.

A microgametocyte produces 12-16 microgametes. A macrogametocyte transforms into only one microgamete.
After fertilization, azygote is formed and later develops into an oocyst.

Oocysts exist in two forms, thin walled and thick walled. Thin walled oocysts reinfect the host (autoinfection) by attacking other epithelial cell whereas thick walled oocysts are excreted out and infect new hosts.

**Laboratory Diagnosis:**

1- Direct microscopic examination of stool. A direct wet mount of stool shows presence of oocysts which measure (4-5 \( \mu \)m) in size and may contain (1-6) large dark granules.

   In a mature post–sporulation cyst, sausage–shaped sporozoites can be seen.

2- Stool concentration smear, best result are obtained with a sugar flotation technique (sheather's technique).

3- Stained smear by using modified acid fast–stain cryptosporidium stains red, the background materials and yeast stained green.

4- Intestinal biopsy. Schizonts containing merozoites and micro and macrogametes can be identified. This is not commonly used method.

5- Indirect Immunofluorescence test oocyst have been detected in faecal specimens.

6- ELISA test for detection of faecal antigen.
PCR is used to detect *C. parvum* in stool specimens. Faecal material must be stored in potassium dichromate or be frozen for detecting the DNA the organism by PCR.

**Pathology and clinical findings**

Cryptosporidium inhabits the brush border of mucosal epithelial cell of the gastrointestinal tract, especially the surface of villi of the lower small bowel.

The prominent clinical feature of cryptosporidiosis is diarrhea, which is mild and self-limited (1-2 weeks) in normal persons but may be severe and prolonged in immunocompromised or very young or old individuals.

**Source of infection & Transmission**

The transmission of *cryptosporidium* spp is through ingestion of a thick wall oocysts that excreted in feces.

The transmission of oocyst is either directly from infected human & animals or indirectly by contamination of environment with fecal materials such as water, food, air contamination.

The other source of infection is the sputum in pulmonary cryptosporidiosis.

The most important routes of transmission are one of the following:

1. **Person to person transmission**: Person to person spread of cryptosporidiosis is believed to be one of the most
common modes of transmission, particularly in urban population. Close contact transmission has been reported in day-care facilities, hospitals, and household settings elsewhere in an urban environment.

2- **Zoonotic transmission**:

Cryptosporidium spp. is capable of infecting all species of mammals including human.

Direct transmission from animal to human was considered the main route of cryptosporidium trans.

Zoonotic transmission may occur from household pets (puppies and kitten) and from laboratory (rodents, rabbits) & farm animals (cows, sheep, cattle, horses).

3- **Food borne transmission**

Food can also be a source of transmission when either an infected person or an a symptomatic carrier contaminate a food supply.

4- **Waterborne transmission**

Cryptosporidium has become the most important contaminant found in drinking water.

Oocysts with their small size and thick outer wall are highly resistant to chemical disinfectant used in the treatment of drinking water.

Physical removal of the parasite from contaminated water by filtration is an important of the water treatment process.
5-Airborne transmission

Airborne is theoretically possible route of transmission but have not been conclusively documented. Since oocysts were isolated from one patient's sputum & the possible of airborne infection has been established.

6- Traveler's Diarrhea

Cryptosporidiosis has also been recognized as a possible cause of traveler's diarrhea. Such cases often have mixed infection, especially with giardia.

7- Insect transmission

House flies (musca domestica) are recognized as transport hosts for a variety of protozoan & metazoan parasite in addition to viral & bacterial pathogens of public health importance.

8- Accidental infection

Many accidental cryptosporidiosis can occur among researchers or laboratory workers during handling infected samples or lab animals.

9- Sexual transmission

10- Nosocomial transmission

Treatment

There are several treatments for cryptosporidium enteritis.

Drugs such as nitazoxanide have been used in children and adults. Other drugs that are sometimes used include:
- Atovaquone
- Metronidazole
- Trimethoprim-sulfamethoxazole