Lab

Cryptosporidium

Phylum: Apicomplexa
Class: Sporozoae
Subclass: Coccidia
Order: Eucoccidiida
Suborder: Eimeriina

Family: Cryptosporidiidae

Disease: Cryptosporidiosis

- *Cryptosporidium* can infect several different hosts, can survive most environments for long periods
- Many species of *Cryptosporidium* exist that infect humans and a wide range of animals.
- Although *Cryptosporidium parvum* and *Cryptosporidium hominis* are the most prevalent species causing disease in humans

Life Cycle

•Complex monoxenous life cycle--completing its entire cycle within a single host with both sexual and asexual cycles, and there are six distinct developmental stages

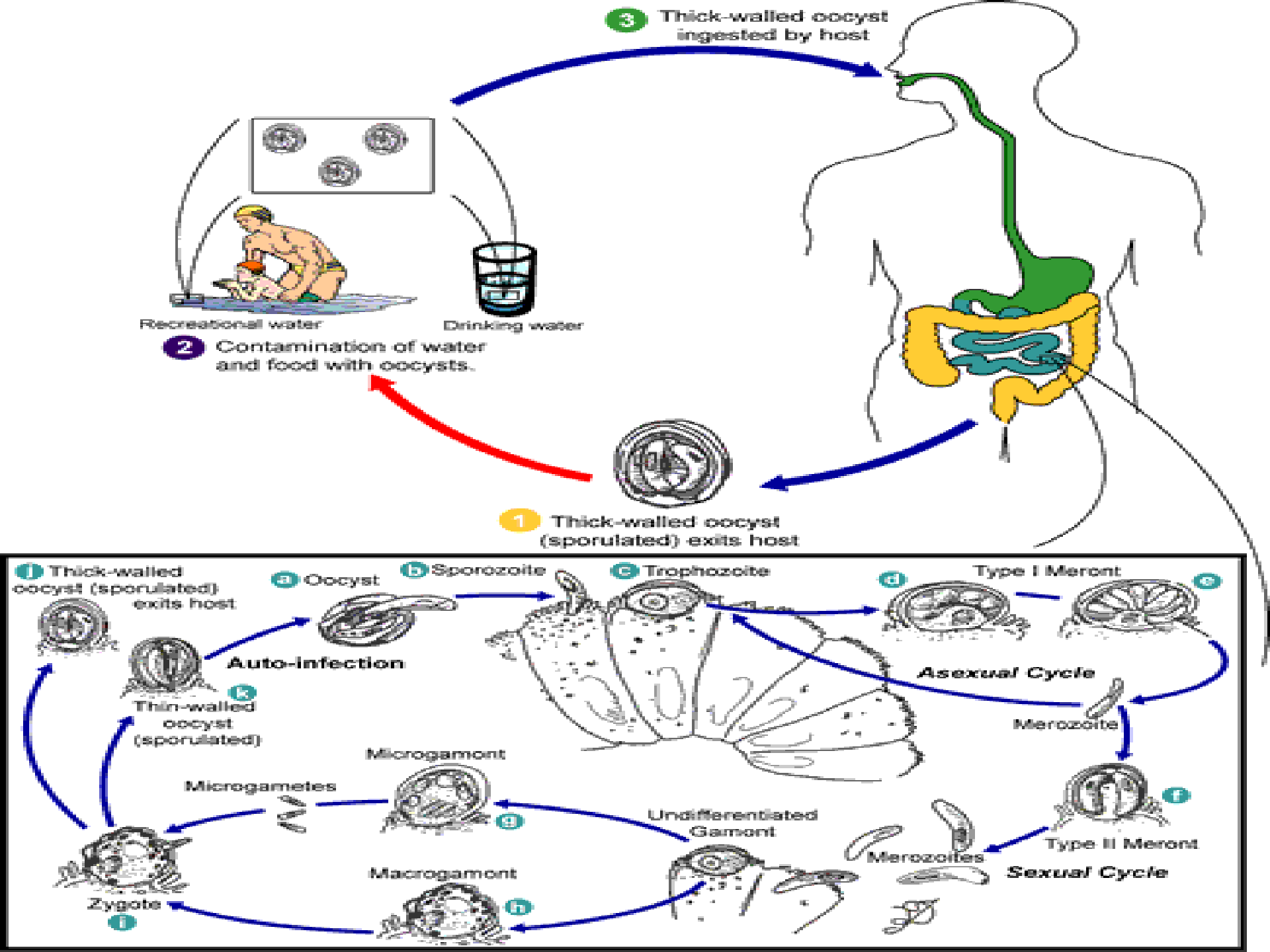
•Excystation of the orally ingested oocyst in the small bowel with release of the four sporozoites

•Invasion of intestinal epithelial cells initiation of the asexual intracellular multiplication stage

•Differentiation of microgametes and macrogametes

•Fertilization initiating sexual replication & Development of oocysts

•The formation of new, infectious sporozoites within the oocyst, which is then excreted in the stool


3 Thick-walled oocyst ingested by host
Recreational water
Drinking water
2 Contamination of water and food with oocysts.
1 Thick-walled oocyst (sporulated) exits host
j Thick-walled oocyst (sporulated) exits host
a Oocyst
b Sporozoite
c Trophozoite
d Type I Meront
e
Auto-infection
k Thin-walled oocyst (sporulated)
Asexual Cycle
Merozoite
Microgamont
Microgametes
g
Undifferentiated Gamont
f
Type II Meront
Merozoites
Sexual Cycle
Macrogamont
h
Zygote
i

Life cycle: Sporulated oocysts, containing 4 sporozoites, are excreted by the infected host through feces and possibly other routes such as respiratory secretions . Transmission of *Cryptosporidium parvum* and *C. hominis* occurs mainly through contact with contaminated water (e.g., drinking or recreational water). Occasionally food sources, such as chicken salad, may serve as vehicles for transmission. Many outbreaks in the United States have occurred in waterparks, community swimming pools, and day care centers.

Zoonotic and anthroponotic transmission of *C. parvum* and anthroponotic transmission of *C. hominis* occur through exposure to infected animals or exposure to water contaminated by feces of infected animals . Following ingestion (and possibly inhalation) by a suitable host , excystation occurs. The sporozoites are released and parasitize epithelial cells of the gastrointestinal tract or other tissues .In these cells, the parasites undergo asexual multiplication (schizogony or merogony) and then sexual multiplication (gametogony) producing microgamonts (male) and macrogamonts (female) . Upon fertilization of the macrogamonts by the microgametes , oocysts develop that sporulate in the infected host.

Two different types of oocysts are produced, the thickwalled, which is commonly excreted from the host , and the thinwalled oocyst , which is primarily involved in autoinfection. Oocysts are infective upon excretion, thus permitting direct and immediate fecal-oral transmission.

Detection and Diagnosis

-Staining methods were then developed to detect and identify the oocysts directly from stool samples.

-The **modified acid-fast stain** is traditionally used to most reliably and specifically detect the presence of cryptosporidial oocysts.
Oocysts of *Cryptosporidium parvum* stained with the fluorescent stain auramine-rhodamine.

-Intestinal biopsy: scizoints containing merozoites and micro and macrogametes can bi identified. This is not acommonly used method.

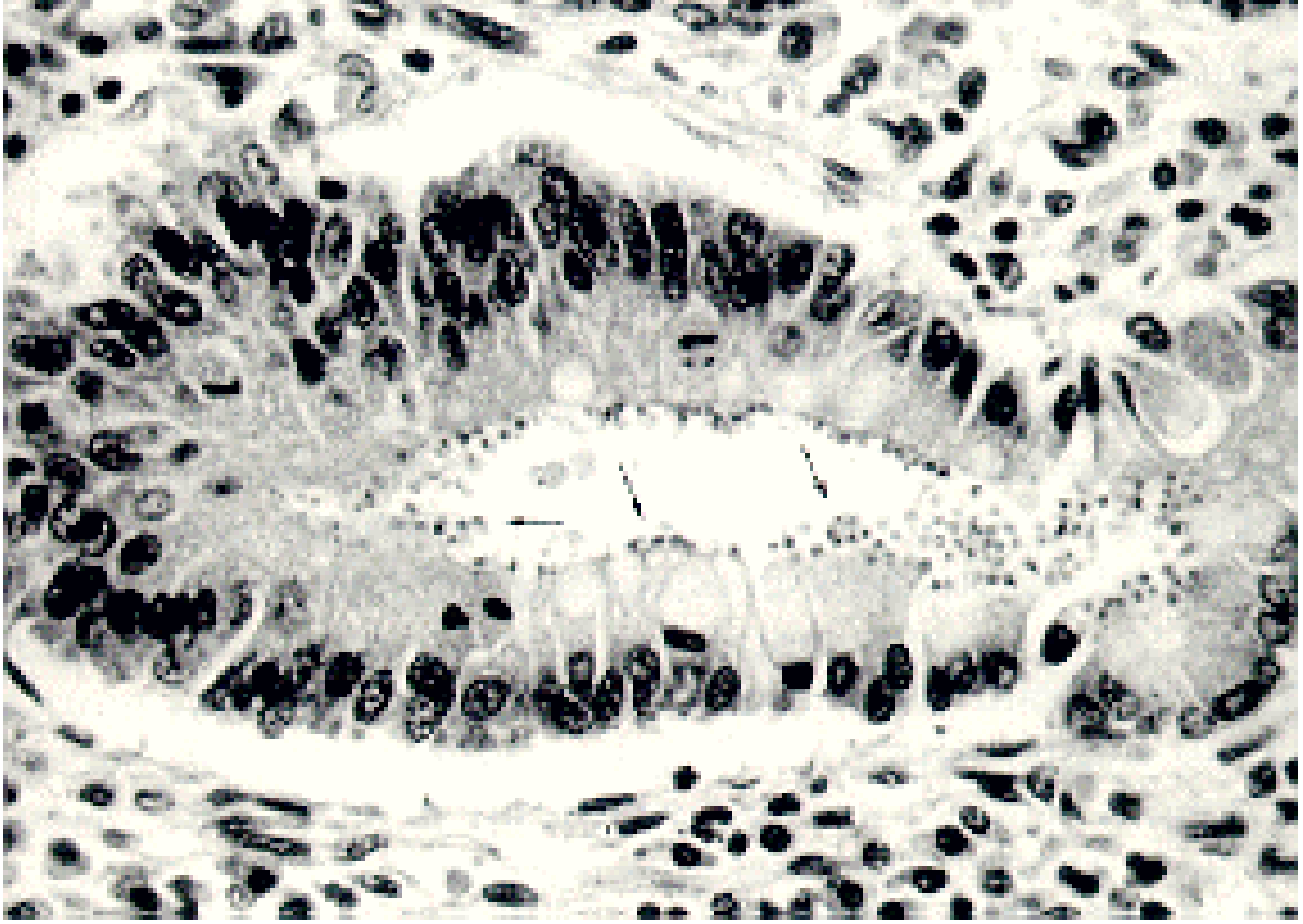
-ELISA or IFA, has recently been described in diagnosis of cryptosporidiosis

-PCR (Polymerase Chain Reaction) has been used for *C. parvum*

Cryptosporidium parvum :Oocysts of *Cryptosporidium parvum*, in wet mount. The oocysts are rounded, 4.2 µm - 5.4 µm in diameter. Sporozoites are visible inside the oocysts

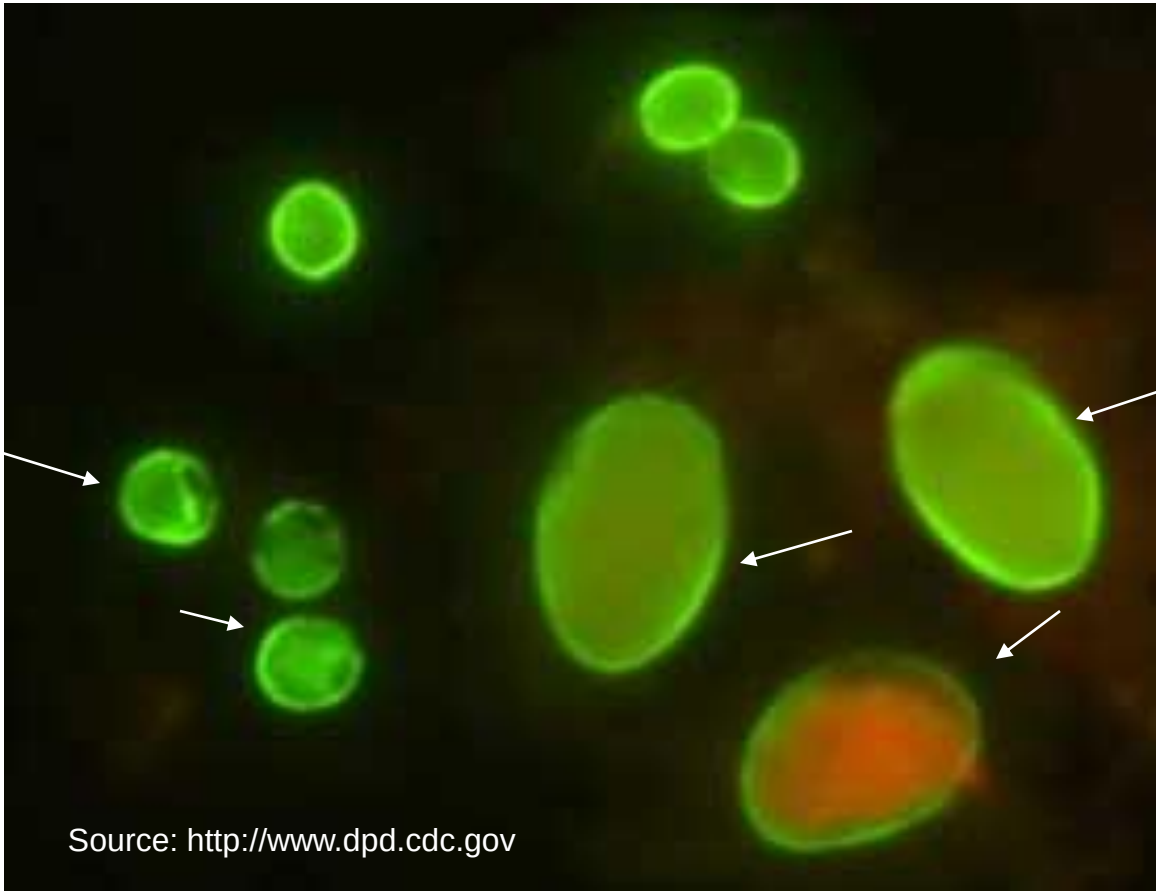
Phase contrast photograph of sporozoite release from the *Cryptosporidium* oocyst

C. parvum - Cysts in stool Acid fast



Duodenal biopsy sample from a patient with AIDS and cryptosporidiosis. Source:http://biology.kenyon.edu

C. parvum



Giardia cyst

Oocysts of *C. parvum* (upper left) and cysts of *Giardia intestinalis* (lower right) labeled with immunofluorescent antibodies