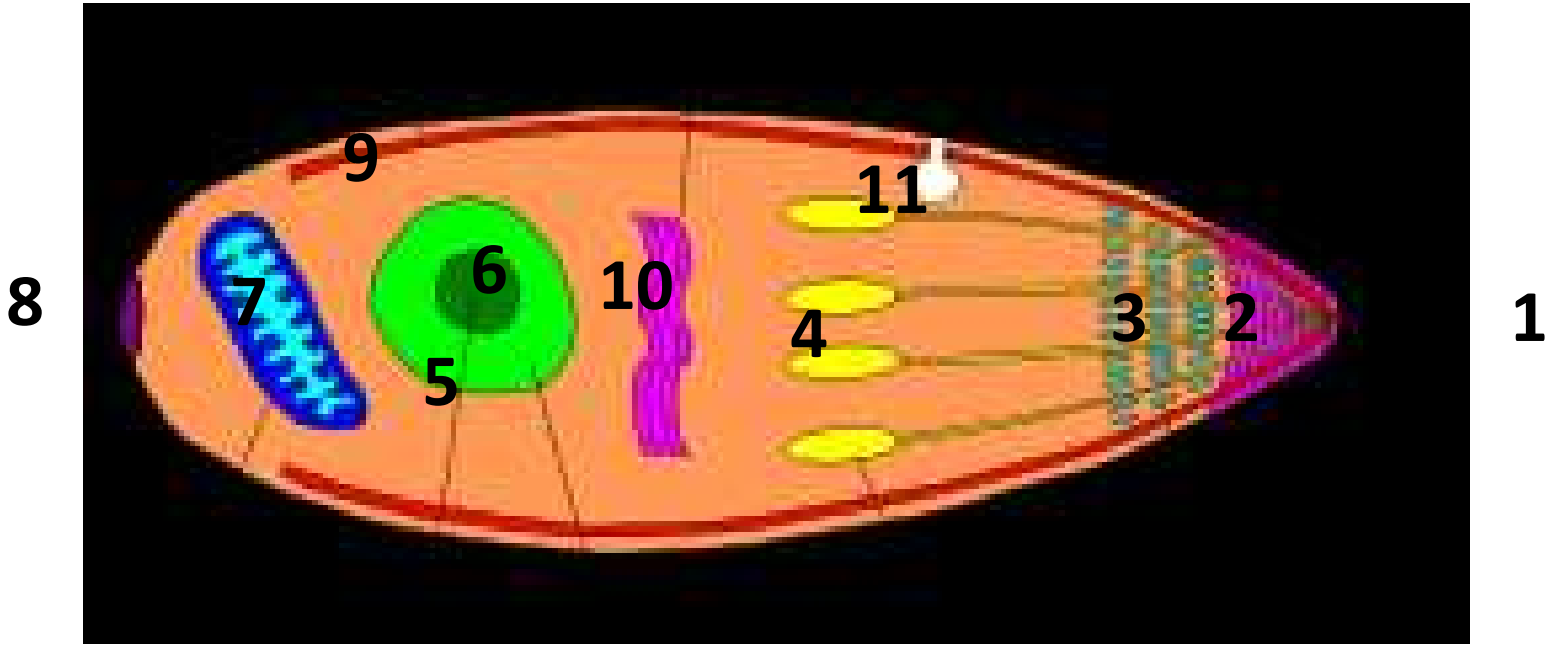
Coccidia

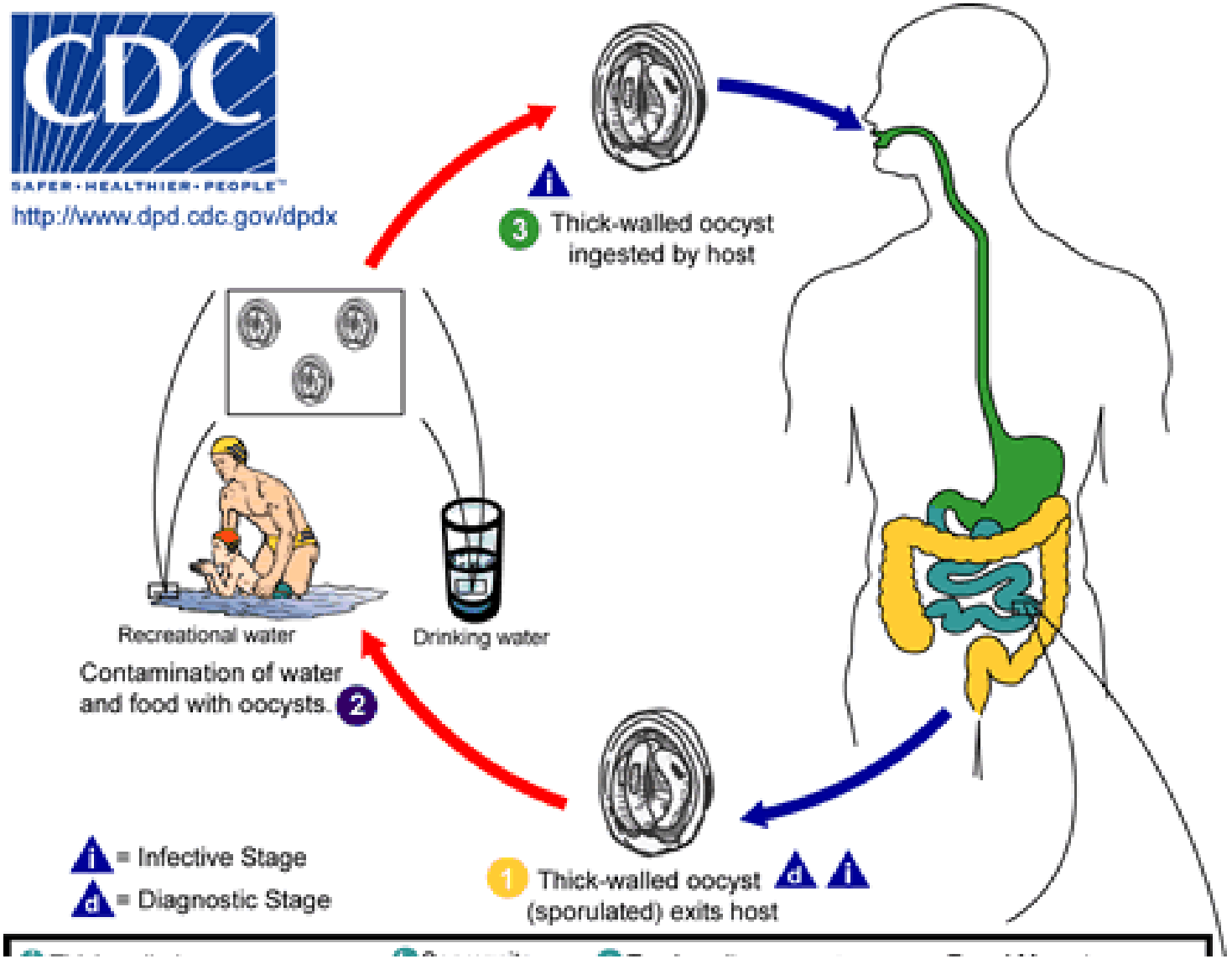
Protozoans, phylum Apicomplexa, class Sporozoasida, subclass Coccidiasina.

- ***Cryptosporidium parvum***
- ***Isospora belli***
- ***Cyclospora cayetanensis***
- ***Sarcocystis* spp**

Apicomplexan structure: 1-polar ring, 2-conoid, 3-micronemes, 4-rhoptries, 5-nucleus, 6-nucleolus, 7-mitochondria, 8-posterior ring, 9-alveoli, 10-golgi apparatus, 11-micropore

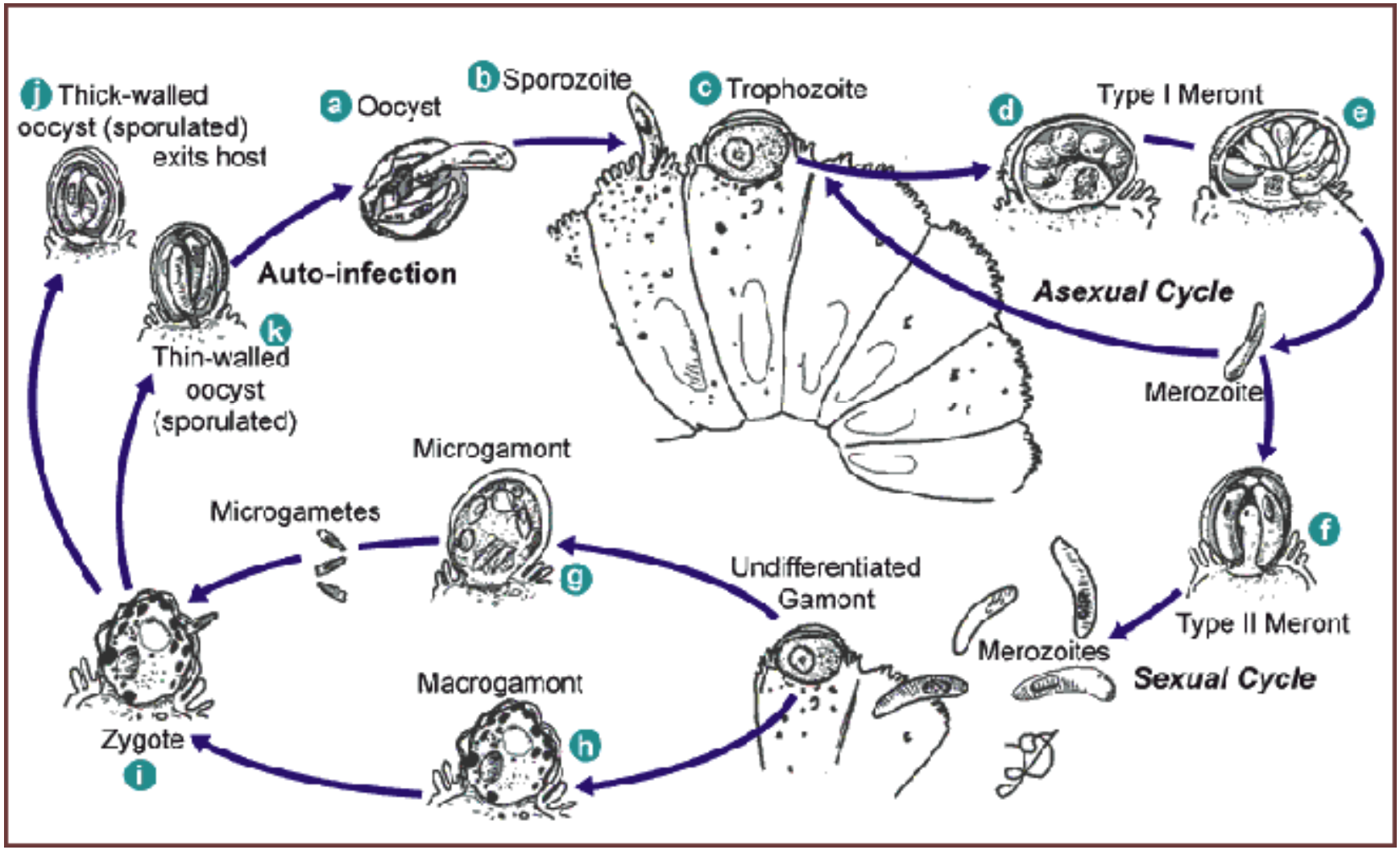


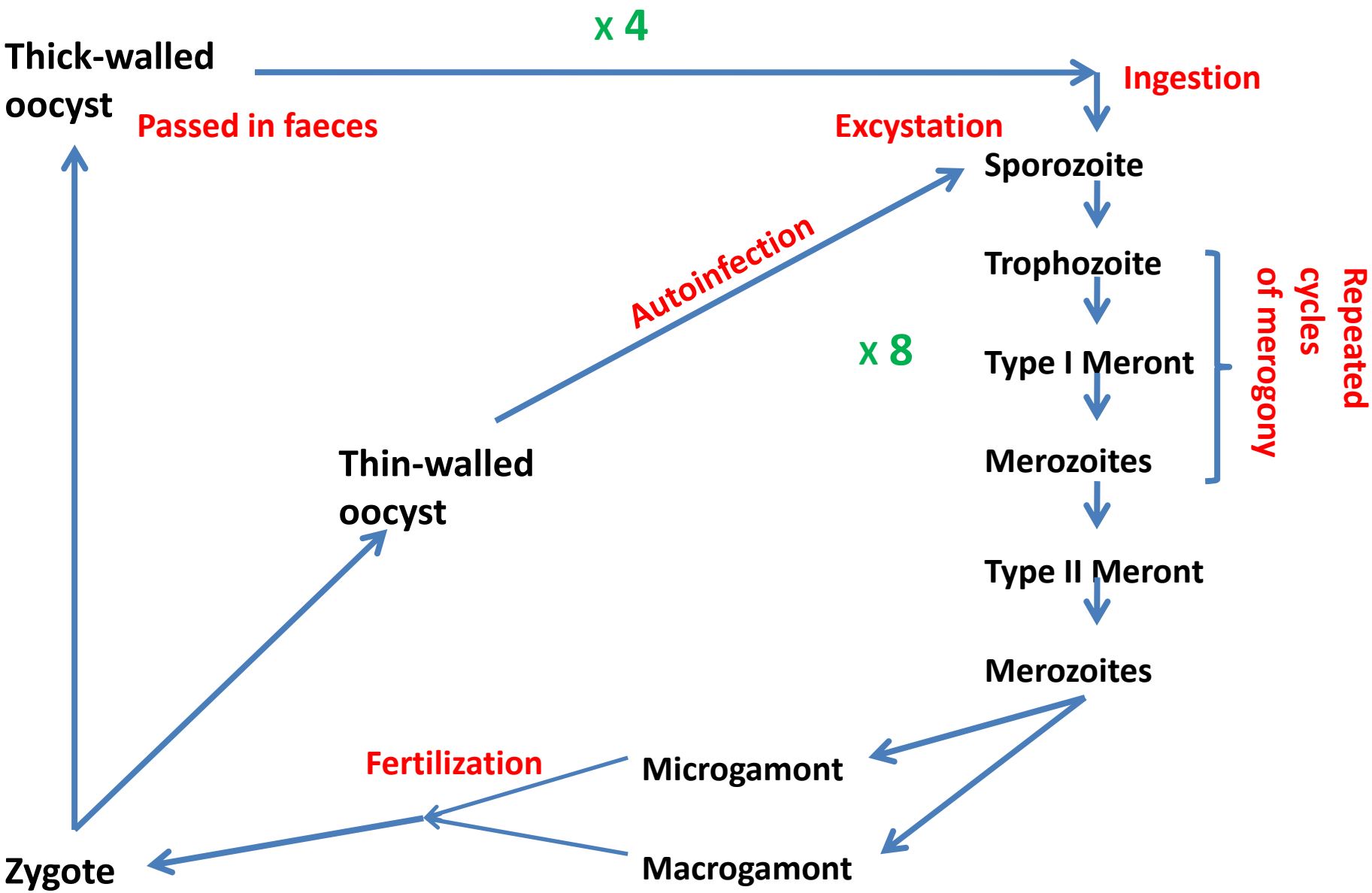
Cryptosporidium parvum



C. parvum - Cycle

Cryptosporidium parvum (c) - Cycle




x 4
Thick-walled oocyst
Ingestion
Passed in faeces
Excystation
Sporozoite
Autoinfection
Trophozoite
x 8
Type I Meront
Repeated cycles of merogony
Thin-walled oocyst
Merozoites
Type II Meront
Merozoites
Fertilization
Microgamont
Zygote
Macrogamont

Cryptosporidium parvum (d)- Epidemiology

Immuno-competent individuals:

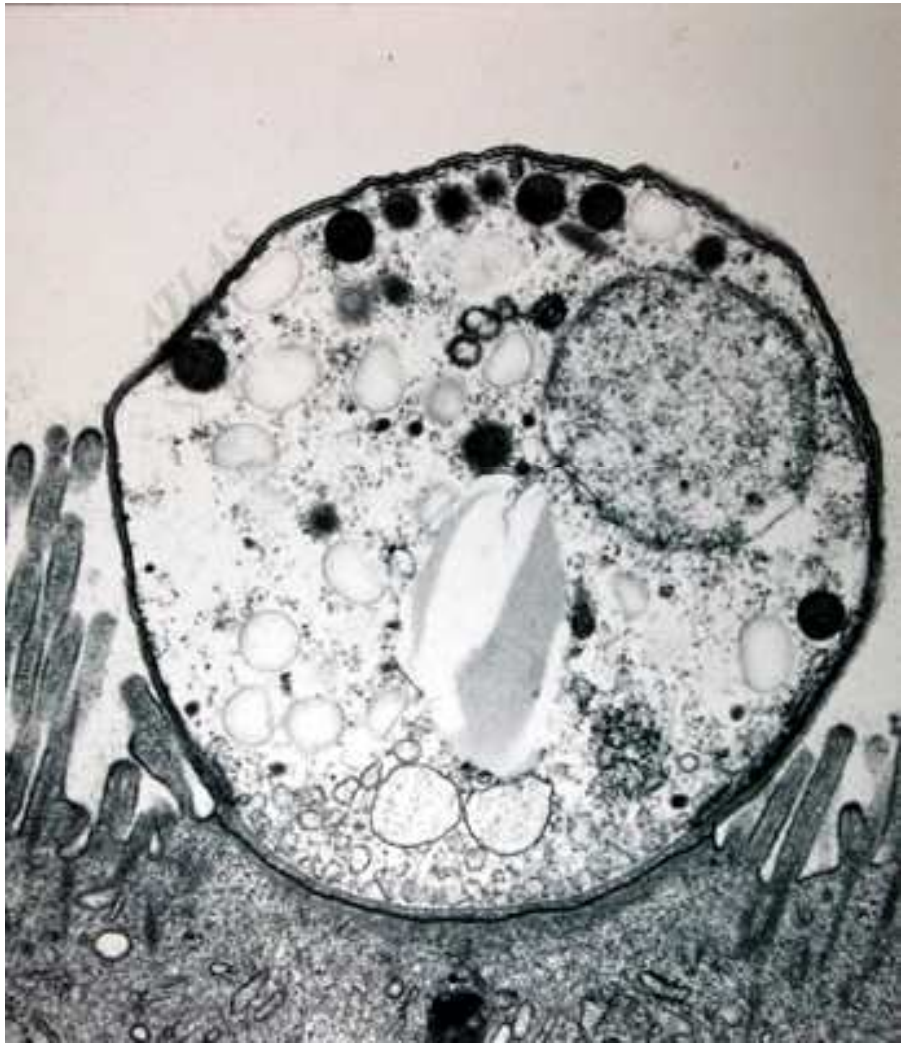
- **Evidence for a water-borne nature of the infection (oocysts can be detected in water, epidemics around water schemes)**
- **Cryptosporidium common in calves, lamb so probably it is a zoonosis**
- **Peak of infection 1-5 year-old, seasonal**
- **Dairy farmers & veterinary people at increased risk of infection**
- **Contributes to childhood diarrhea (4-17% P in children)**
- **Incubation period (≥ 13 d)**

Cryptosporidium parvum (e)- Epidemiology

Immuno-deficient individuals:

- **Faeco-oral route**
- **Course of illness variable, depends on immuno - deficiency but not only**
- **Chronic crypto-diarrhea is a case definition for AIDS**
- **BUT other organisms also contribute, e.g. Salmonella, Shigella, *Strongyloides stercoralis*, viruses, all unclear!**

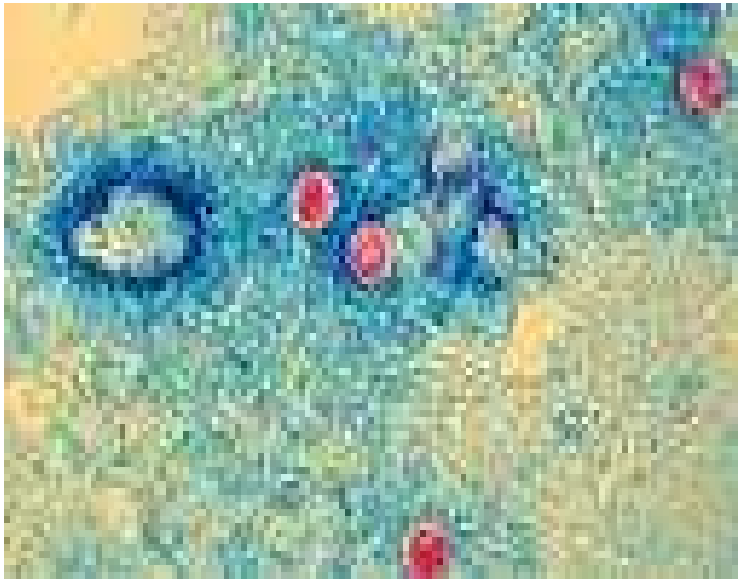
C. parvum - macrogametocyte

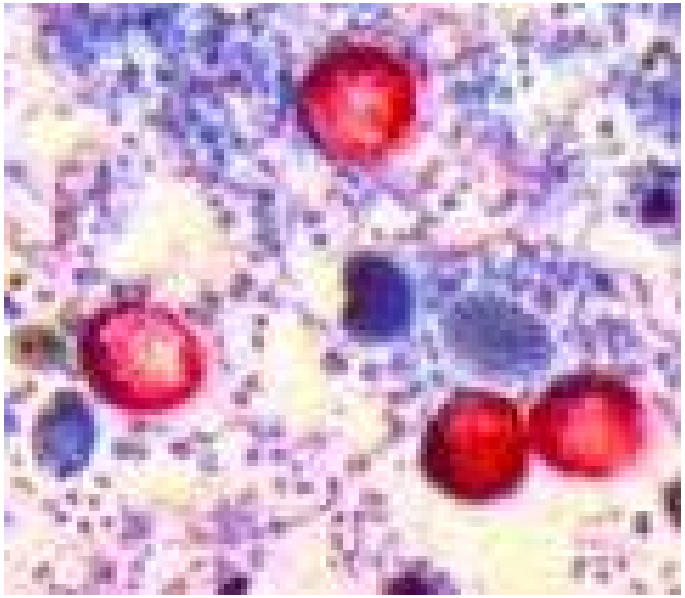


Cryptosporidium parvum (g) - Immunity

- **T cell mediated immunity important as illustrated by increased susceptibility to chronic cryptosporidiosis in HIV-infected people**
- **CD4 cells and interferon γ are required for clearance of parasite**
- **Infection in childhood usually gives good specific immunity in adults**
- **Chronic disease occur usually in HIV-induced immuno-suppression and other forms of immuno-suppression (i.e congenital hypogammaglobulinaemia, IgG2 deficiency)**
- **Innate immunity plays a role in controlling infection**
- **Individuals lacking mannose-binding lectin appear more susceptible to persistent infection**

Cryptosporidium parvum





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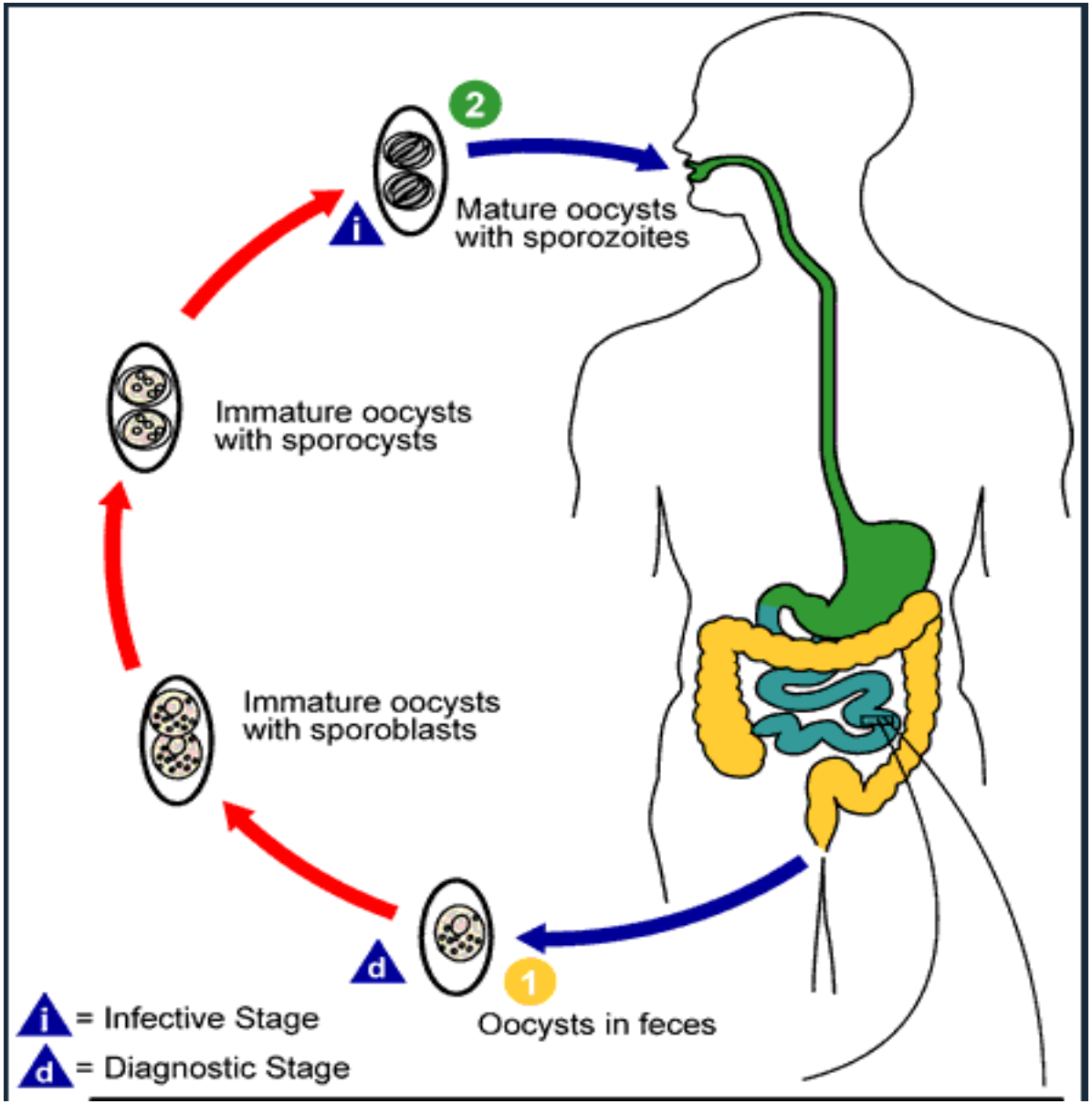
Isospora belli – oocyst with 2 sporoblasts

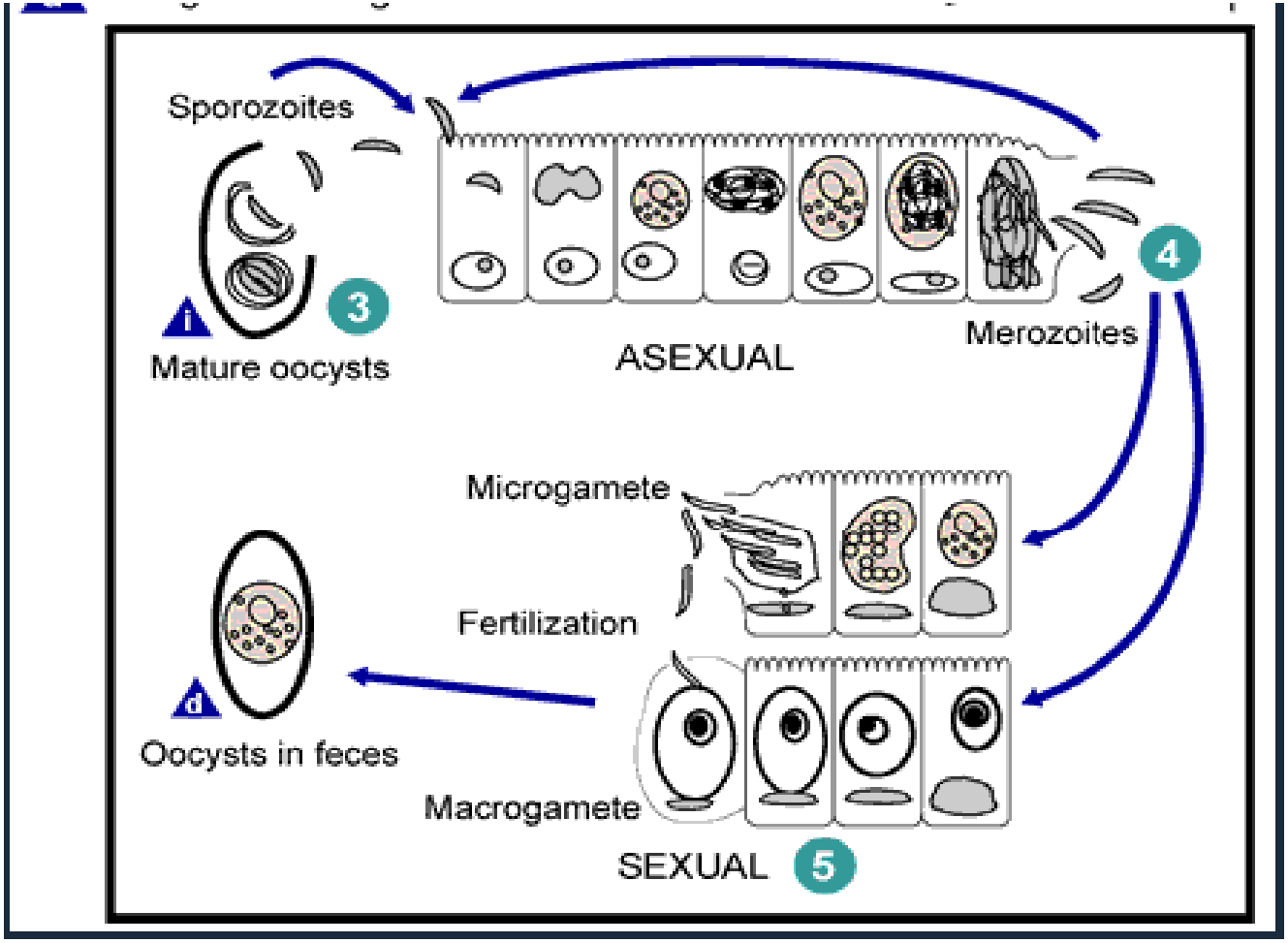
Isospora belli

life cycle



Isospora belli

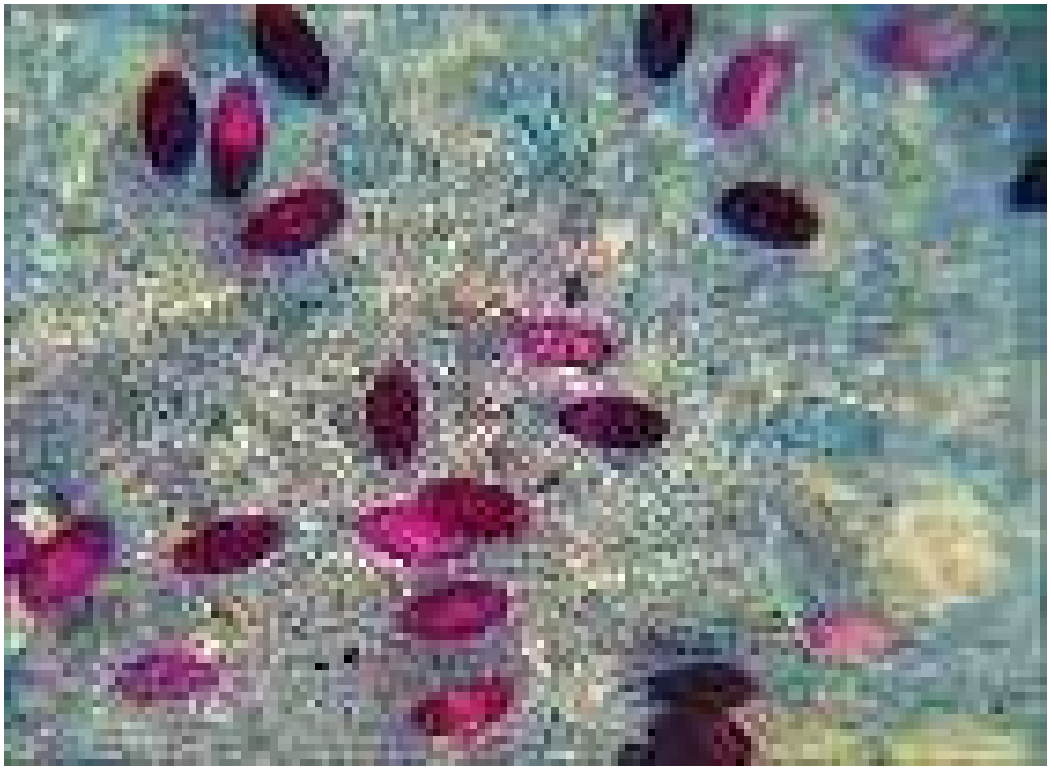
cycle in small bowel



From: Centers for Disease Control and Prevention
HIV Web Study (www.HIVwebstudy.org)

Supported by HRSA

Isospora belli – Diagnosis



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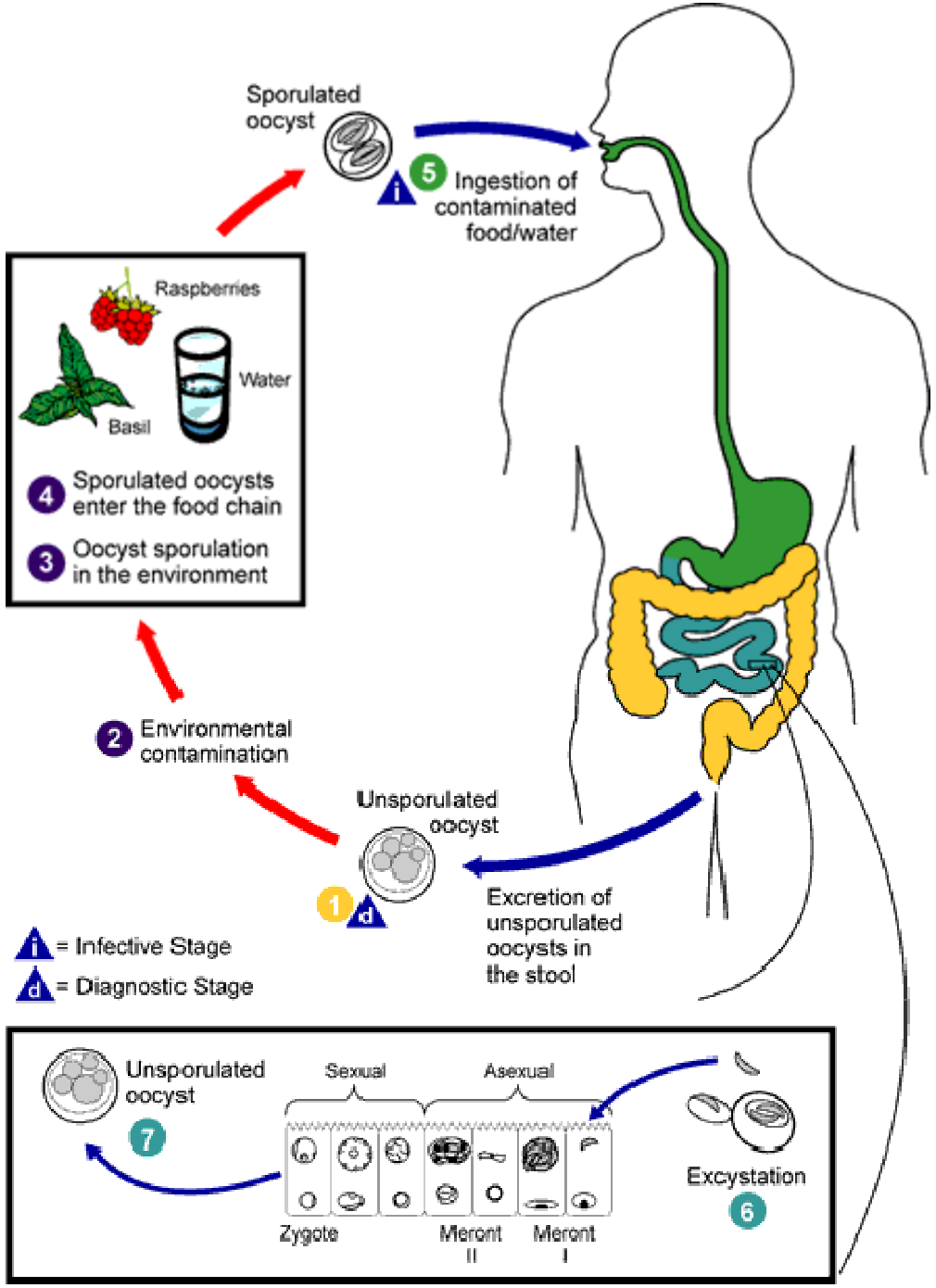
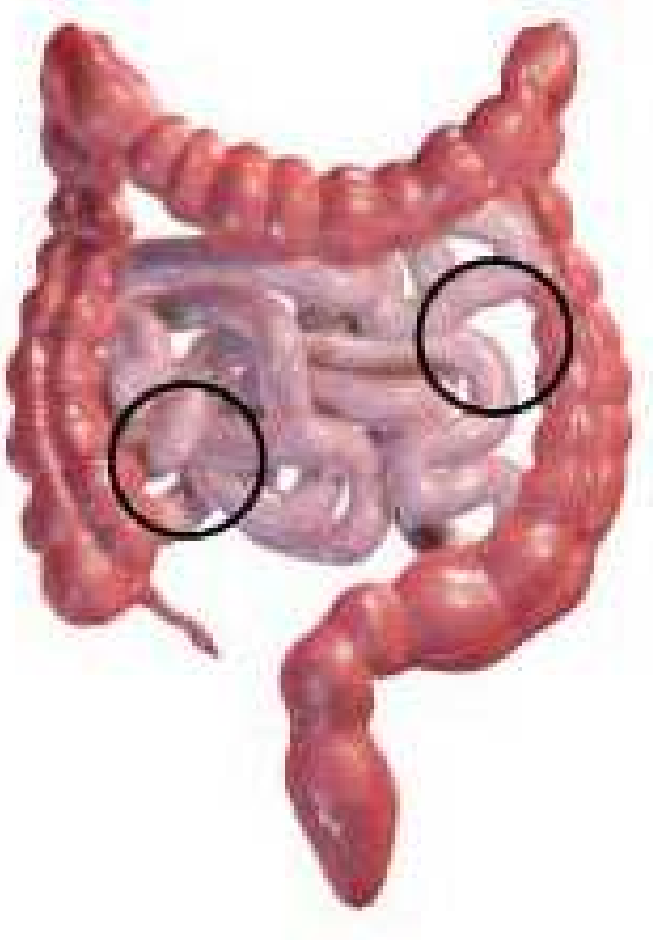
Cyclospora cayetanensis

Cycle



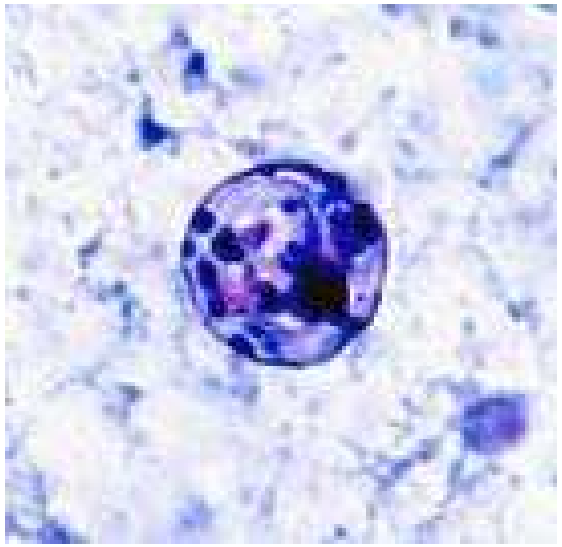
Cyclospora cayetanensis

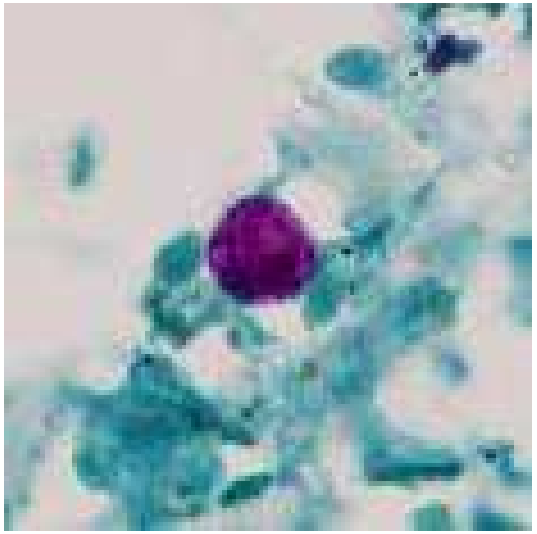
Typical sites of small intestine for *Cyclospora* infection



Cyclospora cayetanensis

Oocysts - acid staining and epifluorescence





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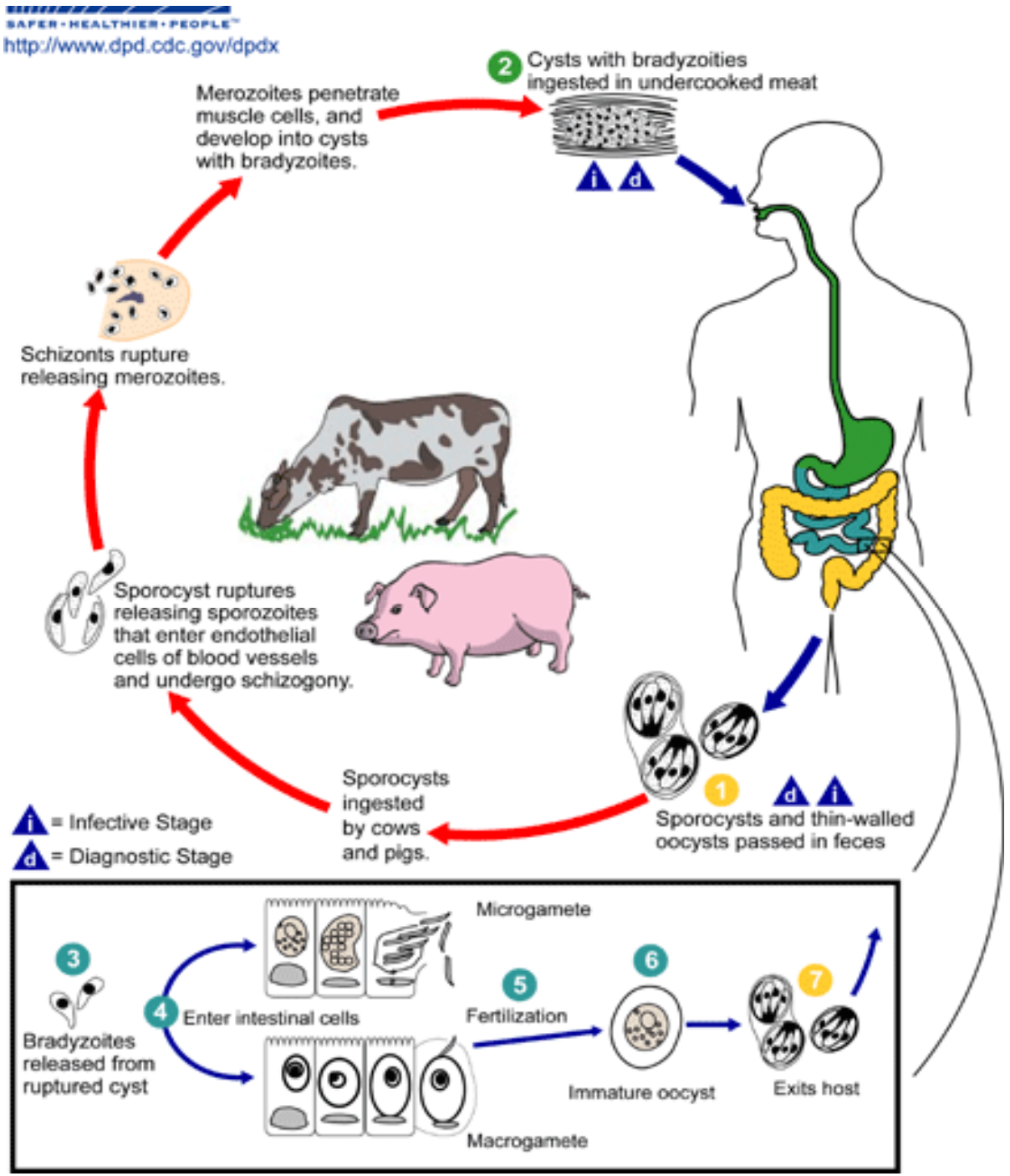
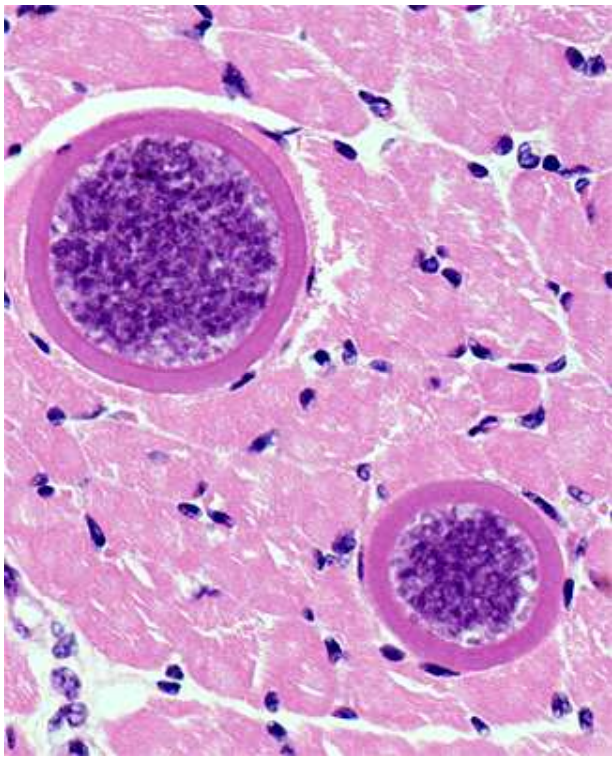
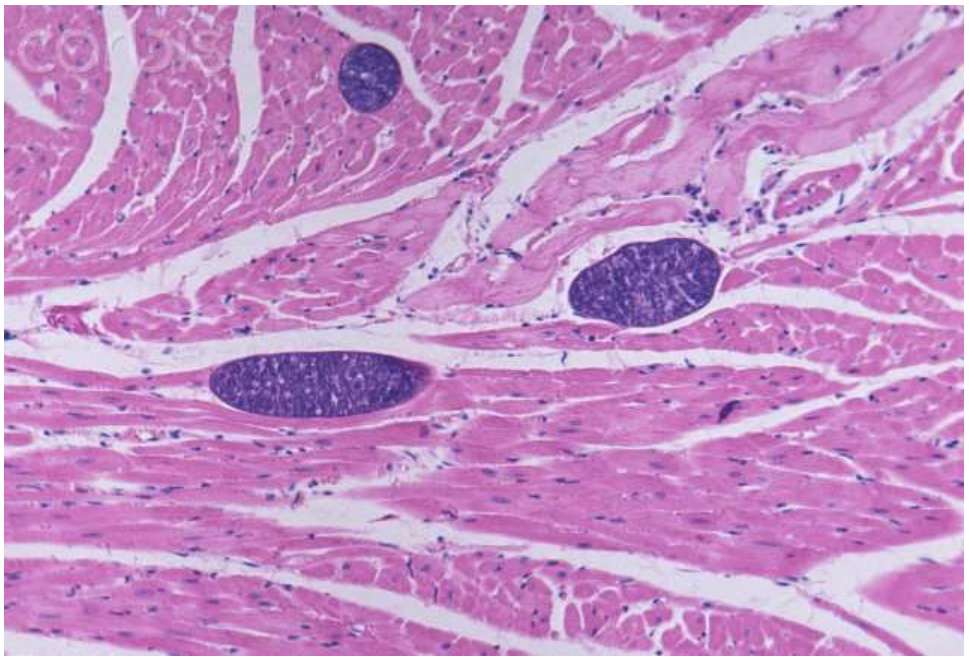


Sarcocystis spp - cycle

Sarcocystis spp - sporocysts

Sarcocystis spp –sarcocysts





Microsporidia

- **Found to infect humans since the outbreak of HIV epidemics**
- **Over 14 species can infect humans. Among those, 2 have known pathogeny:**

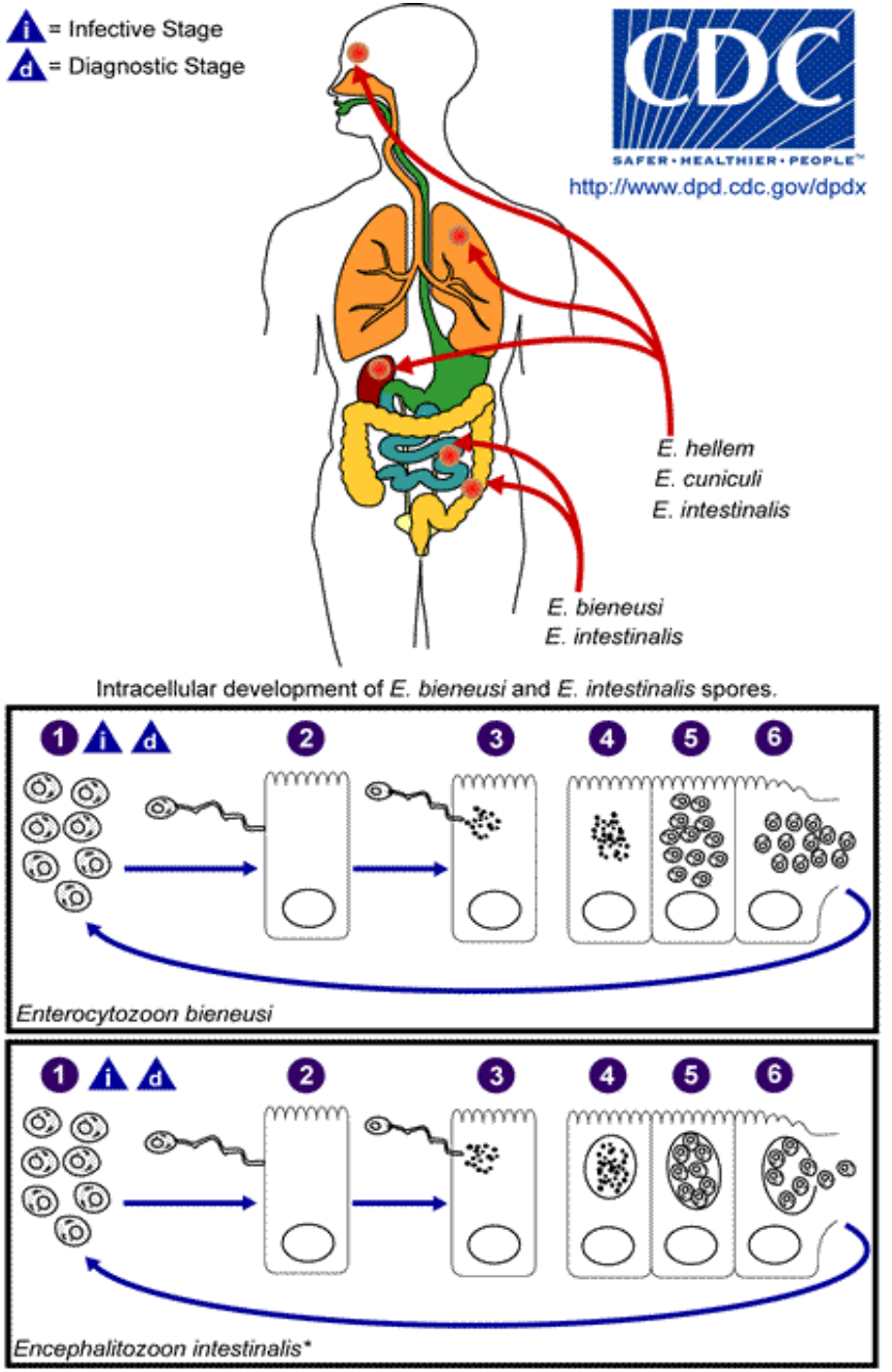
  Enterocytozoon bieneusi

  Encephalitozoon intestinalis
- **Re-classified as FUNGI**
- **Various Microsporidia (over 1000 species) infect different species of vertebrates and invertebrates**

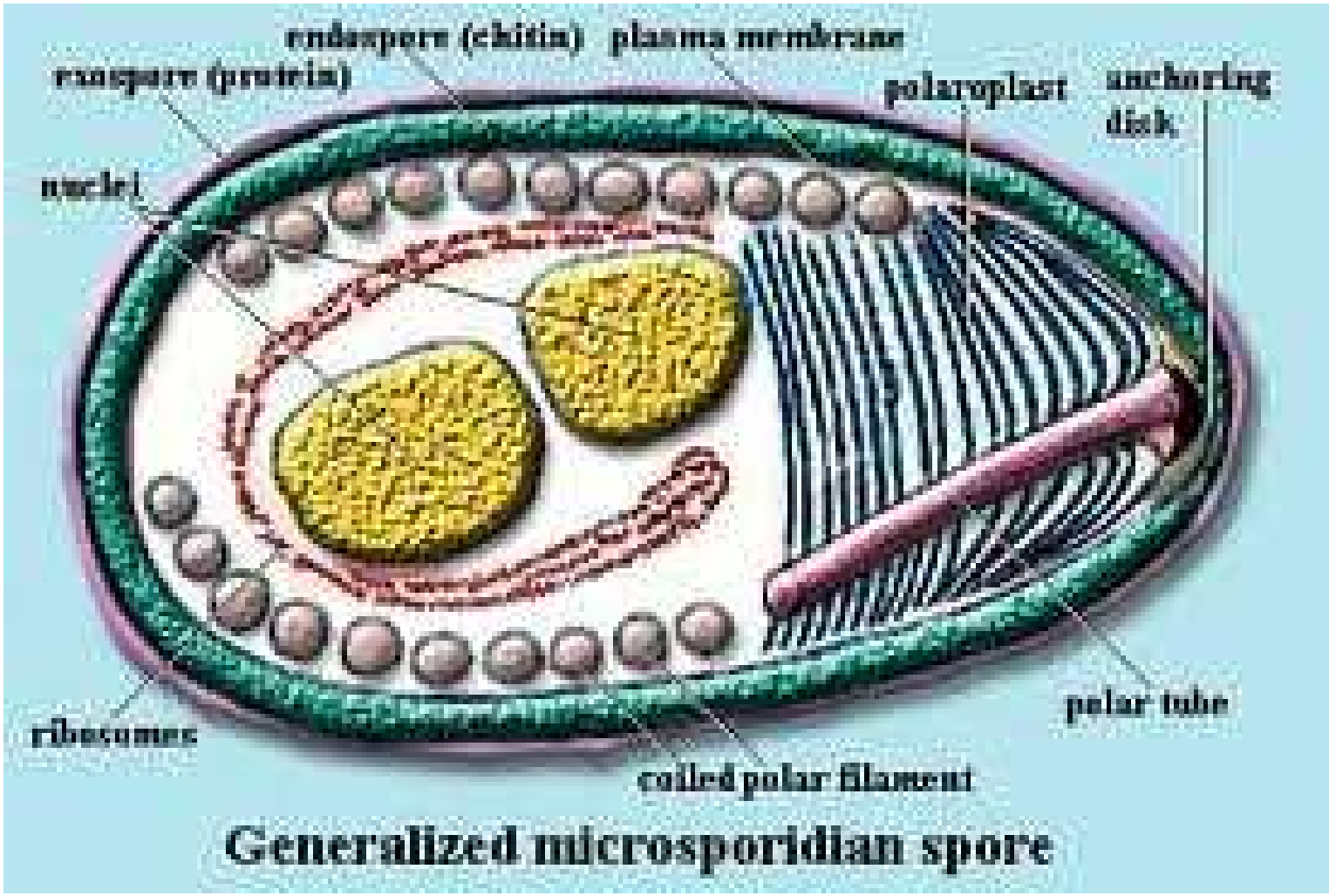
Enterocytozoon bieneusi (1)

- **Reported since syndrome of AIDS-related diarrhoea is known**
- **Is considered casual, opportunistic, accidental in humans**
- **Obligate intracellular spore-forming organism with wide range of hosts**
- **Infection via spores (inhaling, ingesting, other)**
- **After ingestion, spores form a polar tube through which sporoplasm is passed, infecting any enterocyte penetrated by the tube**

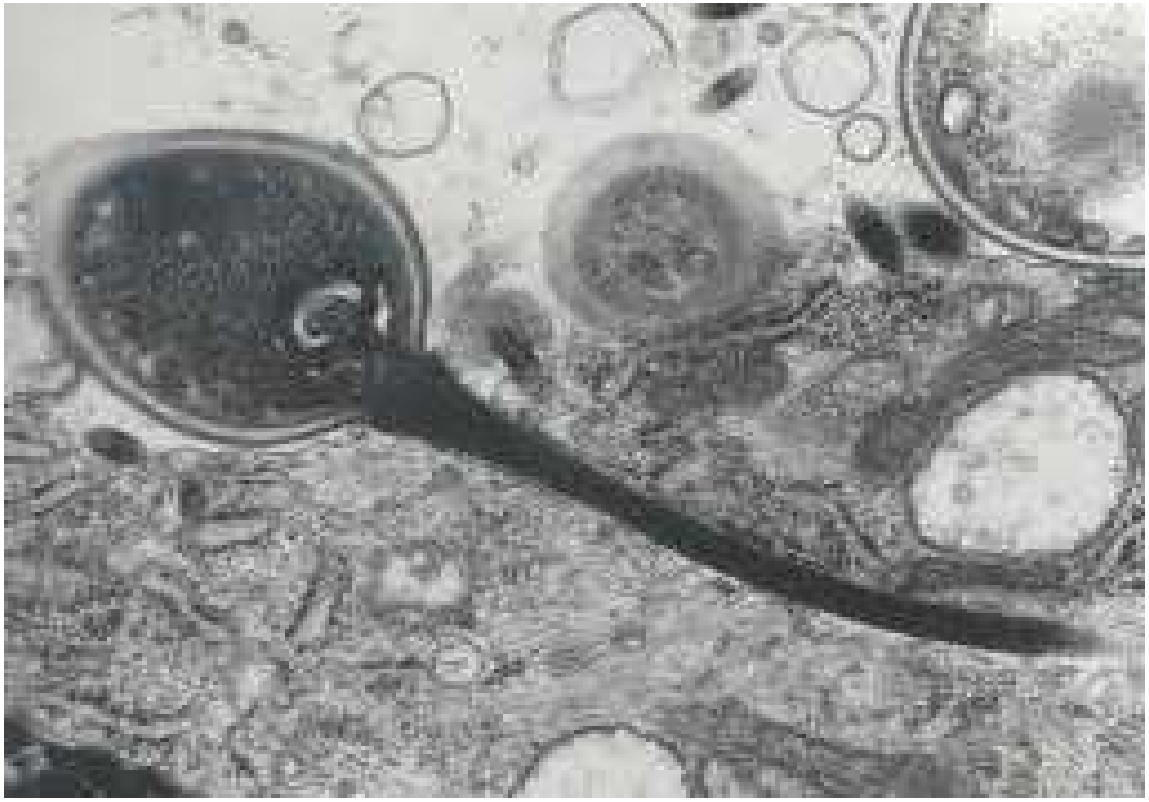
E. bieneusi -cycle



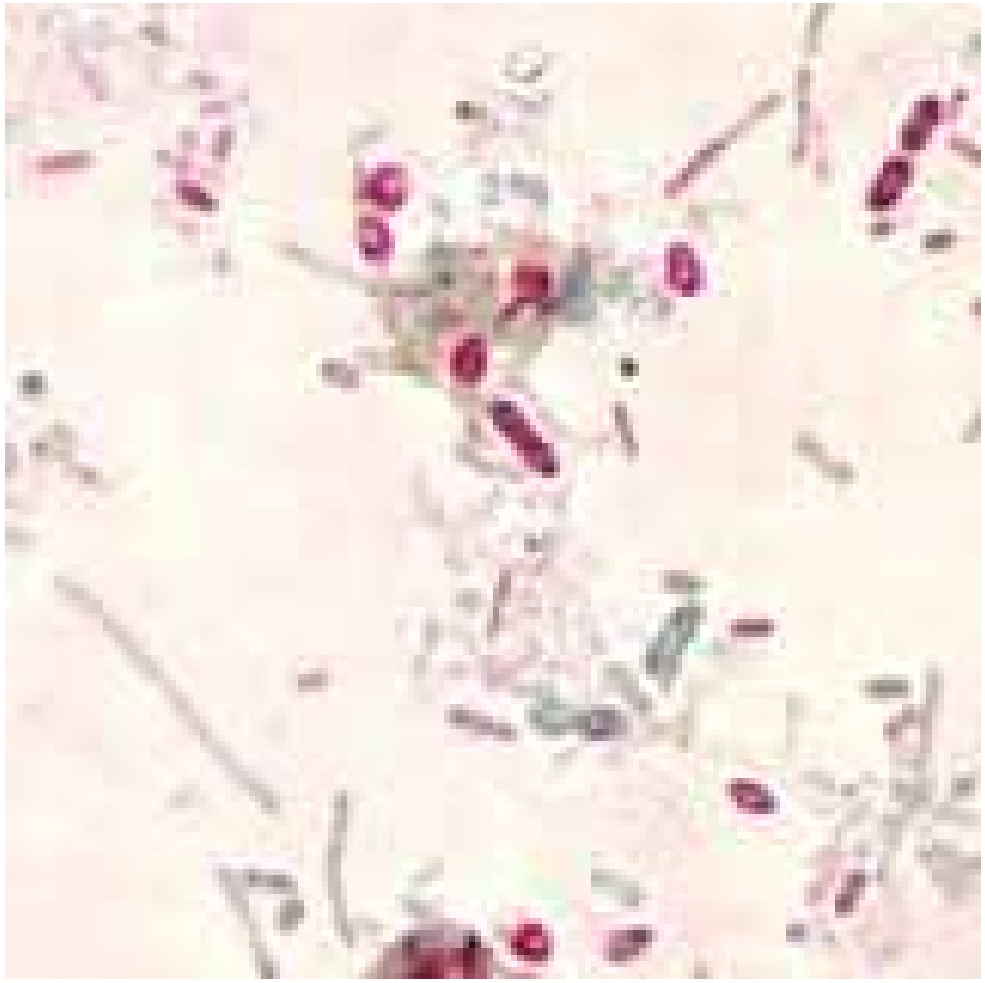
Enterocytozoon bieneusi - structure



Microsporidian spore with an extruded polar tubule



E. bieneusi spores in stools -chromotrope



Encephalitozoon spp - 1

- **Widespread among other vertebrates**
- ***E. cuniculi is* best known with all stages within a parasitophorous vacuole & not causing enteropathy**
- **Exposure to *E. cuniculi* is quite common**
- ***E. hellem* has been recently described in AIDS patients with corneal infection & disseminative disease involving lungs and kidneys but not the gastro-intestinal tract**

Encephalitozoon spp - 2

- ***E. intestinalis* reported in AIDS patients too**
- **Can disseminate and may be found in lamina propria macrophages, renal vascular & portal vein. Spores are shed in urine. Development in a separated parasitophorous vacuole**
- **Less common than *E. bieneusi* but more sensitive to Albendazole**