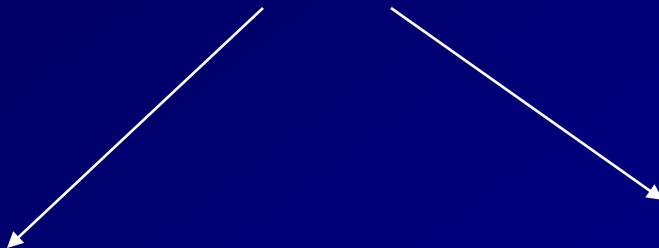


Cryptosporidiosis & other coccidian infections

Dr TGAN Chandrasena

Coccidian parasites of man

- Intracellular parasites
- Complex life cycles: 2 types



- Direct (1 host)
- Indirect (2 hosts)
 - Definitive & intermediate hosts

3 phases of the life cycle

■ Shizogony

Multiple asexual reproductions within host cells with formation of multiple daughter cells (merozoites)

■ Gametogony

Formation of male & female gametes from merozoites

■ Sporogony

Fusion of male & female gametes to form zygote & its division to sporozoites

Medically important spp

- *Cryptosporidium parvum*
- *Isospora belli*
- *Sarcocystis Spp*
- *Toxoplasma gondii*
- *Cyclospora cayetanensis*

Learning objectives

Cryptosporidiosis

- scientific name of causative organism
- morphology
- life cycle & modes of transmission
- clinical features and pathogenesis
- diagnosis
- treatment
- epidemiology (globally and Sri Lanka)
- principles of prevention & control

Cryptosporidiosis

- Causative organism of human disease

Cryptosporidium parvum

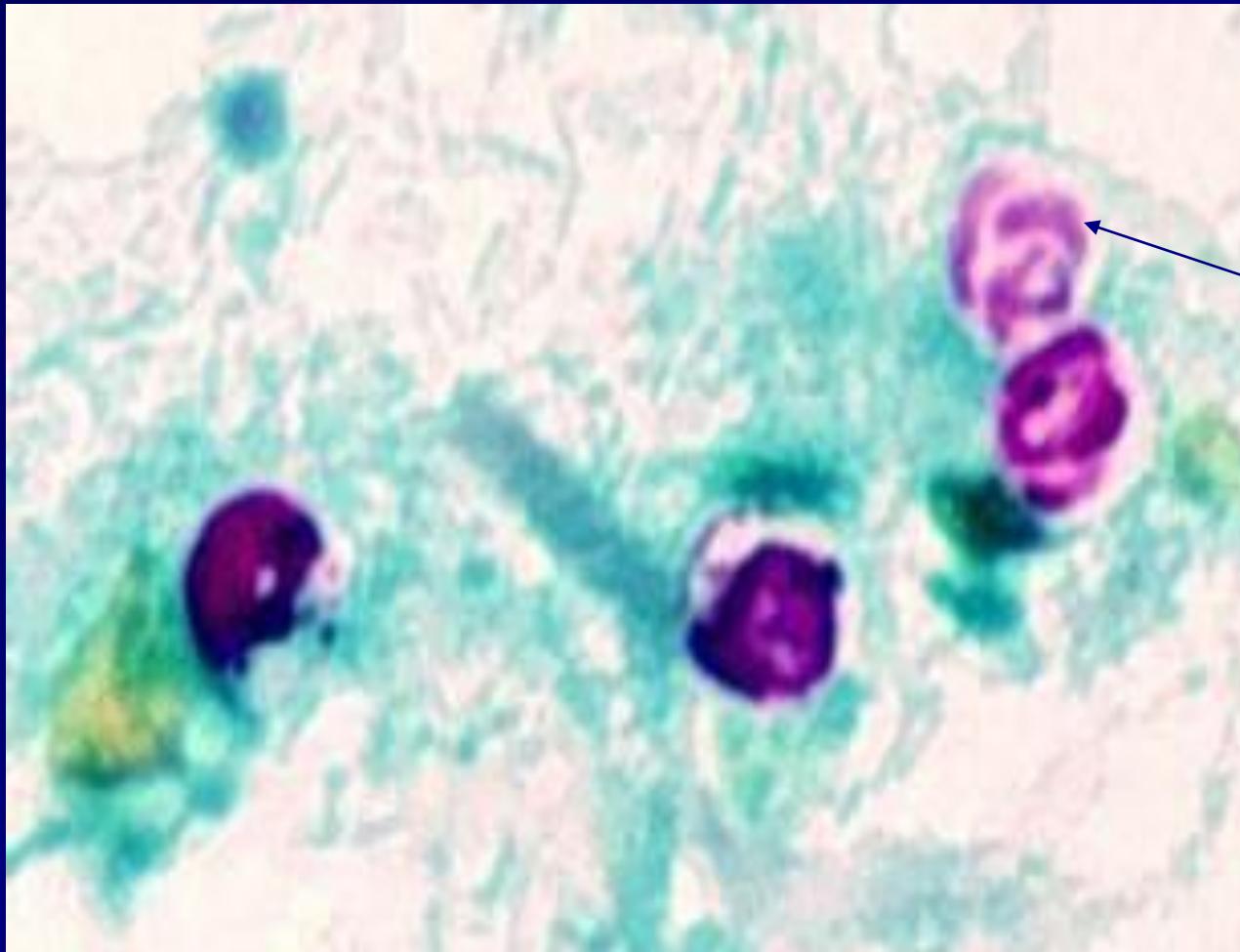
Cryptosporidium hominis

- Habitat- enterocytes of the small intestine
- Unique site-intracellular but extracytoplasmic
- Opportunistic organism

Morphology

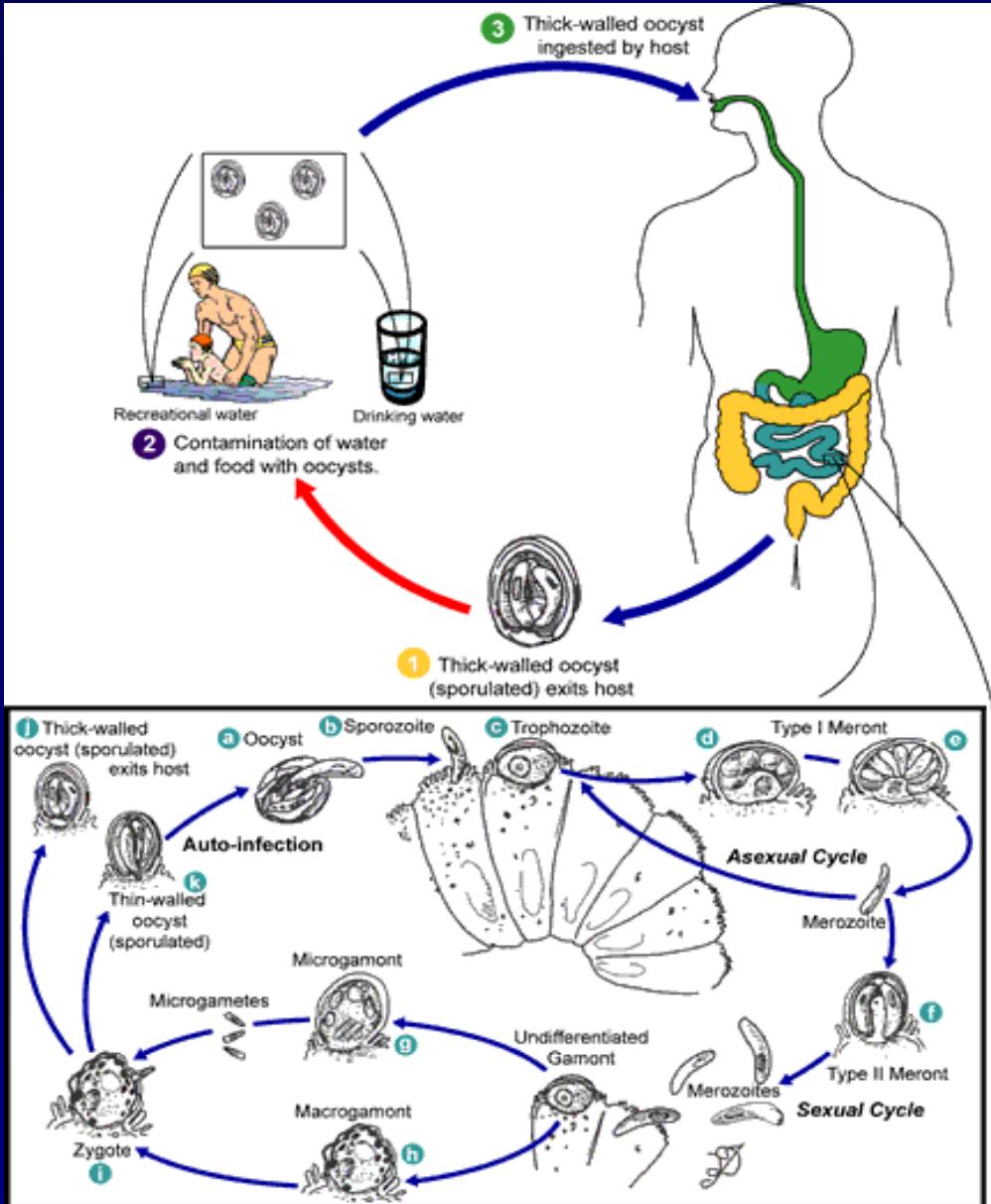
Oocyst

- Size 4.5-5 μ m
- Shape spherical
- Contain 4 sporozoites



Modified Acid fast
stained faecal
smear

Life cycle



Transmission

- Stage: oocyst
- Direct faeco oral (person to person / livestock animals)
- Indirect via contaminated food & water (infective human / animal excreta)
- Water is an important vehicle as oocyst resist chlorination & filtration is ineffective (due to small size)
- Animal dung used as fertilizer may contaminate vegetables & fruits eaten raw

Oocyst survival

- Resistant to most common disinfectants
 - Survive for months in moist cool environments
 - Freeze drying
 - Temp $> 60\text{ C}^{\circ}$ for 30 min
 - Ozone
- 
- Kill the oocyst

Epidemiology

- Distribution world wide
- Prevalence higher in developing nations
- Incidence often sporadic but outbreaks
(water borne) reported
 - San Antonio Texas 1st (sewage leakage into well water)
 - Milwaukee out break- largest waterborne outbreak in US (1993 April)

Epidemiology

- Higher prevalence among children < 2y
- Often seasonal (warmer months)
- Prevalence in SL.- < 1%
at LRH in 1980 2.6%

Risk groups for cryptosporidiosis

- Day care attendees
- Child care workers and parents of infected children
- Travelers including backpackers and hikers drinking untreated water
- Swimmers
- People who handle animals
- People exposed to human faeces by sexual contact
- Health care providers

Clinical features

- ICP 3 – 11 days
- Chronic watery diarrhoea (profuse)
- Abdominal pain, nausea, vomiting
- Weight loss, fever & cough
- Recovery spontaneous in the immunocompetent
- Immunocompromised – persistant profuse diarrhoea → Death due to dehydration
- Extraintestinal infections common-biliary, respiratory, pancreas etc

Pathology

- Distortion of normal villous architecture of small intestines
- Shortening of villi & microvilli with crypt hyperplasia
- Rupturing of schizonts damage the enterocytes
- Food digestion & absorption is impaired

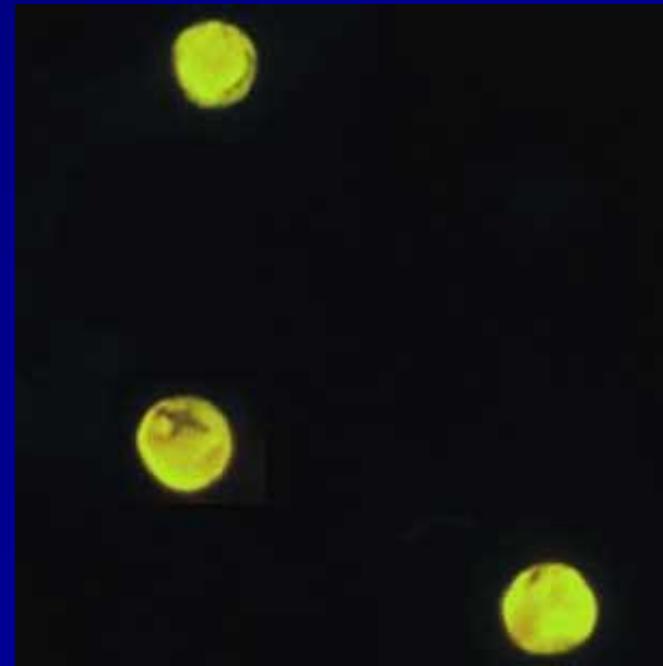
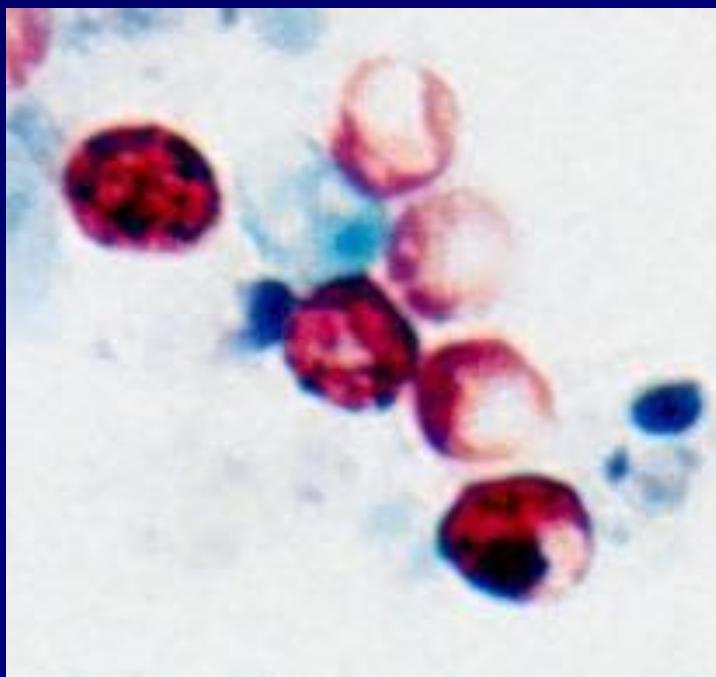
Immunology

- Both humoral & cellular factors impt. in controlling the infection
- Cellular immune response > important
- Esp . CD 4 T cells

Opportunistic infection in the cellular immune deficient ex: AIDS

Diagnosis

- Microscopic examination of stained air dried faecal smears for oocyst
- Stool concentration methods
- Stains –modified Ziehl Neelson /Phenol auramine



Treatment

- No satisfactory drug up to now
- Drugs, paramomycin & nitazoxanide may be effective
- Immunocompetent - self limiting (symptomatic management of vomiting, diarrhoea & dehydration)
- Immunocompromised Prolonged palliative treatment
- AIDS- improve immune functions –anti-retrovirals
immune therapy –

Bovine Colostrum
Immunoglobulins

Prevention

- Reduce opportunities for direct / indirect faeco oral transmission
- Good personal hygiene
- Drink boiled cooled water
- Avoid use of animal excreta as fertilizer
- Patient education

- Patient education
- Thorough hand washing
- Avoid communal swimming pools at least 2 weeks after recovery
- Advise immunocompromised to use boiled /bottled water or use microfilter (<1µm)
- Avoid contact with young animals, people with diarrhoea & communal swimming pools
- Instruct AIDs pts., day care workers, food handlers, health care workers to wear gloves when handling human faeces

Isosporiasis

- Causative organism - *Isospora belli*
- Habitat – small intestine
- Opportunistic infection
 - immunocompetent – mild diarrhoea
 - immunocompromised – severe watery diarrhoea, steatorrhoea, Nausea, vomiting, abd. pain

Morphology Oocyst

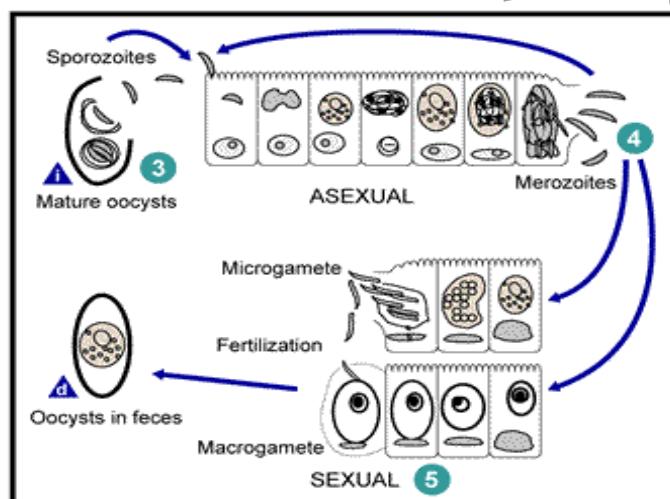
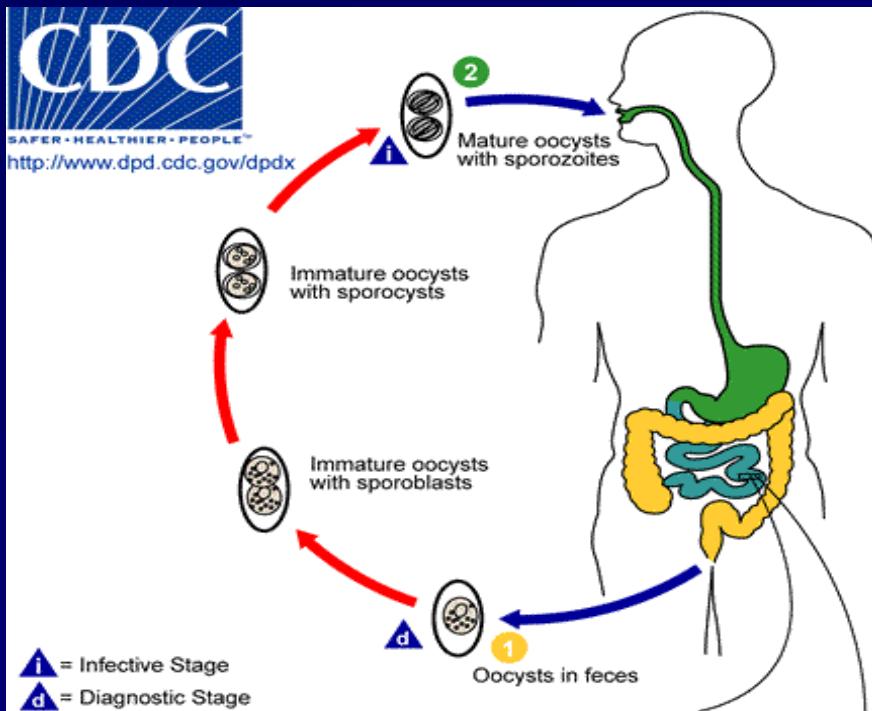


Shape: elongated

Size: 25-33 x 12-16 μ m

2 sporocysts each with 4 sporozoites

Life cycle



Epidemiology

- Mainly seen in tropical & subtropical regions
Latin America, Tropical Africa,
Middle East & South East Asia
Not reported in Sri Lanka
- Diagnosis
Examination of stool smears (wet smears) for
oocysts
- Treatment
Trimethoprim + sulphamethoxazole

Sarcocystosis

- Obligate 2 host life cycle
- *Sarcocystis lindemanni* cystic stages detected in muscles of humans
- Acquired by eating raw meat
- Clinical features
 - ❖ Muscle tenderness ass. with cysts in muscles
 - ❖ Nausea & diarrhoea ass. With enteric infe.

Life cycle of Sarcocystis species

Released sporozoites enter enterocytes of s. intes.



Carnivore



Excrete oocyst

ingested by a carnivore



Herbivore



Sporozoites enter endothelial cells
&
form cysts in muscles



Oocyst ingested by herbivore

. Life cycle *Sarcocystis* spp

60 Diagnostic Medical Parasitology

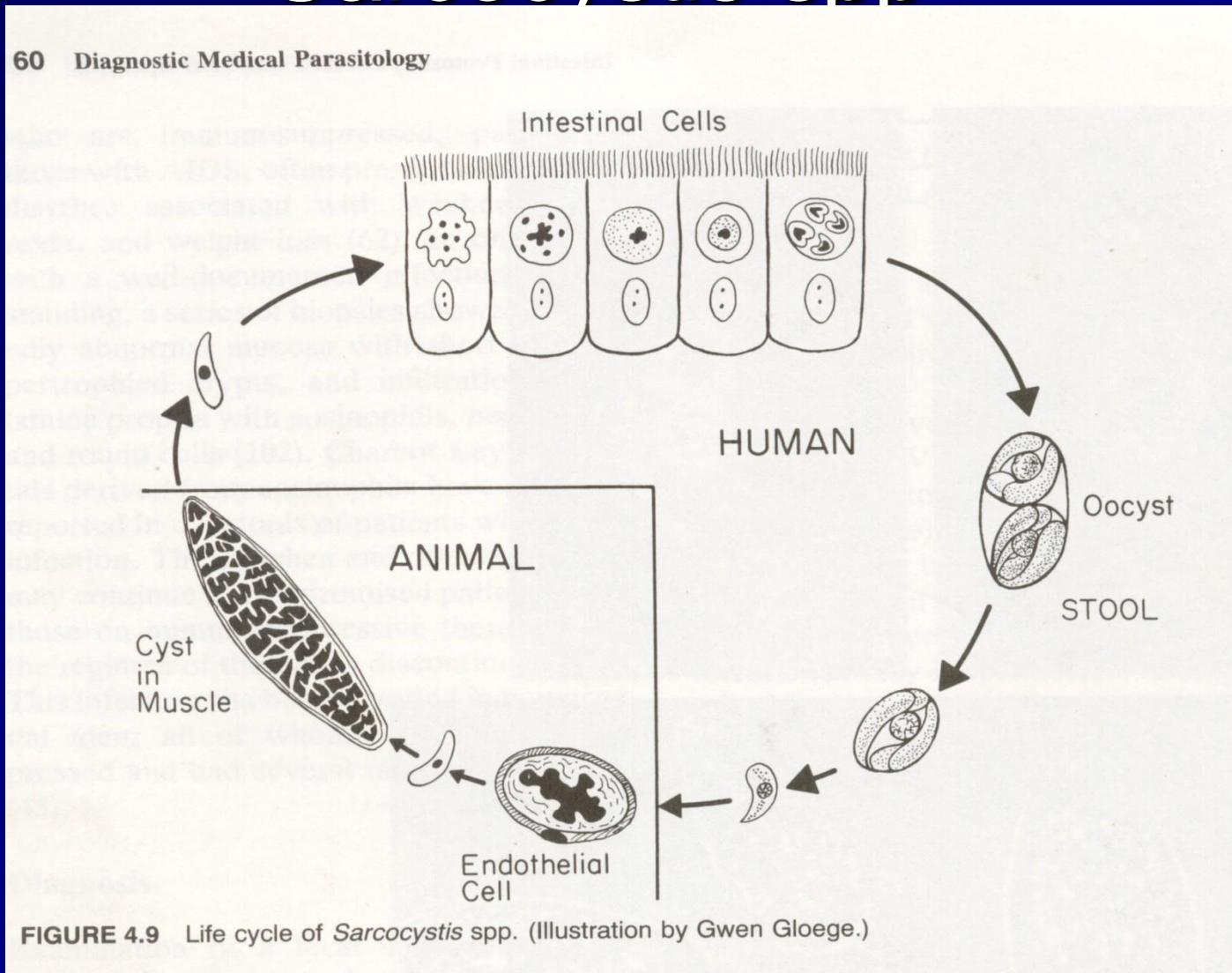


FIGURE 4.9 Life cycle of *Sarcocystis* spp. (Illustration by Gwen Gloege.)

Cyclosporaiasis

■ Causative organism

Cyclospora cayetanensis

- ❖ Opportunistic infection
- ❖ travellers diarrhoea in immunocompetent
- ❖ Clinical disease = Cryptosporidiosis
- ❖ Oocyst larger 8-10µm
- ❖ Contain 2 sporocysts each with 2 sporozoites
- ❖ Exhibits autofluorescence
- ❖ Treatment: Cotrimoxazole

Summary

- Cryptosporidiosis manifests as persistent profuse watery diarrhoea
- Caused by *C. parvum* which inhabits the enterocytes of small intestines of man
- Opportunistic pathogen
- Diagnosed by the presence of oocysts in faecal smears stained with ZN stain
- No satisfactory treatment
- *I. belli*, *C. cayetanensis*, *Sarcocystis* species are other intestinal coccidia