Phylum: Apicomplexa
Class: Sporozoaa
The most characteristic features of sporozoa are
1-unique appearance of most protozoa makes it possible for knowledgeable person to identify them to level of genus and spp. by microscopic alone.

2- motility is absent in most cells except male gamete.

3-life cycle are complex, with well deve. A sexual and sexual stages
4-sporozoans produce special spore-like cells called sporozoite. 5-is an intracellular parasite with a complex cycle alternating between human and mosquitoes. The female gametocytes produce a single macrogamete, & male gametocyte produces multiple gametes.
6--have similar, independent gametocyte the male are microgametocyte and female macrogametocyte
The female gametocyte produce a single macrogamete, and male gametocyte produce multiple gametes.
8- the oocyst in spp. Of isospora and sarcocyst is produce 2 internal sporocyst each with 4 sporozoites, in cryptosporidium the sporocyst stage is omitted
8- only 2 spp. Of coccidia are known to undergo schizogony and gametogony in man.
9-the cytoplasm and nuclei divided like spores (sporogony) inside the oocyst.
10- a thin walled oocyst may rupture within the host and start another auto-infections life cycle.
11-thick walled oocysts are stable in the environment after passage in the feces.
12- the troph. Undergo a form of a sexual replication called schizogony (multiple fission) to produce merozoites within a membrane.
13-the merozoites differentiate into macro. and microgametes and following mating the life cycle is repeated
Eimeria and Isospora
(coccidiosis)
Members of these two genera are often referred to as the "coccidia."
The two genera contain a large number of species that infect a variety of animals throughout the world.
The diseases caused by these parasites are referred to collectively as coccidiosis, and they vary tremendously in virulence.
Some species cause diseases that result in mild symptoms that might go unnoticed (i.e., mild diarrhea) and eventually disappear,
while other species cause highly virulent infections that are rapidly fatal.
The life cycles of both genera are similar. A host is infected when it ingests oocysts that have been passed in the feces of another host.
The oocyst excysts in the host's small intestine, and the sporozoites contained within the oocyst are liberated.
The sporozoites penetrate the cells of the host's small intestine and reproduce asexually. Each generation of asexual reproduction produces multiple merozoites; the merozoites are liberated from the cell and infect new cells.
It is this stage of the infection that can result in destruction of massive numbers of cells in the host's small intestine and, ultimately, lead to the host's death.
Members of the genus *Cryptosporidium* are parasites of the intestinal tracts of fishes, reptiles, birds, and mammals. It seems that members of this genus do not display a high degree of host specificity, so the number of species in this genus remains a matter of some discussion.
Some of the merozoites that enter the host's cells transform into gametocytes. The gametocytes transform into gametes, the gametes fuse, and the resulting zygote begins to develop into an oocyst.
The developing oocyst escapes from the host's cell, and it is passed in the host's feces. Typically, when the oocyst is passed in the feces, it is not infective because it does not contain sporozoites; this is an unsporulated oocyst.
After several days (or weeks, depending on the species) outside of the host's body, the oocyst completes development and sporozoites are found within; this is a sporulated oocyst, and it is infective to the next host (view diagram of the life cycle).
Diagnosis of the infection is based on finding oocysts in the host's feces. Differentiation of the two genera and the species within the genera is based on the internal morphology of the oocyst.
Thus, while it is possible to identify an unsporulated oocyst as a coccidian oocyst, it is virtually impossible to identify the parasite that produced the oocyst until the oocyst is sporulated.
Asexual multiplication of the parasite in the cells of the host's small intestine is self limiting (although in some species the parasite actually kills the host before asexual reproduction stops).
That is, after several generations of asexual multiplication, the parasite simply stops dividing, the host stops passing oocysts, and the host is effectively cured of the infection.
An unsporulated coccidian oocyst. Such oocysts typically measure between 35 and 50 μm.
Another example of an unsporulated oocyst
A sporulated coccidian oocyst. The oocyst contains two sporocysts, each one with four sporozoites and this is typical of the genus *Isospora* (and *Toxoplasma*, although *Toxoplasma* oocysts are much smaller).
Sporulated oocysts of the genus *Eimeria* contain 4 sporocysts each one with two sporozoites.
A sporulated oocyst of *Eimeria sp.*

*This oocyst contains four sporocysts (only three can be seen).*
A histological section showing the asexual reproductive stages of a coccidian in the tissues of the host's small intestine.
Note the many developing meronts (=schizonts) (the large dark blue structures enclosed within the rectangle) in the tissues. Each meront will produce many merozoites
A histological section showing the asexual reproductive stages of a coccidian in the tissues of the host's small intestine.
Cryptosporidiosis
Cryptosporidium isolated from humans is now referred to as C. parvum. Cryptosporidium infections have been reported from a variety of wild and domesticated animals.
and in the last six or seven years literally hundreds of human infections have been reported, including epidemics in several major urban areas in the United States
Cryptosporidiosis is now recognized as an important opportunistic infection, especially in immunocompromised hosts.
Cryptosporidium is a small parasite, measuring about 3-5 μm. It lives on (or just under) the surface of the cells lining the small intestine, reproduces asexually, and oocysts are passed in the feces.
Transmission of the infection occurs via the oocysts. Many human infections have been traced to the contamination of drinking water with oocysts from agricultural "run-off" (i.e., drainage from pastures), so it is considered a zoonosis.
In most patients infected with cryptosporidiosis the infection causes a short term, mild diarrhea. Since such symptoms are
associated with a number of ailments, infected individuals may not seek medical treatment, and the infection may subside on its own.
Thus, it is difficult to say how many people are infected. On the other hand, in persons with compromised immune systems, this parasite can cause a pronounced, chronic diarrhea.
in severe cases the infected individual may produce up to 15 liters/day of stools, and this may go on for weeks or months.
Needless to say, such an infection, if not fatal unto itself, can exacerbate other opportunistic infections common in immunocompromised hosts.
An electron micrograph showing several stages of *Cryptosporidium* (two are marked with asterisks) on the intestinal epithelium of a sheep.
A scanning electron micrograph of *Cryptosporidium* lining the intestinal tract.
A scanning electron micrograph of a broken meront of *Cryptosporidium* showing the...
The trachea of a turkey "lined" with numerous *Cryptosporidium*. 
Cryptosporidium oocysts. (Original image from a Japanese language site tentatively titled Internet Atlas of Human Parasitology)
**Intestinal protozoa**

**Coccidia**

Classification

Phylum
- Apicomplexa

Class
- Coccidea
  - Sexual-asexual cycle in same host
  - Parasitize intestinal epithelium

Order
- Eimeriida
  - Growth period in host cell

Genus
- Isospora
- Sarcocystis
- Toxoplasma
- Cryptosporidium
- Cyclospora

**Isospora belli** (causing coccidiosis in humans)

Life cycle

- Contaminated food or drink
- Motile mature oocysts
- Sporulated oocysts
- Ingested oocysts
- Sporozoites infect intestinal epithelial cells
- Asexual cycle in epithelial cells
- Sporozoites released from epithelial cells
- Enter into new host
- Replicate in new host
- Oocysts released into environment

When stained using an acidfast method, oocysts of *Cryptosporidium parvum* stain bright red or purple, as seen in this preparation and used
Coccidia (continued)

Cryptosporidium parvum

Life cycle

- Ingested (inhaled?)
- Exits host
- Autoinfection
- Thick-walled oocyst (sporulated)
- Thin-walled oocyst (sporulated)

Type I Meront
Different between Isospora and Eimeria sporulation.