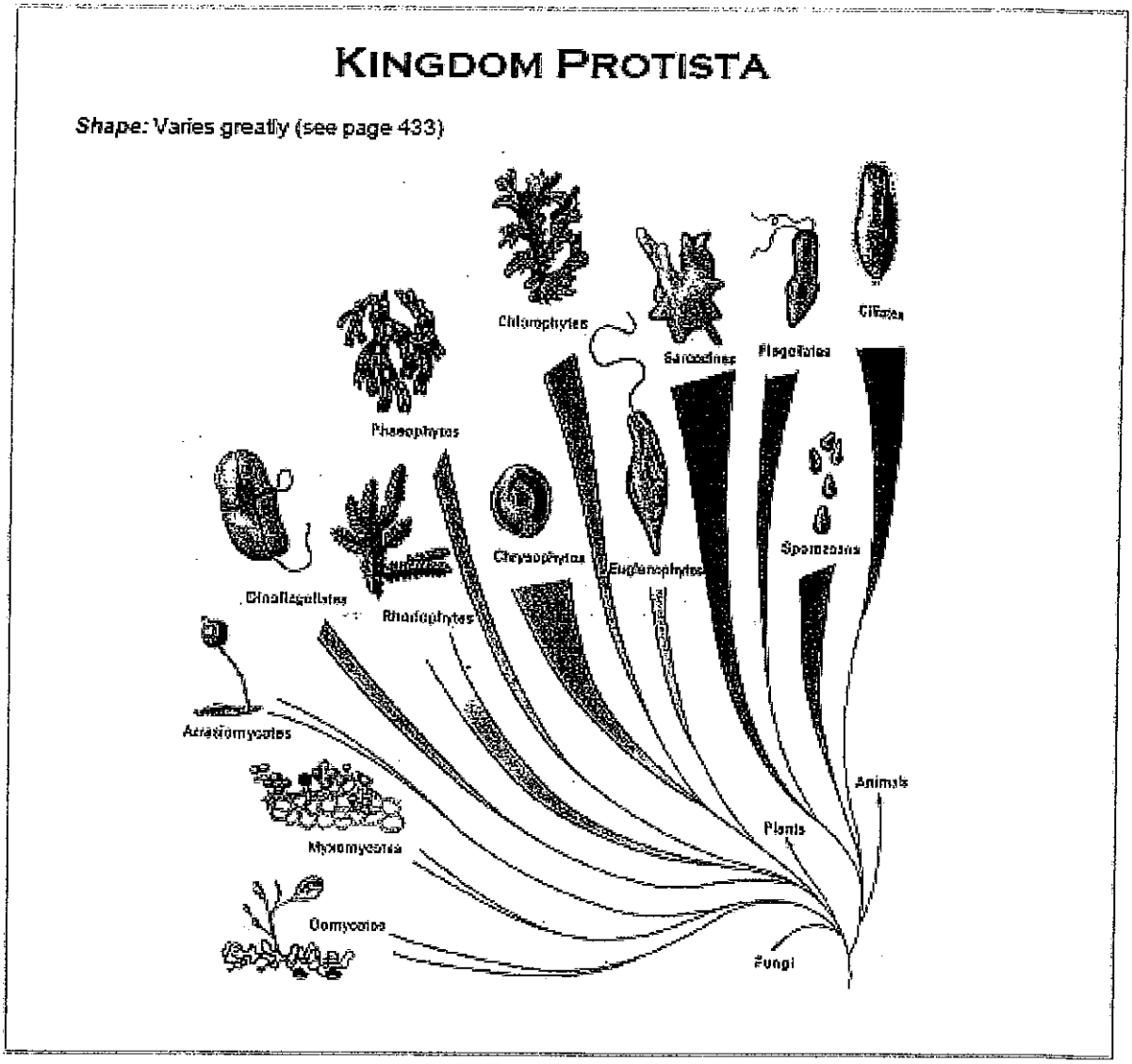

Comparing Animal-like Protists (Protozoa) & Plant-like Protists (Algae)

What is a Protist?

Protists are organisms that are classified into the kingdom Protista. The protists form a group of organisms that really do not fit into any other kingdom. Although there is a lot of variety within the protists, they do share some common characteristics.

All protists are **eukaryotic**. That is, all protists have cells with nuclei. In addition, all protists live in moist environments.

Protists can be **unicellular** or **multicellular**. Protists can be microscopic or can be over 100 meters (300 feet) long. Some protists are **heterotrophs**, while others are **autotrophs**.

Since protists vary so much, we will group them into three subcategories: **animal-like protists**, **fungus-like protists**, and **plant-like protists**.

A wide variety of organisms belong to the Kingdom Protista. However, these organisms share several characteristics. Protists all have nuclei within their cells, & are usually unicellular.

PART A: Protozoa

Animal-like protists are called protozoans ("first animals") because it is thought that they are the evolutionary history of animals. They share many common traits with animals. All of the animal-like protists are heterotrophs; they are unable to make their own food. But unlike animals, they are unicellular. Since they can't make their own food they must be able to move through their environment and catch their food.

The animal-like protists are divided into four groups based upon their means of mobility and manners for catching their food. They are divided into: protists with pseudopods, protists with cilia, protists with flagella, and parasitic protists.

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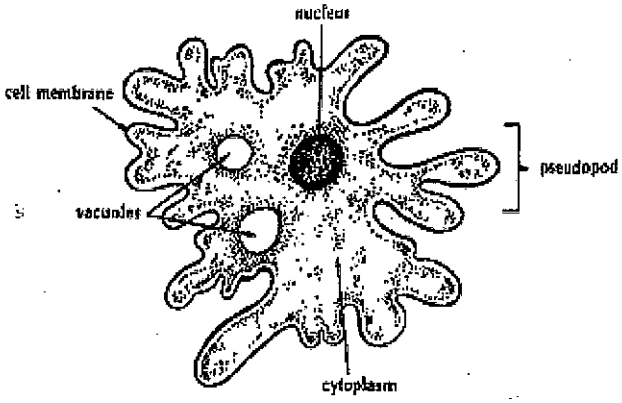
Read the information sheet on Sarcodines (Amoeba)

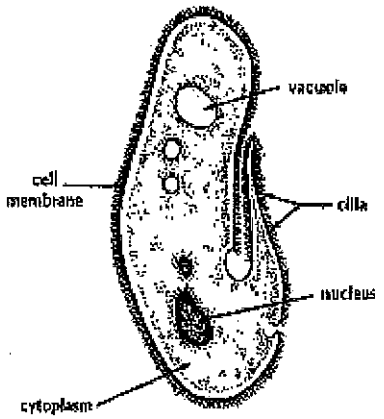


This diagram shows a greatly enlarged view of a protist called Amoeba. Amoeba move by extending parts of their cytoplasm. These extensions are called pseudopods. The special features of the Amoeba are marked on the diagram.

Examine a prepared slide of Amoeba on low power. On the data sheet, draw what you see & label what you see using the labeled diagram as a guide.

****

Read the information sheet on Ciliates (Paramecium)



The next diagram shows an enlarged view of a Paramecium, Paramecium have tiny hair like parts called cilia that stick out of the cell membrane. Cilia Beat the water, & move the Paramecium from place to place.

Examine a prepared slide of Paramecium on low power. On the data sheet, draw what you see & label what you see using the labeled diagram as a guide.

****

Read the information sheet on Flagellates (Trypanosoma & Giardia)

Then look at the "Giant Microbes" for each (African Sleeping Sickness & Giardia) – read the tags; answer the questions on the data sheet

On the data sheet, draw a picture of each in the circles.

Examine a prepared slide of *Trypanosoma* on high power. In the circle on the data sheet, draw what you see.

****

Read the information sheets on Sporozoans (Plasmodium & Toxoplasma)

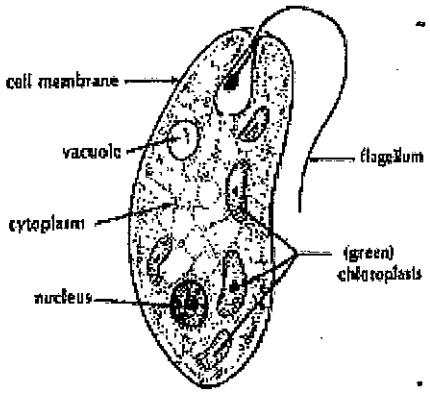
Then look at the "Giant Microbe" for Malaria & Toxoplasmosis – read the tag; answer the questions on the data sheet

On the data sheet, draw a picture of plasmodium & toxoplasmosis in the circles.

PART B: Algae

Plant-like protists are autotrophic; they can make their own foods. They live in soil, on the barks of trees, in fresh water, and in salt water. Plant-like protists are very important to the earth because they produce an abundant amount of oxygen. They are the basis for the aquatic food chain.

****



Read the information sheet on Euglenoids (Euglena)

Observe the diagram of a Euglena. Note the single hair like structure called a flagellum. The flagellum moves the euglena through the water. Euglena are green due to the presence of chlorophyll. The chlorophyll contained within a cell part called a chloroplast. Euglena can make its own food.

Examine a prepared slide of euglena: first locate the organisms on low power – they will be small – carefully switch to high power & use the fine adjustment knob to focus. On the data sheet, draw what you see & label what you see using the labeled diagram as a guide.

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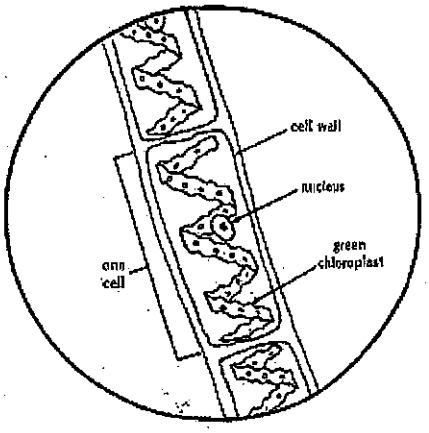


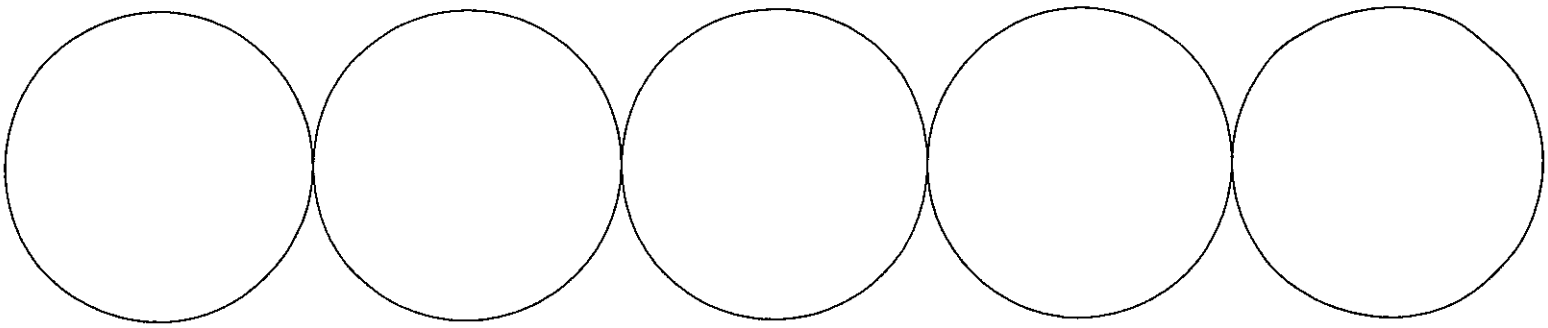
Spirogyra
(high power magnification)

Read the information sheet on green & yellow algae (Diatoms, Volvox & Spirogyra)

On low power, examine the three prepared slides of: diatoms, volvox & spirogyra. On the data sheet, draw what you see & label what you see on the spirogyra slide using the labeled diagram as a guide.

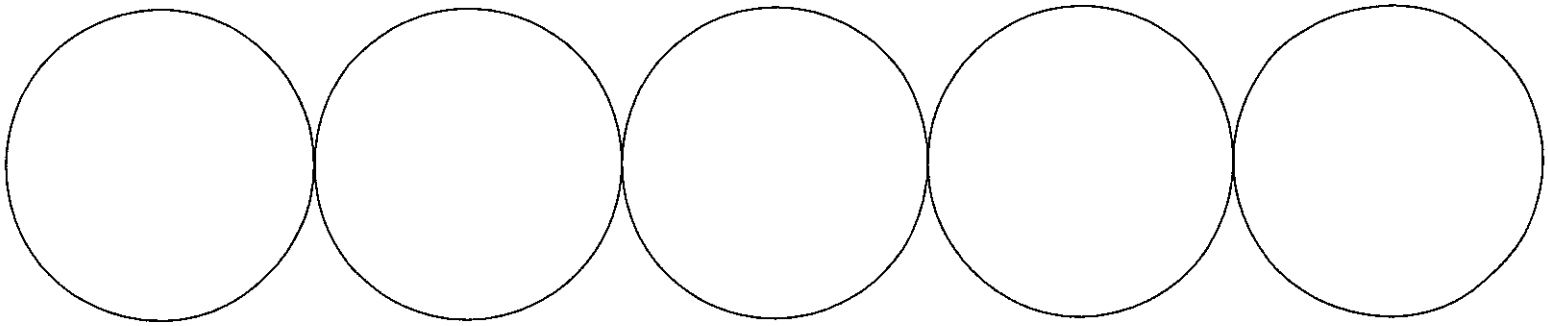
DATA SHEET **NAME**_____

Protozoan Drawings:



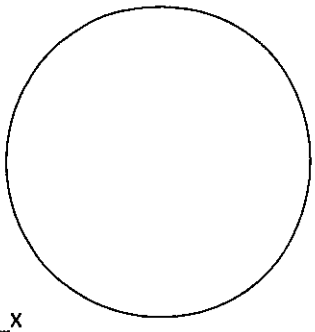
Amoeba ____x Paramecium ____X Trypanosoma Giardia Trypanosoma ___X

Algae Drawings:



Plasmodium Toxoplasmosis Euglena____x Diatoms____x Volvox____x

Giant Microbes Questions:



Spirogyra ___x

→African Sleeping Sickness (Trypanosoma):

1. What does "tsetse" mean?
2. Is the bite of a tsetse fly painful?
3. What are the first indications of African Sleeping Sickness?
4. What is "Winterbottoms sign"?
5. How long can African Sleeping Sickness take to develop?
6. What are symptoms that African Sleeping Sickness has spread to the central nervous system?
7. How many people per year are traumatized by Sleeping Sickness
8. To what area is Sleeping Sickness confined?

→ Giardia:

1. How do people usually acquire Giardia?
2. By what name is Giardia sometimes referred?
3. What allows Giardia to survive in the wide world?
4. What are symptoms of Giardia & how long do they last?
5. How can you avoid Giardia?

→ Malaria (Plasmodium):

1. What does "malaria" mean?
2. What insect carries the Plasmodium parasite?
3. Where is the initial locus of infection?
4. What cells are subsequently destroyed?
5. When toxins are released, what symptoms result?
6. During what construction effort were efforts to control malaria instrumental?
7. How can tropical travelers avoid malaria?
8. Worldwide, how many people develop malaria yearly? How many die? Who is most likely to die?

→ Toxoplasmosis:

1. What percentages of the world's population are infected with toxoplasmosis?
2. How is toxoplasmosis acquired?
3. Where do *T. gondi* oocysts mature?
4. From where do cats commonly contract infections?
5. Describe symptoms of toxoplasmosis:
6. Why are *T. gondi* infections of special concern to pregnant women?

Comparing Protists:

Protist	Nucleus? (yes or no)	Shape:	Autotroph/ Heterotroph/ Parasite	Method of Movement:	Can cause disease? (name the disease)	Other interesting or notable facts:
Amoeba						
Paramecium						
Trypanosoma						
Giardia						
Plasmodium						
Euglena						
Diatom						
Volvox						
Spirogyra						

How can protists be helpful?

How can protists be harmful?

Information sheet on Sarcodines (Amoeba)

Protists with Pseudopods

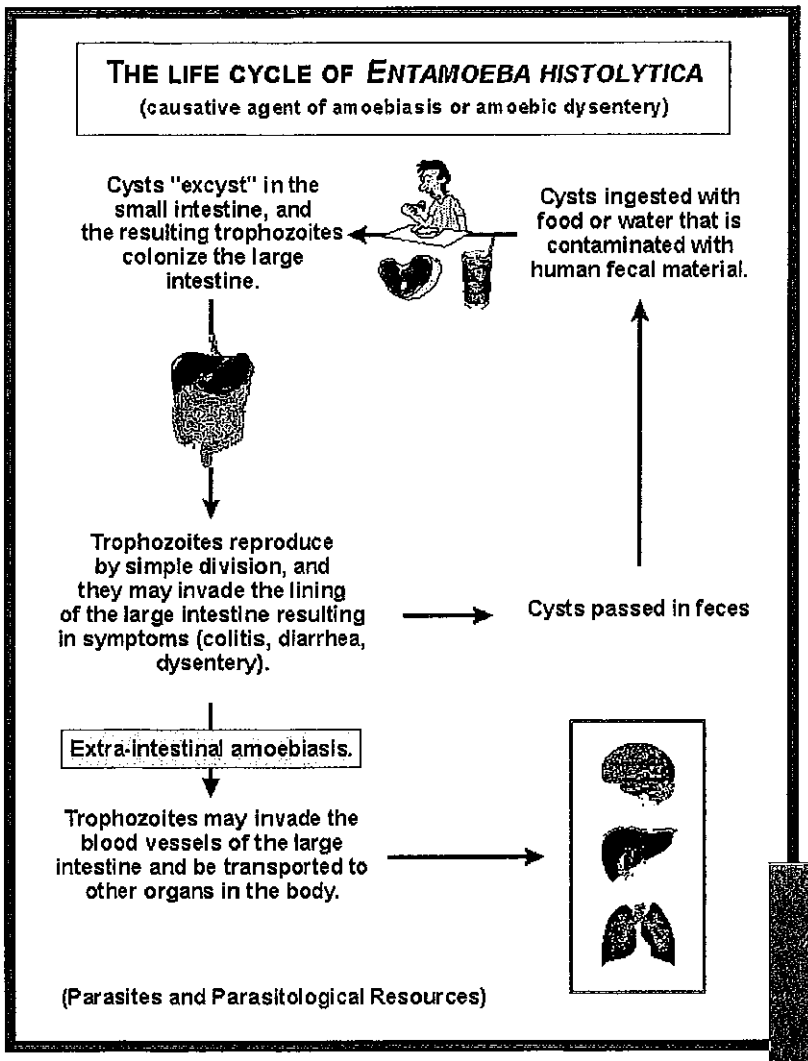
A pseudopod is a "false foot" that slowly moves the protist. These protists move towards their food or prey by extending their cytoplasm into a "false foot". The "false foot" extends from the cytoplasm, attaches to the ground, and pulls the rest of the body toward the food. The pseudopods are not only for the means of locomotion; they also capture the food. They capture the food by wrapping the "false foot" around the prey and bringing it into their bodies. One example of an animal-like protist with pseudopods is the *Amoeba (see picture above).*

Amoeba

Amoebas are single celled animal-like protists that live in moist soil, freshwater, and salt water. There are different types of Amoeba but they all use pseudopods as means of locomotion and capturing food. Most of the Amoebas are free-living and eat things like other protozoans and bacteria; few Amoebas are parasitic and live on or in other organisms, where they obtain nutrients.

An example of an Amoeba is *Entamueba histolytica.* This Amoeba is the cause of *amoebic dysentery*, which is a deadly infectious disease found mostly in tropical areas and usually in areas where sanitation is poor. This disease is the leading cause of death for infants and toddlers; their immune systems are not yet developed, therefore they cannot destroy the disease.

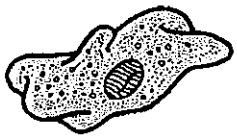
Below is the life cycle of *Entamoeba hisolytica.*



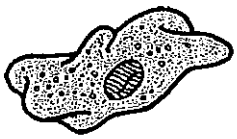
Phylum Sarcodina

- Pseudopods (false feet) projections of cytoplasm.
- Some surrounded by a calcium "shell"

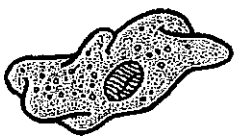
Amoeba has no definite shape



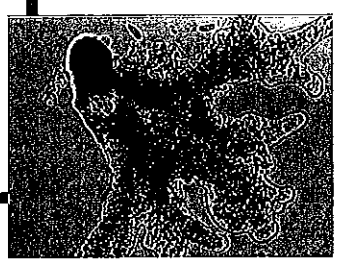
Amoeba Parts
- Nucleus
- Pseudopods
- Food Vacuole
- Cell membrane
- Amoeba Feeding
- Pseudopods



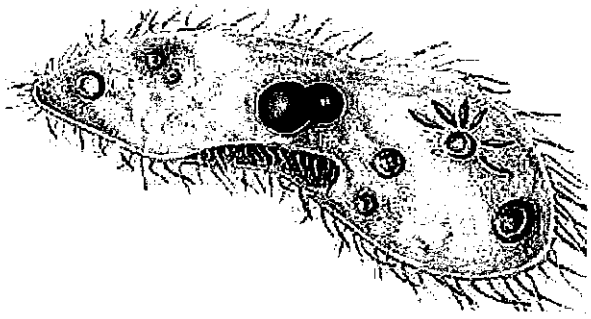
Amoeba Movement
- Pseudopods
- Shape is constantly changing
- Food is surrounded by pseudopods and stored in a food vacuole
- Amoeba Movement and Feeding



Amoeba Reproduction
- Asexual reproduction
- Pseudopods start pulling apart
- Nuclear material replicates itself
- Pseudopods pull apart splitting the cell
- The nucleus splits
- Two smaller cells result



Information Sheet on Ciliates (Paramecium)



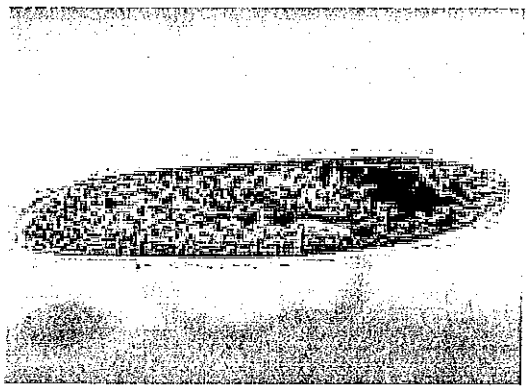
Protists with Cilia

Cilia are tiny hair-like structures that surround some protists. The cilia beat back and forth. This movement enables the animal-like protist to move through its aquatic environment. The cilia also help the organism capture food. When the cilia beat, the prey (food) is moved into its body.

Cilia are composed of ten pairs of microtubules. The microtubules are arranged in what is known as the 9+2 configuration. Of the ten pairs of microtubules nine pairs form a circle. Inside the circle lies the tenth pair; this is how it got the name 9+2 configuration.

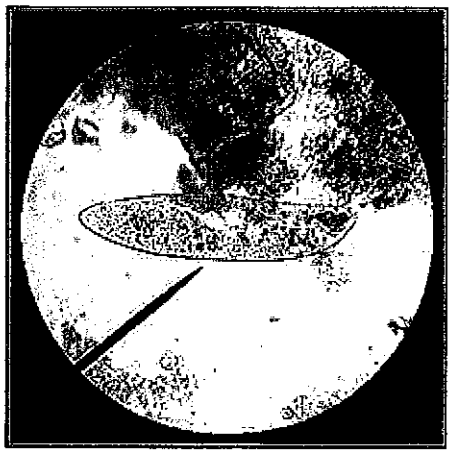
One example of an animal-like protist with cilia is the *Paramecium.*

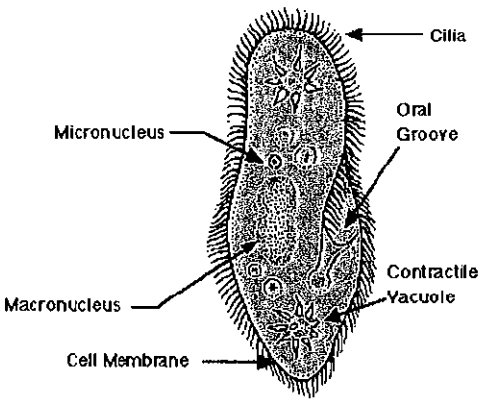
Paramecium



Paramecium is one known ciliated protist. The cilia help the *Paramecium* push the food and water into the cell body. The food then becomes enclosed in a vesicle filled with enzymes. In this vesicle the enzymes help the organism to digest the food.

The cilia can also helps the protist move towards the food/prey by beating the organism through the aquatic environment. The cilia can become leg-like structures under the *Paramecium* allowing it to "run."





Paramecium

Moves using cilia - short hairs lining cell

Ciliophora

- Paramecium Parts
  - Macro nucleus
  - Micronucleus
  - Cilia
  - Food Vacuole
  - Contractile Vacuole
  - Oral Groove
  - Cell membrane

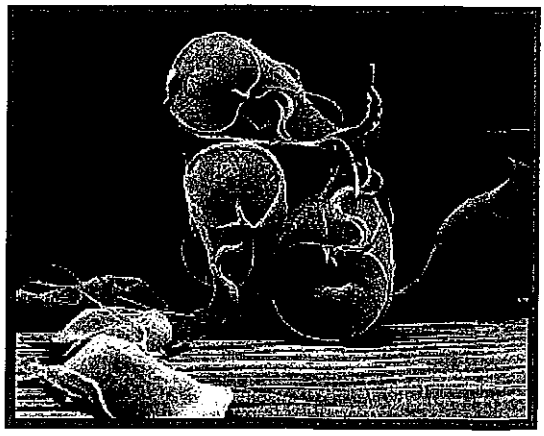
Other Ciliophora

- Stentor
- Vorticella
- Spinostomium

Paramecium Reproduction

- Asexual reproduction
- Nuclear material replicates itself
- Nuclear material splits itself
- Cell starts pulling apart
- Two smaller cells result

Information sheet on Flagellates (Trypanosoma & Giardia)



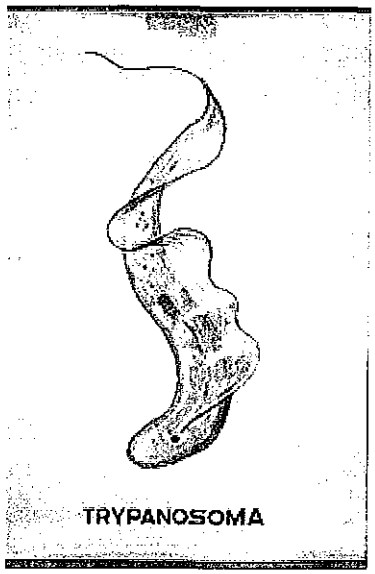
Protists with Flagella

Flagella are long whip-like structures that move back and forth allowing the animal-like protist to move. Protists with flagella beat the long whip-like structure to move through their aquatic environments. These organisms can be free-living; some are parasitic, living in moist tissues of plants and animals. Sometimes the parasitic protists help their host, but others are harmful.

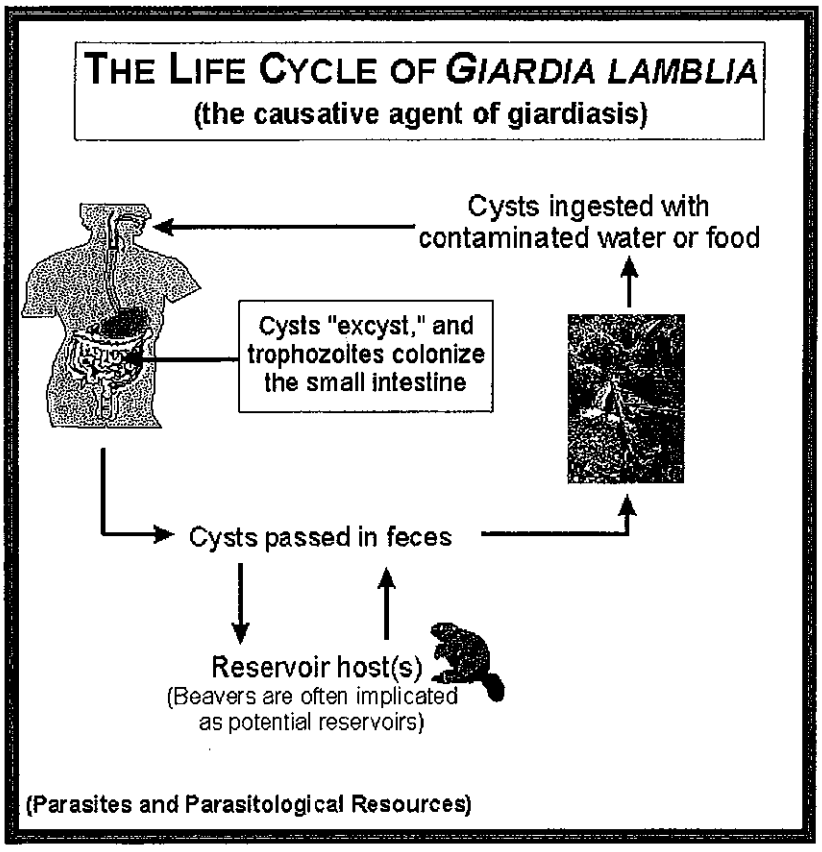
Flagella, like cilia, are composed of microtubules. They are arranged in a 9+2 configuration. Nine of the pairs of microtubules form a circle around the tenth pair.

One example of an animal-like protist with flagella is *Giardia lamblia*.

Giardia lamblia is an animal-like protist that uses flagella as its means of locomotion and food capturing. It is an internal parasite the causes diarrhea. *Giardia lamblia* contaminates waters of aquatic lands and river banks. When animals and humans drink the water, the protist becomes parasitic to the host. It leaves the host through the feces. After it has left the host it then contaminates everything that comes into contact with the feces. Many humans get this disease by drinking infected waters or eating infected meats.



Below is the life cycle of *Giardia Lamblia.*



Flagellates

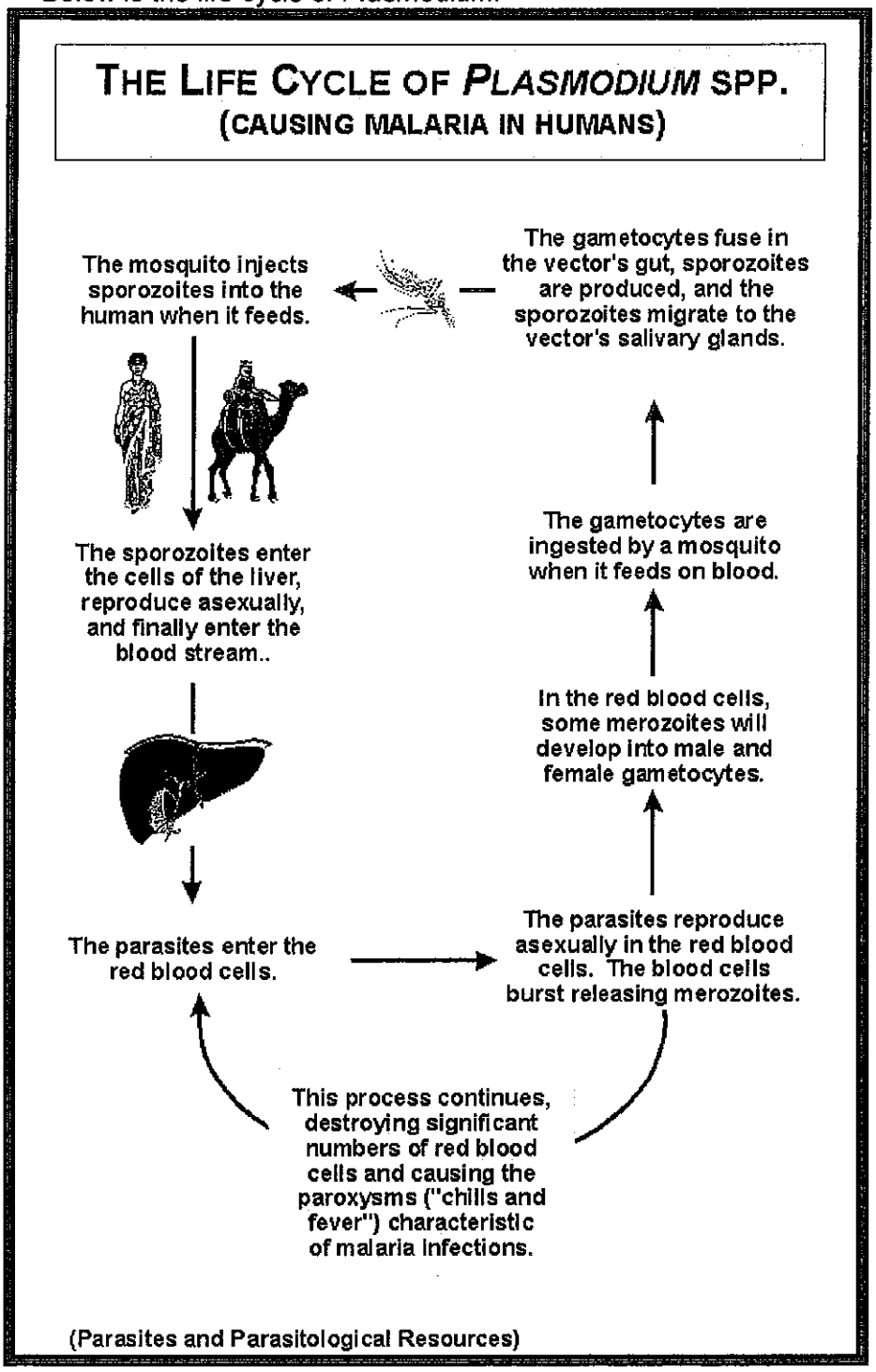
- Often have more than one flagellum
- The organism which causes African sleeping sickness - carried by the tsetse fly
- Some live in the digestive tracts of termites and assist in the digestion of cellulose.

Information sheet on Sporozoans (Plasmodium)

Plasmodium

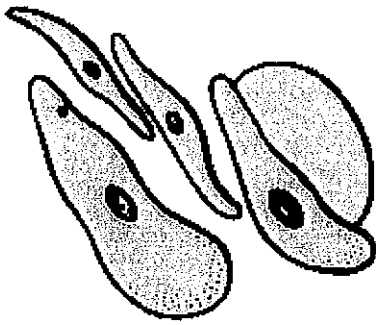
Plasmodium is a parasitic animal-like protist. It is the cause of malaria. *Plasmodium* is transported through mosquitoes. While in the mosquito the *Plasmodium* is in a dormant stage. When it is transported into the human it becomes active. It is mostly found in the red blood cells of humans. The *Plasmodium* asexually reproduces inside the liver and then enters the red blood cells. The red blood cells are destroyed in massive amounts. Merozoites are produced in some of the red blood cells. These merozoites develop into the male and female gametophytes. The infected gametophytes are taken in through a mosquito and the process begins all over again.

Below is the life cycle of *Plasmodium*.



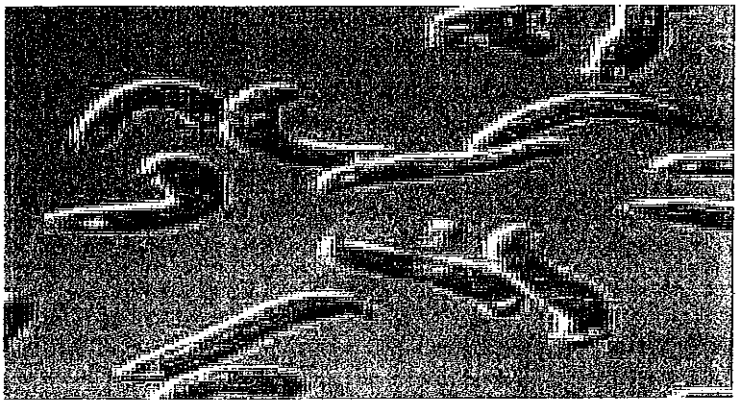
Sporozoans - produce spores

- Passive movement (none)
- The organism which causes
- Malaria



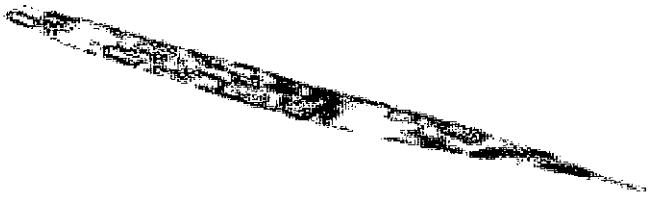
Information sheet on Euglenoids (Euglena)

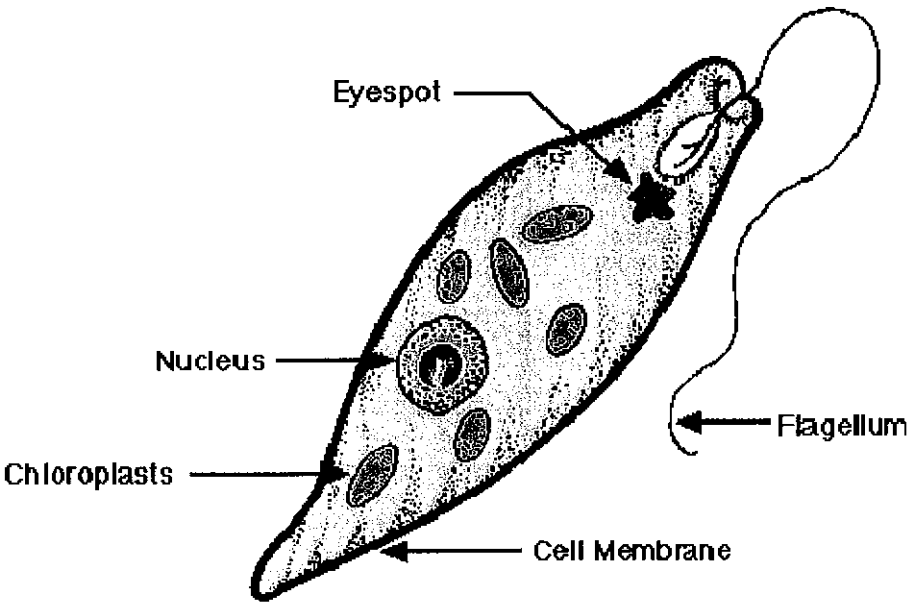
Euglenoids



Euglenoids are plant-like protists that are usually found in fresh water. During the day these protists are autotrophic; they can make their own foods. When night falls they become heterotrophic; they are unable to make their own foods, and thus they must be able to find it. Some Euglenoids have flagella to help them move during the heterotrophic stage.

The Eugleoid is a single celled organism with an abundance of organelles. They have an "eye spot" which covers a light-sensitive receptor. The cell will move to places where the light suits it best.





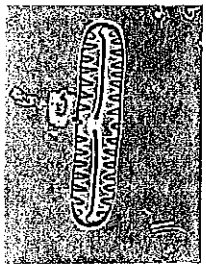
Euglenoids

- Most are unicellular
- Possess movement like animals
- Move by using whip like tail called flagellum (one only)
- Example Euglena
- Reproduces asexually
- Euglenoid Parts
    - Nucleus
    - Chloroplasts
    - Flagellum
    - Eye spot
    - Cell membrane

Information sheet on green & yellow algae (Diatoms, Volvox & Spirogyra)

Algae

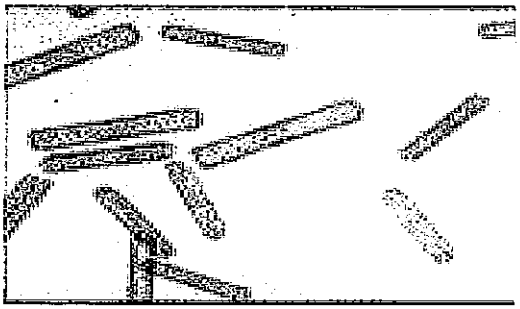
- **All Those members of the protista kingdom which act like plants**
- **Algaes are also found in the Moneran and Plant kingdoms**
- **Possess more "Plant-like" characteristics**
- **Other "algaes" are grouped with the monerans and others with plants.**
- **Vary in color and often named by its color.**
- **Most live in water, some on damp surfaces**
- **Make up a large part of the plankton of the oceans**
- **All algae contain chlorophyll and carry on photosynthesis**



Diatoms - Chrysophyta (golden algae)

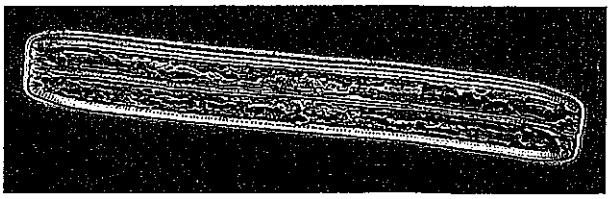
- Golden brown algae
- Two part shell of silicon (glass)
- Food stored as oil
- Responsible for most oil consumed today
- Diatom Parts

Chrysophytes



Chrysophytes are plant-like protists found in toothpaste, scouring products, and filters. Chrysophytes have a glasslike cell wall. The Chrysophytes are free-living, photosynthetic, unicellular protists. They consist of diatoms, golden algae, and yellow-green algae. Many Chrysophytes form colonies.

The diatoms are photosynthetic. They contain a shell that is made of silica. The cell has two parts that overlap. Over millions of years the shells become crushed and form the sand found on the bottom of oceans and lakes.

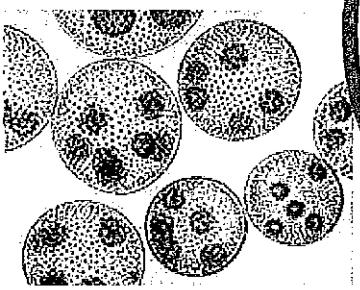


Golden algae have no cell wall. They do have scales made of silica. They also contain chloroplast and they do photosynthesize.

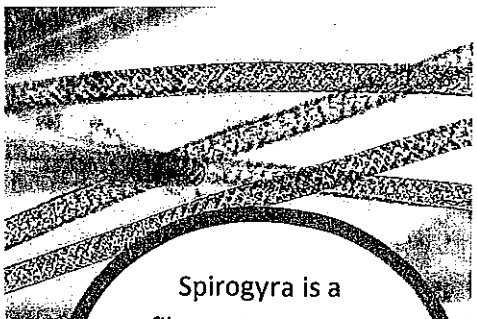
Yellow-green algae also have no cell wall. They are unable to move, but some do have flagella to help assist movement when conditions become harsh. This algae is common in nearly all aquatic environment

Spirogyra

Volvox



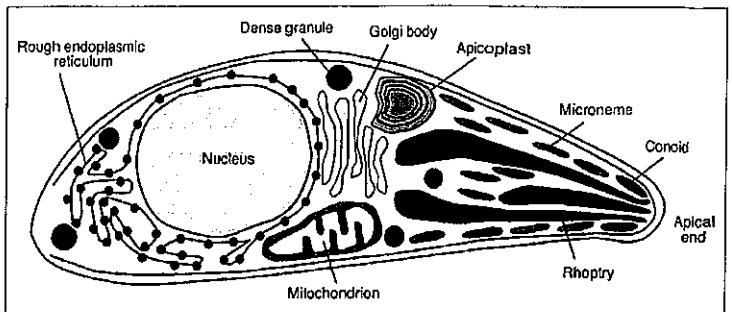
Volvox is a Chlorophyte, or green alga. It exists as a grand spherical colony. Each little alga within the colony bears two flagella, whip-like hairs. The individual alga are connected to each other by thin strands of cytoplasm that enable the whole colony to swim in a coordinated fashion. The individual alga also have small red



Spirogyra is a filamentous green alga which is common in freshwater habitats.

Information sheet on Sporozoans (*Toxoplasma gondi*)

http://www.dhs.wisconsin.gov/communicable/factsheets/Toxoplasmosis.htm



Ultrastructure of a *Toxoplasma gondii* tachyzoite

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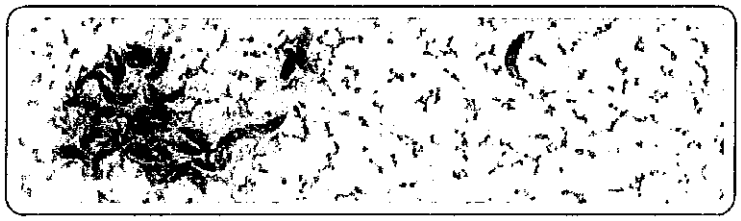
What is toxoplasmosis?
Toxoplasmosis is a disease caused by a single-celled parasite called Toxoplasma gondii.

How does a person acquire toxoplasmosis?
The disease can be acquired by ingesting raw or undercooked infected meat, especially pork, lamb or venison, or in raw milk that contains the parasite. The parasite is shed primarily in the feces of infected cats, and humans can become infected by the ingestion of food, water, or dirt contaminated with cat feces. After the parasite is shed in cat feces, it takes 1 to 5 days to become infective and then may remain infective for months to years. Toxoplasmosis can also be acquired through a transplacental infection, when an infected mother passes the infection to her fetus

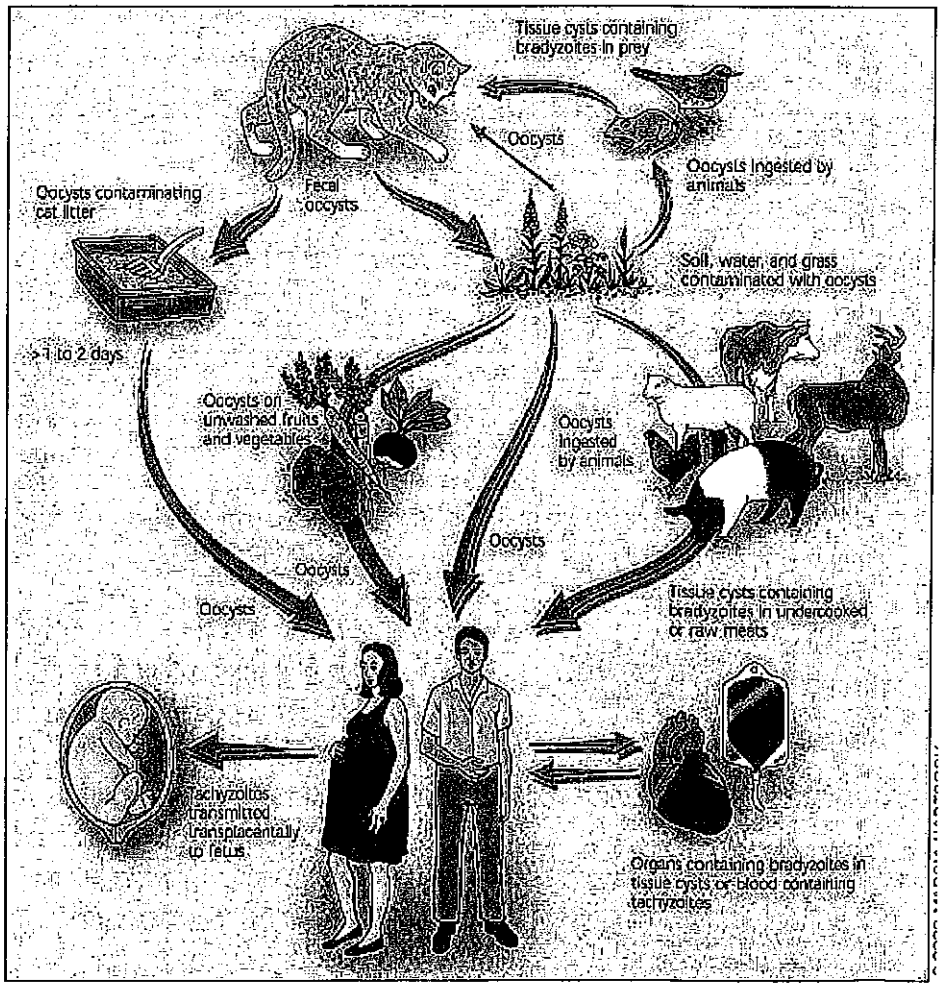


What are the symptoms of toxoplasmosis?
The infection usually does not cause when acquired after birth. Common symptoms of individuals who do become ill, include fever and swollen lymph nodes. Less frequent symptoms include skin rash, fatigue, muscle and joint pain, pneumonia, and central nervous system problems. The illness tends to be more severe in persons with a weakened immune system. When a pregnant woman passes the infection to her fetus, serious abnormalities or death of the fetus may result, especially if the infection occurs early in the pregnancy.

How soon after being infected do symptoms appear?
Symptoms usually take between 5 and 23 days to appear after infection.

Does past infection make a person immune?
Past infection with Toxoplasma gondii will probably result in long-term immunity.

How is toxoplasmosis treated?
Most cases of toxoplasmosis do not require treatment. In seriously ill patients or infected pregnant women, a combination of sulfa drugs and anti-parasitic drugs may be used. Persons with a weakened immune system are often placed on a long-term preventive course of sulfa drugs.



What can be done to prevent the spread of toxoplasmosis?
Meat should be cooked thoroughly prior to eating. Wash hands and utensils after contact with raw meat. Avoid eating raw eggs and drinking unpasteurized milk. Wash or peel fruits and vegetables before eating.

Cats become infected from other cats or from eating the flesh of infected birds or mammals. Therefore, pet cats should not be fed raw meat and should be prevented from hunting or scavenging. Dispose of cat feces and litter daily before the Toxoplasma parasites have a chance to become infective. Feces can be flushed down the toilet or deeply buried; litter can be sealed in a plastic bag in a manner that will not disperse litter dust (and possibly the Toxoplasma gondii organism) into the air. Disinfect litter pans daily with scalding water. Unless they are known to have immunity to toxoplasmosis, pregnant women should avoid cleaning litter pans and avoid contact with cats that have an unknown feeding history.

Outdoors, one should wear gloves when gardening. Prevent cats from gaining access to sandboxes used by children; change sand if it is contaminated. Boil lake and river water before drinking.