

Names: _____

Class: _____

Date: _____

Biology - Mr. Croft

Termite Symbiosis Lab

50 Points

Introduction

Zootermopsis is the large damp-wood termite native to the western U.S. This genus is ideal for study due to its large size, ease of maintenance, and year-round availability. Termites (in the order Isoptera) are structurally primitive insects that live in large colonies. They have a well-developed social order consisting of three distinct castes: workers, soldiers, and reproductive (winged) forms. In *Zootermopsis*, nymphs take the place of the worker caste. The nymphs are easily distinguished from the soldiers, which are much larger and have darker colored heads with prominent mandibles.

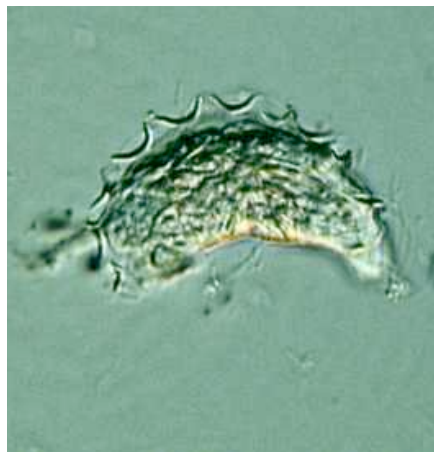
With their ability to feed on wood, termites are important recyclers in their ecosystem. Initiating breakdown of fallen trees, termites return vital nutrients to the ecosystem. The ability to feed on wood, however, also turns termites into highly damaging pest organisms. Once they infest structures, termites feed on wooden framework, paneling, wallpaper, and virtually anything made from plant fibers. It is estimated that termites cause approximately one billion dollars of damage every year in the United States alone. The subterranean termite, *Reticulitermes*, and the recently introduced Formosan termite, are the genera most responsible for damage in the United States.

The ability of the termite to ingest wood and derive nutrition from the material is solely dependent upon symbiotic protists that inhabit the digestive tract of the termite. A variety of protists inhabit the intestines of *Zootermopsis*, including the large hypermastigote *Trichonympha*, as well as *Trichomonas*, *Streblomastix*, *Trichomitopsis*, and *Hexamastix*. These commensal organisms digest the cellulose in wood. The termites assimilate the products resulting from the digestion of cellulose by the internal symbionts and are thus able to survive on their diet of wood.

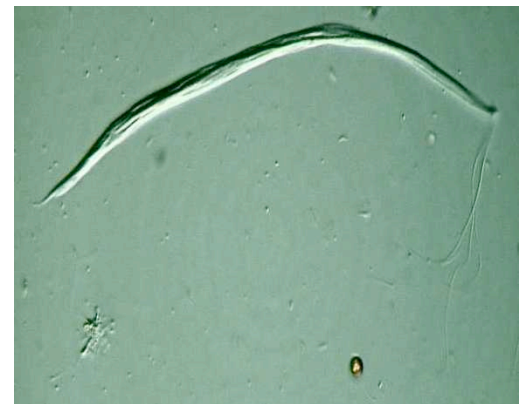
Wood-eating termites are totally dependent upon their internal symbionts for survival. Because of this, if termites were totally devoid of their internal "guests", they would continue to ingest wood but would be unable to digest it and extract nutrition, resulting in eventual death by starvation. Newly hatched termites, in fact, emerge free of symbionts and must ingest hindgut fluids from other termites in order to "infect" themselves with the necessary protists. Mature termites must do the same after each molt, as the lining of the intestine is shed along with the internal occupants. Reinfection is the only way to insure survival.



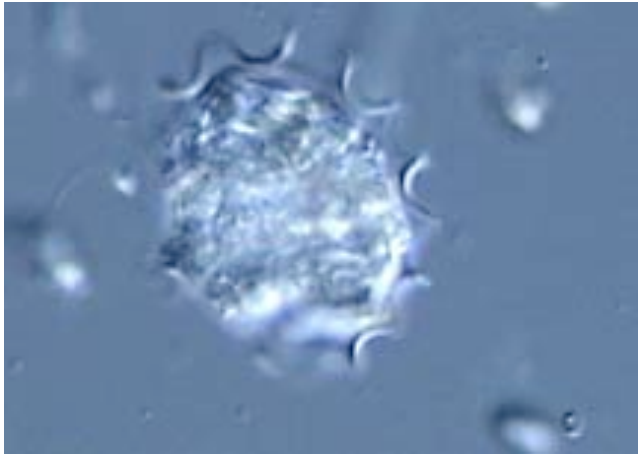
Trichonympha



Trichomitopsis



Streblomastix



Trichomonas



Hexamastix

Purpose

To extract symbionts from a termite and observe them under a microscope to better understand the mutualistic relationship that exists between termites and the parasites that live in their digestive tract. The various symbionts found within *Zootermopsis* are easily extracted from the host and readily observed under the microscope. View the included video for more information on the organisms found within termites and methods for extracting and observing the organisms.

Procedure

1. Obtain a microscope slide and coverslip.
2. Place a drop of sterile saline solution in the center of the microscope slide.
3. With forceps, **gently** grasp a termite by the thorax. Be careful not to allow any termites to escape!
4. **Lightly** squeeze the thorax of the termite. This will cause the termite to evacuate its intestine, producing a milky fluid.
5. Dip the termite's abdomen in the drop of saline applied to the microscope slide.
6. Gently cover the drop of saline with a coverslip, being careful not to trap any air bubbles underneath.
7. Observe the prepared mount under high power magnification (400X).

Results - 20 Points

Draw and label the contents of the intestine of a termite. Label sketches of the protozoa found in the termite. Students are responsible for locating and drawing as many different species of protozoa as possible. See the Introduction for help identifying the different species of protozoa.

Conclusions (Summary of Experiment, Analysis of Data, Discussion of Error) - 10 Points

Write your conclusion on a separate piece of paper

Questions (complete sentences) - 4 Points Each

Answer questions on a separate piece of paper.

1. What does the protozoan *Trichonympha* do for the termite? (1 thing)
2. What does the termite do for the protozoan *Trichonympha*? (2 things)
3. What is symbiosis? What is mutualism?
4. How does the relationship between *Trichonympha* and the termite qualify as a mutualism?
5. Why do newly hatched termites have to ingest hindgut fluids from other termites?