

Effects of a Tobacco Suspension on Euglena

Arthur D. Meyer
Lakewood High School
Lakewood, Ohio 44107

An interesting exercise when studying protists microscopically in the laboratory concerns the effects of a tobacco suspension on the common flagellate, euglena. Among the several objectives of this procedure is the dramatic demonstration of the adverse effects of cigarette tobacco on a living cell. Protist avoidance reactions, "euglenoid movement," and a practical application of the relationship between surface area and volume may also be illustrated through this study. The technique is simple, but the results are quite impressive, and may be effective in causing biology students (and others) to consider carefully the potential personal health hazards of tobacco.

The Procedure

1. Place the tobacco from one cigarette into 50 ml of tap or distilled water. The cigarette paper may or may not be included. (I use whole cigarettes that students accidentally drop in the halls—several butts could also be used.)

2. Allow the above mixture to set for several hours (preferably overnight) to produce a suspension.

3. Have the students make up a wet mount slide from a good, active, healthy culture of any euglena species.

4. Allow the students to observe normal euglena behavior—movement, activity, response, etc. Sketches of normal shape and structure should be made during the ten-to-fifteen-

minute observational study (fig. 1).

5. Have the students place several drops of the tobacco suspension at one side of the floating cover slip so that the fluid will gradually diffuse into the normal euglena population. If observations are limited to low power (100x) only, cover slips may be omitted. Results will be more rapid.

6. During the next ten to fifteen minutes, students may observe the gross effects of the suspension on these sensitive organisms. Again, sketches are advisable. The usual sequence observed is erratic movement, spinning, avoidance, irritability, contraction (euglenoid movement), and change to a spherical shape (fig. 2). Cessation of all movement usually occurs within this period (fig. 3).

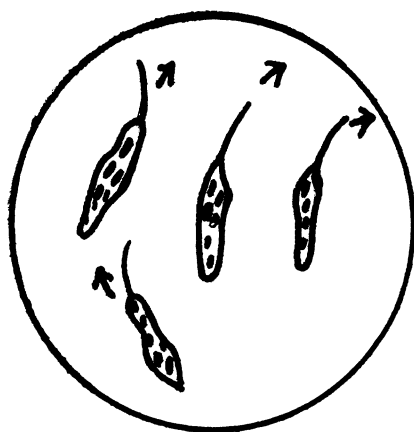


FIGURE 1. Typical shape of euglena, 100x under normal conditions.

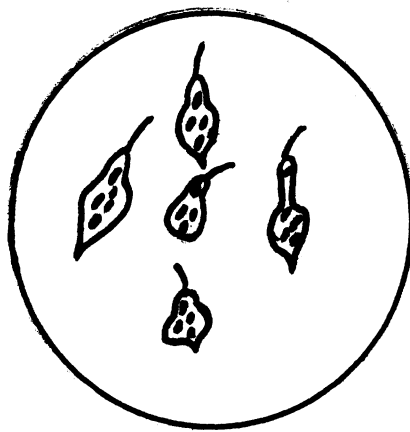


FIGURE 2. Typical euglenoid shapes after a few minutes' exposure to tobacco suspension. Note contraction.

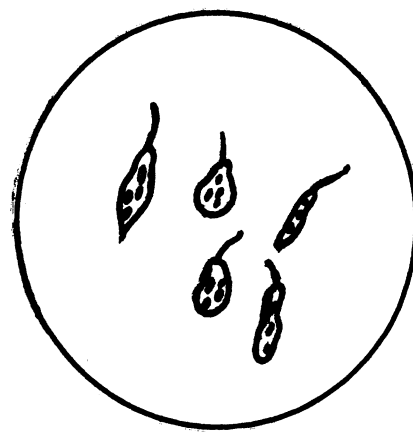


FIGURE 3. Typical shapes after all movement stops (10-15 minutes later).

Conclusion

The exercise provides a good opportunity to discuss the effect of toxic substances on living cells and the “attempts” of these organisms to counter that toxicity. *Euglena* behavior and the relationship of volume to surface area—the apparent attempt of the *euglena* to resist the diffusion of the toxic material by presenting less surface area—should be discussed.

Other protists and other toxic substances may be used to explore fur-

ther effects and reactions. (I have also used tadpoles with dramatic success.)

Some questions to discuss relative to this specific study might be:

- Describe the sequence of changes observed as the tobacco suspension apparently diffuses into the cell. How do you explain these changes?
- How long did it take for most of the *euglena* population to cease locomotion?
- Recall the relationship of volume to surface area in a growing active cell. Why do the *euglenas* tend to form a ball as the tobacco suspension invades their environment?
- Do you think that reactions similar to the ones observed in this exercise might occur when tobacco substances contact human cells? Why? What do you conclude about the personal hazards of tobacco use?

STATE OBTA DIRECTORS

ALABAMA

Donna Bentley
State Dept. of Educ.
111 Coliseum Blvd.
Montgomery, AL 36109

ALASKA

Gail Nichols
North Pole Jr./Sr HS
P.O. Box 1250
Fairbanks, AK 99707

ARIZONA

James R. David
Flagstaff Jr. HS
755 North Bonita St.
Flagstaff, AZ 86001

ARKANSAS

E. E. Hudson
Dept. of Biology
Arkansas Technical University
Russellville, AR 72801

CALIFORNIA

Sr. Corinne Clay
Dept. of Biology
California State University
Fresno, CA 93740

COLORADO

Robert Alexander
Overland HS
12400 E. Jewell Ave.
Aurora, CO 80012

CONNECTICUT

Don Gabriel
30 Hearshstone Drive
Huntington, CT 06484

DELAWARE

Francis A. Castelli
1404 Olive Circle
Wilmington, DE 19810

DISTRICT OF COLUMBIA

Mary B. Harbeck
Instructional Service Center
DC Public Schools
20th & Everts Sts. NE
Washington, DC 20018

FLORIDA

Herbert H. Stewart
Dept. of Science Educ. T-6
Florida Atlantic University
Boca Raton, FL 33432

GEORGIA

Donald Berryhill
400 Pineview Drive
Waycross, GA 31501

HAWAII

NABT/OBTA
11250 Roger Bacon Dr. #19
Reston, VA 22090

IDAHO

Michael Heikkinen
College of Education
University of Idaho
Moscow, ID 83843

ILLINOIS

Maurice Kellogg
Science Education
Western Illinois University
Macomb, IL 61455

INDIANA

Walter Cory
Memorial Hall W-108
Indiana University
Bloomington, IN 47405

IOWA

David V. McCalley
Dept. of Biology
University of Northern Iowa
Cedar Falls, IA 50613

KANSAS

Harold Durst
School of Graduate Studies
Emporia State University
Emporia, KS 66801

KENTUCKY

Carolyn Owsley
Heath HS
Route 1
W. Paducah, KY 42086

LOUISIANA

Don McGehee
State Supervisor of Science
Dept. of Education
P.O. Box 44064
Baton Rouge, LA 70804

MAINE

Jane Abbott
Waterville HS
Waterville, ME 04901

MARYLAND

William Trautman
3101 Rosekemp Ave.
Baltimore, MD 21214

MASSACHUSETTS

Dorothy M. Andrews
The Bromfield School
Harvard, MA 01451

MICHIGAN

Martin Hetherington
Science Teaching Center
E37 McDonal Hall
Michigan State University
E. Lansing, MI 48824

MINNESOTA

Jerome Knutson
242 Dowell Annex
University of Minnesota
Crookston, MN 56716

MISSISSIPPI

Fred W. Brown
Box 378 Southern Station
Univ. of Southern Mississippi
Hattiesburg, MS 39401

MISSOURI

Michele B. Grant
Vashon HS
3405 Bell Avenue
St. Louis, MO 63106

MONTANA

Jim Cusker
Missoula County HS
901 South Avenue West
Missoula, MT 59801

NEBRASKA

Harland Pankratz
617 East 10th Street
Wayne, NE 68787

NEVADA

NABT/OBTA
11250 Roger Bacon Dr. #19
Reston, VA 22090

NEW HAMPSHIRE

Mary Bilheimer
Plymouth State College
Plymouth, NH 03264

NEW JERSEY

NABT/OBTA
11250 Roger Bacon Dr. #19
Reston, VA 22090

NEW MEXICO

David E. Kidd
Dept. of Biology
University of New Mexico
Albuquerque, NM 87131

NEW YORK

Elizabeth Mallon
P.O. Box 337
Stony Brook, NY 11790

NORTH CAROLINA

Carol D. Hampton
Science Education Dept.
East Carolina University
Greenville, NC 27834

NORTH DAKOTA

Richard J. Swanson
Science Dept.
West Fargo HS
West Fargo, ND 58078

OHIO

Evan McFee
Education Dept.
Bowling Green State Univ.
Bowling Green, OH 43403

OKLAHOMA

Dorothy Frosch
School of Math and Science
Central State University
Edmond, OK 73034

OREGON

Ray Thiess
Oregon Dept. of Education
700 Pringle Parkway SE
Salem, OR 97310

PENNSYLVANIA

Stuart Hughes
Central HS
Ogontz & Olney Aves.
Philadelphia, PA 19141

PUERTO RICO

Fernando Cofresi Sala
Biology Dept.
University of Puerto Rico
Mayaguez, PR 00708

RHODE ISLAND

Charles Foltz
Professor of Biology
Rhode Island State College
Providence, RI 02908

SOUTH CAROLINA

Donna McGehee
Richland NE HS
7500 Brookfield Road
Columbia, SC 29206

SOUTH DAKOTA

R. Evelyn Roberts
Dept. of Math. Sci., & Health
Northern State College
Aberdeen, SD 57401

TENNESSEE

Lanny S. Moore
Jefferson Jr HS
Fairbanks Road
Oak Ridge, TN 37830

TEXAS

Dr. Shin-ichi Tokuno
Dept. of Biology
Texas A & I University
Kingsville, TX 78363

UTAH

Evan Jensen
Clearfield HS
931 South 1000 East
Clearfield, UT 80415

VERMONT

Judith Allard
Burlington HS
Burlington, VT 05401

VIRGINIA

Franklin D. Kizer
Rt. 2, Box 637
Lancaster, VA 22503

WASHINGTON

Barbara Schulz
Sherwood HS
17300 Freemont Ave. N
Seattle, WA 98133

WEST VIRGINIA

Patrick Balch
Science Department
West Virginia University
Morgantown, WV 26506

WISCONSIN

Madhu N. Mahadeva
Professor of Biology
Univ. of Wisconsin-Oshkosh
Oshkosh, WI 54901

WYOMING

Bill Futrell
Science Consultant
Wyoming Dept. of Education
Cheyenne, WY 82002

CANADA

NABT/OBTA
11250 Roger Bacon Dr. #19
Reston, VA 22090