

Bioluminescent Dinoflagellates
Growing and Experimenting for Advanced Students

By: Edith A. Widder, President and Senior Scientist
Ocean Research & Conservation Association
1420 Seaway Drive, Fort Pierce, FL 34949

You can order bioluminescent dinoflagellates from Sunnyside Sea Farms, 475 Kellogg Way, Goleta, CA 93117-3804 (Tel 805-964-3755, e-mail: sunnyside@seafarms.com). The first 50 ml bag is \$6.00 and the price drops the more bags you purchase. These dinoflagellates have the scientific name *Pyrocystis fusiformis*, which literally means spindle-shaped (fusiform) fire (Pyro) cell (cystis).

These cells need to photosynthesize in order to make their bioluminescent chemicals so you will need to set them up under fluorescent lights. Although they are usually only bioluminescent during the night you can fool them by having the lights on during the night and keeping them in the dark during the day. Then if you take them out and shake the container you will see them flash. Be careful not to let them get too warm. They grow best at about 68-75 degrees F. You can blow a fan over them to help keep them cool. You can keep the cultures going indefinitely by transferring them to sterile seawater with some added nutrients. You can pasteurize seawater in a microwave if you can adjust the temperature so the water doesn't boil. Put 100 ml of seawater in a 250 Erlenmeyer flask with 0.05 ml of Micro Algae Grow (Aquaculture Supply 5532 Old St. Joe Road, Dade City FL 33525 Tel. 904 567 8540 A 200 ml bottle cost \$4.20). Put a 50 ml beaker upside down on the flask. Microwave the seawater for 20 mins at 180 degrees F. Don't let it boil! Allow the seawater to sit for at least a day before inoculating the culture. Transfer a little of the old dinoflagellate culture to the flask by lifting the beaker but holding it over the mouth of the flask. If you don't have a microwave with a temperature probe – they used to be more common than they are now – you will either need an autoclave or a pressure cooker. Both of these methods use pressure to keep the seawater from boiling. You need to prevent boiling because it causes some of the essential nutrients to precipitate out and then the cells won't grow in the medium.

Once you have a few flasks going, try growing them under different light/dark cycles and look at the cells to see how different they appear in their day phase, compared to their night phase. See what happens if you keep one of the cultures in constant darkness. What about under constant light? How long does it take for the bioluminescence to turn on when you place a culture in the dark? How long to turn off when you place it in the light? Can you mechanically stimulate the cells to exhaustion so they don't bioluminesce any more? Do they recover during their night phase? How about after their next day phase? Are there other ways to stimulate bioluminescence than mechanically? Place some of the culture in a test tube and add a drop or two of 10% acetic acid or if you don't have any laboratory acids try vinegar. What happens? Can you get any more bioluminescence out of the cells after they have been chemically stimulated?

Web Sites

<http://www.bioscience-explained.org/EN1.1/menu.html>

<http://lifesci.ucsb.edu/~biolum/>

http://siobiolum.ucsd.edu/biolum_intro.html

<http://www.biolum.org/>

Scientific References

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