



# CALIFORNIA STATE SCIENCE FAIR 2008 PROJECT SUMMARY

<b>Name(s)</b> <b>Ronit B. Abramson</b>	<b>Project Number</b> <b>S1501</b>
<b>Project Title</b> <b>Further Investigation of Diatoms as Biological Indicators of Pharmaceutical Runoff</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> This research is intended to study possible physiological changes in diatom structure as a result of the presences of antibacterial pharmaceuticals in their aquatic environment. The purpose of this work is to determine the potential for diatoms as biological indicators of antibiotics in water.</p> <p><b>Methods/Materials</b> Five species were isolated from two different wild sites and cultured in COMBO Media (Kilham, et. al, 1998). Each of the five species was then exposed three antibiotics (tetracycline, ampicillin, kanamycin) in five different concentrations: 200 microgram/ml, 67 microgram/ml, 22 microgram/ml, 7 microgram/ml, and 0 microgram/ml (control). After a seven-day exposure, the organics were cleaned from the cells using hydrochloric acid. The silica frustules, or cell walls, were visualized using scanning electron microscopy to observe morphological changes in the cells grown in antibiotic exposures.</p> <p><b>Results</b> When exposed to 200µg/ml of ampicillin, all of the nitzschia palea cells visualized using scanning electron microscopy showed stretches on the frustules surface where the usually regular rows of punctae, small pores, were noticeably absent. These findings were later confirmed through replication. Mayamea atomus, a species with a less detailed valve structure, did not show any change in morphology when exposed to 200µg/ml ampicillin, 200µg/ml of tetracycline, or 200µg/ml of kanamycin. The antibiotics did not appear to affect the median groove elliptical-shaped characteristic appearance of this species. Striae, rows of pores, were also visible in radiating curves from the center of the cell.</p> <p><b>Conclusions/Discussion</b> Ampicillin is designed to inhibitor of the enzyme transpeptidase, a protein needed for cell wall synthesis. Although intended to affect only prokaryotes, certain proteins within the eukaryotic diatom cell have close evolutionary relationships with prokaryotic cells and therefore might unintentionally affected by pharmaceutical molecules. The large affected areas indicate that the changes are likely caused by protein malfunctions. These effects could cause morphological changes by inhibiting the silica deposition process associated with the growth and development of the cell.</p>	
<b>Summary Statement</b> Distinct structural changes occur in some diatom species cells when grown in aquatic environments containing antibiotics; therefore, they have the potential to sever as biological indicators of these products.	
<b>Help Received</b> Used lab equipment at Scripps Institution of Oceanography under supervision of Dr. Mark Hildebrand; Wendy Slijk (science fair advisor); Elizabeth Ruck and Claire Serieyssol provided knowledge for selection of a freshwater media; Mark Edlund and Teofil Nakob assisted species identification	