

Understanding the Effects of Exposure to Environmental Contaminants on Normal Zebrafish Development

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This mini workshop describes a five-week lab in which students use zebrafish (*Danio rerio*) to examine the effects of various drugs or environmental contaminants on normal development. Zebrafish have become a widely-used model system for the study of vertebrate development and can be incorporated into classes such as 'Toxicology' or 'Developmental Biology.' This system is particularly amenable for use in the laboratory because of the ease of collection and manipulation, as well as the rapid rate of development. The lab is divided up into two separate sections. In the first section students examine normal development, and compare it to overall development, growth, weight, and behavior of zebrafish exposed to a toxicant. Toxicants which have successfully been used for this experiment include: retinoic acid (10^{-8} M, 10^{-9} M, 10^{-10} M, 10^{-11} M), lithium chloride (0.15 M, 0.30 M, 0.75 M), and ethanol (1%, 2%, 3%). Students collect data on mortality, notochord length and dry weight to determine if exposure results in variation from the control. The data is quantitatively evaluated for statistically significant differences between treatments. The importance of this section is to get the students acquainted with zebrafish development, maintenance, and measurements. The second part of the lab is multifaceted. Students write a research proposal for an independent experiment of their choice, carry out the experiment, analyze the data, and present their findings. The design of this enables students the freedom to pick their toxicants and to carry out the experiment independently. Some examples of toxicants which students have investigated in the past were ethidium bromide, caffeine, acutane, and saccharine. In order to evaluate the effectiveness of the toxicant students are required to run multiple tests and conduct statistical analysis of the data. Students present their findings in a poster presentation and in some cases these projects were continued as independent projects for other classes.