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Investigating development and pigmentation using zebrafish in a biology laboratory course

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Abstract

Our society treats individuals differently based on their skin pigmentation. However, many of us are limited in our knowledge of skin pigmentation or melanin, the pigment present in our skin. This 10-week development and cellular biology laboratory course was designed to focus on topics of skin pigmentation, development of pigment cells (melanocytes), and development and incidence of melanoma, integrating social issues into the course. A major learning goal for the course was to apply the process of science to learning about development and pigmentation. This included generating hypotheses, designing, and conducting experiments, predicting expected results, and interpreting data. For these experiments, zebrafish embryos and larvae are an ideal model organism, as they are transparent, and students are able to conduct experiments and collect data on both development and pigmentation. Melanocytes in zebrafish are present within 3 days of fertilization (Mort *et al*., 2015) and visible with either a stereoscope or compound microscope. Here, I describe 5 weeks of labs where students investigated how the presence of a tyrosinase inhibitor affects development and pigmentation in zebrafish embryos and larvae. The first lab was focused on familiarizing students with the use of a stereoscope and compound microscope to observe different developmental stages of zebrafish. The next two labs focused on comparing the development and pigmentation of zebrafish larvae treated with or without a tyrosinase inhibitor. In the final two labs, students compared the melanin protein concentration in zebrafish treated with or without a tyrosinase inhibitor. Laboratory skills learned include microscopy, ImageJ data analysis, statistical analysis, protein isolation and quantification, and micro pipetting. Lastly, students wrote an introduction, results (including figures and figure legends), and discussion section of a lab report to assess their writing skills in communicating science, which is another major learning goal of the course.

Keywords: melanin, developmental biology, cell biology, melanocytes, zebrafish

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