



Linking chemical concepts of enzymatic function in the introductory biology lab

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Abstract

In our experience, students often struggle with making the connection between the use of indicators to signify enzyme activity. Therefore, we have chosen catalase as a commonly available easily detectable enzyme to show enzyme activity in our introductory biology course. Catalase is found in nearly all organisms and catalyzes the decomposition of hydrogen peroxide into water and oxygen, a reaction that is noted by the presence of bubbles. After introduction to the concept of catalase catalysis, students will delve deeper into catalase activity using a colorimetric indicator along with Beer's law to quantify activity. They are presented with the opportunity to propose a source of dietary flavonoid, potential inhibitors of catalase, from which to test. Flavonoids are natural products that are found in many fruits, vegetables, and even beverages such as teas. They are characterized by their polyphenolic structure and are proposed to have anticancer activity, at least in part through inhibition of catalase. These compounds inhibit catalase activity through the conversion of catalase to an inactive form preventing the decomposition of hydrogen peroxide. Based on their proposal, students in a parallel organic chemistry course will determine methods of flavonoid extraction. Thus, two sets of students will simultaneously engage in hypothesis generation and method development for this inquiry-based series. In these modules students will begin to build their lab skills including micro pipetting, aseptic technique, microbiological culture, and searching and interpreting the primary literature. This lab series is intended for introductory biology and organic chemistry students but could be adapted for a single course in biochemistry.

Keywords: enzyme activity, introductory biology, catalase, flavonoid

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