Enzyme activity essay sample

We performed these experiments to observe the effects of enzymes on the rate of reactions. We tested and compared the activity of the enzyme catalase on the substrate H2O2 in various states and percentages, and observed the absorption values of the enzyme-substrate relationship at different concentrations. Our results show that the more substrate available, the quicker the reaction will happen except in one test, which might mean that a balanced concentration of the two is most beneficial. Introduction

The objectives of these experiments were to observe the effects of the enzyme-substrate relationships and to record our findings. Enzymes increase the rate of reactions by lowering the energy needed to activate the reaction (McNeil et al. 2013). Enzymes will work with substrates to produce reactions and products and they will bind together at an active site. They will only bond to with particular molecules and environmental factors can also affect their productivity. They are proteins, and proteins are made up of many amino acids (Brian et al. 2013). We used the enzyme catalase that occurs naturally in many organisms to study the qualitative and quantitative results of enzymatic activity. My hypothesis is that the findings in these experiments will show that the enzyme catalase will increase the rate of reaction with the substrate. Methods

In Activity 1 Procedure A, we had four test tubes filled with different components. The table below shows each tube’s components. In each test tube, we added 5. 0 mL 3% H2O2. We recorded initial observations and checked frequently for changes.

Table 1.

Tube #| Contents|

1| 1 mL H2O|

2| ¼ × ¼” potato cube |

3| 1 mL Enz.|

4| 1 mL Enz boiled for 5 minutes, then cooled|

In Activity 1 Procedure B, we prepared two more test tubes with different substrates. In each empty tube we put 1 mL of enzyme. To that, we added the same substrate with different percentage levels. What we added to the test tubes is depicted in the chart below. We recorded our observations of these tubes and compared observations initially with those of minutes 4-5.

Table 2.

Tube #| Contents |

A| 1 mL Enz. + 5. 0 mL1. 5% H2O2|

B| 1 mL Enz. + 5. 0 mL . 75% H2O2|

In Activity 2 Procedure C, we filtered the catalase used in Procedures A and B with #4 filter paper. We made a black solution without the catalase and another with it to be compared in the spectrophotometer. The contents of the blank and cuvette #1 are shown below. We observed absorbance levels at 470 nm and measured the blank to subtract its values from those of cuvette #1. We measured the absorbance every minute for 5 minutes and recorded our observations. After the 5 minutes we removed them and observed differences.

Table 3.

Cuvette #| Contents |

Blank | 6. 0 mL dH2O + . 100 uL guaiacol + . 150 uL H2O2|

1| 1. 0 mL catalase + 5. 0 mL dH2O + . 100 uL guaiacol + . 150 uL H2O2|

In Activity 2 Procedure D, we followed the same procedures as we did in Procedure C; however, the contents of the blank and cuvette were changed. The changes are shown in the table below.

Table 4.

Cuvette #| Contents |

Blank | 5 mL dH2O + . 100 uL guaiacol + . 300 uL H2O2|

1| 1. 0 mL catalase + 4. 0 mL dH2O + . 100 uL guaiacol + . 300 uL H2O2|

These methods came from the Biology 183 Introductory II Lab Manual.

Results

The presence of an enzyme speeds up chemical reactions and is affected by the concentration of the substrate. We found that the results of reaction were much greater and happened faster with the presence of a greater amount of substrate and enzyme until there was too much substrate in relation to enzyme.

In Activity 1 Procedure A, we found that the more available substrate present, the faster the reaction would happen. More product was observed when there was increased substrate surface area. The table of results is depicted below.

Table 5.

Tube #| Contents| What Happened?|

1| 1 mL H2O + 5. 0 mL 3% H2O2| No reaction |

2| ¼ × ¼” potato cube + 5. 0 mL 3% H2O2| Bubbling and foaming occurred but not much| 3| 1 mL Enz. + 5. 0 mL 3% H2O2| More foam and bubbles than in previous| 4| 1 mL Enz boiled for 5 minutes, then cooled + 5. 0 mL 3% H2O2| Barely any sign of reaction|

In Activity 1 Procedure B, we found that the concentration of substrate affects the activity of the enzyme. The solution with a higher concentration of substrate produced greater results.

Table 6.

Tube #| Contents | What Happened?|

A| 1 mL Enz. + 5. 0 mL1. 5% H2O2| Foamed and bubbled quickly; much more than B| B| 1 mL Enz. + 5. 0 mL . 75% H2O2| Foamed and bubbled less and at a slower rate. |

In Activity 2 Procedure C, we discovered that our solution with catalase formed products and the solution without did not. The spectrophotometer collected data for us to show this.

Table 7.

Cuvette #| Contents | What Happened?|

Blank | 6. 0 mL dH2O + . 100 uL guaiacol + . 150 uL H2O2| No change| 1| 1. 0 mL catalase + 5. 0 mL dH2O + . 100 uL guaiacol + . 150 uL H2O2| The color of the solution changed. It got darker.|

Table 8.

Absorbance Data Collection of Cuvette Containing Catalase| Time (min)| 0| 1| 2| 3| 4| 5|

Absorbance at 470 nm| 1. 200 A| 1. 449 A| 1. 673 A| 1. 872 A| 2. 056 A| 2. 223 A|

In Activity 2 Procedure D, our results showed us that the concentration of substrate can be too high for a same product in enzyme activity when compared with the table in Procedure C. A table of the results of Procedure D and a graph comparing Procedures C and D are depicted below.

Table 9.

Cuvette #| Contents| What Happened?|

Blank | 5 mL dH2O + . 100 uL guaiacol + . 300 uL H2O2| No Change| 1| 1. 0 mL catalase + 4. 0 mL dH2O + . 100 uL guaiacol + . 300 uL H2O2| The color of the solution changed. Got darker but not as dark as Cuvette 1 in Procedure C.|

Table 10.

Absorbance Data Collection of Cuvette Containing Catalase| Time (min)| 0| 1| 2| 3| 4| 5|

Absorbance at 470 nm| . 428 A| . 673 A| . 876 A| 1. 063 A| 1. 228 A| 1. 377 A|

Figure 1.

Figure 1.

Discussion

The results found in our experiments supported the hypothesis that enzymes

would increase the rate of reaction. In one case, however, it was found that if the concentration of substrate is too high, the enzymatic relationship will be thrown off. We observed noticeable products more quickly with the enzyme present in both experiments in Activity 1. Our experiment in Activity 2 Procedure D shows that with a higher percentage of substrate, less light was absorbed. This was unexpected because we thought that with more substrate, the reaction would take place more quickly. Our findings supported that enzymes increase the rate at which reactions occur. If this experiment was repeated, we might get a few variations in results. The measurements of some substances might have been a little off and the time that we took to put some of the cuvettes might have been too long and affected the results.