

**Liver Enzyme Lab**

**Background**

What would happen to your cells if they made a poisonous chemical? You might think that they would die. In fact, your cells are always making poisonous chemicals. They do not die because your cells use enzymes to break down these poisonous chemicals into harmless substances. Enzymes are proteins that speed up the rate of reactions that would otherwise happen more slowly. The enzyme is not altered by the reaction. You have hundreds of different enzymes in each of your cells.

Each of these enzymes is responsible for one particular reaction that occurs in the cell. In this lab, you will study an enzyme that is found in the cells of many living tissues. The name of the enzyme is catalase (KAT-uh-LAYSS); it speeds up a reaction which breaks down hydrogen peroxide, a toxic chemical, into 2 harmless substances--water and oxygen.

2H2O2 ----> 2H2O + O2 (gas)

This reaction is important to cells because hydrogen peroxide (H2O2) is produced as a byproduct of many normal cellular reactions. If the cells did not break down the hydrogen peroxide, they would be poisoned and die. In this lab, you will study the catalase found in liver cells. You will be using chicken or beef liver. It might seem strange to use dead cells to study the function of enzymes. This is possible because when a cell dies, the enzymes remain intact and active for several weeks, as long as the tissue is kept refrigerated.

**Hypothesis**

Today you will be given a piece of liver that will contain the enzyme catalase. Come up with a hypothesis for what will happen when you place a piece of boiled liver in a test tube with H2O2,. Your controls will be water, hydrogen peroxide test tube without liver, hydrogen peroxide in a test tube with an object that has no catalase enzyme and hydrogen peroxide in a test tube with liver.

**Materials:**

* Test tubes (5)
* 10 ml graduated cylinder
* Tweezers
* Liver
* Hydrogen Peroxide
* A non-catalase object

**Procedure:**

1. Label your test tubes, 1,2,3,4 and 5.
2. Put your non catalase object in test tube number 2. Put a small piece of liver (no bigger than a pea) in test tube number 3. Also put a small piece of liver (around the same size as test tube 3) in test tube number 4 and 5.
3. In test tube 1 place 4ml of hydrogen peroxide. Let it sit for two minutes. Make any observations you can during these minutes. Record them in data table 1.
   1. If any oxygen is given off, please rate the release of oxygen on a scale of 1 – 10. 1 would be no bubbles at all and 10 would be bubbles overflowing your test tube. Record that in data table 1A.
4. In test tube 2 place 4ml of hydrogen peroxide. Let it sit for two minutes. Make any observations you can during these minutes. Record them in data table 2.
   1. If any oxygen is given off, please rate the release of oxygen on a scale of 1 – 10. 1 would be no bubbles at all and 10 would be bubbles overflowing your test tube. Record that in data table 2A.
5. In test tube 3 place 4ml of hydrogen peroxide. Let it sit for two minutes. Make any observations you can during these minutes. Record them in data table 3.
   1. If any oxygen is given off, please rate the release of oxygen on a scale of 1 – 10. 1 would be no bubbles at all and 10 would be bubbles overflowing your test tube. Record that in data table 3A.
6. In test tube 4 place 4ml of water. Let it sit for two minutes. Make any observations you can during these minutes. Record them in data table 4.
   1. If any oxygen is given off, please rate the release of oxygen on a scale of 1 – 10. 1 would be no bubbles at all and 10 would be bubbles overflowing your test tube. Record that in data table 4A.
7. Place test tube 5 in a hot water solution for 3 minutes. After the full three minutes have passed, carefully remove it and place it back in you test tube rack. Now add 4ml of hydrogen peroxide. Let it sit for two minutes. Make any observations you can during these minutes.
   1. If any oxygen is given off, please rate the release of oxygen on a scale of 1 – 10. 1 would be no bubbles at all and 10 would be bubbles overflowing your test tube. Record that in data table 1A.
8. Clean up all materials. All solid materials should be thrown out. All liquid materials should be disposed of down the drain.

**Data**

Data Table 1

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Data Table 2

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Data Table 3

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Data Table 4

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Data Table 5

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Data Table 1A

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| Test Tube Number and Contents | Rate of Oxygen Release | Observations of Oxygen Relsease |
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Data Table 2A

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| --- | --- | --- |
| Test Tube Number and Contents | Rate of Oxygen Release | Observations of Oxygen Relsease |
|  |  |  |

Data Table 3A

|  |  |  |
| --- | --- | --- |
| Test Tube Number and Contents | Rate of Oxygen Release | Observations of Oxygen Relsease |
|  |  |  |

Data Table 4A

|  |  |  |
| --- | --- | --- |
| Test Tube Number and Contents | Rate of Oxygen Release | Observations of Oxygen Relsease |
|  |  |  |

Data Table 5A

|  |  |  |
| --- | --- | --- |
| Test Tube Number and Contents | Rate of Oxygen Release | Observations of Oxygen Relsease |
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**Conclusion**

Using the data that you have gathered, provide insight on the hypothesis that you made earlier in the lab.

**Analysis**

1. What is an enzyme? Why do living things use enzymes?
2. What reaction happened in this lab?
3. Describe what happened to the test tube when hydrogen peroxide was added to the liver. What gas was produced? What liquid was left behind?
4. Why was there no reaction when water was added to a piece of liver?
5. Explain the results from test tube 5. Why did it behave like it did?