Name Removed for Privacy 10-20-08
Lab #8

Exploring Biomolecules: Looking at Carbohydrates

Purpose: The purpose of this lab activity was to identify the three main types of carbohydrates through the use of chemical indicator tests.

Hypothesis: If we put honey and Benedict's solution in a test tube and place the test tube in the hot water bath for 5 minutes, then when we remove the test tube, the color will change because glucose, a monosaccharide, is present in the honey.

Experiment Planning:
A. the independent variable is the carbohydrate we use.
B. the dependent variable is the color of the solution after it is taken out of the hot water bath.
C. the control is the amount of the carbohydrate we put in the test tube, and the amount of Benedict's solution and iodine used.
D. our sample size is 20 drops of unknown carbohydrates, and we will do one trial.

Materials:

Test tubes
Test tube racks
Polysaccharide solution
Disaccharide solution
Monosaccharide solution
Droppers
Hot plate
Apple juice
Iodine
Powdered sugar
Table sugar
Oats
Honey
Water
Beaker
Benedict's Solution

Procedure:
Part One: Pre-lab

1. My partner and I examined the structural formulas of three sugars (Hydrogen, Carbon, and Oxygen- which were Monosaccharides)

and answered the questions that followed.
2. We examined a model of sucrose (Disaccharide) and answered the questions.
3. We looked at a starch molecule (Polysaccharide) and answered the questions that followed.

Lab- Part A

1. We numbered three clean test tubes 1, 2, and 3 and added 30 drops of monosaccharide solution to tube 1, 30 drops of disaccharide solution to tube 2, and 30 drops of polysaccharide solution to tube 3.
2. We added 15 drops of Benedict's solution to each tube and placed the three test tubes into the hot water bath for 5 minutes.
3. We used a test tube holder to remove the tubes and observed any color changes in the solutions.
4. We recorded our observations in Table 1.

Lab-Part B

1. We numbered three clean test tubes 1, 2, and 3 and added 30 drops of monosaccharide solution to tube 1, 30 drops of disaccharide solution to tube 2, and 30 drops of polysaccharide solution to tube 3.
2. We added 4 drops of iodine solution to each tube and mixed the contents by gently swirling.
3. We observed any color changes and recorded observations in Table 1.

Lab-Part C

1. We numbered five clean test tubes 1,2,3,4 and 5 and added 20 drops of honey to tube 1, 20 drops of liquid oats to tube 2, 20 drops of table sugar solution to tube 3, 20 drops of apple juice to tube 4, and 20 drops of powdered sugar to tube 5.
2. We added 30 drops of Benedict's solution to each tube.
3. We placed all 5 tubes in the hot water bath for 5 minutes.
4. We removed the test tubes from the bath with a test tube holder and noted any color changes.
5. We recorded the color of the solutions in Table 2.
6. We prepared five more test tubes containing the substances we

had just used but did not add Benedict's solution, but added 4 drops of iodine to each test tube and mixed by swirling.

7. We noted any color changed as recorded them in Table 2. We also classified each carbohydrate as a monosaccharide, disaccharide, or polysaccharide and recorded our answers in Table 2.

Results: What happened in our lab was we looked at different carbohydrates known as monosaccharides, disaccharides, or polysaccharides. We found that all carbohydrates are made of sugars and contain carbon, hydrogen, and oxygen in a 1:2:1 ratio.

The monosaccharides we looked at were glucose (6:12:6), galactose (6:12:6), and fructose (6:12:6). So, based on the 1:2:1 ratio, the chemical formula for glucose is $C_6H_{12}O_6$, the chemical formula for galactose is $C_6H_{12}O_6$, and the chemical formula for fructose is $C_6H_{12}O_6$. Even though all of these sugars have the same chemical formula, they are different because they all have different arrangements of atoms. You find 2 times as many hydrogen atoms as oxygen atoms in molecules of glucose, fructose, and galactose.

The disaccharide we looked at was sucrose, whose common name is table sugar.

The polysaccharide we looked at was a starch molecule. We found that the body stores glycogen, a common polysaccharide, in the pancreas, and plants produce cellulose, another common polysaccharide, which holds the plant upright.

Data and Tables

TABLE 1: RESULTS TEST WITH KNOWN CARBOHYDRATES

Tube #	Carbohydrate type	Benedict's color after heating	Iodine Color
1	Monosaccharide	Orange	Red-brown
2	Disaccharide	Light blue	Orange
3	Polysaccharide	Green	Black

TABLE 2: RESULTS OF TESTS WITH UNKNOWN CARBOHYDRATES

Carbohydrate	Benedict's Color	Iodine color	Type of carbohydrate
Honey	Red	2 levels: red yellow	Monosaccharide
Oats	Orange	Dark brown	Polysaccharide
Table sugar	Greenish	Rusty orange	Disaccharide
Apple	Dark orange	Rusty red	Disaccharide
Powdered sugar	Teal	Black	Polysaccharide

Conclusion:

The purpose of this lab activity was to identify the three main types of carbohydrates through the use of chemical indicator tests.

What happened was we looked at monosaccharides, disaccharides, and polysaccharides and tested known and unknown carbohydrates to find which type of carbohydrate each was. I accept my hypothesis because when we removed the test tube with the solution of honey and Benedict's solution, we observed that the color changed from blue to red, signifying that a monosaccharide was present in the carbohydrate (honey). The information from the lab said that if the color changed, a monosaccharide was present, and if the color did not change, then the carbohydrate was a disaccharide or polysaccharide.

I think this happened because the heating of the honey along with the Benedict's solution brought about the color change (blue →red), which showed the type of carbohydrate honey was(monosaccharide).

The three categories of carbohydrates studied in this lab are monosaccharides, disaccharides, and polysaccharides. The three elements present in all carbohydrates are Carbon, Hydrogen, and Oxygen. The prefixes mono-, di-, and poly- are used in describing types of carbs. because mono- means one and monosaccharides are

single sugar molecules, di- means two and disaccharides are double sugar molecules, and poly- means many and polysaccharides are many sugar molecules. By using Benedict's solution, you can tell what type of carb. is present because if the color of the substance changed, then a monosaccharide is present, and if the color stays blue, then either a disaccharide or polysaccharide is present. When using iodine solution, if the solution changes colors, then a polysaccharide is present, and if the color stays the same, the carb. Is either a monosaccharide or disaccharide is present. Then you match up the color changes and you will find what type of carb the substance is. If a certain sugar has no change in color when tested with Benedict's solution, you cannot tell what type of carb it is because you will need to test the sugar with iodine as well so you can match the color changes and find whether the carb is a disaccharide or polysaccharide. If a sugar turns orange with Benedict's solution, the sugar is a monosaccharide because when the color changes, you know the carb is a monosaccharide.

A lapse that may have affected our results was the labels on our test tubes were condensated off from the hot water bath during Part B of the lab, but we matched up the colors of our solutions from the colors of another group's test tubes. However, I have good confidence in our results because we matched the colors perfectly and got the same results we would have gotten.

Two new concepts I have learned after doing this lab are that there are three types of carbohydrates, which are monosaccharides, disaccharides, and polysaccharides, and all carbohydrates contain carbon, hydrogen, and oxygen in a 1:2:1 ratio. Two new questions I now have are "How do Benedict's solution and iodine indicate the type of carbohydrate?" and "Why do carbohydrates contain carbon, hydrogen, and oxygen in a 1:2:1 ratio?"