

Identification of carbohydrates, lipids and proteins lab essay sample



**ASSIGN
BUSTER**

Background: Carbohydrates are composed of only the elements Carbon, Hydrogen, and Oxygen, and all carbohydrates have the same empirical formula: (C H O). They provide a source of energy to all cells. Plants manufacture their carbohydrates through the process of photosynthesis. Animals need carbohydrates to function, but they cannot produce any on their own, therefore, they have to consume plants, or an animal that eats plants to receive their share.

In this experiment, we use Benedict's solution to detect certain carbohydrates called "reducing sugars" in the materials. The free aldehyde groups of the reducing sugars are oxidized by the metallic ion found in Benedict's solution. If a substance does contain "reducing sugars" then the reaction results in the formation of a coloured precipitate.

We also use iodine to detect the presence of starch and glycogen. Iodine solution reacts with the starch producing a purple black color. It also reacts with glycogen to produce a more brown color.

Purpose: The purpose of this experiment is to determine the types of carbohydrates that are found in various foods.

Independent variables: The materials tested (1% glucose, 1% fructose, etc.)

Dependant variables: The colour change of the materials

Controlled variables: Volume of materials tested, volume of Benedict's solution added, volume of iodine added

Control Sample: Distilled water

Lipid Identification - Investigation 3

Background: Lipids contain Carbon, Hydrogen, and Oxygen and make up fats, oils, and waxes. Living things need lipids for long term energy storage, insulation, and to form structural components of cells. Lipids are formed when a glycerol combines with three fatty acids.

Lipids can be detected through the means of rubbing substances on paper. If lipids are present, the paper will turn translucent.

Lipids can also be identified through the means of an emulsion test. When a sample is soaked in ethanol, the lipids dissolve. The solution is then poured into water. Since lipids don't dissolve in water, when the ethanol is diluted, it falls out of solution. We can then search for Colloidal droplets under a microscope. They indicate that a lipid is present.

You can also find lipids through the means of adding Sudan IV to a solution. The solution turns red if there are lipids present.

Purpose: To show the presence of lipids in various foods.

Independent Variables: The materials tested

Dependent Variables: the translucency of the paper/ the presence of colloidal droplets/ the colour of a substance.

Controlled variables: same paper is used, same amount of materials, same amount of ethanol used, same amount of distilled water, same amount of Sudan IV

Identification of Proteins

Background: Proteins are the most common organic compounds in living cells. They are composed of Carbon, Hydrogen, Oxygen, Nitrogen, and sometimes Iron and Phosphorus. Proteins are the building blocks for many organelles, cell membranes, enzymes, muscles and more.

Proteins can be detected by adding copper ions.

Purpose: to show the presence of proteins in various foods

Independent variables: different materials used

Dependent variables: color changes of materials

Controlled variables: volume of materials used, volume of NaOH and CuSO₄ used, volume range of HNO₃ used.

Materials

Investigation 2 Investigation 3 Investigation 4

MATERIALS

Peanuts

Butter

Beef fat*

Lean meat

Lard

Vegetable Oil

Skim milk

Whole milk

Distilled water

Isopropanol (propanol)**

Sudan IV

MATERIALS

10% egg albumin

1% gelatin

Milk

Chicken bouillon

Distilled Water

0.02 mol/L CuSO₄

MATERIALS

1% Glucose

1% Fructose

1% Maltose

1% Sucrose

1% Glycogen

1% Starch

10% Corn syrup

Skim milk

Carrot extract

Celery extract

Potato Extract

Iodine Solution

Benedict's solution

Distilled water

*beef fat was not used for experiment due to shortages

*Ethanol replaced isopropanol in the experiment

Procedures

Refer to attached handout in appendix

Observations

Investigation 2: Identification of Carbohydrates - a) Reducing Sugars Test

Material Used

Color Before Heating

Color After Heating

1% Glucose

Blue (light)

Murky Brown

1% Fructose

Blue (light)

Dark red-brown

1% Maltose

Green blue- more to green

Dirty orange

1% Sucrose

Clear blue

Vivid Orange

1% Glycogen

Blue (not light, not dark)

Bright Blue

1% Starch

Dark blue

Clear blue

10% Corn syrup

Clear blue

Vivid orange

Skim Milk

Blue at the bottom, white at the top

Puke yellow with white precipitate

Carrot Extract

Murky orange

Light orange

Celery Extract

Green with tints of blue

orange

Potato Extract

Teal, green-blue

Green (murky)

Distilled Water

Clear, light blue

Clear light blue

Investigation 2: Identification of Carbohydrates - b) Starch and Glycogen
Test

Materials Used

Color Before Iodine Is Added

Color After Iodine Is Added

1% Glucose

Clear

Orange yellow

1% Fructose

Clear

Orange yellow

1% Maltose

Clear

Dark orange/red

1% Sucrose

Clear

Clear orange

1% Glycogen

White/clear

Clear, light orange

1% Starch

Clear White

Clear brown

10% Corn Syrup

Yellow/Clear

Darker, clear orange

Skim Milk

Murky White

White murky yellow, color doesn't dissolve

Carrot Extract

Murky Orange

Clear brown

Celery Extract

Light clear green

Clear orange

Potato Extract

Murky brown

Black-brown peach color

Distilled Water

Clear

Clear orange yellow

Investigation 3: Lipid Identification - a) Translucence test

Materials

Observations When Holding Paper Up To Light

Peanuts

Spotted translucent spots, paper is spotted in a type of oil

Butter

Large translucent spot

Lean Meat

Small translucent spot in middle, paper stained red

Lard

Large clear translucent spot

Vegetable Oil

Large very clear translucent spot

Skim Milk

Paper isn't that translucent

Whole Milk

More translucent than skim, still not very translucent

Distilled Water

Translucent (40%)

Ethanol

Barely translucent (7%)

Sudan N.

Paper isn't translucent but it's stained red

Investigation 3: Lipid Identification - b) Emulsion test

Materials

Observations Under Microscope

Butter

Bubbles (small) seen, lipids seen + fat (clump)

Lard

Bubbles small, spreading out, no fats

Peanuts

Bubbles small, lipids seen + fat

Lean Meat

No lipids, but bubbles seen

Investigation 3: Lipid Identification - c) Sudan IV test

Materials Sudan Dissolves in:

Skim Milk, Whole Milk, Vegetable Oil

Investigation 4: Identification of Proteins - a) Biuret test

Materials

Colour before adding NaOH and CuSO₄ then shaking

Colour after adding NaOH and CuSO₄ then shaking

10% egg albumin

Clear

Violet (deep purple); purple doesn't diffuse easily, stays on top

1% Gelatin

Clear

Even deeper violet; purple doesn't diffuse easily, stays on top

Milk

White

Blue, then light purple (after shaking)

Chicken Bouillon

Clear

Blue

Distilled Water

Clear

Layer of blue on top

Investigation 4: Identification of Proteins - b) Xanthoproteic Test

Materials

Colour before adding HNO₃

Colour after adding HNO₃

10% egg albumin

Clear

Murky white

1% Gelatin

Clear

clear

Milk

White

Precipitate forms

Chicken Bouillon

Clear

Murky

Distilled Water

Clear

Clear

Analysis

Investigation 2: Identification of Carbohydrates - a) Reducing Sugars Test

Material Used

Reducing sugars present

1% Glucose

Yes

1% Fructose

Yes

1% Maltose

Yes

1% Sucrose

Yes

1% Glycogen

No

1% Starch

No

10% Corn syrup

Yes

Skim Milk

Yes

Carrot Extract

Yes

Celery Extract

Yes

Potato Extract

No

Distilled Water

No

Investigation 2: Identification of Carbohydrates - b) Starch and Glycogen

Test

Materials Used

Starch Present

Glycogen Present

1% Glucose

yes

yes

1% Fructose

no

yes

1% Maltose

no

yes

1% Sucrose

no

no

1% Glycogen

no

yes

1% Starch

yes

no

10% Corn Syrup

no

yes

Skim Milk

no

no

Carrot Extract

no

yes

Celery Extract

no

yes

Potato Extract

yes

yes

Distilled Water

no

no

Investigation 3: Lipid Identification - a) Translucence test

Materials

Lipids Present

Peanuts

yes

Butter

yes

Lean Meat

yes

Lard

yes

Vegetable Oil

yes

Skim Milk

Yes, but very little amount

Whole Milk

Yes, not a lot

Distilled Water

no

Ethanol

no

Sudan N.

no

Investigation 3: Lipid Identification - b) Emulsion test

Materials

Lipids present

Butter

Yes

Lard

No

Peanuts

Yes

Lean Meat

No

Investigation 3: Lipid Identification - c) Sudan IV test

Materials with lipids

Skim Milk, Whole Milk, Vegetable Oil

Investigation 4: Identification of Proteins - a) Biuret test

Materials

Proteins Present

10% egg albumin

yes

1% Gelatin

yes

Milk

yes

Chicken Bouillon

no

Distilled Water

no

Investigation 4: Identification of Proteins - b) Xanthoproteic Test

Materials

Proteins Present

10% egg albumin

Yes

1% Gelatin

No

Milk

Yes

Chicken Bouillon

Yes

Distilled Water

No

Discussion

The data shown to use by these test shows use which substances have carbohydrates, which substances have lipids, and which substances contain proteins. Using the results from this experiment, we can now arrange our diets in a way that we receive all the substances we need to maintain a healthy diet. For example, using the results from the Xanthoproteic test, we now know that milk is a source of protein. Protein is essential for the development of muscles and organelles. Using this connection, we can conclude that milk can help the development of muscles and organelles, and that we - as humans - should drink more of it for a balanced healthy diet.

This experiment did not run as smoothly as I thought it would. Certain tests had problems that may have resulted in inaccuracy of results or frustration during experimentation.

During the reducing sugars test, there was a problem with the water used to heat the test tubes containing the solutions. The procedure provided did not tell you how much water to heat. Too much water, and the masking tape used to label the test tubes would fall off in the water. Too little water and the tubes would tilt and not stay upright. To improve this experiment, the procedure should state that water should be added to a point where the test tubes are three quarters submerged.

In the Emulsion test, the crushing of the solid ingredients was a very messy task. When crushing a solid in a mortar, you had to add ethanol. The solids were very difficult to mash, and the liquids kept spilling over. If you mashed too hard, it would spill, but if you didn't grind as hard, the solids would remain solids for ages. To improve this experiment, I would suggest using a

smaller sample of solids and liquids. I would reduce the amount from 3 grams to 1.5 grams (of solids) and I would reduce the amount of ethanol used from 10mL to 5mL. In the end of the experiment, only one drop of the liquid I required, so reducing the sample size makes a lot of sense

During the Sudan IV test, we had to “shake the mixture vigorously”. This was a problem because Sudan IV is corrosive and touching it would be potentially dangerous. The instructions don't specify a safe way to shake the test tubes. I would suggest that the instructions include that you use a test tube stopper to prevent the corrosive solution from spilling.

Conclusion

The only ingredient tested in experiment one that didn't contain carbohydrates is distilled water. The ingredients that don't contain lipids are ethanol, Sudan IV and distilled water. The ingredients that don't contain proteins are distilled water.