Digestive System Lab

Application:

Use of dialysis tubing to model absorption of digested food in the intestine.

Background:

Cola drinks contain a mixture of substances with different particle sizes. They can be used to represent food in the small intestine. Dialysis tubing is semi-permeable so can be used to model the wall of the small intestine. Cola contains glucose, phosphoric acid and caramel, a complex carbohydrate added to produce a brown color. Keep in mind which of these substances will diffuse out of the bag, and predict whether the bag will gain or lose mass during the experiment.

Purpose:

Use dialysis tubing to model absorption rate of digested food in the small intestine.

Hypothesis:

Materials:

Procedure:

1. Fill a beaker with 200 ml of water and test 1 ml of the solution for glucose using benedict's solution and a hot bath.
2. Record the initial pH of the water solution.
3. Make the model of the small intestine with cola inside. To make a model of the small intestine, cut a length of dialysis tubing and seal one end by tying a knot in the tubing. Pour in a 10ml of cola and seal the open end by tying a knot.
4. Rinse the outside of the bag to wash off any traces of cola and then dry the bag.
5. Find the mass of the bag using an electronic balance.
6. When you are ready to start the experiment, place the bag in the beaker of water from step 1.

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7. Test the water around the bag at suitable time intervals. A suggested range is every five minutes..
8. At each time lift the bag up and down a few times to mix the water in the beaker, then do these tests:
    a. Put a sample of the water in a spot plate. Look carefully at the water to see whether it is still clear or has become brown.
    b. Run the benedict's test on 1 ml of the water to see if the glucose concentration has changed.
    c. Record the pH of the water surrounding your model.
    d. Record or take a picture of the benedict's test results.
9. At the end of your experiment find the final mass of your model.
10. Create a data table to record all the data collected in the lab.
11. Create a color array that can help to quantify the data concerning the glucose concentration in the outside environment.
12. Create a graph that shows how glucose concentration and pH changes throughout the experiment.
13. Attach data table and graph to end of lab.

Data:
See attached documents

Conclusion:

1. Explain the conclusions that you can draw about the permeability of the dialysis tubing from the tests of the water and from the change in mass of the bag.

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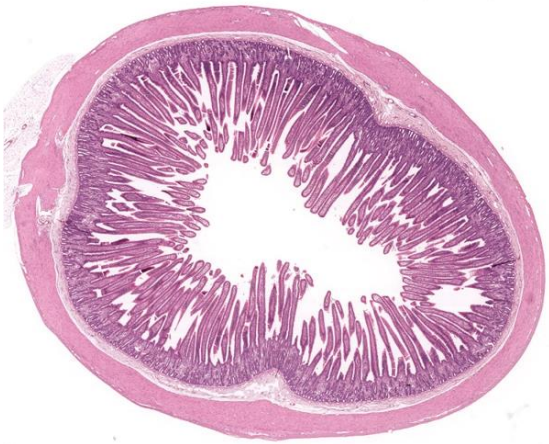
2. Compare and contrast the dialysis tubing and the plasma membranes that carry out absorption in villus epithelium cells in the wall of the intestine.

3. Use the results of your experiment to predict the direction of movement of water by osmosis across villus epithelium cells.

Skill:

Identification of tissue layers in transverse sections of the small intestine viewed with a microscope or in a micrograph. Also draw the longitudinal section to contrast. Identify in both:

- Serosa
- Muscle Layers
- Sub-mucosa
- Mucosa



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Skill:

Production of an annotated diagram of the digestive system. (Annotate: Add brief notes to a diagram or graph)
Include:

- Mouth
- Esophagus
- Stomach
- Small Intestine
- Pancreas
- Liver
- Gall Bladder
- Large Intestine