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Lab 3 Endocrine System: Blood Glucose and Ketone Body Testing

Description:

The pancreas is the endocrine organ responsible for regulating blood glucose levels. There are specialized structures in the pancreas known as pancreatic islets (or islets of Langerhans) that secrete the hormones insulin and glucagon. When blood glucose levels are high (as they normally are directly after a meal), insulin is secreted which promotes the storage of glucose as glycogen in cells. The main glucose storage sites include the liver and skeletal muscle cells. On the other hand, when blood glucose levels are low, glucagon is secreted to take glucose out of storage and release it into the bloodstream. The breakdown of glycogen to glucose subunits is a process known as glycogenolysis.

The body prefers to metabolize glucose for energy, however if glucose is not available (i.e. during long-term fasting or in diabetic patients) the body will metabolize fatty acids for energy instead. Ketone bodies are a byproduct of fatty acid metabolism. The presence of ketone bodies in urine indicates that glucose is not available for energy metabolism. If ketone bodies continue to form, the patient is at risk for developing a condition known as keto-acidosis.

Objectives:

Understand the effects of blood glucose on our bodies before and after the intake of food.
Understand the how insulin and glucagon play a role in our body.
Test for the presence of glucose and ketones

Materials:

1 Glucometer
3 Glucometer Test Strips
3 Ketone Body test strips
3 Lancets
1 Urine receptacle
3 Alcohol Prep Pads
Protective gloves
Snacks (≈100g of sugar)

Procedure:

Students are to divide among groups of 4-5 members. Only one volunteer member from each group will provide the samples. The volunteer should be any team member in good health with no prior history of hypo or hyperglycemic episodes, epilepsy, high/low blood pressure, cardiac problems, diabetes, pregnant, or presumably pregnant, lactating, dieting regime (Atkins or South Beach, etc.). The best candidate will be any person fasting (except extended fasting) that perhaps that has not eaten anything in at least the last 3-4 hours.

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Initial Blood Sugar Reading: (Read all directions first.)

1. Put on a pair of gloves
2. Cleanse the tip of the donor's finger with an alcohol pad and allow to dry.
3. Press center button on Glucometer to turn it on
4. Insert the gold end of a Glucometer test strip into the slot located on the upper part of the apparatus. A black blinking "blood drop" should show on the screen.
5. Remove the tab of the lancet, and quickly puncture the finger of the donor.
6. Squeeze the donor's finger expel a drop of blood, and touch the end of the strip (in the glucometer) to the drop. It should soak onto the strip. **Note:** Do NOT drop the blood directly onto the strip- this will give an error.
7. In a few seconds the unit will display your blood glucose level in **mg/dL**
8. Place a gauze pad on the finger and apply gentle pressure for 1 minute to stop the bleeding.
9. Record this initial blood sugar reading in the table provided.

Testing for Ketone Bodies

* The following is to be done by two people: a donor that will provide a urine sample, and an assistant that will accompany the donor to open and close doors (bathroom and classroom). This procedure is done to minimize contamination.

Note: When returning to the classroom, place urine sample in the designated location. NOT at your table.

Wash hands!

Place a ketone body test strip in the urine for the specified amount of time, and by comparison to the key provided on the container of test strips, determine the initial count of Ketone bodies in the urine.

Record your findings in the table provided.

Sugar Consumption and Exercise

- Eat approximately 100 grams (g) of simple carbohydrates provided by the instructor.
- Wait approximately 15-20 minutes; retake glucose measurement.
- Exercise: Use treadmill, elliptical bicycle, or jump rope for about 10-15 minutes
- Retest blood glucose and ketone levels as outlined above.
- Record your results in the table provided.

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MEMBERS OF A GROUP THAT DOES NOT CLEAN UP WILL RECEIVE A ZERO FOR TODAY'S LAB!!!

-Remaining urine samples must be disposed of into the toilet, and receptacles discarded into the restroom trash cans.

-Anything that came in contact with blood should be disposed of into the proper biohazard waste container.

-Lab benches must be cleaned well with Vesphene (disinfectant)!!!