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Lab 8: Glucose Tolerance

Purpose: To determine the changes in level of blood glucose following the intake of glucose.

Procedure:

8-A: Glucose tolerance test

The glucose tolerance test assays the ability of the body (especially the pancreas) to respond to an excess ingestion of glucose. The changes in blood glucose level following glucose ingestion (1 g/kg body weight) are markedly different between the normal and the diabetic person. This difference is shown in Figure 8.1. In the normal person, the blood glucose level rises from about 90 mg% to around 140 mg% in 1 hour and then falls back to normal within 3 hours or even below normal due to excess insulin release by the pancreas. The diabetic person shows a hyperglycemic response in which the blood glucose level rises from about 120-160 mg % to as high as 300 mg% and then slowly falls to the fasting diabetic level after 5-6 hours. The diabetic's abnormal response is caused by the inability of the pancreas to secrete additional insulin in response to elevated blood glucose levels.

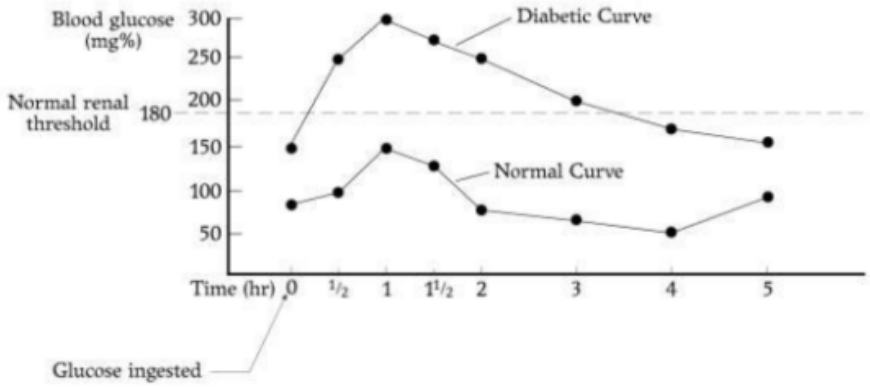


Fig. 8-1: Changes in the level of glucose in blood following the ingestion of glucose.

Procedure

1. Six student volunteers will be selected for this experiment. These subjects should report to the lab in the fasted state – not having eaten for 10-12 hours.

2. Each student's normal fasting blood glucose level will be determined using the test strips for the glucometer assigned to each student. Each volunteer will clean a finger with 70% alcohol, then use a sterile lancet to obtain a drop of blood for the test. **If a student is helping another obtain a blood sample, gloves and universal precautions will be followed.

3. Each subject will then drink a lemon-flavored solution (Tru-Glu) of 25% glucose. The quantity of solution will be based on 1 g of glucose per kilogram of body weight. To determine body weight in kilograms, the weight in pounds will be divided by 2.2.

4. After ingesting the glucose, the subject will repeat the blood testing procedures every 30 minutes. Testing will continue in this manner for 1 1/2 hours or until the end of the lab period.

5. Record and graph the average of the class results of the blood glucose tests.

6. Compare the results with the normal glucose tolerance test curve. Describe the graphs in terms of absorptive and post-absorptive states.

8-B: Insulin shock (information only)

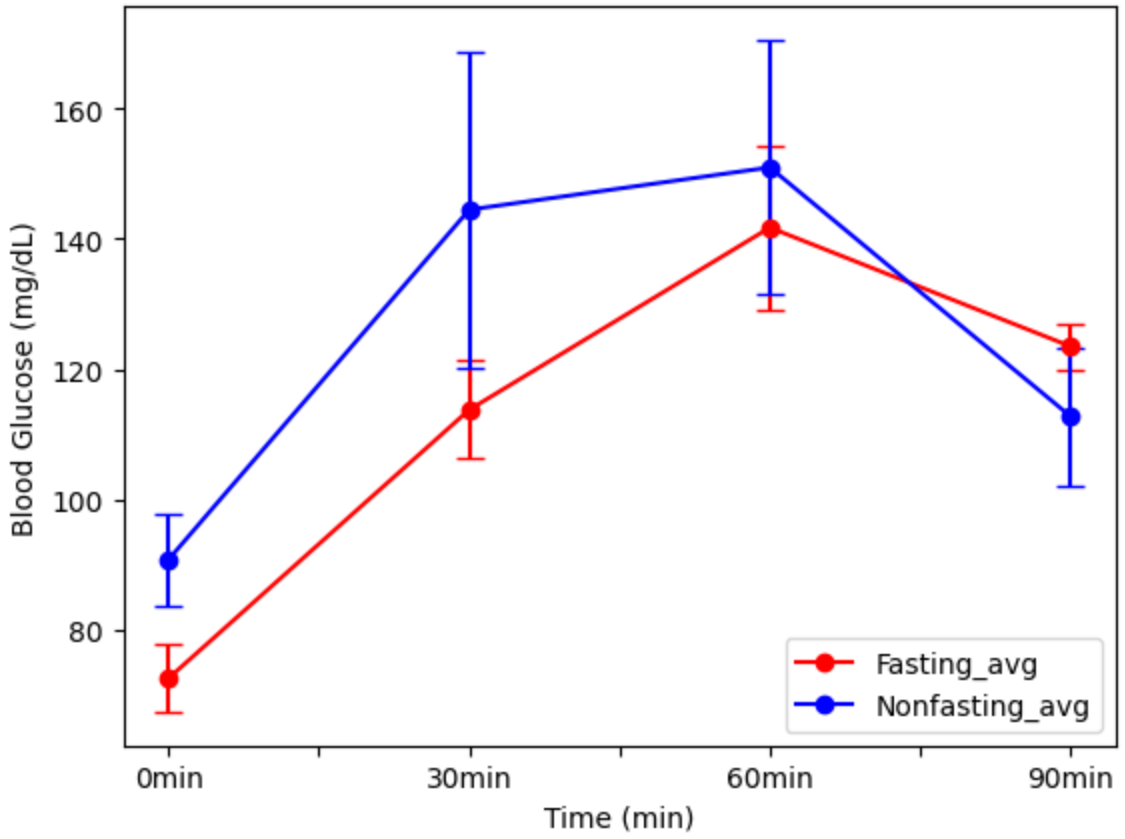
An excess blood level of insulin causes a state of extreme nervousness and convulsions that is referred to as insulin shock. Insulin shock is caused by a low level of blood glucose (hypoglycemia), produced when insulin stimulates the entry of glucose into the body cells. The brain cells depend almost totally upon glucose for their energy, and when the blood glucose falls to a low level (50-70 mg%), the neurons become hyperexcitable and extreme nervousness develops. If the blood glucose level is lowered still further (30-50 mg%), clonic (spastic, irregular) convulsions may develop and eventually coma and death may result.

Final review

- Understand the basic mechanism of hormonal activity and the second messenger theory of some hormones.
- Understand absorptive and post-absorptive states.
- Understand the role of insulin and glucagon in the regulation of blood glucose.
- Understand the differences between IDDM and NIDDM.
- Understand the terms hyperglycemia and hypoglycemia.
- Understand the terms glucosuria, polyuria, and polydipsia.
- Understand the term acidotic.
- Understand what causes insulin shock.

*This lab was adapted from Tharp, G.E. Experiments in Physiology. 1986. Macmillan Publishing Co.; New York; pp. 177-183.

Results:



Discussion: The glucose tolerance showed me how fast and how much glucose reacts with our bodies.

Conclusion: After completing the glucose tolerance lab, I now understand how fasting significantly increases the effect of glucose ingestion in our bodies within an hour. I also understand how body size also affects the ingestion of glucose as well.