

Glucose regulation

[Health & Medicine](#), [Diabetes](#)



Aim:- To measure blood sugar levels in human subjects following the ingestion of different volume of glucose , sucrose depending on the subject's body weight and pure water (control).

Method: – Altogether three different conditions/ groups were prepared including glucose, sucrose and control group. Each subject in each group had to keep record of their previous meals including morning and evening meals.

For glucose and sucrose group- a weighting scale was provided to determine the body weight of each subject in kilograms. Each subject had to calculate, considering their body weight; the quantity of sugar (glucose or sucrose) needed to ingest 1. 25g/kg.

Each subject had to weight the sugar out into a plastic cup using the scales provided and then dissolved the sugar into 300ml of water.

Each subject took the initial (time zero) blood sample and measured the blood glucose using glucose meter.

The blood glucose measurements were noted by the helpers or inputting data assistant in each group.

Immediately after the timer began, each subject consumed the drink (glucose mixed with 300ml of water or sucrose mixed with 300ml of water) within less than 5 minutes.

After 15 minutes, each subject took the next blood glucose measurement and continued to carry out the same procedure after every 15 minutes for 2 hours.

For the control group- Each subject measured 300ml of water using a measuring jug and then each subject took the initial (time zero) blood sample and measured the blood glucose using glucose meter.

The blood glucose measurements were noted by the helpers or inputting data assistant in each group.

Immediately after the timer began, each subject consumed the water within less than 5 minutes. After 15 minutes, each subject took the next blood glucose measurement and continued to carry out the same procedure after every 15 minutes for 2 hours.

To measure the blood glucose using glucose meter- Each subject used an alcohol pad to clean the area that was to prick (finger) and pricked it with a sterile lancet to obtain a drop of blood. Each subject placed the drop of blood onto the test strip and then gently inserted the test strip into the glucose meter. Almost after few seconds the glucose meter showed a number for the blood sugar level for each subject, which was noted by the helper/inputting data assistant. This was carried out for each condition/group including glucose, sucrose and control.

Statistics

The statistics used in this experiment is paired two tailed t-test to compare and blood glucose levels (variable). This is because paired t-test compares the means of a variable in the same sample under different conditions or at two different times.

Another statistic used is one- way ANOVA test to compare the means between the groups followed by Post-hoc test. This is used at the second stage of the analysis of variance (ANOVA) to determine which groups significantly differ from others in respect to the mean.

Introduction:-

The regulation of glucose is an essential system inside the human body. Most cells in the human body use glucose as their major source of energy such as red blood cells and muscle cells. Glucose molecules are hydrolysed within cells in order to produce ATP, which stimulates numerous cellular processes within the body. Glucose molecules are delivered to cells by the circulating blood and therefore, to ensure a constant supply of glucose to the cells, it is important that blood glucose levels be maintained at relatively constant levels. Even excess level of glucose can lead to further complications such as diabetes or damage to organs. Level constancy is accomplished primarily through negative feedback systems, which ensures that blood glucose concentration is maintained within the normal range (3.6 – 5.8 mmol/L). Negative feedback systems are extremely important in homeostasis as it sense changes in the body and activate mechanisms that reverse the changes in order to restore conditions to their normal levels. Therefore any disruption in homeostasis can lead to potentially serious situations. The major factor that can increase the blood glucose levels and the production of new glucose molecules is the liver cells. The major factor that can decrease the blood glucose levels including the transport of glucose

into cells and the loss of glucose is through urine. This is an abnormal event that also occurs in diabetes mellitus.

Normally, in a healthy person, the blood glucose levels can easily be restored to normal levels through the actions of two pancreatic hormones: Insulin and glucagon. If blood glucose levels rise after the digestion of food then the beta-insulin cells of the pancreas respond by secreting insulin. The secretion of insulin stimulates cells in the body to increase their rate of glucose uptake from the blood, increase the formation of glycogen from glucose in liver and skeletal muscle cells and also stimulates fat synthesis from glucose in liver cells and adipose tissue. These factors cause a decrease in the blood glucose levels back to normal levels.

However, if the blood glucose levels fall below normal levels for example during fasting state or starvation then the insulin secretion from the pancreas is inhibited. As a result alpha cells of the pancreas respond by secreting glucagon, which increases the breakdown of glycogen to glucose in liver and skeletal muscle cells and this would also increase the breakdown of fats to fatty acids and glycerol in adipose tissue. Consequently, the release of these substances into the blood would stimulate the liver cells to increase glucose synthesis so as a result glucose is released into the blood. These factors cause an increase in the blood glucose levels back to normal levels. In addition to insulin and glucagon hormones, there are also several other hormones that can stimulate the blood glucose levels such as epinephrine, cortisol, and growth hormone.

Results

<https://assignbuster.com/glucose-regulation/>

Null hypothesis- No effect

Blood glucose

Fasting blood glucose 70–99 mg/dL or less than 5.5 mmol/L

2 hours after eating (postprandial) 70–145 mg/dL (less than 7.9 mmol/L)

Random (casual) 70–125 mg/dL (less than 7.0 mmol/L)

Evaluation

Before the practical, each subject (except helpers) was advised to avoid eating or drinking (except water) for four hours prior to the test so the results are not affected. Despite of that, some individuals did not follow the strict instructions and had a meal before the practical so this may have affected the results. Even if the subject is diabetic and had eaten before the blood glucose test, the blood glucose level would increase or even testing after 90minutes would still show an increase in the blood glucose level as all the food will eventually digest and convert into glucose. Perhaps this could give an inaccurate blood glucose measurement.

Another factor which could influence the results is the movement (walking) of subjects. During the 15minutes wait for the next blood glucose measurement, few subjects continuously walked around the room. During high intensity of exercise (which sometimes can even be walking for some individuals who are deconditioned) muscles require more glucose. Thus, more signals are sent for more energy which comes from the blood glucose or stored glycogen in the liver. As a result, the body responds by releasing more glucose and without sufficient insulin, which causes the blood glucose levels to increase. Similarly, during low intensity of exercise, the blood

glucose level can also decrease so therefore it is important that the subject remain sat down on the chair during the experiment and avoid as much movement as possible.

If the experiment was to be carried out once again, I would ensure that all subjects participating clearly understand and strictly follow the instructions in order to obtain accurate set of results. Firstly, I would inform subjects that smoke to avoid smoking or drinking coffee in the morning of the test, as this would affect their blood glucose level. Also, I would ensure that each subject avoid having a meal at least 4 hours before the test as this is also one of the factors that can increase the blood glucose level and therefore can affect the results.

In addition to this, I would also ensure that each subject must remain sat on the chair during the experiment and avoid any movements such as walking or running. As mentioned before, this could also increase the blood glucose level and therefore can affect the results.

HarvardReferences

D. E. HURLBUT ET AL. (2002). Does age, sex, or ACE genotype affect glucose and insulin responses to strength training *Journal of Applied Physiology*. 92 (2), 643–650