

**Greater San Diego Science and Engineering Fair
2018 PROJECT SUMMARY**

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Project Title: Artificial Pancreas: An Automatic Insulin Delivery System

Abstract

Objectives/Goals

The objective of the experiment is to create an automatic closed loop system that can model a working pancreas.

Hypothesis

It is hypothesized that 85 percent of the time the pH level of baking soda solution will rise until it reaches within 5% of pH 7. It is further hypothesized, that the time taken to completely neutralize the baking soda solution would be proportional to the concentration of the solution.

Methods/Materials

The automated system consisted of a solderless breadboard, multiple electric resistors, a jump wire kit, a MOSFET, 3 potentiometers, 8 AA batteries, battery holder (8) and peristaltic liquid pump. The rest of the materials are liquids, such as vinegar, water and baking soda. Throughout the experiment, baking soda represented the blood glucose levels and vinegar represented insulin.

Results

The concentration of the baking soda solution was varied in between 2.5 grams and 7.5 grams per 200 mL to test the performance of the closed loop system. When the concentration of baking soda per 200 mL of water was 2.5 grams, the automatic system usually neutralized the solution under 1 minute and 25 seconds. When the quantity of the solution was 200 mL and the concentration were 7.5 grams the solution took over seven minutes to neutralize.

Conclusions/Discussion

The automatic insulin delivery system was successfully constructed and tested by varying the concentration of baking soda. The concentration of the baking Soda directly corresponded with the time the Automatic Closed Loop System took to neutralize the solution. The automatic closed loop system was successful when neutralizing baking soda solution with different concentrations. The system can be used in future experiments for controlling blood glucose levels of diabetic patients.

Summary Statement

My project tests the reliability and effectiveness of An Automatic Insulin Delivery System

Help Received

Mother: Helped edit the research paper. Father: Provided the proper equipment and materials, helped during experimenting. Elaine Gillum: helped edit the paper and choose project idea

