Name(s)	Project Number
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Project Title

Developing a Model of an Artificial Pancreas

Abstract

Objectives/Goals

The objective of this experiment was to see if a simplified model of an artificial pancreas is able to detect high simulated blood glucose levels and add insulin to the simulated glucose levels.

Methods/Materials

In this experiment, a model of an artificial pancreas was first developed using electronic parts and a motor pump. Simulated blood glucose and insulin were then created using water, vinegar, and baking soda. The conductivity sensor was calibrated so that it would cause the pump to stop once it detected the neutralization of the high simulated glucose level (vinegar) by the insulin (baking soda solution) that was pumped into it. In the ideal setting, the pump would have stopped pumping once 200 mL of baking soda solution is pumped out and 100 mL remained in the bowl (meaning the vinegar had been neutralized).

Results

The first trial in balancing the high simulated blood glucose level using the artificial pancreas model resulted in 200 mL of baking soda solution remaining in the bowl which is far from the expected result. In the ideal setting, the pump should have stopped pumping once 100 mL of baking soda solution remained in the bowl and 200mL is pumped out(meaning the vinegar had been neutralized). The second trial resulted in 120 mL of baking soda solution remaining which is closer to the the ideal. Subsequent trials were also successful with the third trial resulting in 105 mL and the fourth trial with 110 mL of baking soda solution remaining.

Conclusions/Discussion

After performing four trials of balancing a high simulated blood glucose level with the artificial pancreas model I can conclude that my model is able to successfully balance simulated blood glucose levels. It was able to pump the right amount of baking soda into the vinegar to neutralize the vinegar. The future of treatment of type 1 diabetes is through an artificial pancreas, it can make living with type 1 diabetes easier, instead of managing blood glucose levels carefully with constant insulin shots and finger pricking.

Summary Statement

My project aims to create a model of what a future artificial pancreas used to help improve the treatment of type 1 diabetes would be like.

Help Received

My father helped me in purchasing the materials required and in assembling the circuit and conductivity sensor. My mother helped me in board design and proof-reading.