The Infusion Solution: Designing a Multifunction Medical Pump to Treat Hyper/Hypoglycemia

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Over 2 million Americans and countless others around the world suffer from type 1 diabetes which is an incurable health condition where the pancreas stops making essential hormones called insulin and glucagon. Without these key hormones the body struggles to keep blood sugar levels in range and outside assistance is needed to control the blood glucose levels. The purpose of my project is to build a machine that can simulate an insulin and glucagon pump to treat hyperglycemia (high blood sugar) and hypoglycemia (low blood sugar) to help type 1 diabetics and others with certain health conditions to keep their blood sugar levels in range. To build the machine I used an Arduino uno and other small electronics to let the Arduino tell two separate pumps how much of each liquid to pump. The first version of my device's code worked sufficiently but the accuracy of the pumps did not meet my expectations so I lowered the voltage to the pumps. My second version of the machine met the coding expectations 100% of the time and released the correct amount of each liquid within a 5% error 91.7% of the time. To improve on the prototype I could replace some parts with more efficient/accurate parts to increase the success rate and better replicate a medical grade version. An insulin and glucagon pump could improve the lives of many people and could improve their health and wellness.

Awards Won:
Arizona State University: Arizona State University ISEF Scholarship (valued at up to $32,000 each)