

Artificial Pancreas

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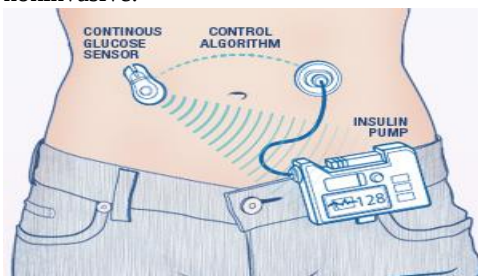
Abstract—The artificial pancreas is a device made to ease the lives of diabetics. It uses wireless connection between an insulin pump and a glucose monitoring system to systematically inject diabetics with insulin.

I. INTRODUCTION

Diabetes is the 7th leading cause of death in the United States. In the United States 29.1 million people have diabetes. Diabetes is a lifelong chronic disease in which the body isn't able to produce insulin. Insulin allows the body to convert glucose from the blood into glycogen which can be stored into our livers and muscles. In type 1 diabetes the body isn't able to produce any insulin and has no known cure. In type 2 diabetes, the body is able to produce insulin, however the body does not know how to use it. Currently, diabetics have been injecting themselves with insulin in order to stay alive. As a result, they are troubled in their physical activities, what they can eat, and having to consistently monitor themselves. Recently, biomedical engineers have made one of the greatest breakthroughs in their attempt to cure diabetes. After many years the engineers have finally designed and created an artificial pancreas.

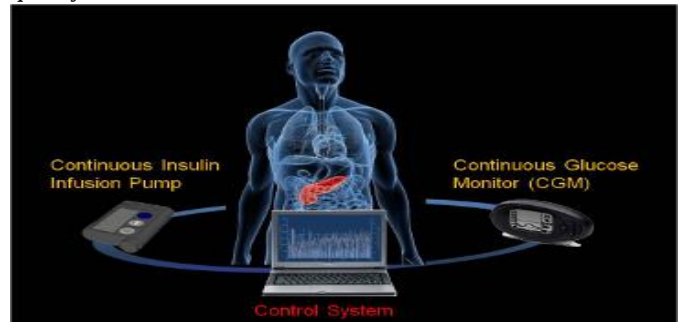
II. METHODS

The artificial pancreas has not been released to the public as they are still in the human trial phase. As of today, diabetics with type 1 have to continuously monitor themselves and inject themselves with insulin. Type 1 diabetics have to check their insulin and glucose levels whenever they participate in any physical activity and when they eat. The artificial pancreas is not a cure to diabetes but is only a method to ease the lives of the diabetics. The artificial pancreas does not require any surgery because it is not an actual pancreas. The artificial pancreas is a system that uses algorithms to connect the insulin pumps and the CGM (continuous glucose monitoring system). This will allow the device to inject insulin into the body when the body needs it. It would be able to monitor the amount of insulin the diabetic would need when they are doing a physical activity or just eating. Ideally, the artificial pancreas should come with an alert system in case the algorithm ever fails. Furthermore it should be small and noninvasive.



III. RESULTS

Human trials for the artificial pancreas have begun and as of right now the results are successful. The University of Cambridge is currently running a seventy patient trail, in which the patient are left unmonitored overnight. The patients so far have commented saying that the device seems to be working perfectly, and that it has greatly improved their quality of life.



IV. DISCUSSION

The artificial pancreas is among of one of the greatest technological advances in biomedical engineering. The many advantages of the artificial pancreas include improving the quality of life for diabetics, peace of mind for parents and loved ones, and it will make sure that the glucose levels in the body stay at accurate levels. This will also help in the long term as it will help in the prevention of blindness and kidney failure which is common in diabetic patients. The limitations and disadvantages in the artificial pancreas are that it is battery powered and if communication is ever lost between the CGM and insulin pump. Battery powered devices are risky because if the patient didn't pay attention to warnings the results could be fatal. For the future I hope to see that engineers are able to make a more sustainable energy source and make the device even less invasive. Finally, a major concern for patients will be the cost for the device. The estimated cost without insurance is around \$8000. Unfortunately, the device is expensive and will probably be very difficult for lower income families to afford.

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