

# **Dealing with Diabetes and, To Develop an Artificial Pancreas**

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## 1. Abstract

# Abstract

This scientific study focuses on developing and implementing advanced technological solutions to enhance diabetes management, specifically in terms of insulin and glucagon administration and blood glucose monitoring. The research investigates the complexities of engineering artificial pancreas systems, which automate blood glucose regulation in individuals with diabetes. These systems integrate insulin pumps, glucagon pumps and glucose sensors in a closed-loop configuration, enabling real-time adjustments of insulin and glucagon delivery based on glucose measurements.

The study explores the intricacies of artificial pancreas technology, including the temporal characteristics of insulin action, algorithm selection for glucose control, and challenges related to individual variability and physiological dynamics. Through an in-depth literature review and a model version of an artificial pancreas system, the research illustrates the system's components, functionalities, and operational framework.

Furthermore, the research examines the scientific principles underlying the closed-loop control mechanism of the artificial pancreas system. It investigates optimal timing and dosage adjustments of insulin and glucagon delivery in response to changes in blood glucose levels, prioritizing safety and efficacy. Advanced computational simulations and mathematical modeling optimize the system's performance.

The study's findings provide insights into the challenges faced by engineers and scientists developing artificial pancreas technologies. Accurate glucose sensing, reliable insulin and glucagon delivery, and robust control algorithms are emphasized for optimal glycemic control. The model version of the artificial pancreas system demonstrates its potential to enhance diabetes management through automation, underscoring the need for further advancements in the field.

In conclusion, this investigation comprehensively analyzes the complexities of developing and implementing artificial pancreas systems. The research advances understanding of the challenges involved in designing and optimizing these systems, with the aim of improving the lives of individuals with diabetes. Continued research and development are crucial for advancing personalized diabetes management solutions.

**Keywords:** Diabetes management, Artificial pancreas systems, Insulin and glucagon administration, Blood glucose monitoring, Closed-loop control, Glucose sensing