Automated Glucose Control:

A Review

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ABSTRACT

Automated blood glucose control for diabetes mellitus is a highly desired pursuit of researchers around the globe. Advancement in sensing and control capabilities has paced the development of closed-loop control systems for insulin-dependent diabetes. Traditional treatment methods and recent approaches using automated control systems are reviewed in this article. Invasive and non-invasive glucose-sensing methods along with insulin therapy are presented in detail. Control algorithms are studied and evaluated based on their ability to keep blood glucose levels in euglycemic range by regulating the amounts of insulin bolus. The article highlights the advantages of using an automated control system over the traditional control strategies for insulin-dependent diabetes.

KEYWORDS

Closed-Loop, Control System, Diabetes, Glucose Level, Hypo-Hyper Glycaemia, Insulin, Neural Networks, Sensors

INTRODUCTION

Diabetes is a metabolic condition where people are unable to regulate their blood glucose levels according to their needs. In T1D body is unable to produce insulin due to the destruction of insulin secreting beta cells. These cells are destructed by the autoimmune response because of reasons unknown to us. In case of T2D body produces less amounts of insulin because of insulin resistance, where there is less glucose uptake by the cells. A strict glycemic control is very important to carry out our daily activities and also to reduce risk of developing life threatening complications (Bertachi, 2018). High fluctuations (hyper and hypoglycemic events) of glucose levels for a longer duration often lead to development of micro and macro vascular diseases (Damji, 2021). According to research study carried out in U.K (Stratton, 2000), there is 37% decrease in risk of developing micro vascular disease with just 1% reduction in HbA1c and hence 21% decrease in risk of death related to diabetes. It is often recommended that a person should visit to a general practitioner within 3-months for glycemic control. Although with modern technological advancements, we have more sophisticated glucose monitoring tools and better bolus calculating systems, the less optimal traditional insulin delivery mechanism remains common in people living with diabetes. This is because glucose levels inside the bloodstream are influenced by so many factors including insulin absorption rate, physical activities of varied intensities, sleep amount and pattern, food intake, etc. Research is going on to develop an automated glucose control system that have minimal human intervention possible and it seems that with the effort of researchers globally, artificial pancreas would soon be commercially