An interactive quantitative temporal physiological model of glucose passage and absorption through the gastrointestinal tract and subsequent modulation of insulin and glucagon secretion in humans


ABSTRACT

An interactive quantitative temporal model of glucose intake, absorption, and utilization in humans has been developed using the Center for Research and Education in Aging Language (CREAL). CREAL is a language that can be used to describe biological systems from a macro to a molecular scale. This model depicts the interaction of glucose throughout the gastrointestinal (GI) tract in relation to time. The rate of absorption of glucose through the intestinal walls and subsequent modulation of insulins and glucagon secretion rates can be graphed in relation to time as well as the utilization and depletion of glucose by the various organ systems. The model can also be utilized as a part of a more complex network of other biological systems, be it the immune system, bone, or muscle, as well as other compounds, such as lipids, proteins, minerals and substrates. The model is 30 years old and was generated through the development of results from higher-resolution simulations such as those that take place in the cellular scale.

INTRODUCTION

Based on the development of CREAL, on adequate tools to simulate the effects of aging on organ systems, we are able to approach physiological problems by modeling existing situations. We are taking the physiological components of glucose passage in the human body with quantitative values that show the rate of absorption and secretion of carbohydrates such as insulins and glucagons. The size of a temporal function provides the capability to monitor and collect data on a scale. The ability to track the specific components in the gastrointestinal tract known for future models that will assist physicians, researchers, and biologists to look at the human body from a cellular, organ, and holistic view with the potential to understand the human body on the cellular level.

The utilization and depletion of glucose in the body is based on the intake of food that is consumed in 30-60 minute intervals. These components are broken down and turned into glucose for absorption by the intestinal walls and gastrointestinal tract and are utilized to obtain the quantitative values. The modulations of the gastrointestinal tract data can be viewed as a part of a more comprehensive system. The communication is observed in the simulation by the use of CREAL, which supports the findings in other experimental research. The 30 year old model is used as an example of a human body analyzing food intake, which leads to the breakdown of glucose through glycosis, showing the absorption, secretion, and the maintenance of hormones of carbohydrates such as insulins and glucagons.

The CREAL language assigns node IDs to every component in the system, including the nodes glucose, insulin, and glucagon in the system. It also includes the nodes of the gastrointestinal tract, the small intestine, and the stomach. The data shown in the graph is that glucose absorption is graphed in relation to time, the utilization and depletion of glucose by the gastrointestinal tract, the small intestine, and the stomach.

METHOD

To generate a quantitative model of glucose passage and absorption through the gastrointestinal tract and the resulting fluctuations of insulins and glucagons, we developed a model that can be used to track the various components of glucose absorption, secretion, and utilization. The model provides quantitative values for the rate of absorption and secretion of carbohydrates, as well as the rate of absorption and depletion of carbohydrates.

We have developed a model that can be used to simulate the interaction of glucose throughout the gastrointestinal tract. The model can be used to track the various components of glucose absorption, secretion, and utilization. The model provides quantitative values for the rate of absorption and secretion of carbohydrates, as well as the rate of absorption and depletion of carbohydrates.

RESULTS

The results provide a visual understanding of glucose absorption in the gastrointestinal tract through a physiological model that models the CREAL language. For example, the following figure 6 shows the results of the simulation for glucose intake and absorption in the gastrointestinal tract. The results are obtained by the simulation of the glucose solution in real-time. The results are obtained by the simulation of the glucose solution in real-time and the corresponding effects on blood glucose and glucagon levels.

DISCUSSION

This research provides a visual understanding of glucose absorption and utilization in the gastrointestinal tract through a physiological model that models the CREAL language. For example, the following graph 6 shows the results of the simulation for glucose intake and absorption in the gastrointestinal tract. The results are obtained by the simulation of the glucose solution in real-time and the corresponding effects on blood glucose and glucagon levels. We have developed a model that can be used to simulate the interaction of glucose throughout the gastrointestinal tract. The model can be used to track the various components of glucose absorption, secretion, and utilization. The model provides quantitative values for the rate of absorption and secretion of carbohydrates, as well as the rate of absorption and depletion of carbohydrates.

REFERENCES


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