The Role of the Human Kidneys in Glucose Homeostasis: A Phenomenological Based Semiphysical Model

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INTRODUCTION

Kidneys play an important role in glucose homeostasis in three ways:

- Applicate the conservation principles and physical laws
- Propose a Phenomenological Based Semiphysical Model, with knowledge to describe the role of the kidneys in the glucose homeostasis in humans.

METHODOLOGY

- Verbal description of the real object and modeled hypothesis
- Applicate the conservation principles and physical laws
- Make explicit the specification levels from constitutive equations and evaluate the meaning of the parameters
- Representation like a set of process systems
- Degree of freedom analysis
- Computation solution of the model
- Model validation

RESULTS

Renal Endogenous Glucose Production in Post-absorptive State

The results were adapted to the data reported in the literature. In the post-absorptive state, renal glucose production is approximately 20-25% of total body glucose, while in the postprandial state renal glucose production is three times higher than production in the post-absorptive state, reaching 60%. The literature reports precise data on the use of non-carbohydrate precursors for the renal endogenous glucose production in the post-absorptive state, therefore the mathematical model for each precursor could be solved. However, for the postprandial state there are no specific data on the use of each non-carbohydrate precursor. Our results show how the non-carbohydrate precursors filtered through the glomeruli are utilized, remaining just a few amount unutilized.

REFERENCES


FUTURE WORK

Construction of a whole mathematical model with parameters interpretability describing the dynamic of blood glucose in the human body.