

Stochastic models for the glucose-insulin system

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- 1) Introduction to energy metabolism
- 2) Test experiments for the determination of insulin resistance (IVGTT, OGTT, Clamp)
- 3) Criteria for modeling physiological systems.

The Glucose/Insulin system has received much attention from deterministic modelers in the past thirty years, in the quest for the determination of insulin sensitivity. The basic physiology of the regulation of energy metabolism will be illustrated, and the most commonly employed experimental procedures for testing the compensation of the regulation system for glucose and insulin will be described. General criteria as to the acceptability of a mathematical description of a physiological system will be discussed, using real examples, and the structural problems which a solely deterministic approach creates will be indicated. The way is thus paved for the introduction of stochastic differential models in the study of this branch of physiology.

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Estimation of ordinary and stochastic differential models of the euglycemic hyperinsulinemic clamp

Stochastic differential equations have become an important tool to study the dynamics of many physical and biological phenomena. However the modeling of the glucose-insulin system has not received much attention so far. In these lectures we consider the problem of modeling the euglycemic hyperinsulinemic clamp (EHC), which is an experiment frequently employed by physiologists to assess the degree of 'insulin sensitivity' (see also the lectures by A. De Gaetano). The main focuses of these lectures will be the theoretical and computational issues arising for the estimation of either ordinary (deterministic) and stochastic differential models of the EHC.