

# Incorporating a Generic Model of Subcutaneous Insulin Absorption into the AIDA v4 Diabetes Simulator

## 1. A Prospective Collaborative Development Plan

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### Abstract

#### Introduction:

AIDA v4 is an interactive educational diabetes simulator that has been made available, for over a decade, without charge via the Internet. The software is currently freely accessible at <http://www.2aida.org>. This report sets out a collaborative development plan to enhance the program with a new model of subcutaneous insulin absorption, which permits the simulation of rapidly acting and very long-acting insulin analogues, as well as insulin injection doses larger than 40 units.

#### Methods:

A novel, generic, physiological subcutaneous insulin absorption model is overviewed and a methodology is proposed by which this can be substituted in place of the previously adopted insulin absorption model utilized within AIDA v4.3a. Apart from this substitution it is proposed to retain the existing model of the glucoregulatory system currently used in AIDA v4.3a.

#### Results:

Initial simulation results based on bench testing of this approach using MATLAB are presented for the exogenous insulin flow profile ( $I_{ex}$ ) following subcutaneous injections of a rapidly acting insulin analogue, a short-acting (regular) insulin preparation, intermediate-acting insulins (both Semilente and neutral protamine Hagedorn types), and a very long-acting insulin analogue.

#### Discussion:

It is proposed to implement this collaborative development plan—first by bench testing the approach in MATLAB and then by integrating the generic subcutaneous insulin absorption  $I_{ex}$  model into the AIDA simulator in Pascal. The aim is to provide enhanced functionality and educational simulations of regimens utilizing novel insulin analogues, as well as injections larger than 40 units of insulin.

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**Abbreviations:** (BG) blood glucose, ( $I_{ex}$ ) exogenous insulin flow profile, (IU) international units [of insulin], (NPH) neutral protamine Hagedorn

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