



The oral glucose minimal model in type 1 diabetes: an ingredient of DIAdvisor™

Stefania Guerra¹, Chiara Dalla Man¹, Giovanni Sparacino¹,
Eric Renard² and Claudio Cobelli¹

¹*Department of Information Engineering, University of Padova*

² *CHU, Centre Hospitalier Universitaire, Montpellier*

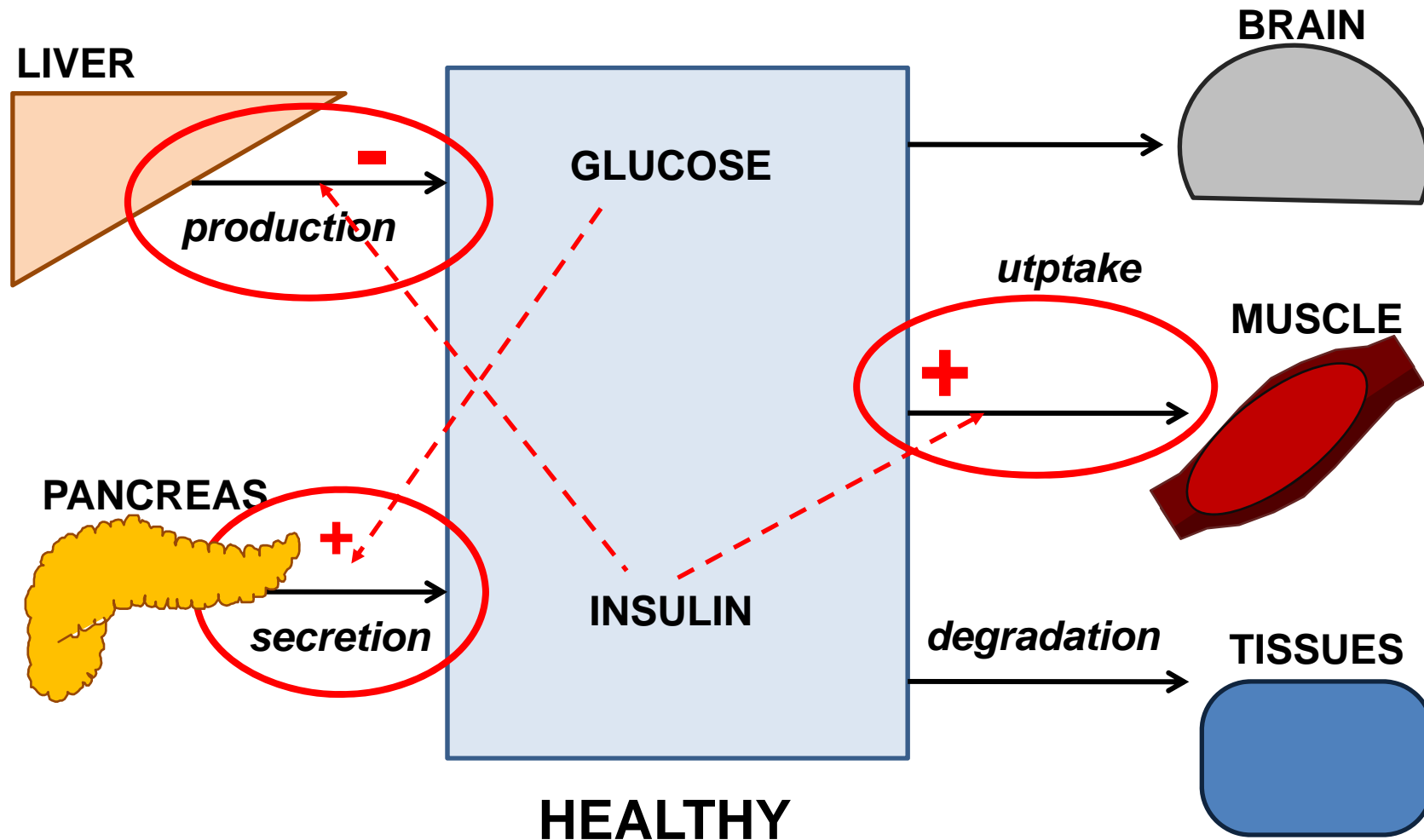


*This project is partially funded under FP7
By the European Commission*



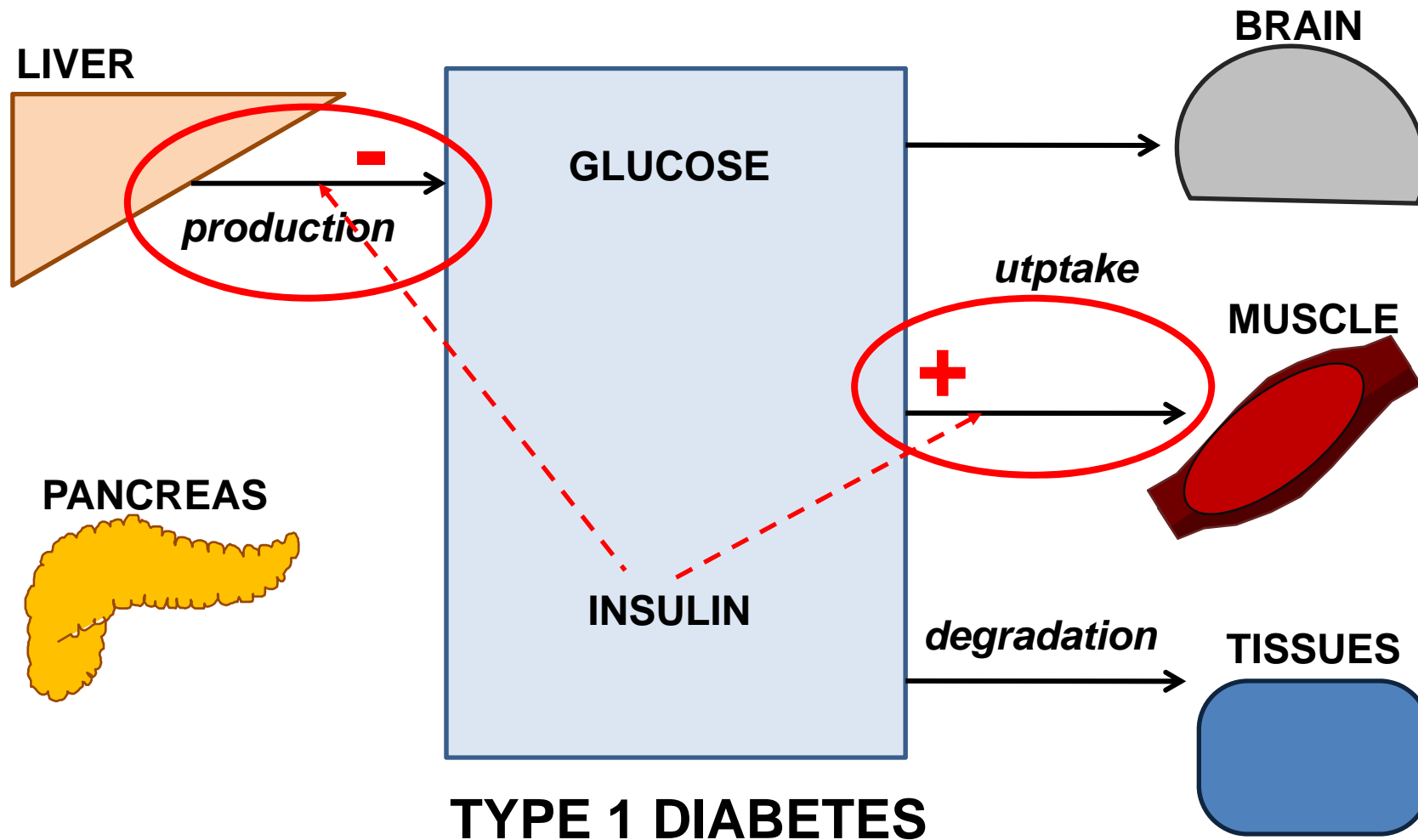
The Glucose-Insulin System:

Type 1 diabetes is a pathology that consists in impaired/absent insulin secretion



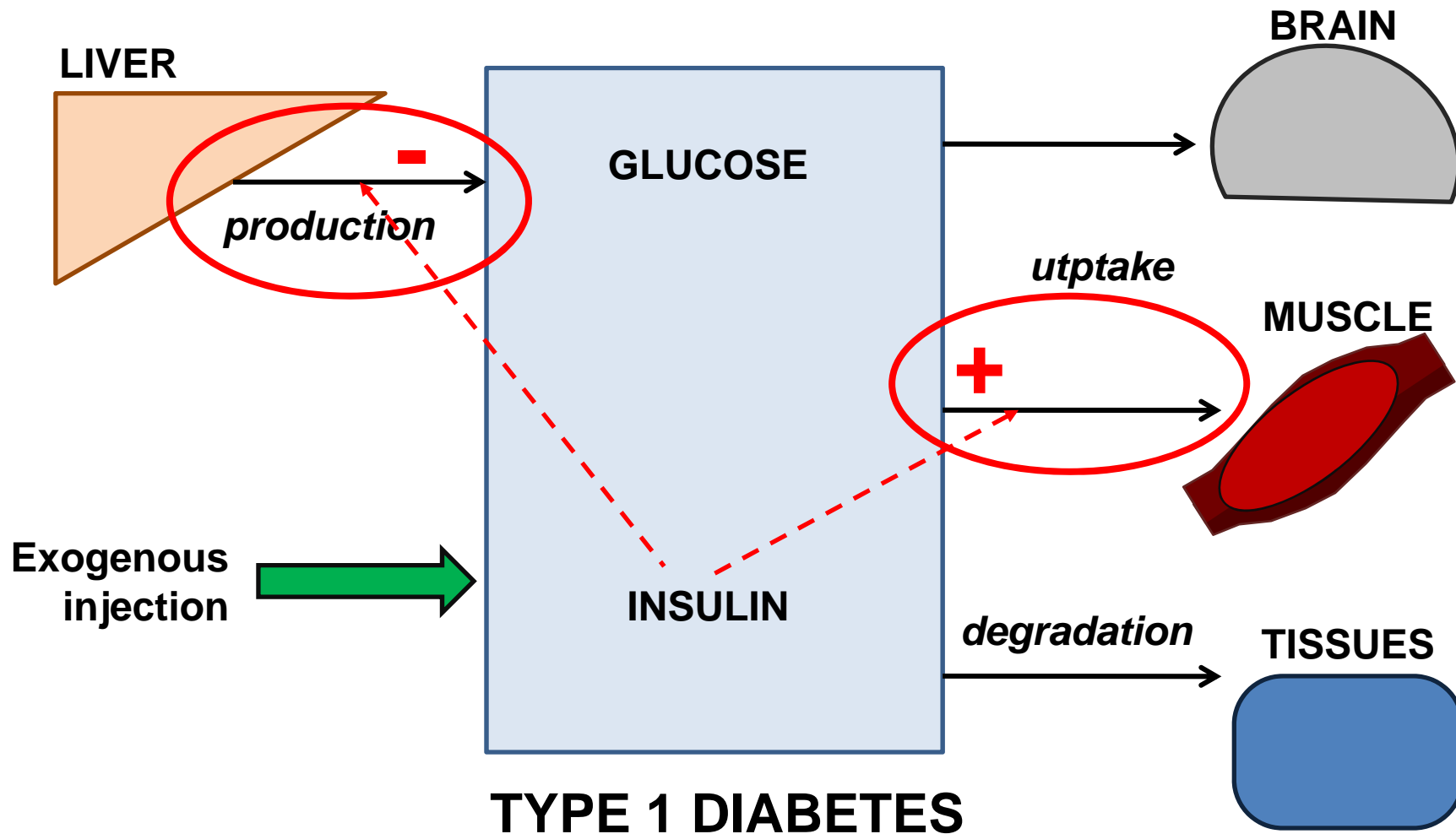
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The DIAdvisor™ Framework



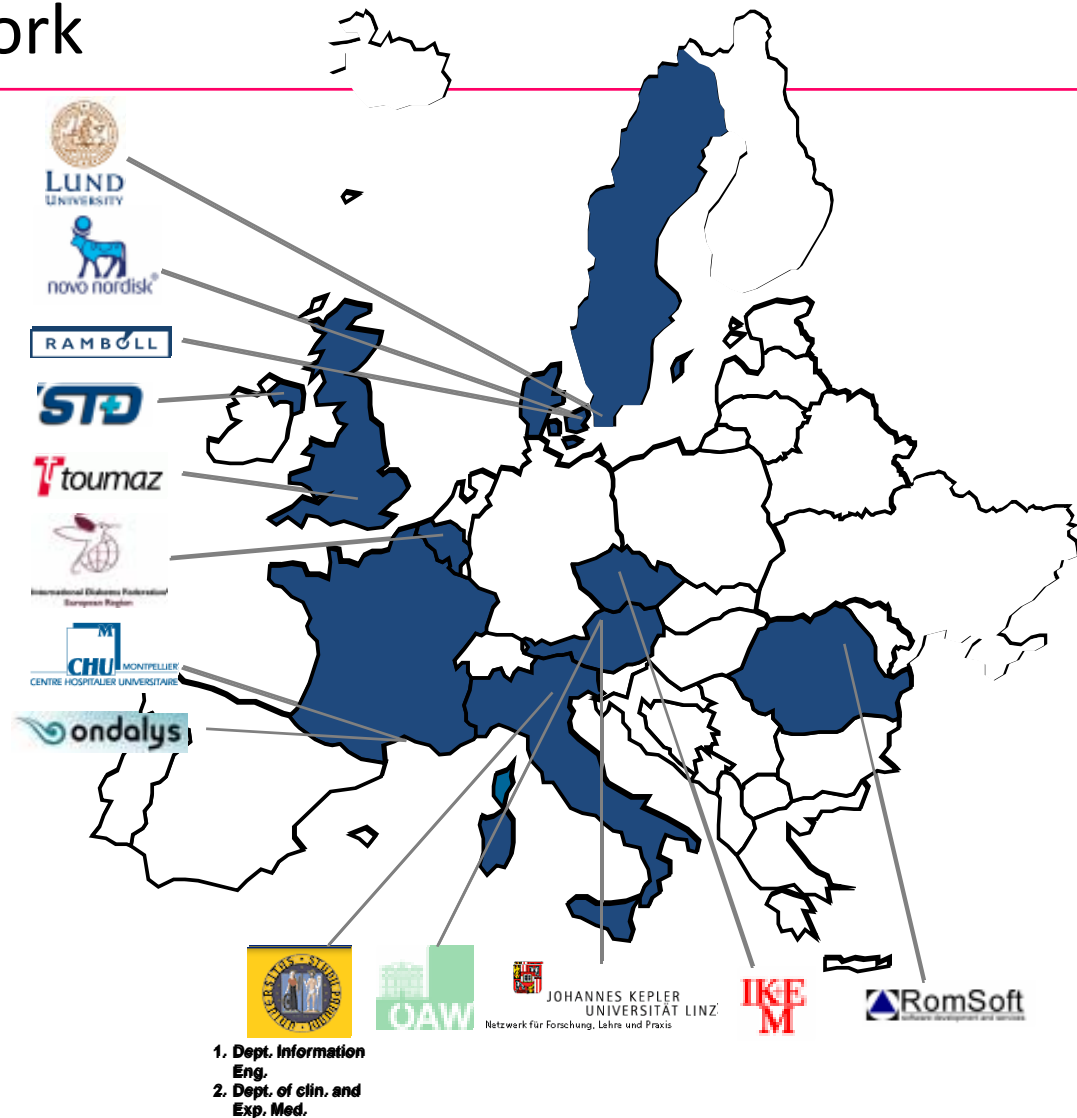
- 9 countries
13 partners:
- 3 Universities
 - 3 Hospitals
 - 4 SME's
 - 2 Large enterprises
 - 1 NGO

Budget

9.3 M€

EC funding

7.1 M€



Aim of DIAdvisor™

To develop an advisor based on short-term glucose prediction and control algorithms. Its aim is to generate alarms and give suggestions for the optimal disease management

OBJECTIVES:

To personalize the DIAdvisor device, estimation of insulin sensitivity could be of major importance. To assess insulin sensitivity, the widely used minimal model can be employed

HOWEVER

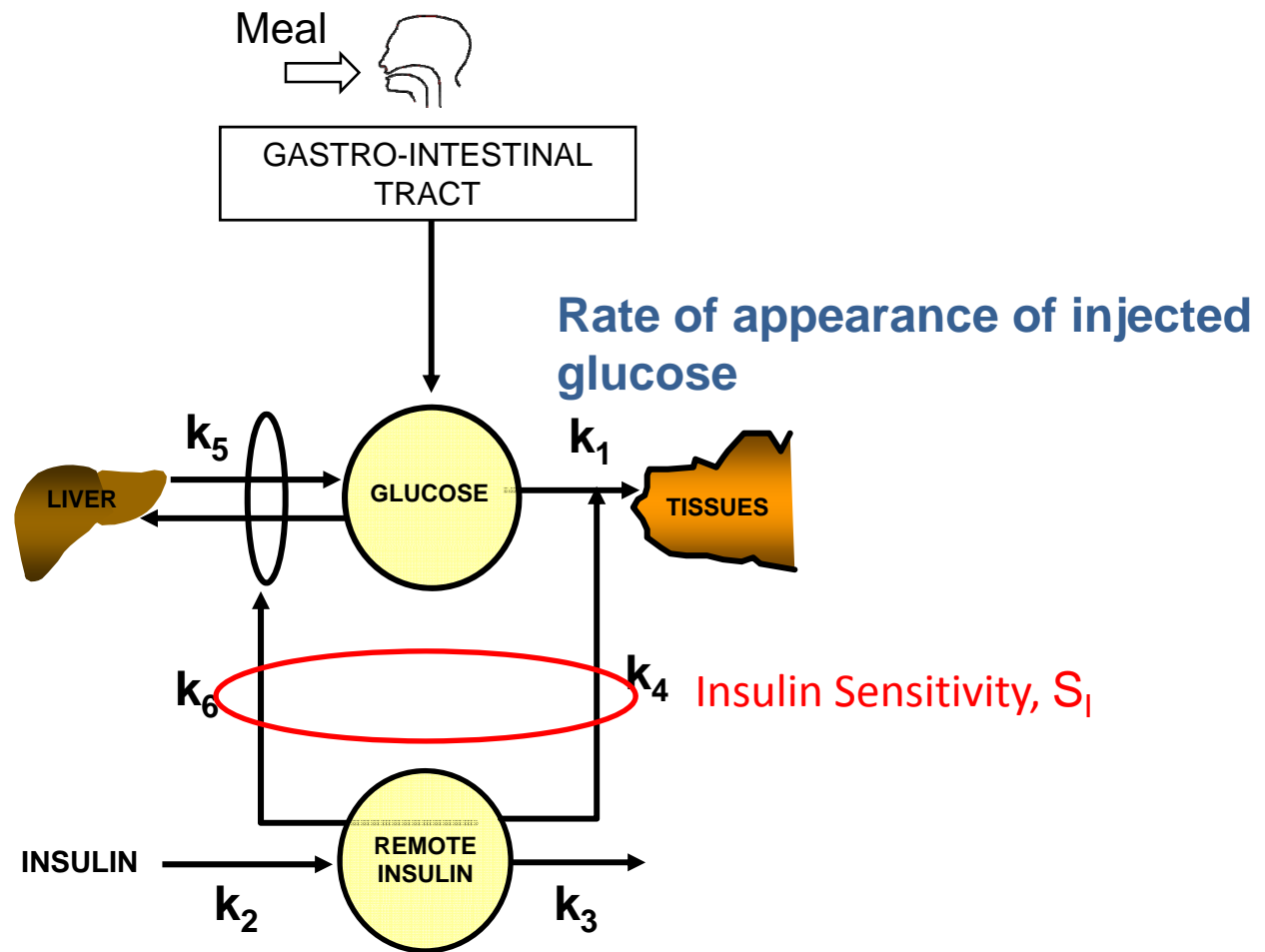
The minimal model has never been applied to type 1 diabetes



Aim of this study

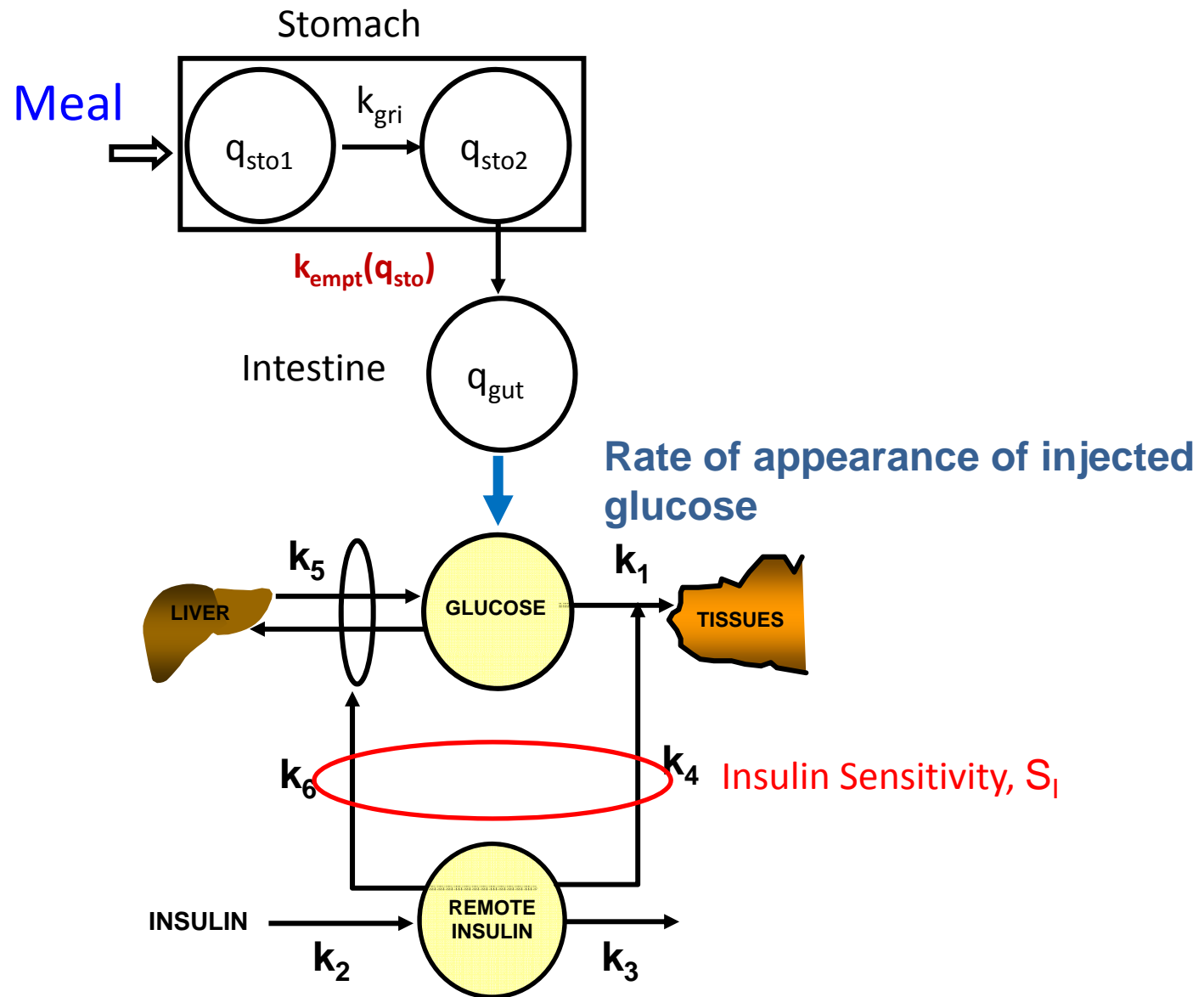
to assess the oral minimal model in type 1 diabetes

The Oral Glucose Minimal Model



(Dalla Man et al, 2002)

The Oral Glucose Minimal Model

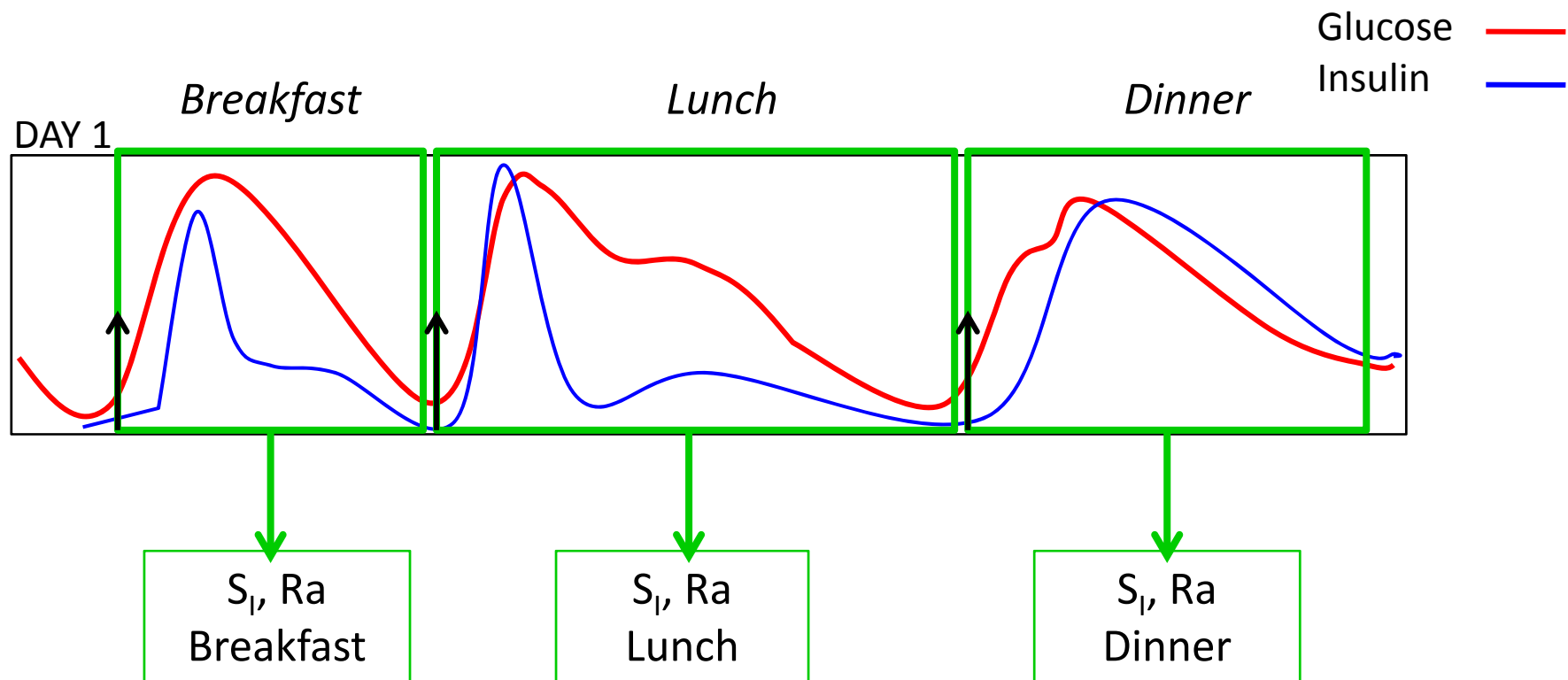


(Dalla Man et al, 2002 + Dalla Man et al, 2006)

Protocol and Database

Subjects: 11 diabetics (age 48 ± 12 ; 7 male, 4 female)

Protocol: 3 days in hospital (3 meals/day)

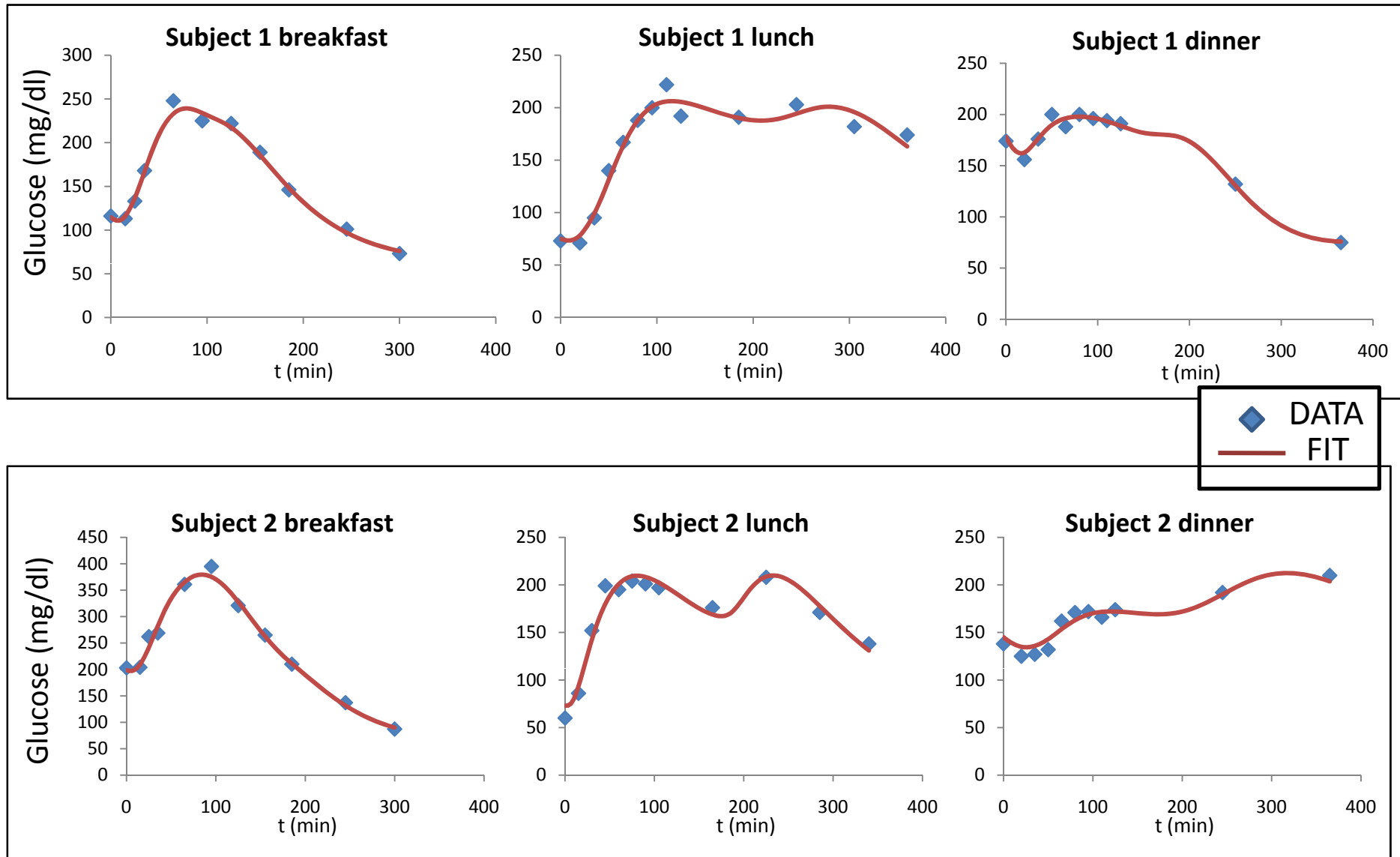


Parameter Estimation

Numerical identification

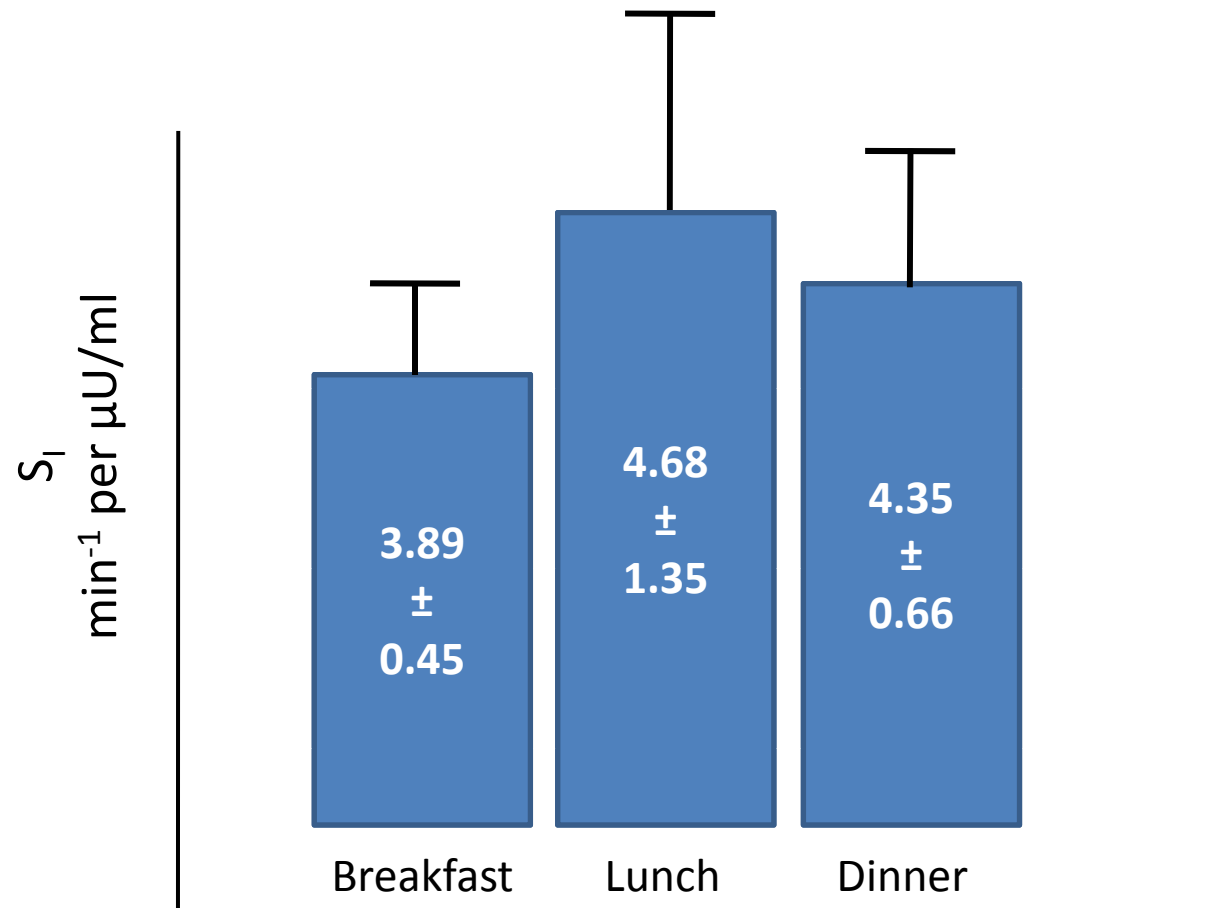
- Maximum a posteriori Bayesian estimation has been employed
- The model was identified on the data of each meal separately

Results – Fit of glucose data

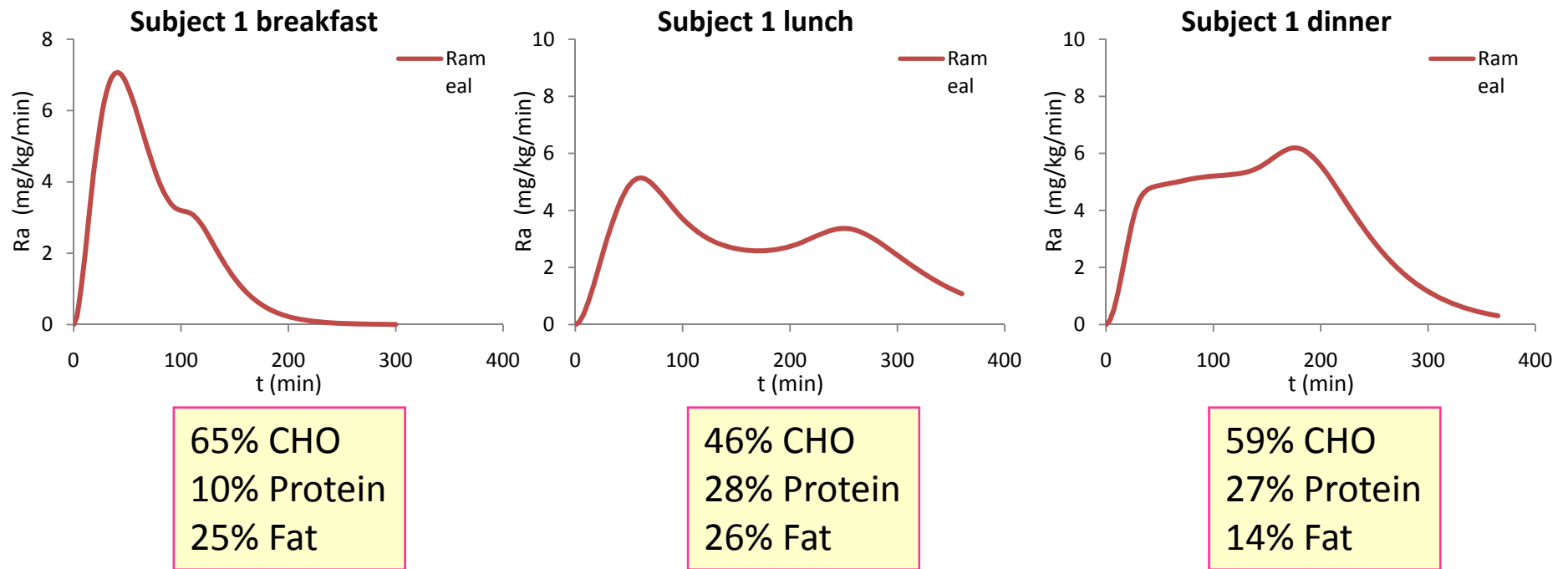


Results – Parameter Estimation

S_I was estimated with good precision (CV<50%)



Results – Rate of Appearance



Rate of appearance profiles were physiologically plausible

Dependence of profiles pattern on meal composition is under investigation

Conclusions

- ✓ The new version of the Oral glucose minimal model has been successfully identified on Type 1 diabetes data
- ✓ S_1 was successfully estimated during breakfast, lunch and dinner and estimated Ra profiles are physiologically plausible

Further works:

- Assessment of possible trends in the daily variability of S_1 exploiting the new data coming from ongoing experiments
- Analysis of relations between Ra profiles and meal composition
- Integration of the model knowledge in the DIAdvisor prediction and control algorithms