

RELATIONSHIP BETWEEN IN VITRO AND IN VIVO APPROACHES ON SLOW APPEARANCE RATE OF STARCH: A META-ANALYSIS

Sophie Vinoy ¹, Aurélie Goux ¹, Olivier Brack ², Alexandra Meynier ¹

¹ : Mondelez France R&D, Saclay, France ; ² Statistique Industrielle KHI2 Consulting (KSIC), Esches, France

INTRODUCTION

- Starch is one of the most important glycaemic carbohydrate (CHO) components in cereal products; specific steps during the manufacturing process influence its digestibility and then its impact on glycemic response.
- Many studies compared the physiological effects of starch-based products and showed a correlation between *in vitro* starch digestibility and the postprandial plasma glucose and insulin responses.

OBJECTIVES

A meta-analysis performed on 3 intervention studies evaluates the strength between Slowly Digestible Starch (SDS) content and **appearance rate of exogenous carbohydrates (RaE)** from cereal foods. The aim was to determine the contribution of SDS level to RaE kinetic across the postprandial period on continuous data.

METHODS / DESIGN

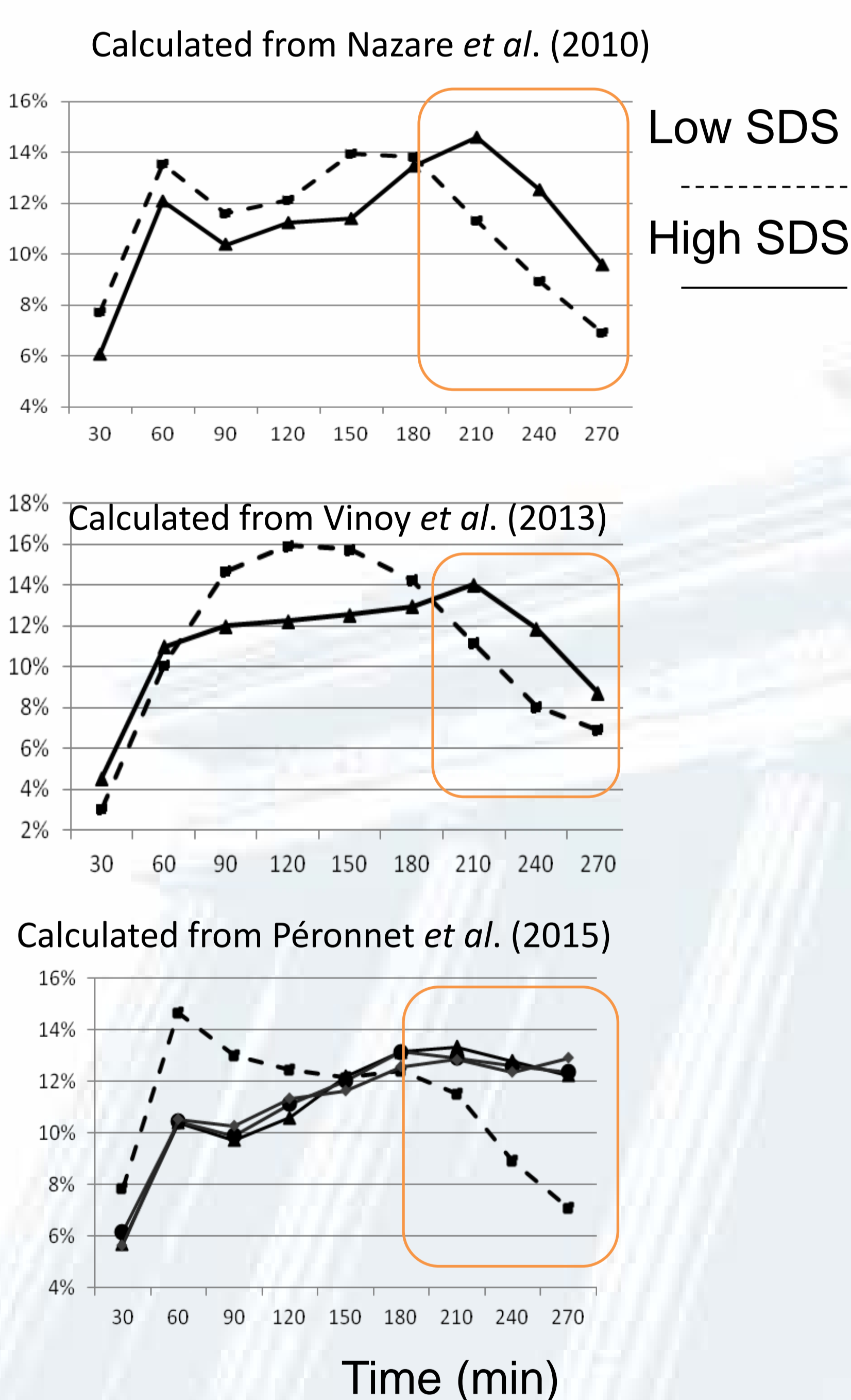
3 intervention studies were selected after systematic review using SDS (measured by Englyst method) and RaE.

3 references	Population	Number of subjects
Nazare et al., 2010	Healthy overweight subjects (age: 20-60 yo; BMI: 25-30 kg/m ²)	38 subjects (20 men and 18 women)
Vinoy et al., 2013	Healthy subjects (age: 18-40 yo; BMI: 20-25 kg/m ²)	12 men (part 1)
Peronnet et al. 2015	Healthy subjects (age: 19-26 yo; BMI: 20.2-24.4 kg/m ²)	16 women
Total	Age: 18-60y ; BMI 20-30kg/m²	66 (52% women)

- SDS Content:** Cereal products contained high SDS level (12 to 21g/portion) vs. low SDS level (0 to 1g/portion).
- Test breakfasts were composed of a cereal product / milk / hot beverage and contained 380 – 450 kcal with (60% CHO, 29% Fat, 11% Proteins)
- A Partial Least Square (PLS) analysis** was performed on RaE, in relation to SDS content, time and their interaction.
- The contribution to the incremental Area Under the Curve (iAUC) of RaE was calculated by dividing each 30-min period iAUC value by the iAUC value over the whole postprandial period for each study.

RESULTS

% of contribution to iAUC(RaE)



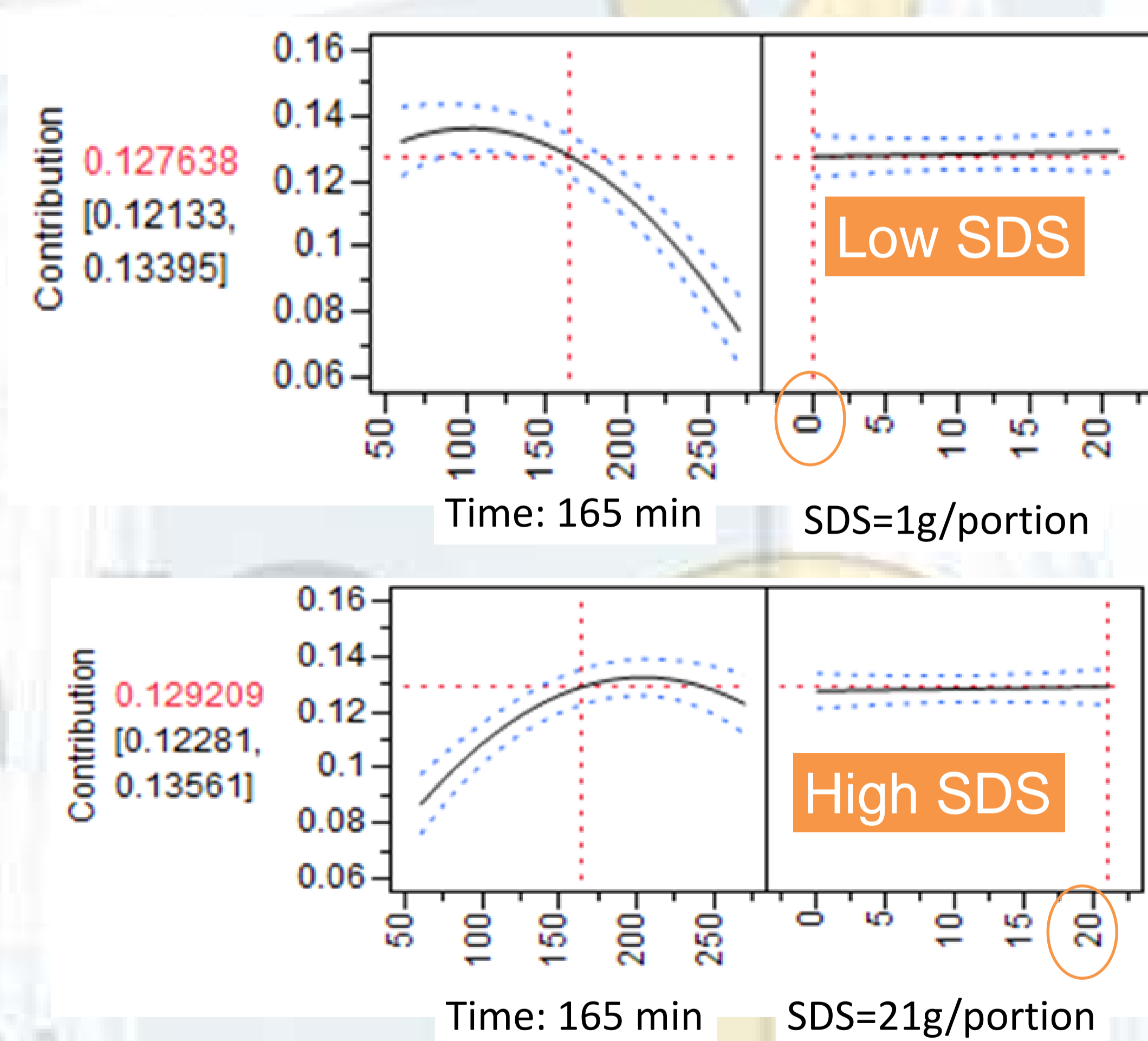
PLS analysis: the following model explains 61% of RaE contribution

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	0.137	0.005	27.83	<.0001*
Time	-5.527e-5	2.28e-5	-2.42	0.0184*
SDS	7.474e-5	0.0002	0.37	0.7094
(Time-165)*(Time-165)	-2.205e-6	3.8e-7	-5.80	<.0001*
(Time-165)*(SDS-10.4093)	0.00002	2.903e-6	7.34	<.0001*

The predictor profiler illustrated the link between SDS content and contribution to RaE, depending on time: 2 examples

With low SDS content, the major contribution to RaE occurs **before 165 min**

With high SDS content, the major contribution to RaE occurs **after 165 min**



CONCLUSIONS

- These results demonstrates **the dynamic contribution** of SDS to the appearance rate of CHO during the postprandial period.
- High SDS content** of cereal products included in a breakfast contributes to the late phase of the appearance rate of carbohydrates during postprandial period to reach its highest contribution between 165 and 270 minutes.
- This phenomenon reduces the challenge to plasma glucose and insulin demand which is related to metabolic disease prevention