



HAL
open science

Food matrix structure (from biscuit to custard) impacts on folate bioavailability in healthy volunteers

Caroline Buffière, Manon Hiolle, Ruddy Richard, Nathalie Meunier, Bruno Pereira, Cindy Batisse, Didier Remond, Françoise Nau, Marie-Agnès Peyron, Isabelle Savary-Auzeloux

► To cite this version:

Caroline Buffière, Manon Hiolle, Ruddy Richard, Nathalie Meunier, Bruno Pereira, et al.. Food matrix structure (from biscuit to custard) impacts on folate bioavailability in healthy volunteers. 6. International Conference on Food Digestion, Apr 2019, Grenade, Spain. , 2019. hal-02100444

HAL Id: hal-02100444

<https://hal.science/hal-02100444>

Submitted on 2 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

* *Caroline Buffière*¹, **Manon Hiolle*², *Ruddy Richard*³, *Nathalie Meunier*³, *Bruno Pereira*⁴, *Cindy Batisse*⁴, *Didier Rémond*¹, *Françoise Nau*², *Marie-Agnès Peyron*¹, *Isabelle Savary-Auzeloux*¹

¹UNH, INRA, Clermont-Fd, ²STLO, INRA, Rennes; ³CRNH Auvergne, Clermont-Fd; ⁴ Université Clermont Auvergne, Clermont-Fd ;France

* *The 2 authors participated equally to the study*

Introduction

Because folate deficiency has been associated with an increased risk of development of neural tube defect, depression... folate fortification is recommended for populations at risk (pregnant, frail population), including supplementation within food-matrix. However, folates, when incorporated within a food matrix, can differently interact with food components. This could ultimately impact on bioavailability of folates in plasma. The aim of the present study is to assess, in human volunteers, the impact of folic acid supplementation within 4 different food models characterized by similar composition (ingredients and chemical composition) but 4 various structures (Biscuit, Sponge cake, Pudding, Custard) on plasma folates appearance postprandially.

Material & Methods

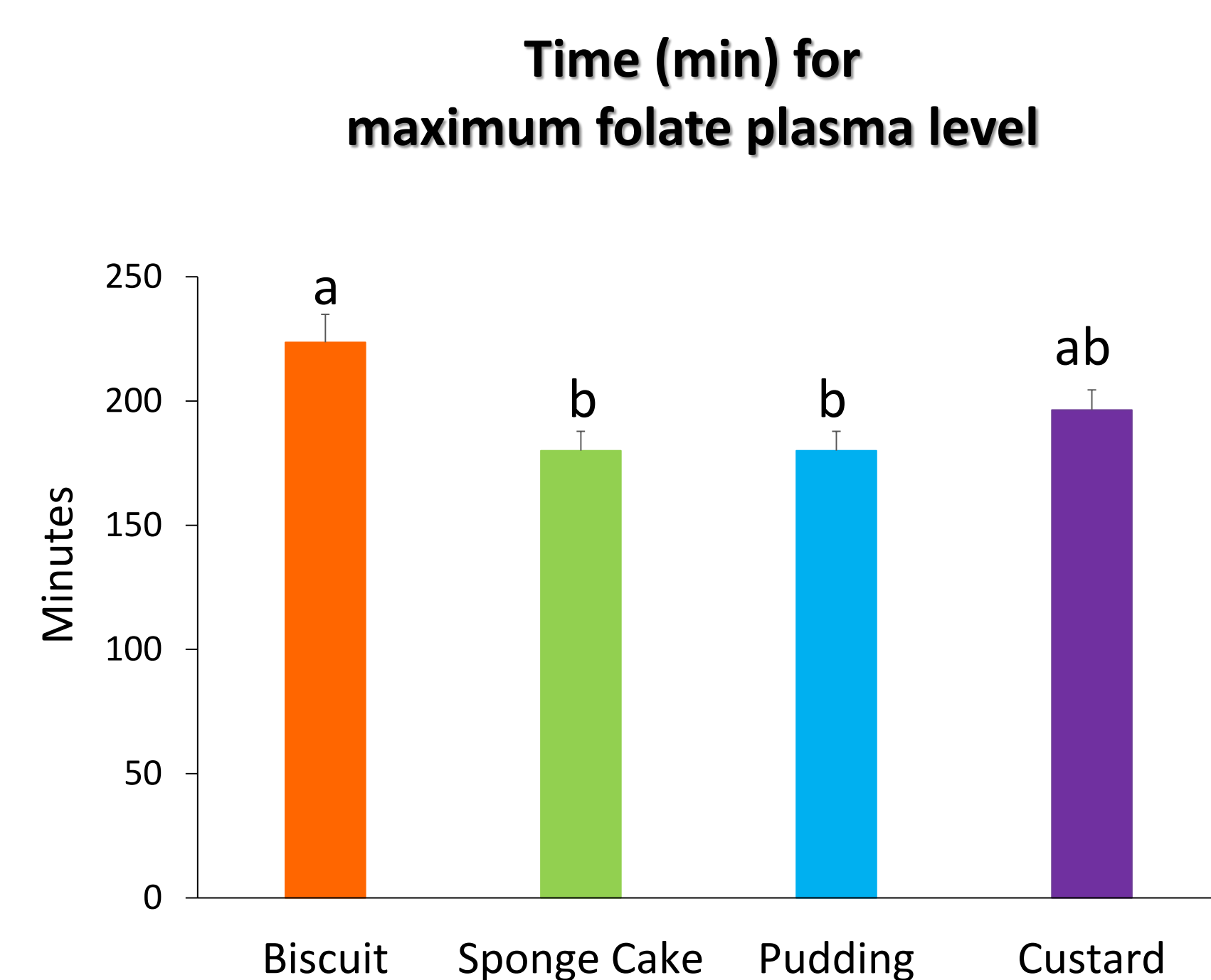
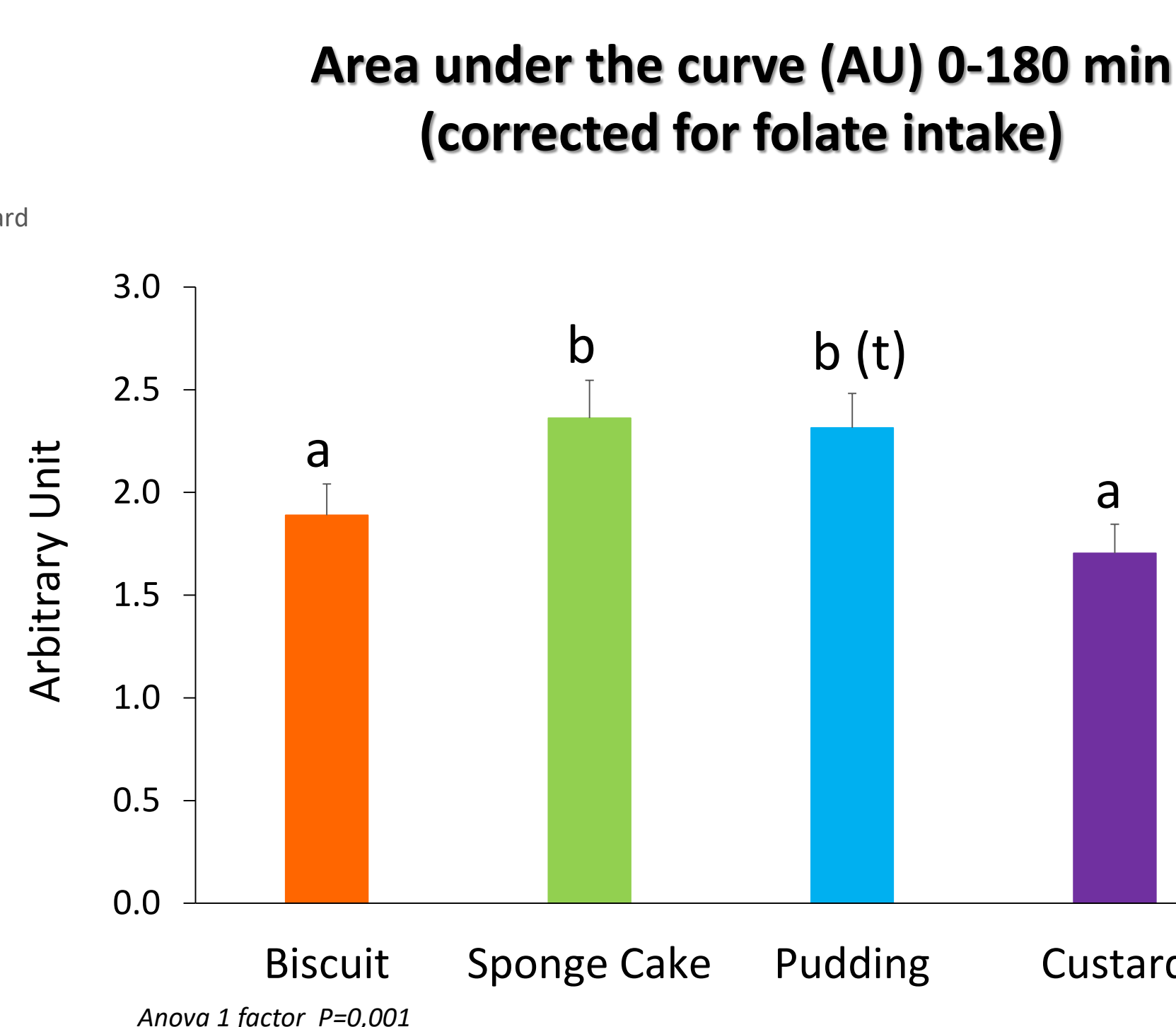
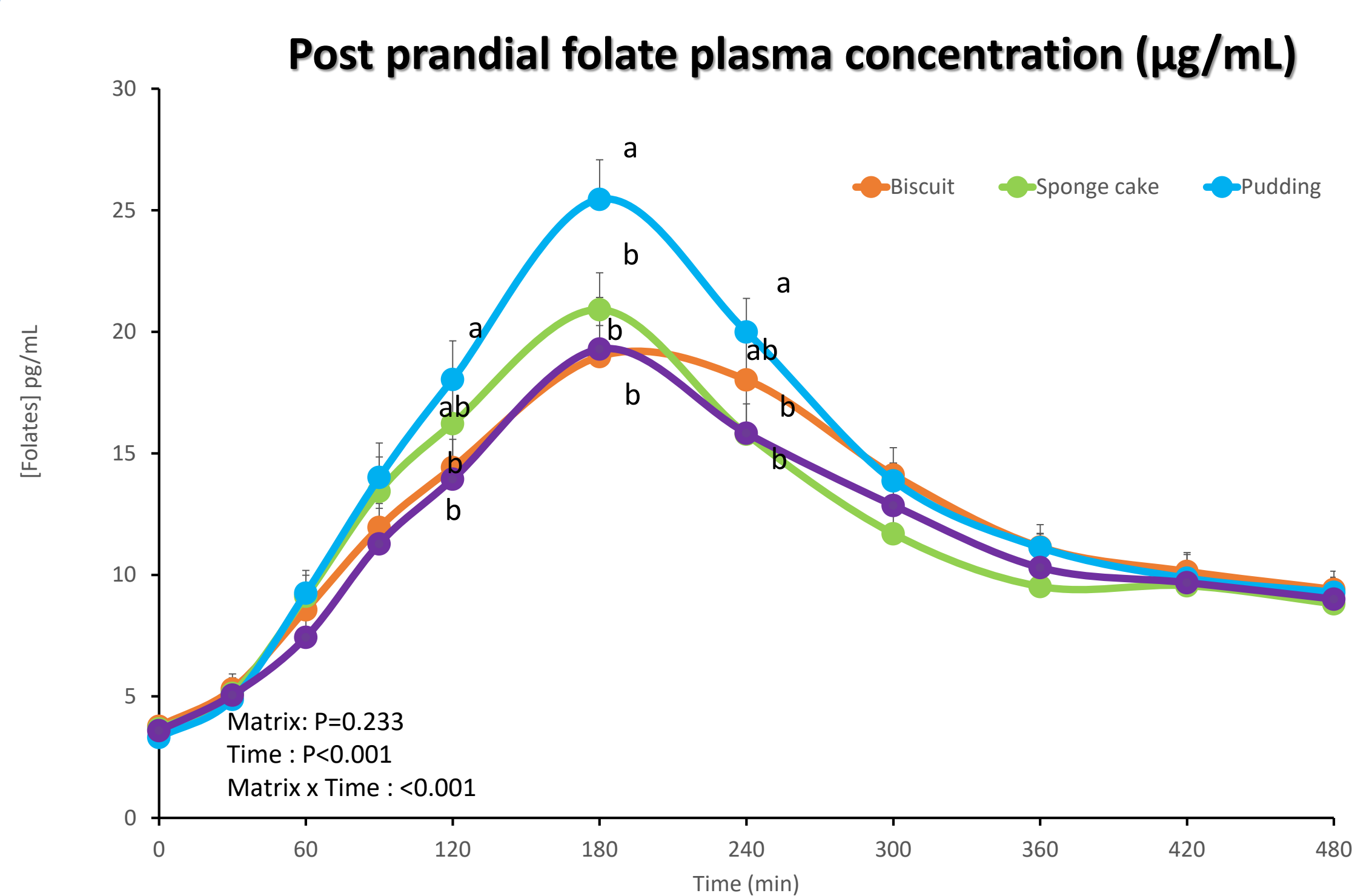
Eleven young adult volunteers (22.6 ± 0.4 years old) were offered the four tested matrix according to a randomized, controlled cross over design. Plasma folate concentrations were determined before and up to 8 hours post matrix ingestion (Simultrac SNB kit, MP Bio). The concentration of other major macronutrients were also determined both in the fasted and the fed states (glucose, insulin, alpha amino nitrogen, triglycerides) to be compared to folate data. Data were presented as means ± SEM, Comparisons between groups determined using 1 or 2 factors repeated measures ANOVA and Holm-Sidak post-hoc analysis. Difference considered significant for P<0.05; tendency (P<0.10)

Folates ingestion (µg)

µg	Mean	SEM
Biscuit	966.8	38.7
Sponge cake	889.3	59.8
Pudding	1096.1	35.4
Custard	1095.9	100.0

Folates ingestion is not statistically different between matrix
ANOVA 1 factor : P=0,64

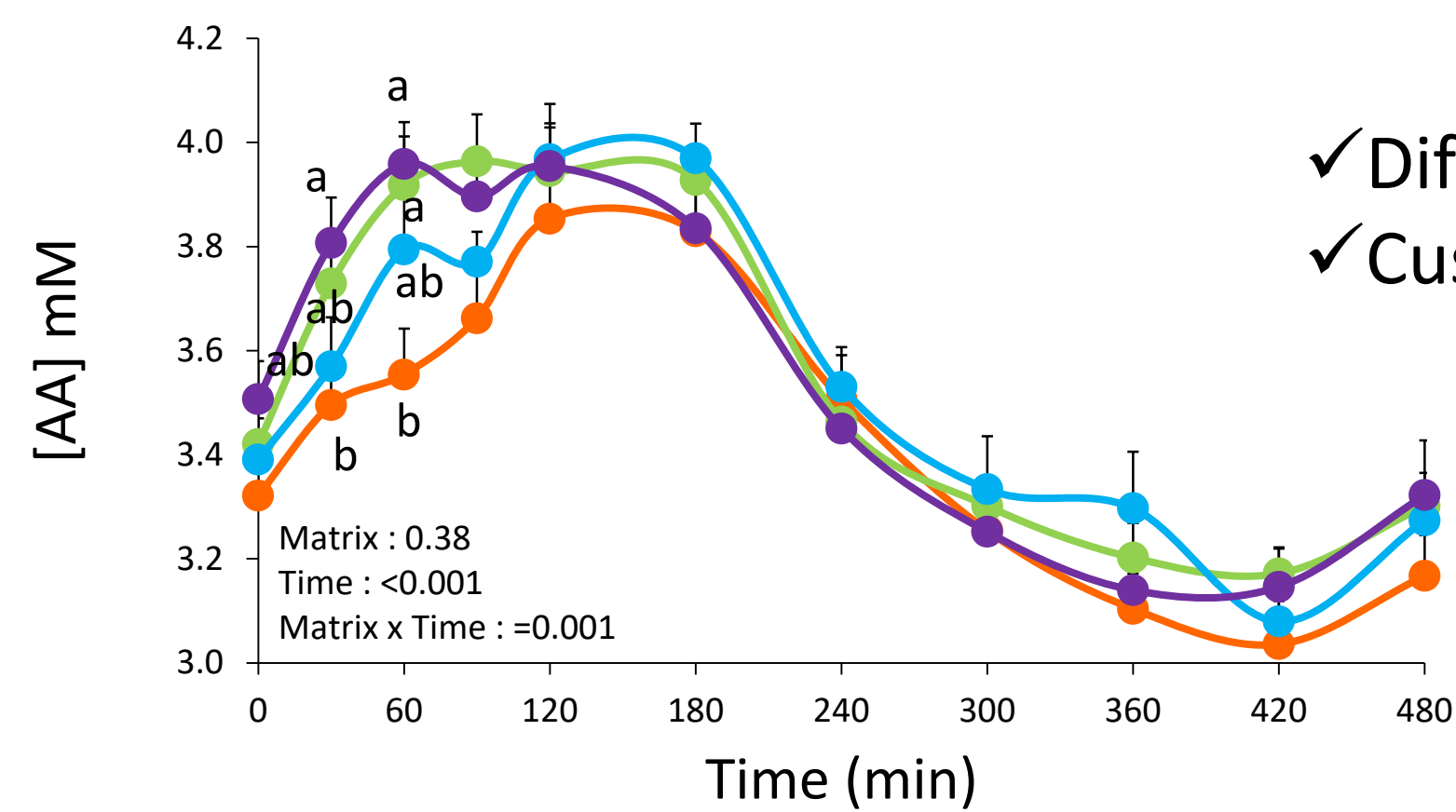
Folates



- ✓ Plasma folates are more ↑ in plasma following **pudding** ingestion. This is also the case after calculation of the area under the curve and correction for folate ingested in the first 3 hours post matrix ingestion. The AUC calculation also showed that Sponge cake allows a better plasma bioavailability, within the first 3 hours following matrix ingestion .
- ✓ Biscuit and Custard : lowest plasma PP levels; **28.9% difference in AUC 480 min (i.e. total availability) between Custard and Pudding**
- ✓ Plasma folate peak delayed with Biscuit

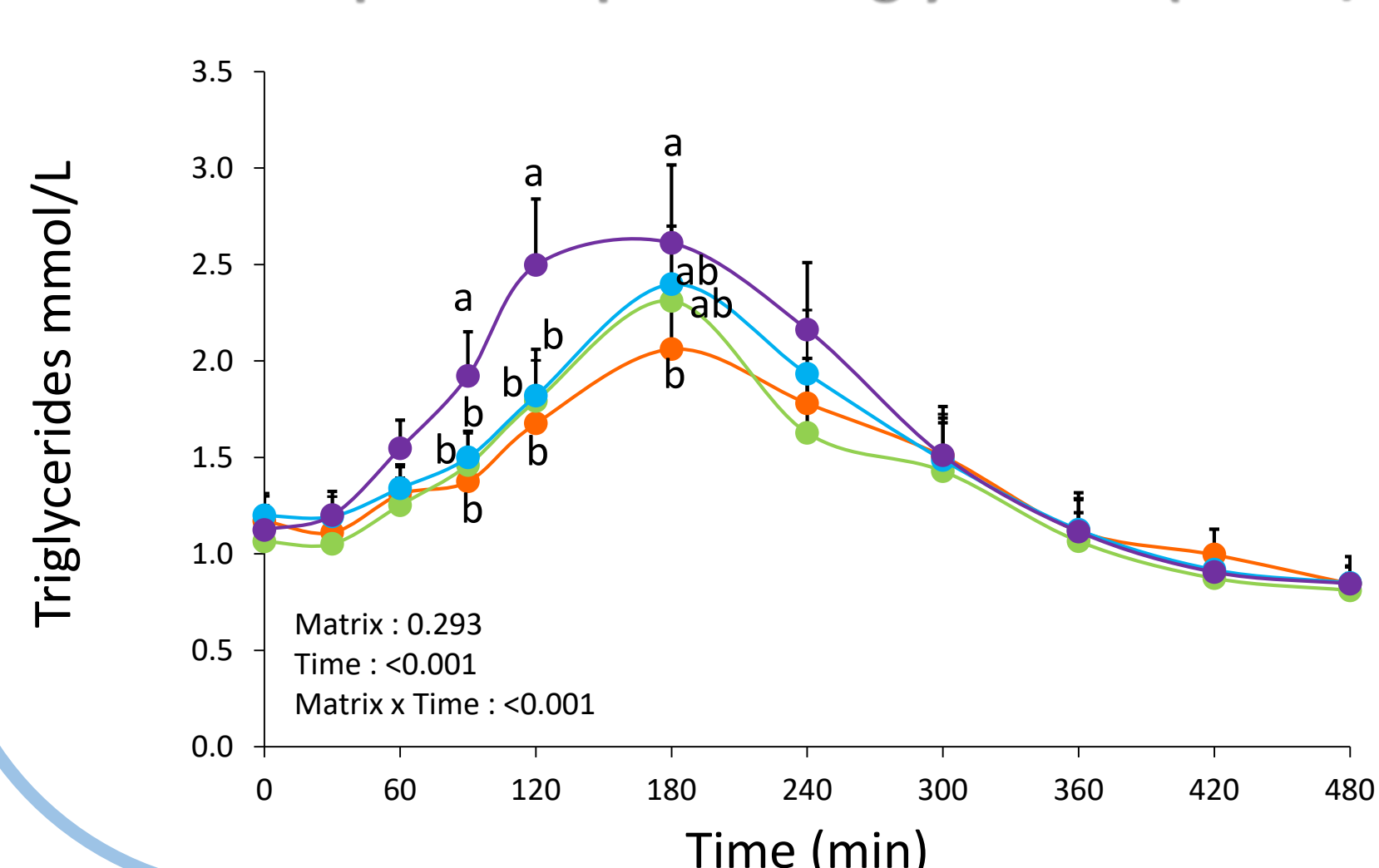
Macronutrients / hormones

Post prandial plasma Alpha Amino Nitrogen (mM)

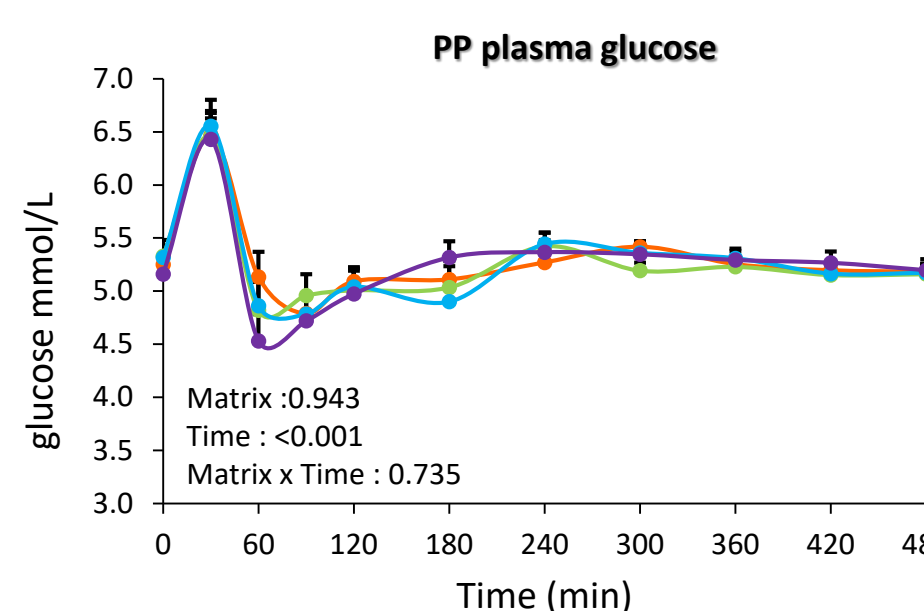
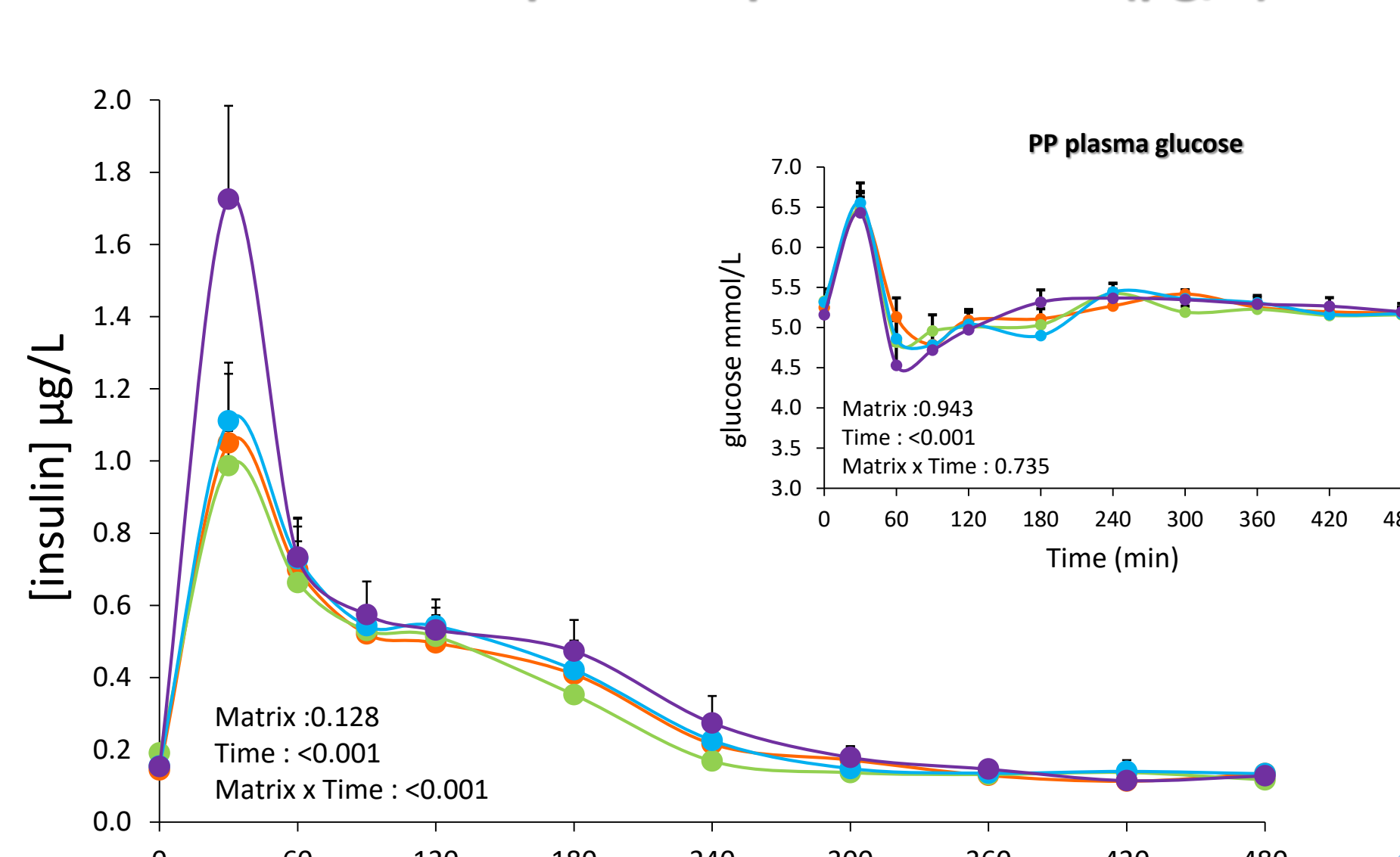


- ✓ Different profiles observed compared to folates
- ✓ Custard - higher insulin peak (30 min PP)
 - higher TG peak vs pudding, biscuit and sponge cake
 - higher amino-N vs biscuit (not the case anymore when corrected for fasting level)

Post prandial plasma triglycerides (mmol/L)



Post prandial plasma insulin (µg/L)



Conclusion

- For macronutrients, Custard ingestion (liquid matrix) leads to the highest plasma levels, but it is not true for folates
- Matrix impacts greatly on overall folates availability : 28.9% difference between Biscuit and Pudding
- Folates levels in plasma post prandially are the consequence of different digestive/metabolic processes compared to what happens for amino nitrogen, triglycerides or glucose/insulin.

← **Custard :**
Macronutrients (glucose, TG, amino N)
Rapidly available for digestion and absorption at duodenum/jejunum levels

→ **Pudding and sponge cake :**
Folates
- Specific interaction with diet components ?
- Is custard reaches too rapidly duodenum for an appropriate absorption of folates ?
- Specific metabolism of folates / interaction with insulin ?