

FOOD MATRIX EFFECTS: IS IT TIME TO RE-THINK HOW WE EVALUATE THE HEALTH EFFECTS OF FOODS?

Ian Givens

Professor of Food Chain Nutrition

Director, Institute for Food, Nutrition & Health

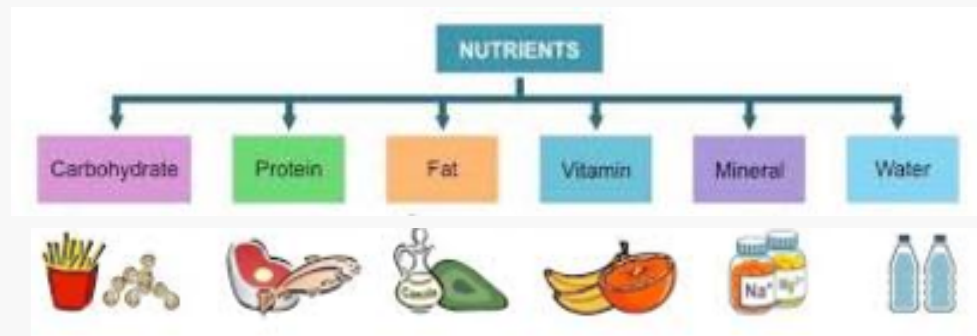
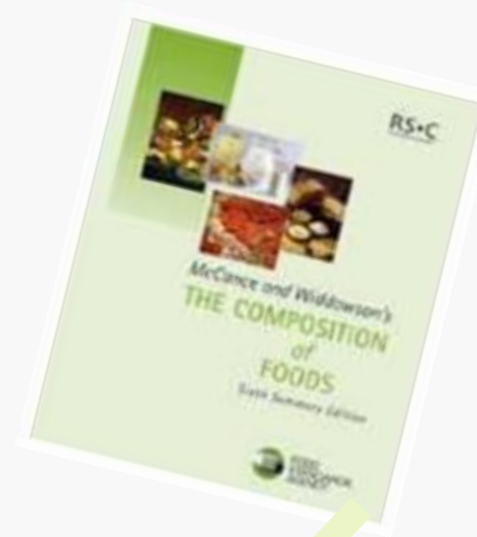
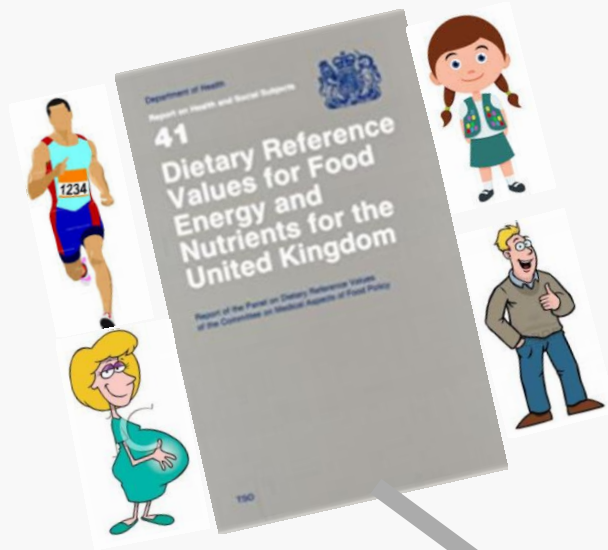
University of Reading, UK

The dairy matrix:
a new approach
to understanding
the health effects of food



What is the food matrix?

Nutrient-based nutrition system



Assumes nutrient additivity and exclusivity

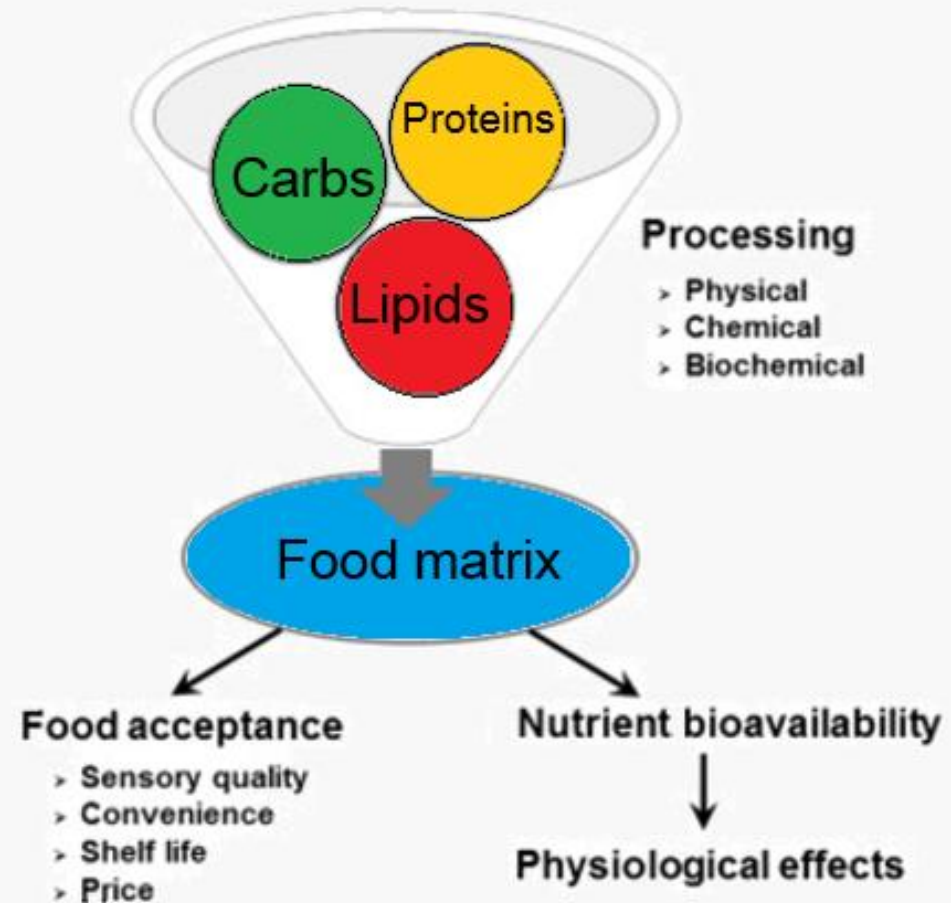


What is the food matrix?

What is a matrix?



...a substance in which
other things are fixed, buried, etc...

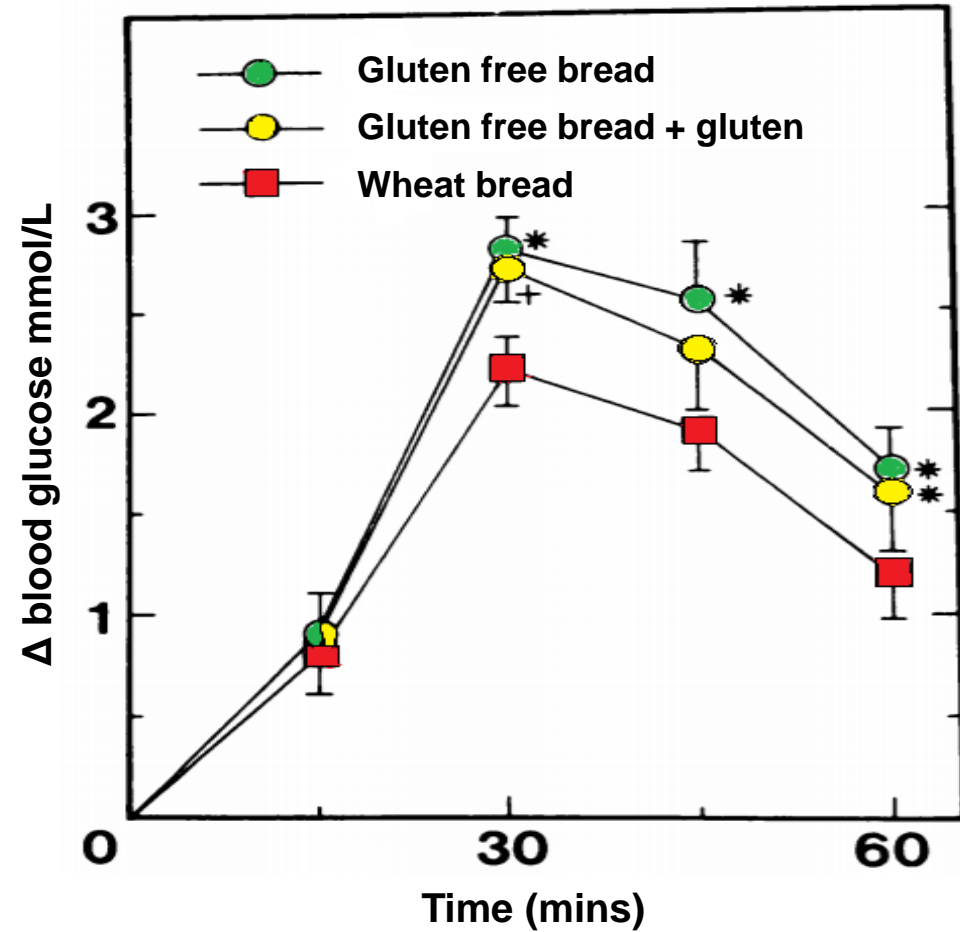
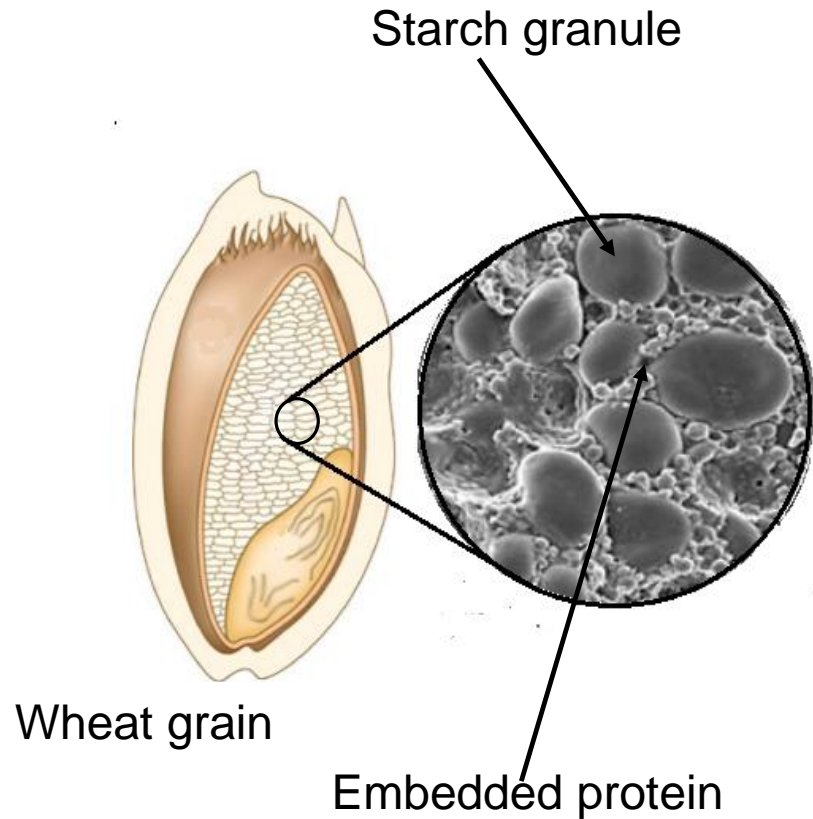




Can the food matrix affect nutrient bioavailability?

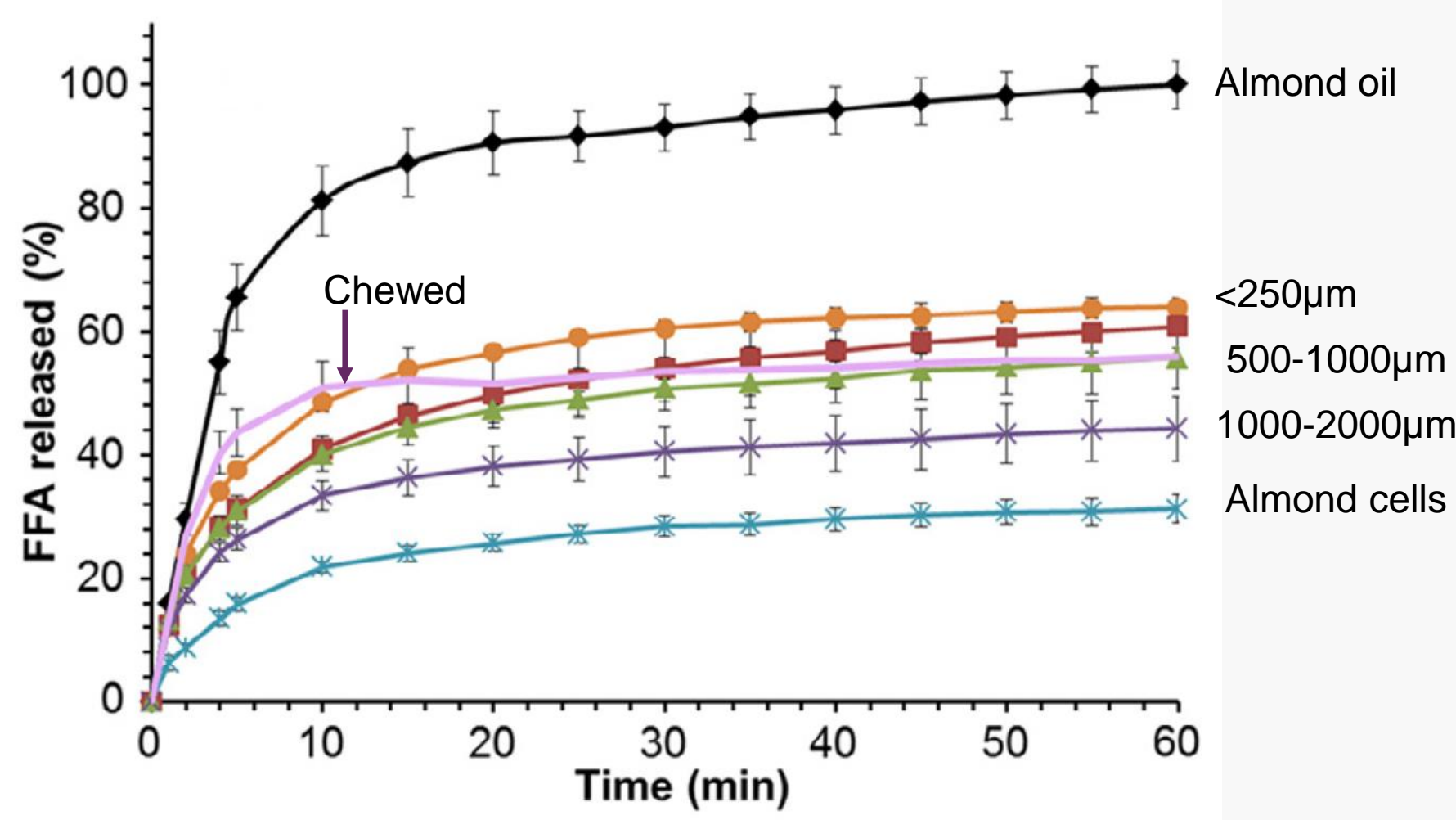
Effect of food matrix of wheat on glycaemic response

Jenkins et al. (1998)



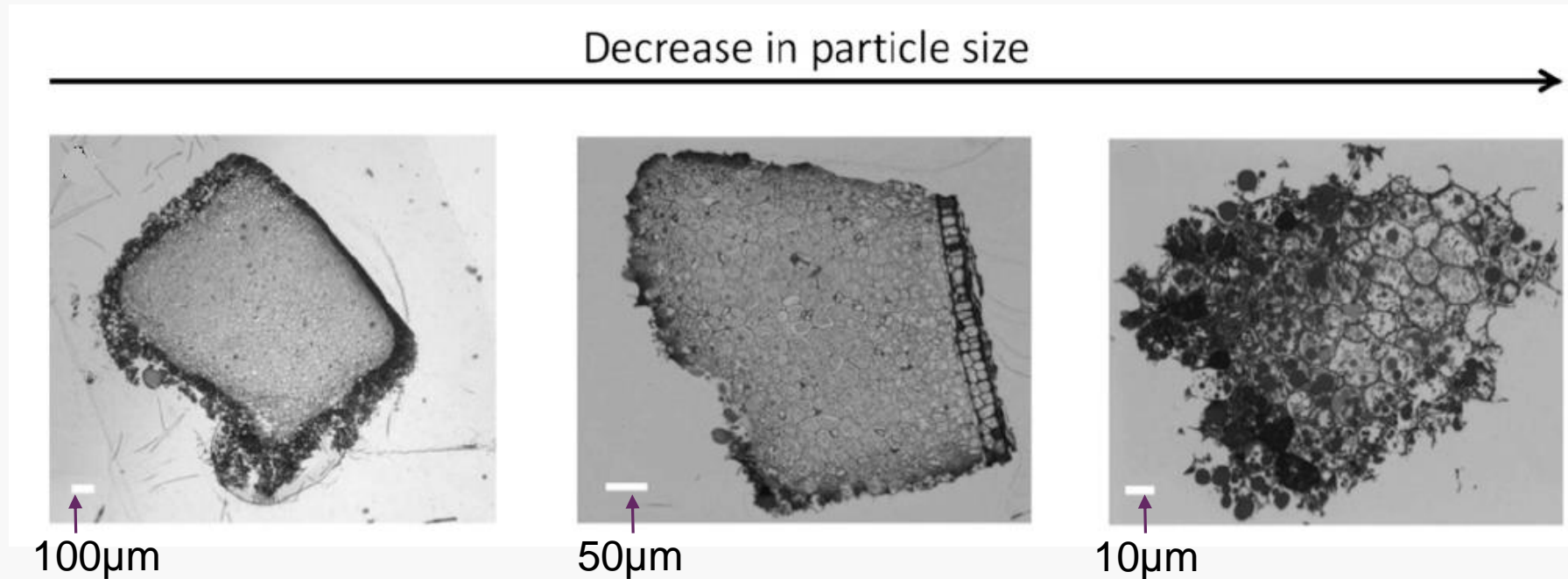
Effect of almond particle size on lipid bio-accessibility *in vitro*

Grundy et al. (2015a)



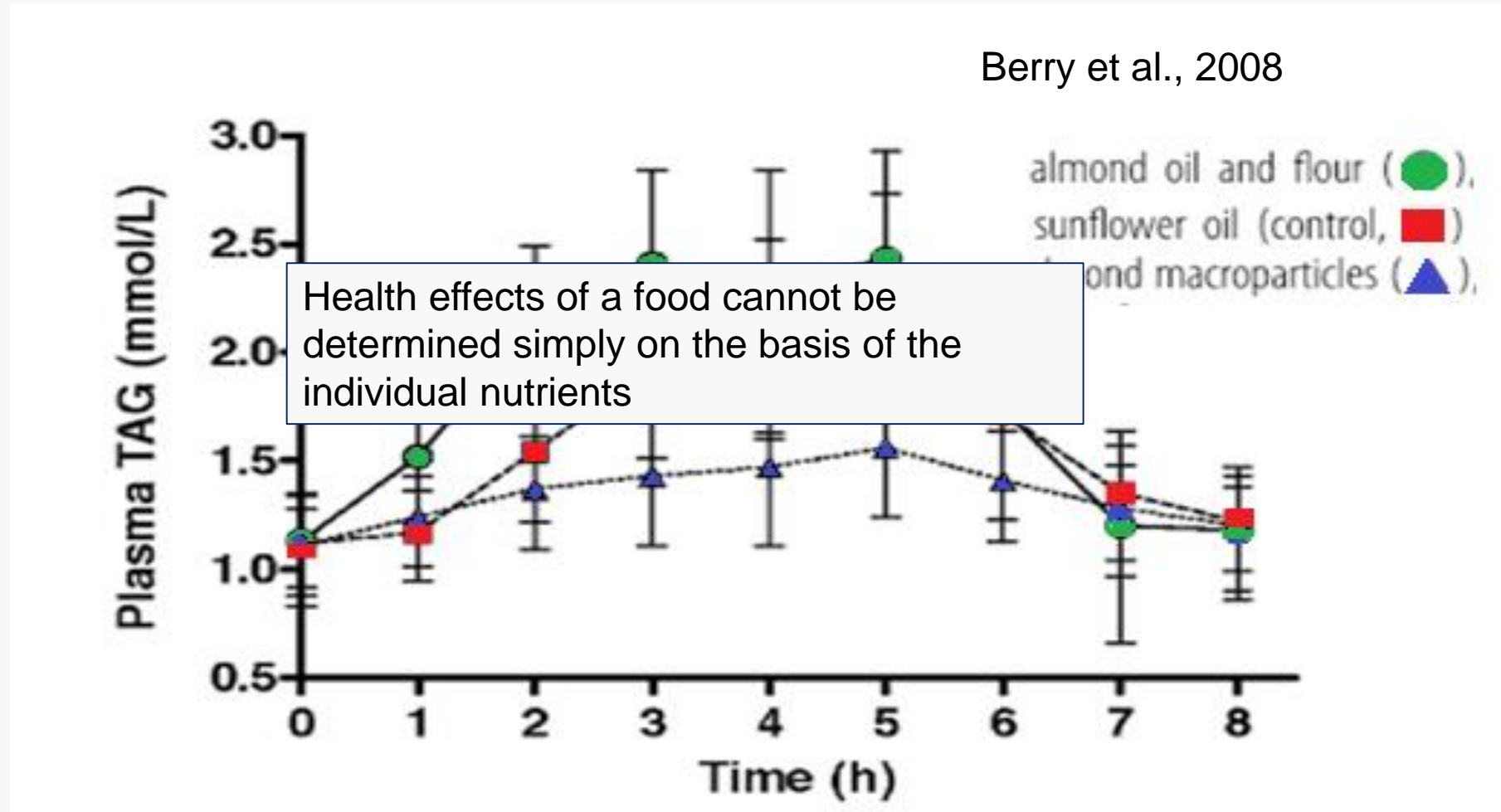
Effect of mastication of almonds on parenchyma cell damage and hence lipid bioavailability

Grundy et al. (2015b)



Physical matrix affect

Acute effect of 50g fat on plasma TAG in healthy men



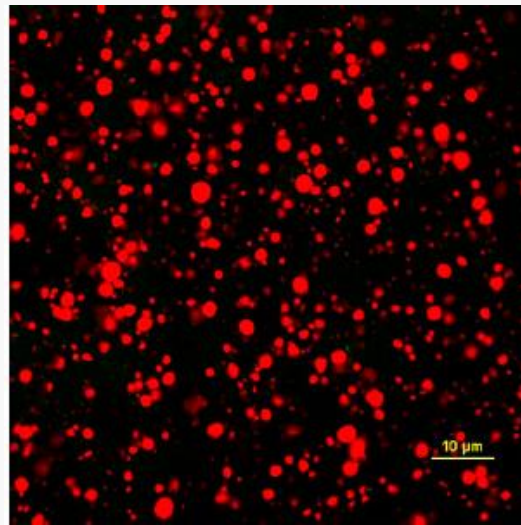


The dairy food matrix: Some examples

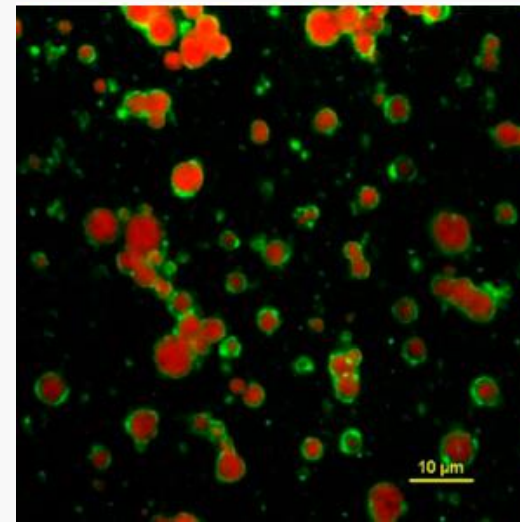
Effect of 40 g fat/day for 8 weeks with (whipping cream) and without (butter oil) MFGM on plasma lipids

Rosqvist et al., 2015

Confocal laser scanning micrographs



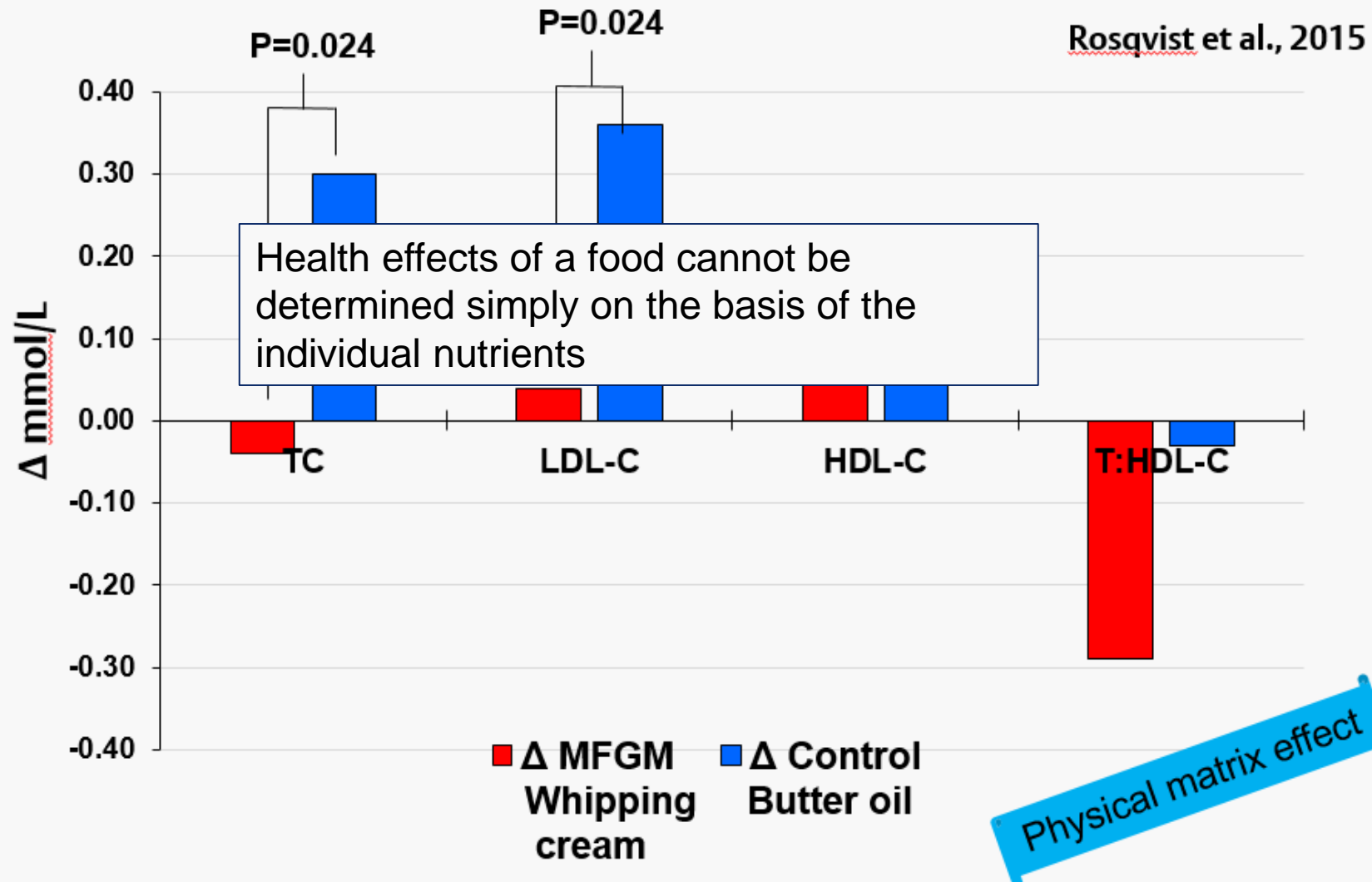
Milk fat globules in emulsion
from butter oil
Fat=red; MFGM=green



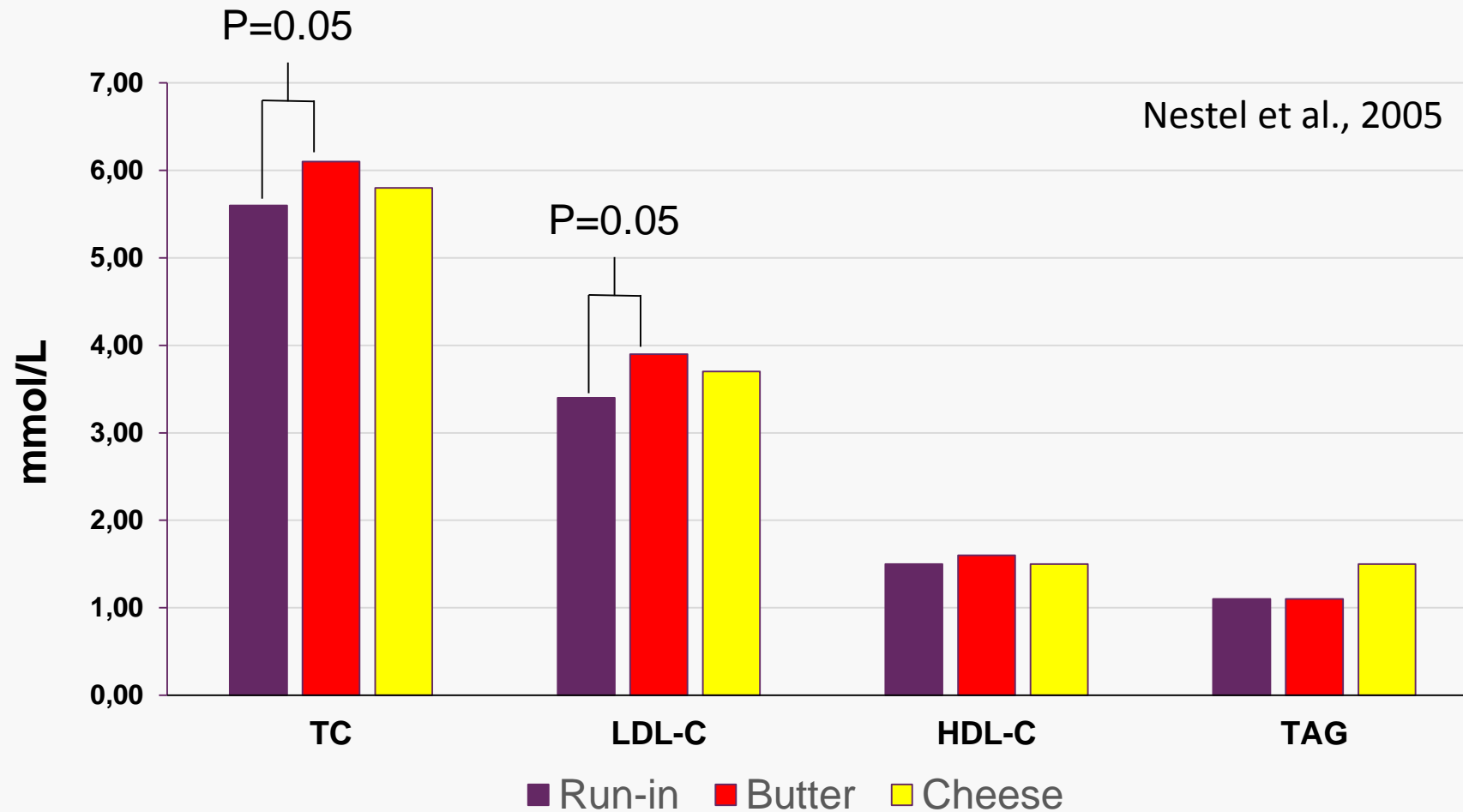
Milk fat globules from
whipping cream
Fat=red; MFGM=green

Physical matrix effect

Effect of 40 g fat/day for 8 weeks with (whipping cream) and without (butter oil) MFGM on plasma lipids



Plasma lipids at baseline and after butter and cheese (both 40 g fat/d for 4wk)

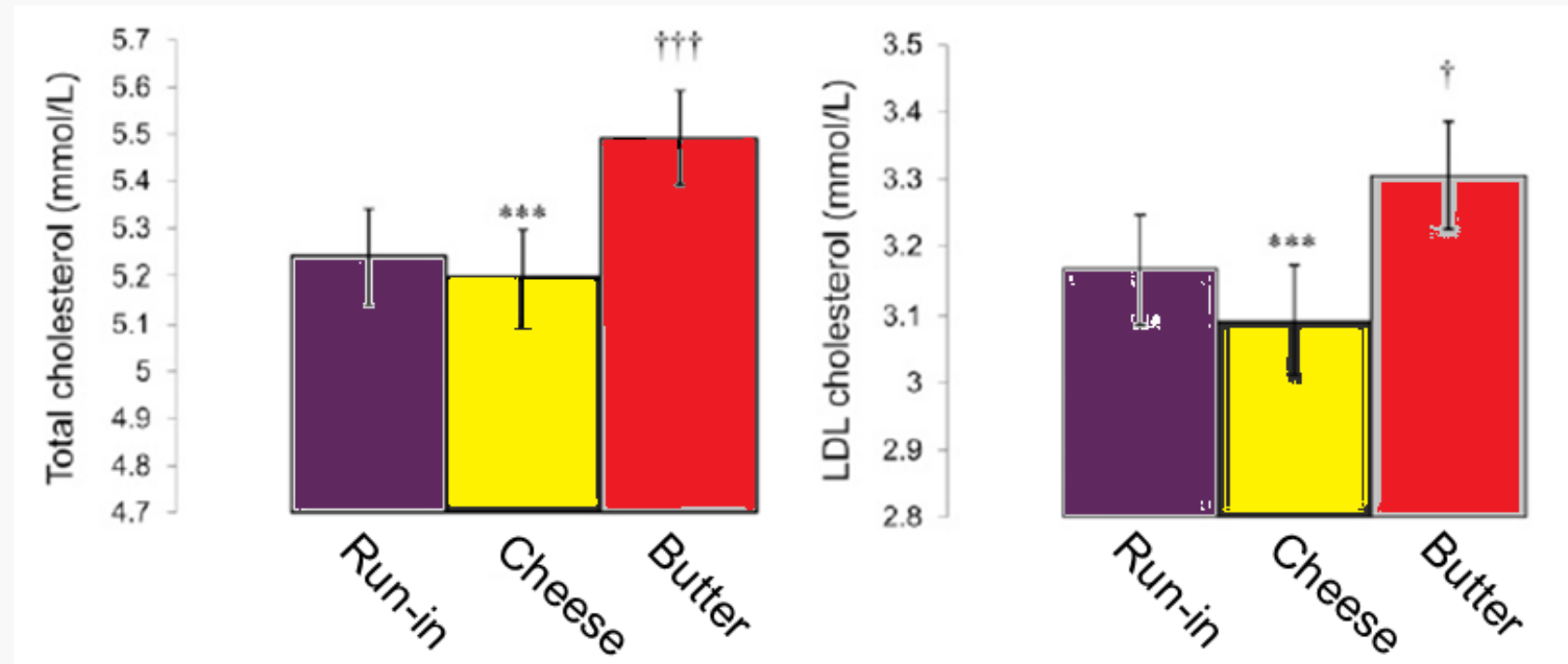


No Ca data

Changes in total and LDL-cholesterol after consumption of ~80 g/d fat (~36g/d SFA) as cheese or butter for 6 wk

Hjerpsted et al., 2011.

*** Cheese vs. butter ($P < 0.0001$) †††/† Butter vs. run-in ($P < 0.0005/0.05$)



Ca
1192 mg cheese, No effect on faecal fat excretion
417 mg butter

Dairy calcium intake modifies faecal fat, Ca and bile acid excretion

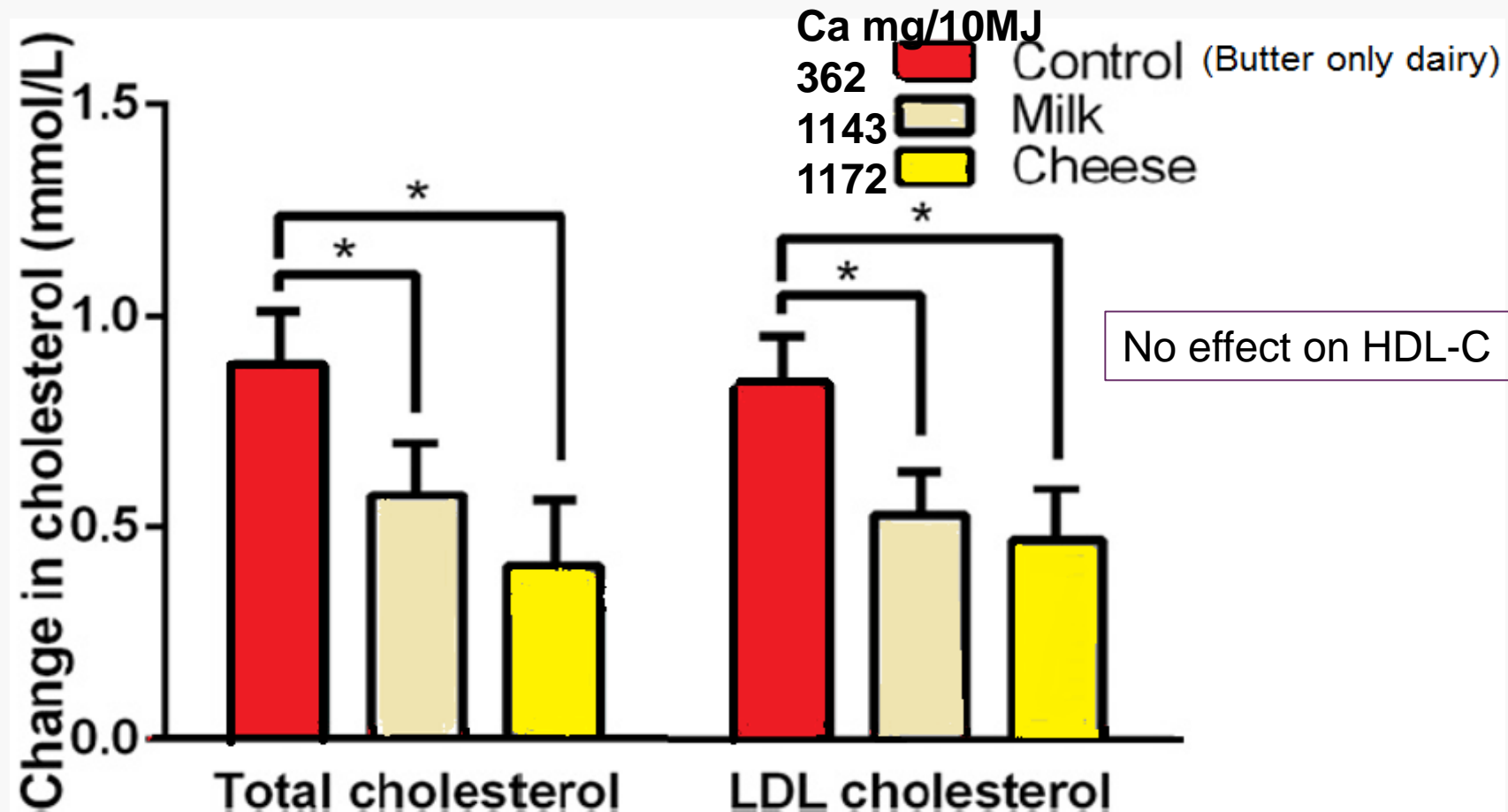
Lorenzen and Astrup (2011)

	High fat		Low fat		P for	
	Low Ca	High Ca	Low Ca	High Ca	Ca	Fat
Fat (g/d)	6.6	11.3	5.5	8.0	***	**
Ca (mg/d)	549	2477	576	2478	***	NS
Bile acid (μmol/d)	274	393	178	346	**	NS

Faecal fat only explains about 30% of effect on cholesterol

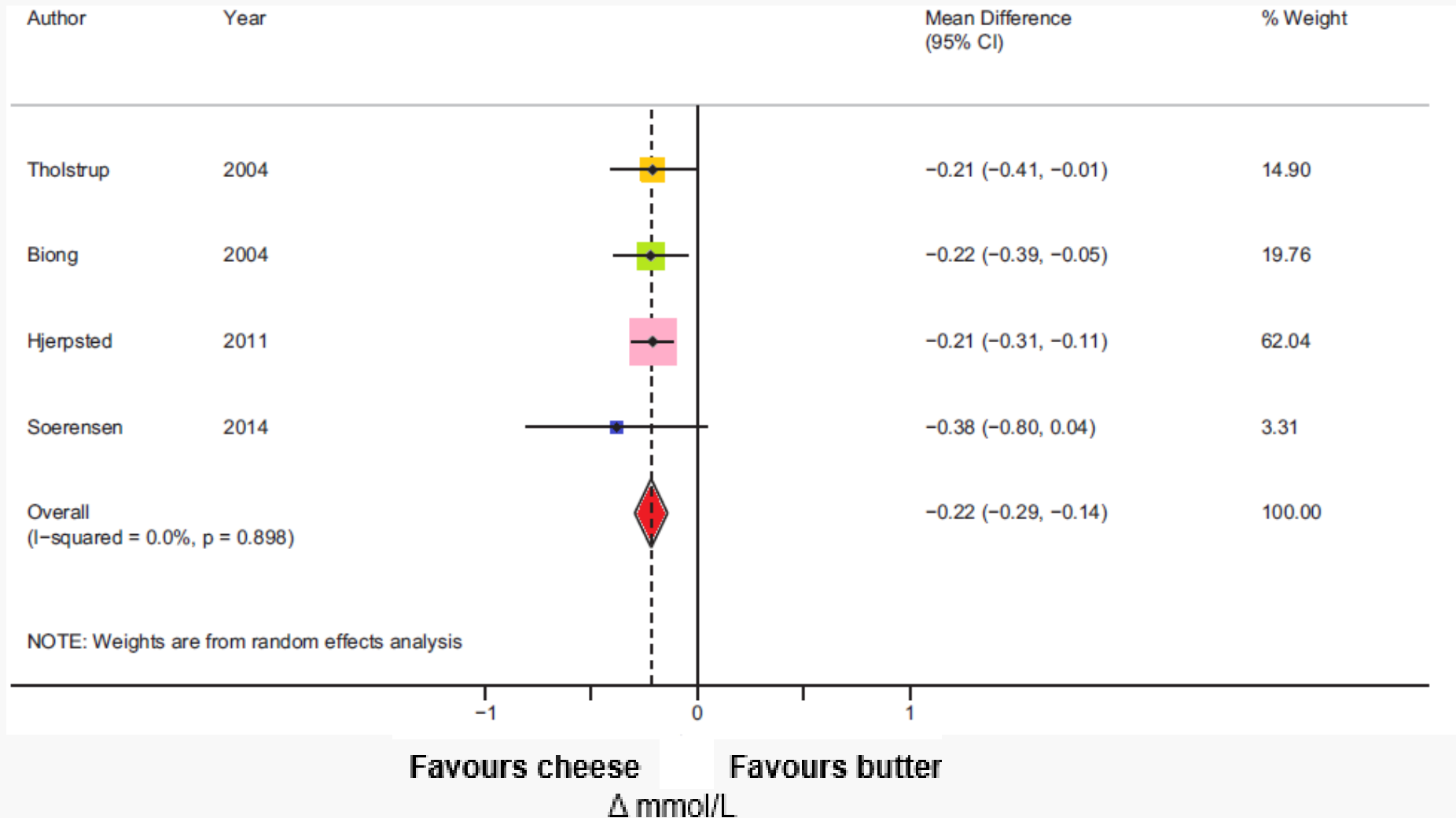
Effect dairy Ca from cheese and milk on blood lipids in young men (~46g SFA/d)

Soerensen et al., 2014



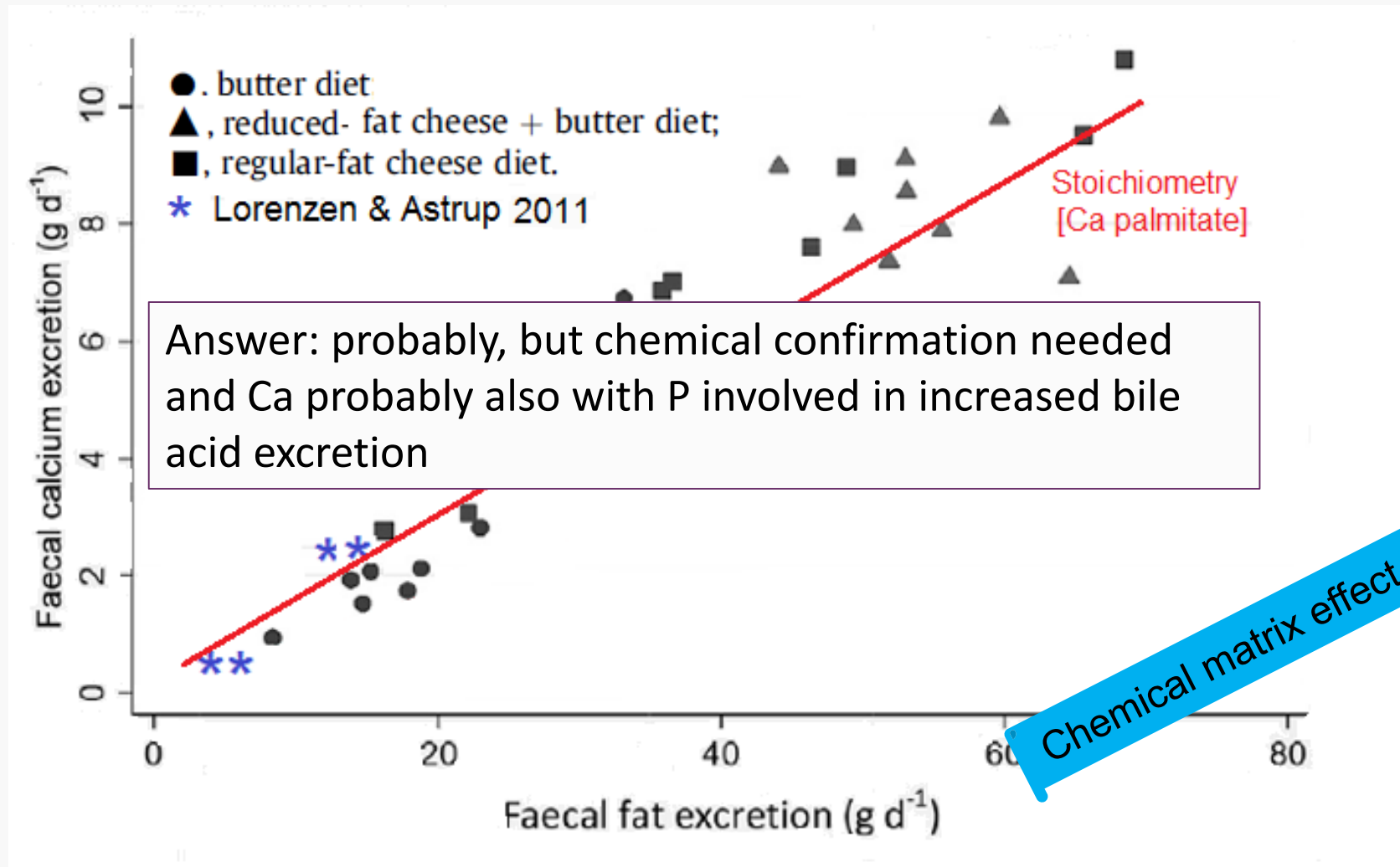
Meta-analysis of RCTs: cheese vs. butter on LDL-C (TC same)

De Goede et al., 2015

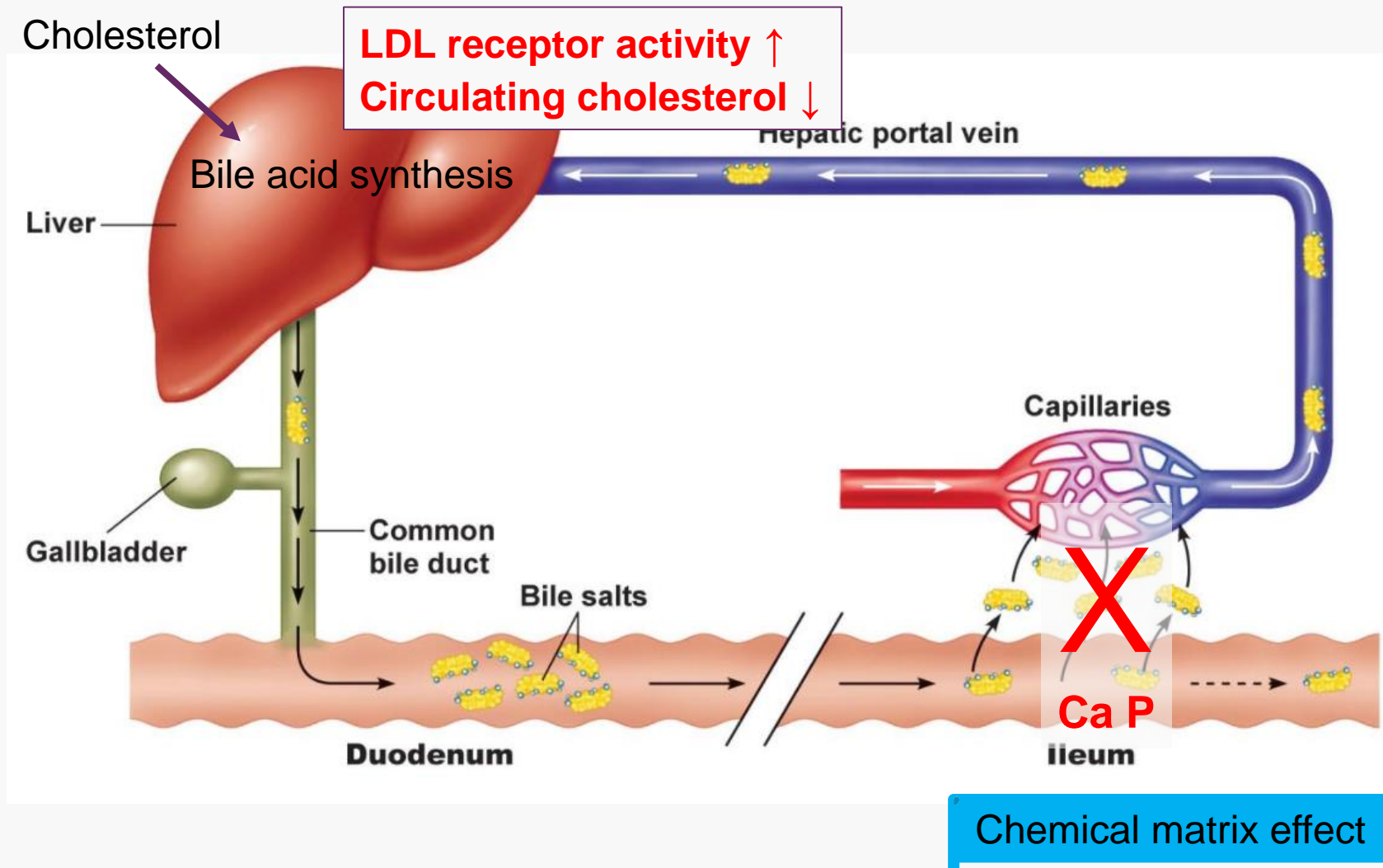


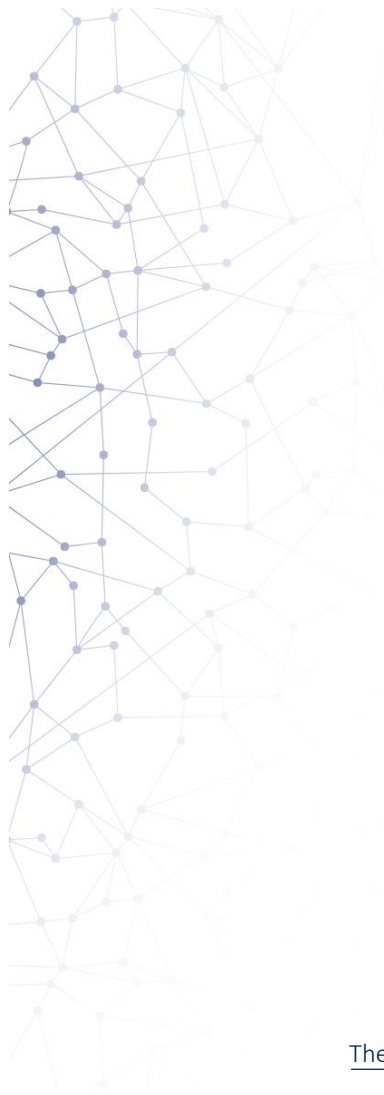
Is the role of Ca in reduced fat absorption due to saponification with fatty acids?

Thorning et al. 2016 (pigs)



Effect of reduced bile acid enterohepatic recycling on plasma cholesterol

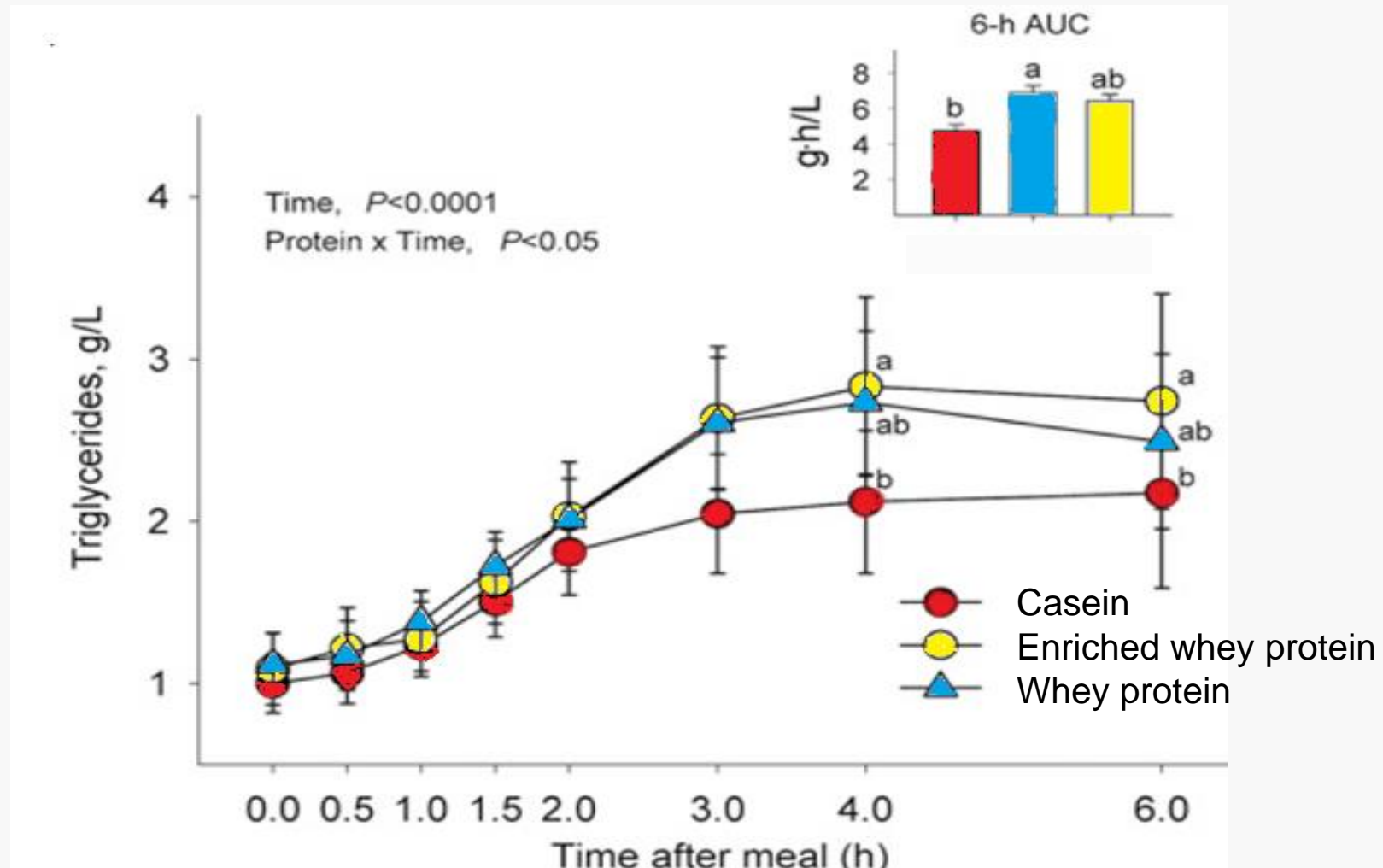




Do certain components in the food matrix modify/ compensate fat/SFA effects?

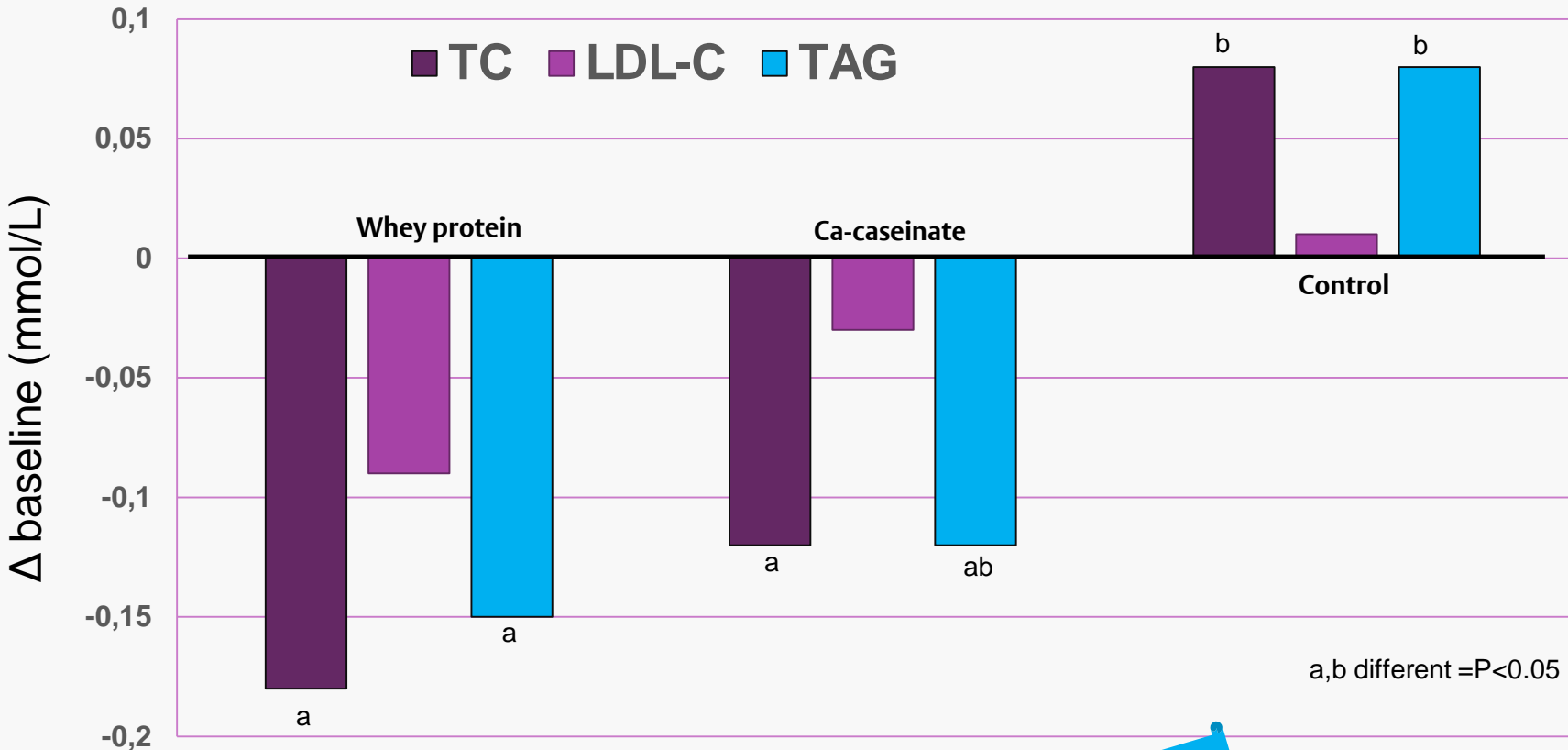
PP kinetics of TAG after high fat meal including casein, whey protein and enriched whey protein

Mariotti et al. (2015)



Milk proteins and blood lipids

Fekete et al., AJCN (2016)

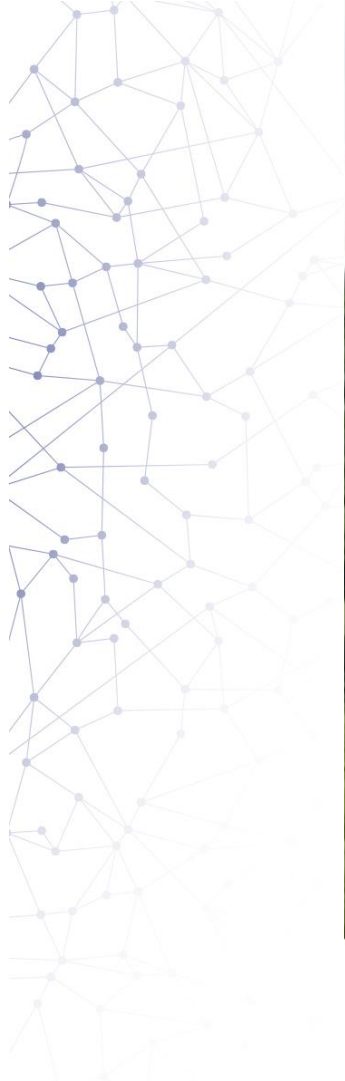


Association matrix effect

Conclusions

- Food matrix effects exist
- The matrix effect is probably mainly a combined function of nutrient composition and food structure
- May be physical, chemical or associative and maybe all?
- They mean that health effects of a food cannot be determined simply on the basis of the individual nutrients it contains.
- The food matrix can determine nutrient digestion and absorption, thereby also altering the overall nutritional properties of the food.
- Evidence to date suggests the dairy matrix may have unique benefits for bodyweight control, bone and cardiovascular health but more on these to follow.....





European
Milk
Forum



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