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

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Milk Matrix

milknutritiousbynature.eu

What is the food matrix?

Nutrient-based nutrition system

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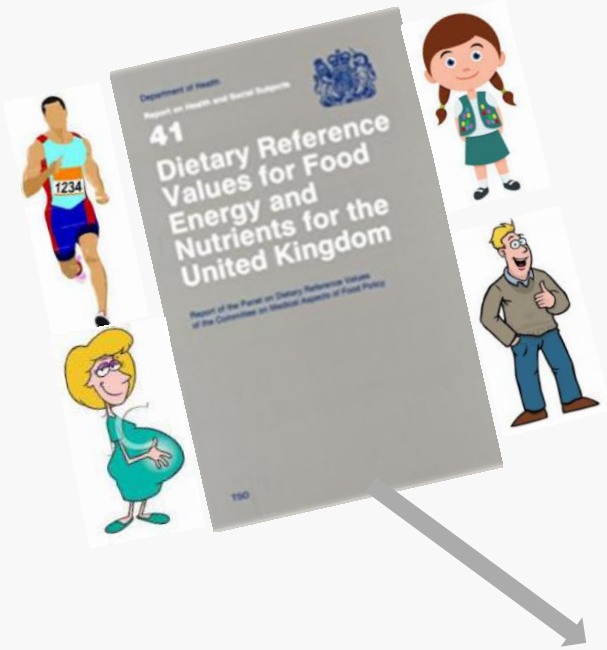

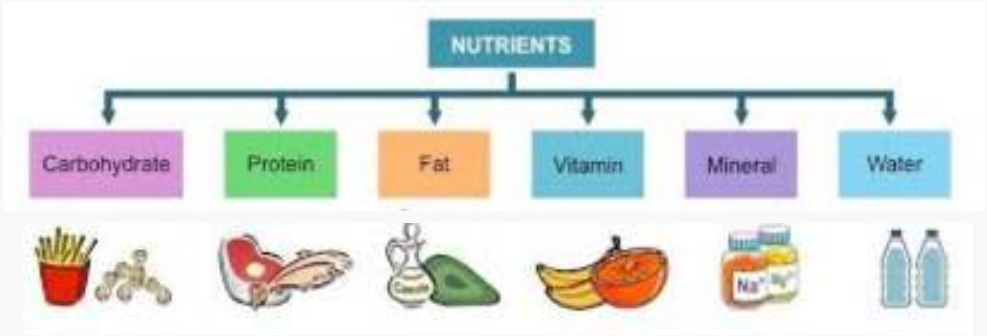

Assumes nutrient additivity and exclusivity

What is the food matrix?

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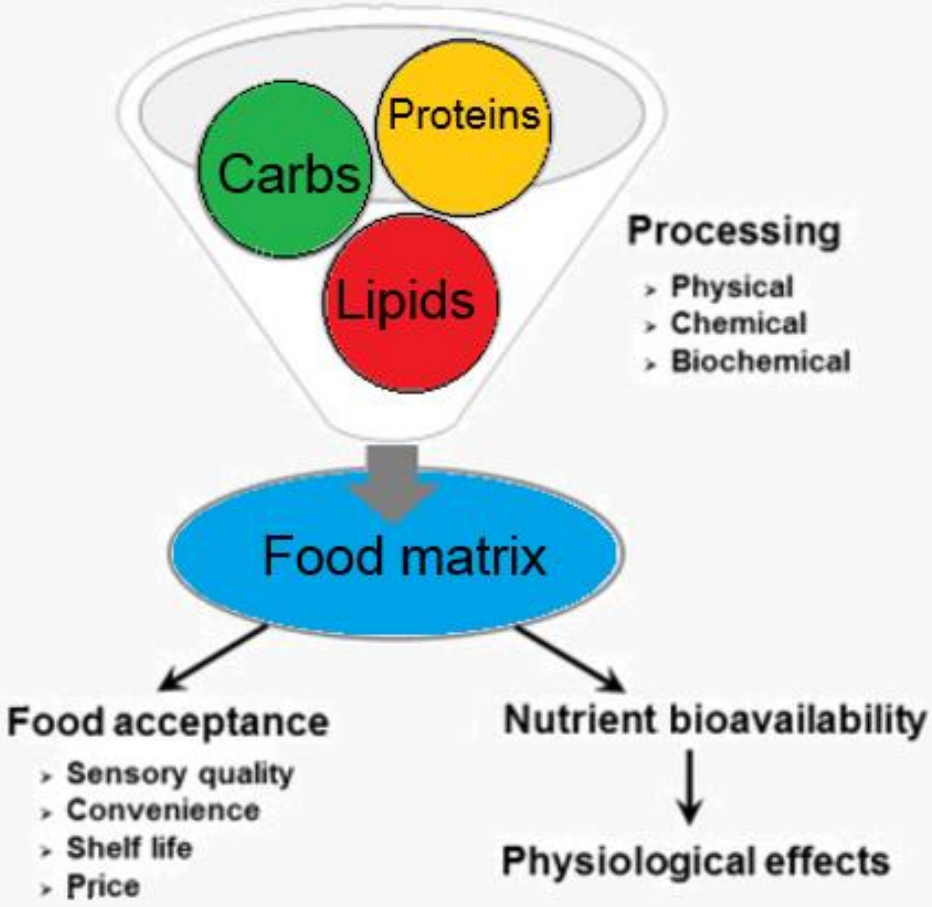
What is a matrix?

Cambridge Dictionary

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



Does the food matrix affect lipid/saturated fat bioavailability?

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

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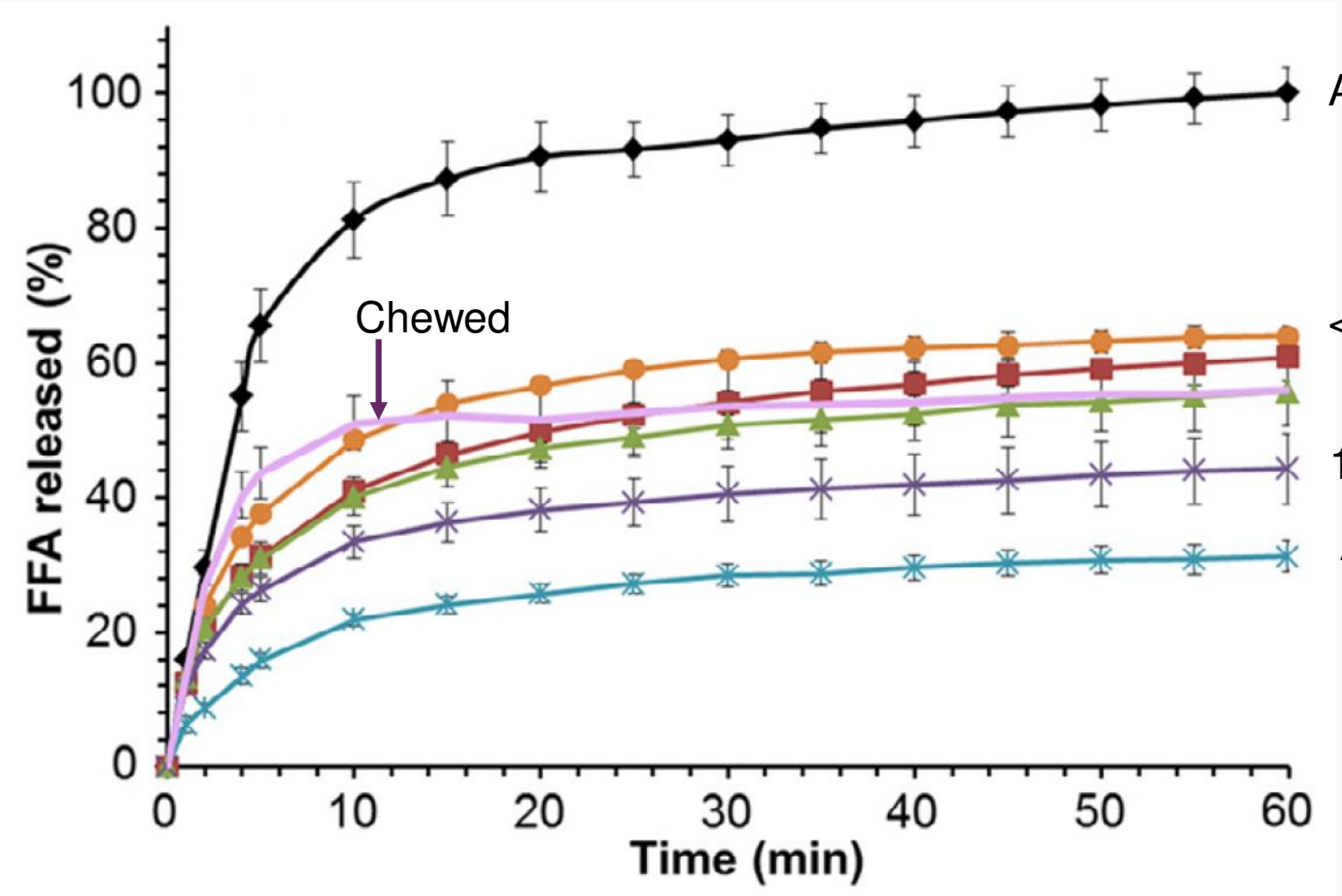
Grundy et al. (2015a)



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

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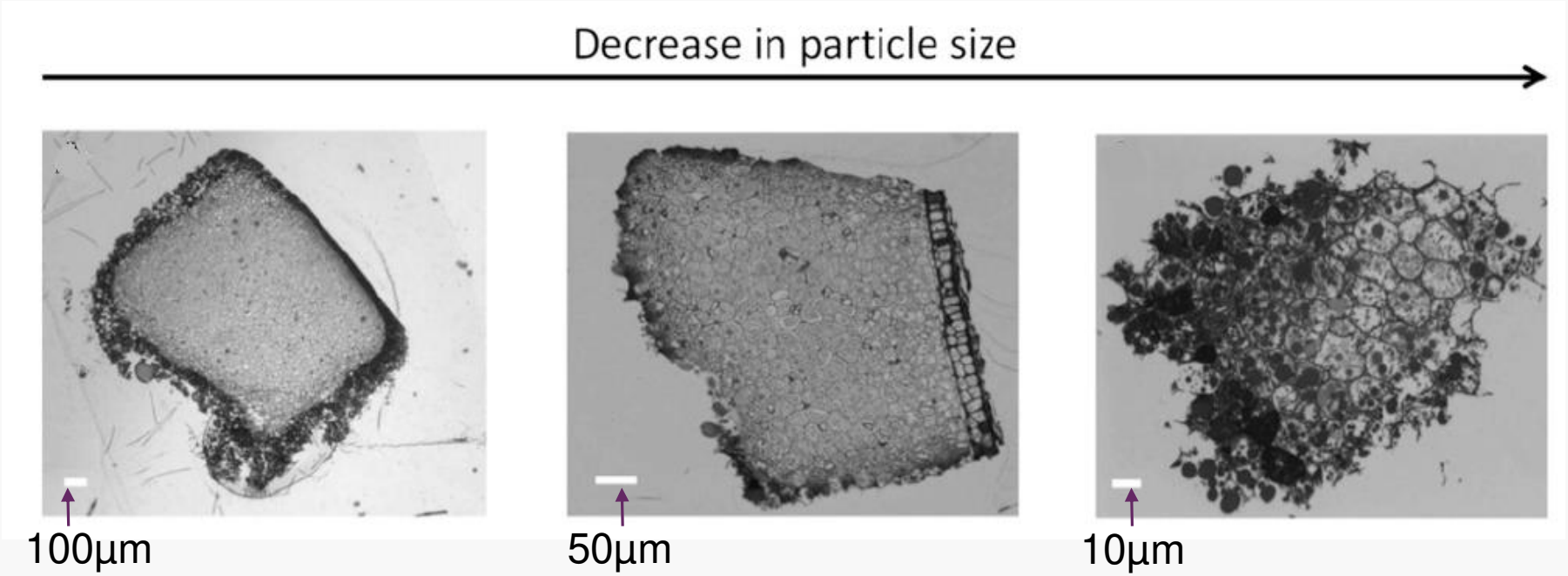
Grundy et al. (2015b)



Physical matrix affect

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

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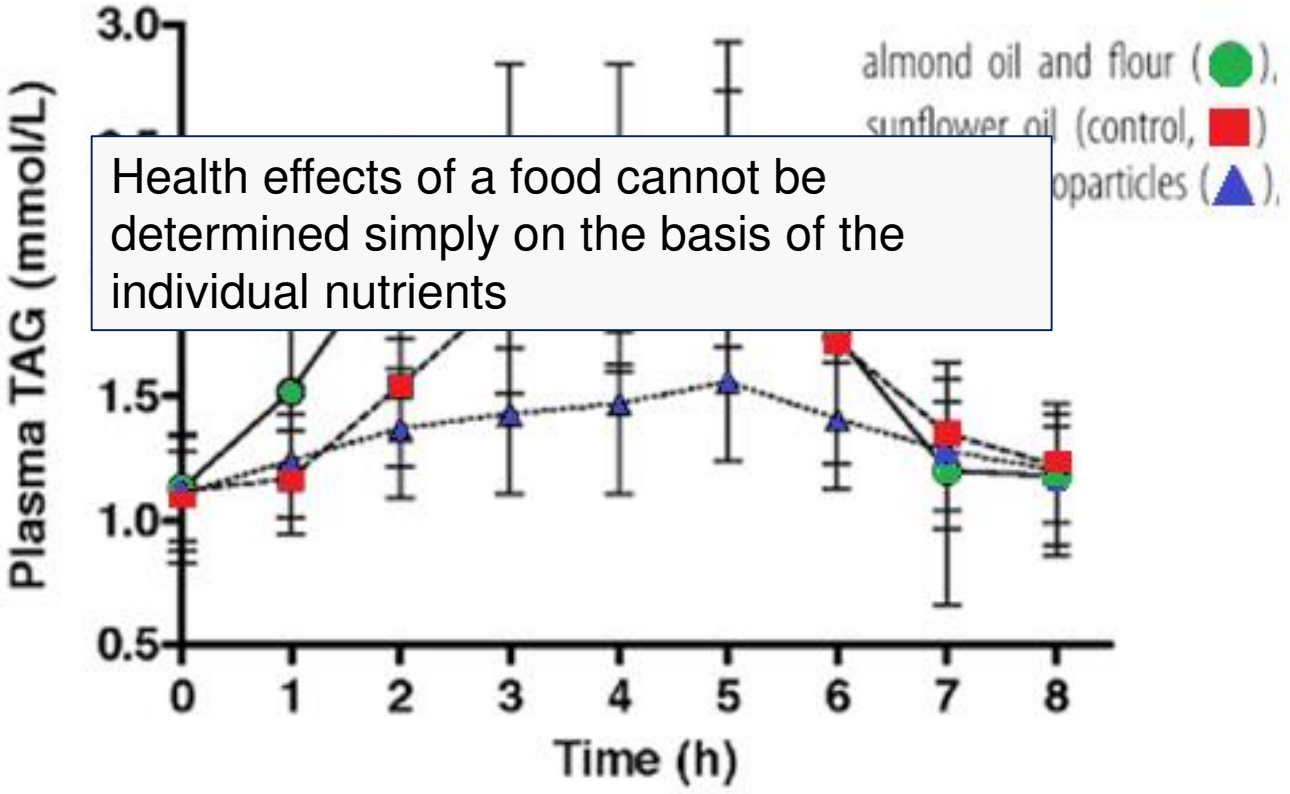
Berry et al., 2008



Health effects of a food cannot be determined simply on the basis of the individual nutrients

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

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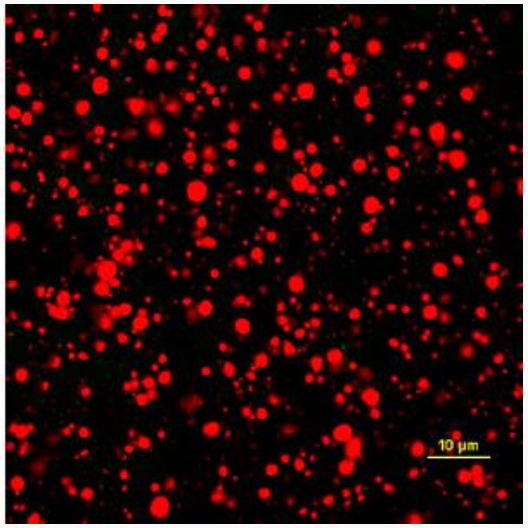
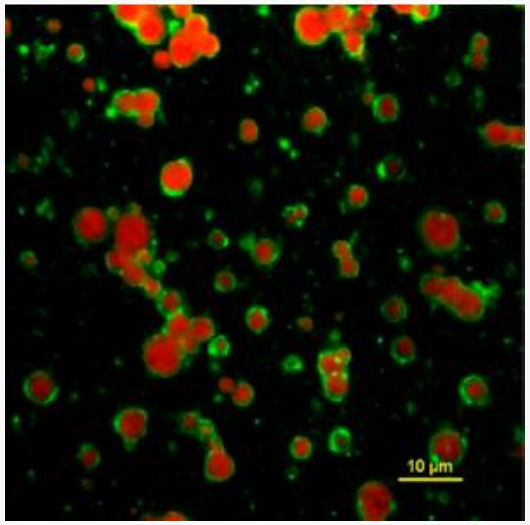
Rosqvist et al., 2015

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

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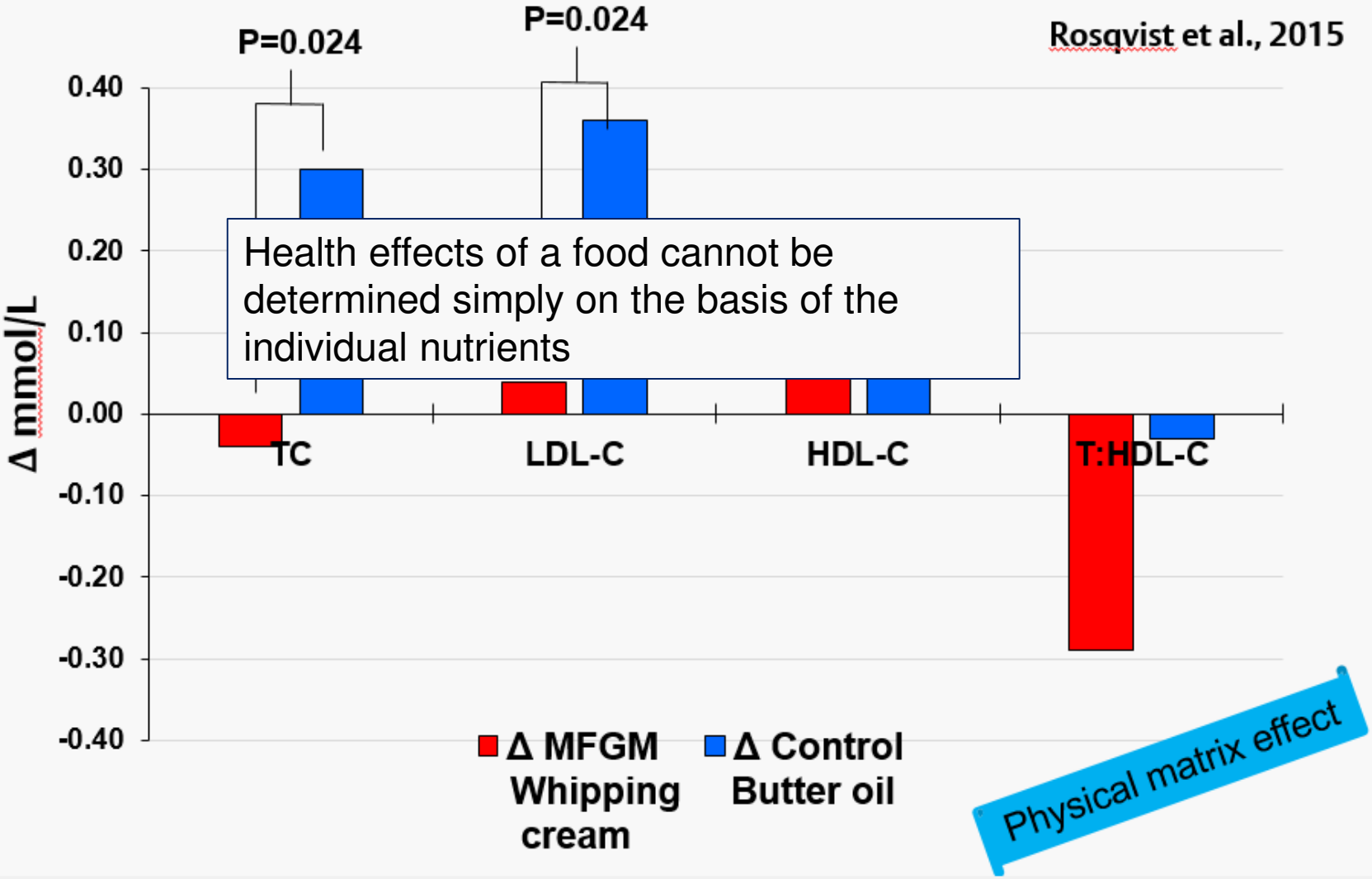
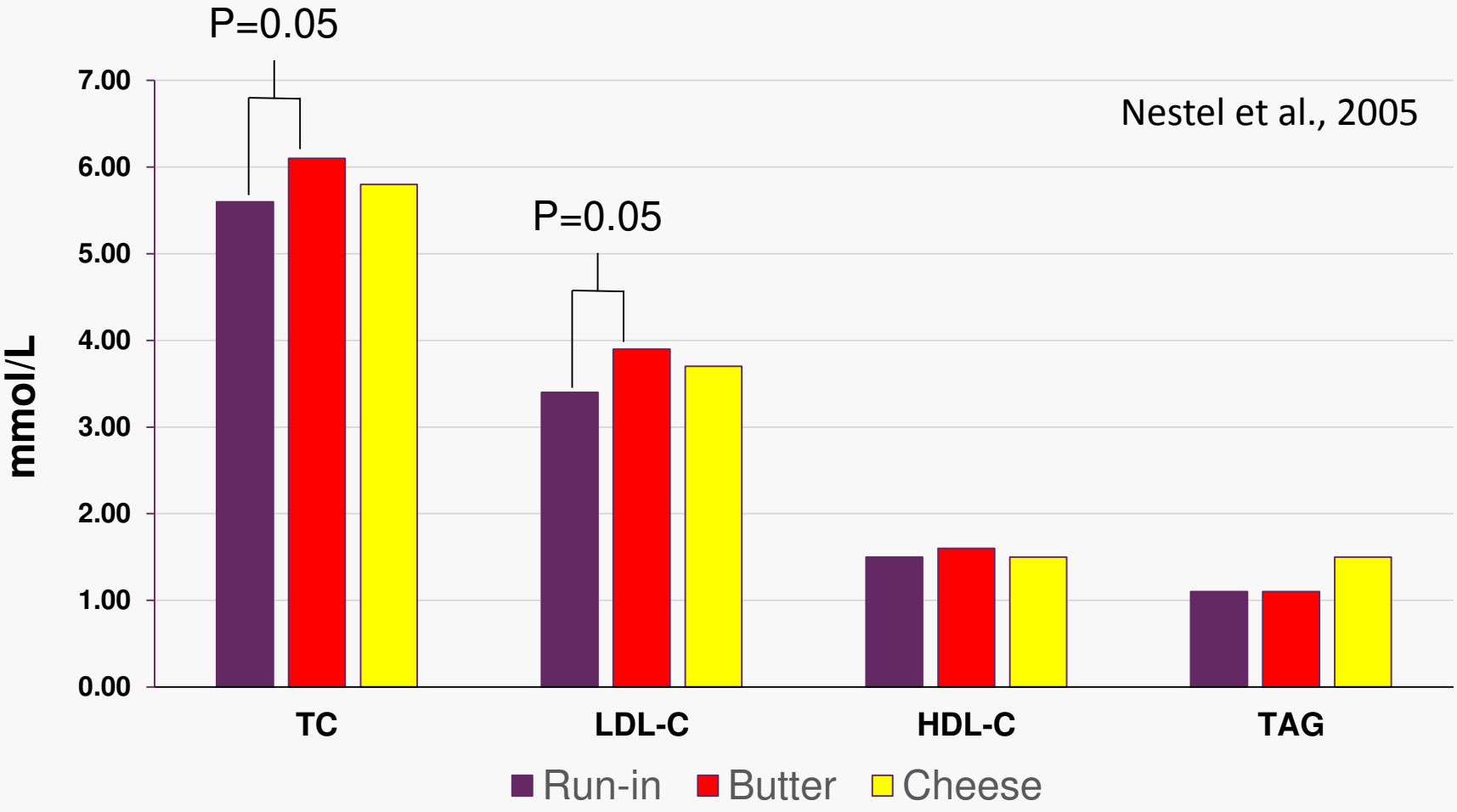


Plasma lipids at baseline and after butter and cheese (both 40 g fat/d for 4wk)



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

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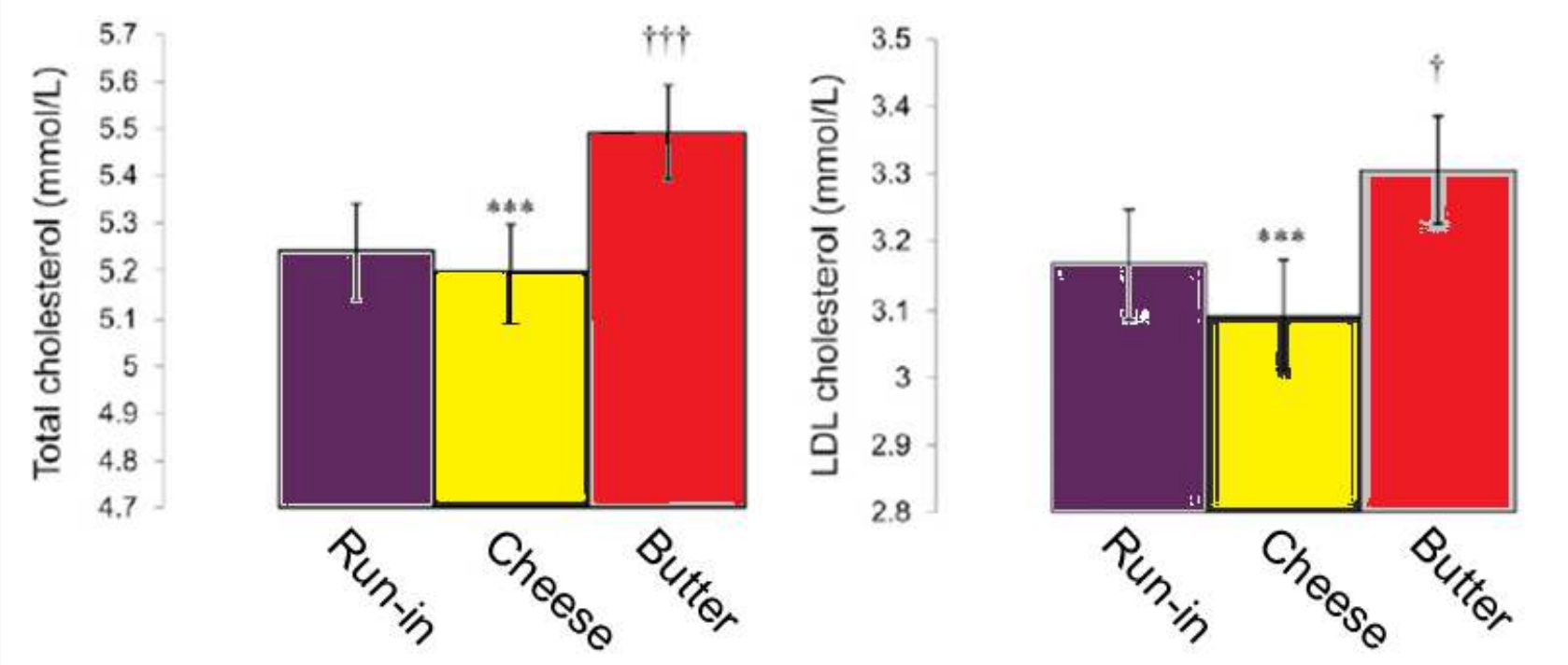
Hjerpsted et al., 2011.

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



Ca
1192 mg cheese,
417 mg butter

No effect on faecal fat excretion

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

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Lorenzen and Astrup (2011)

	High fat			Low fat		P for	
Faecal losses	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)

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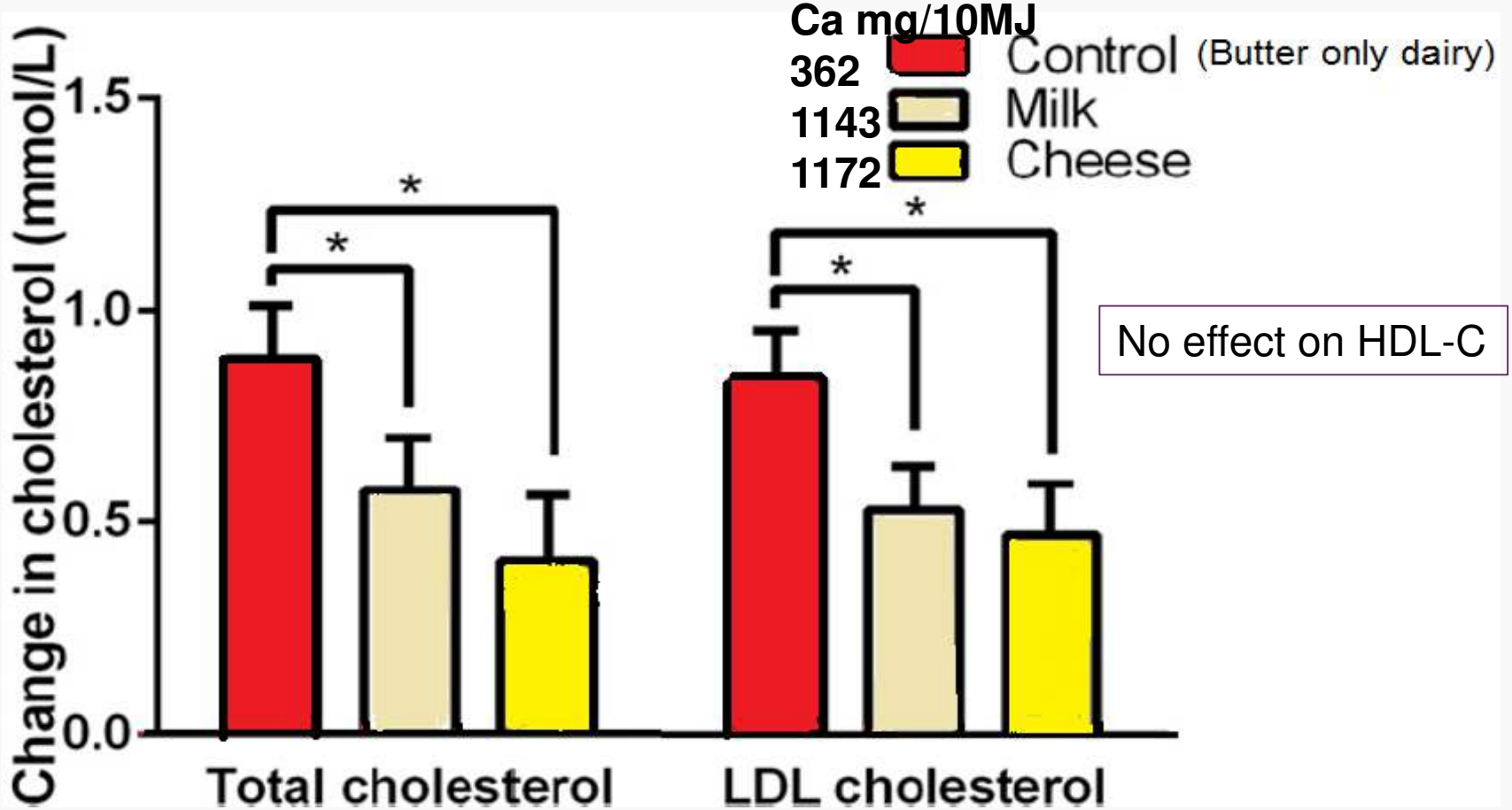
Soerensen et al., 2014



No effect on HDL-C

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

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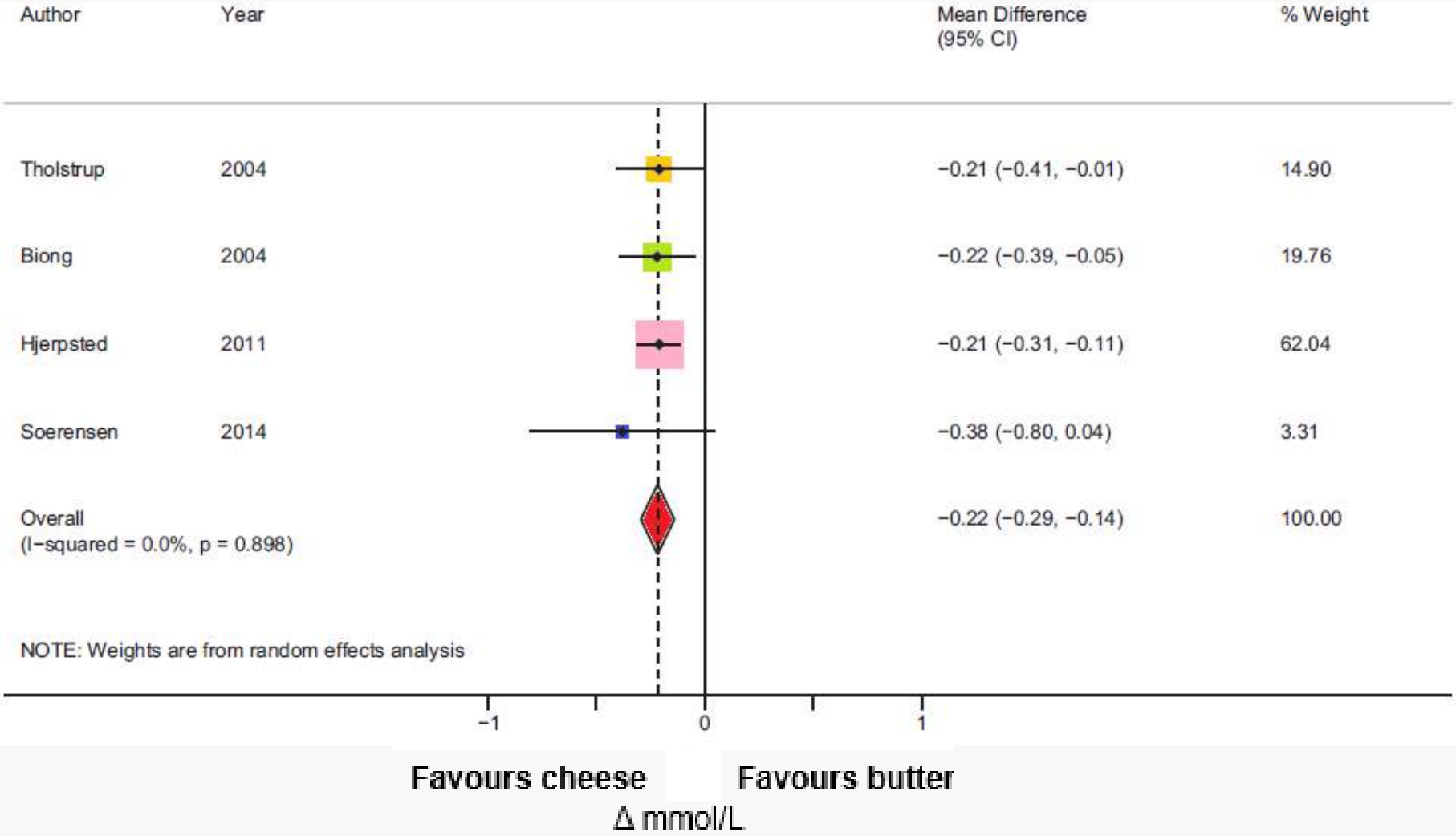
De Goede et al., 2015



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

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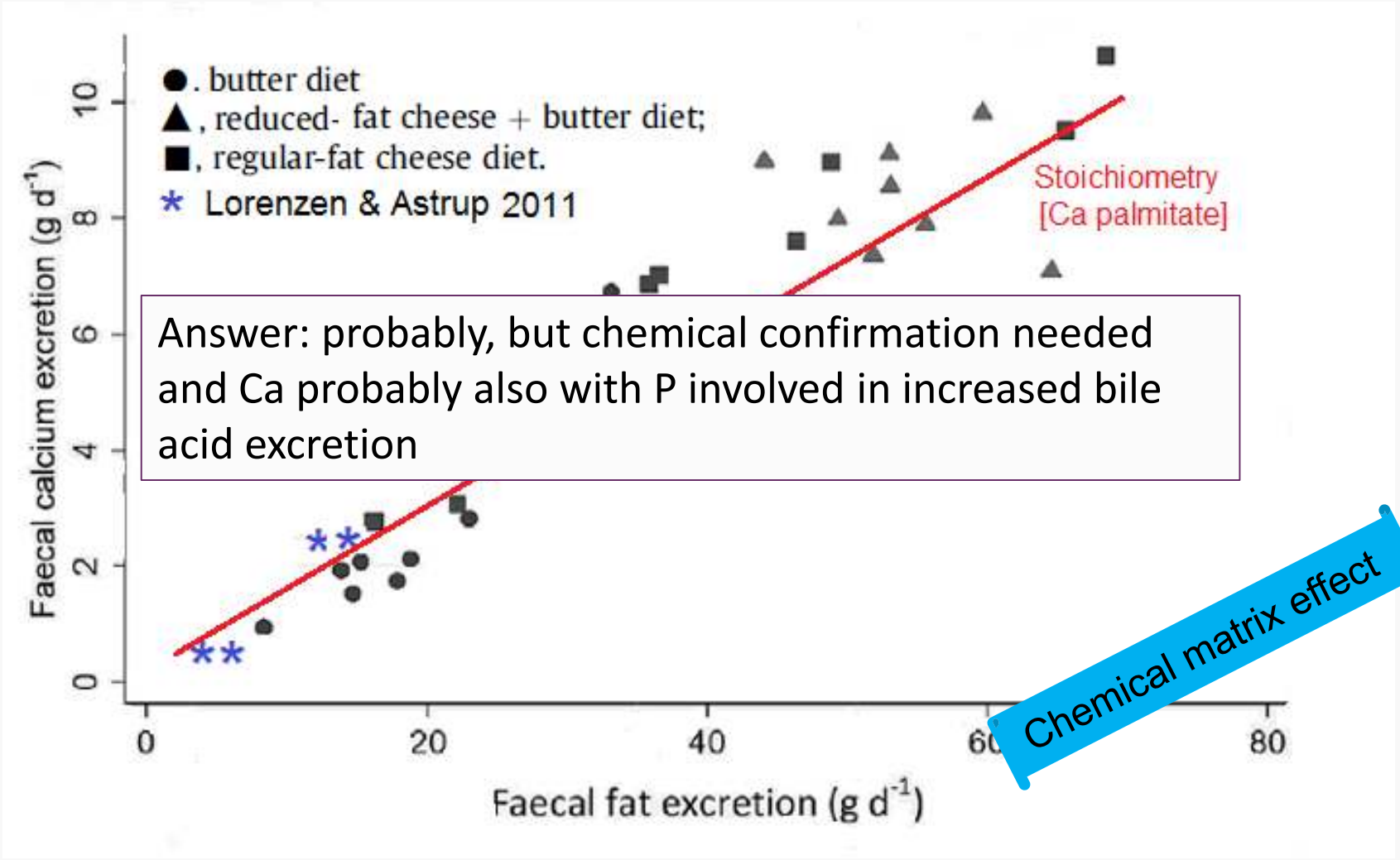
Thorning et al. 2016 (pigs)



Answer: probably, but chemical confirmation needed and Ca probably also with P involved in increased bile acid excretion

Chemical matrix effect

Effect of reduced bile acid enterohepatic recycling on plasma cholesterol

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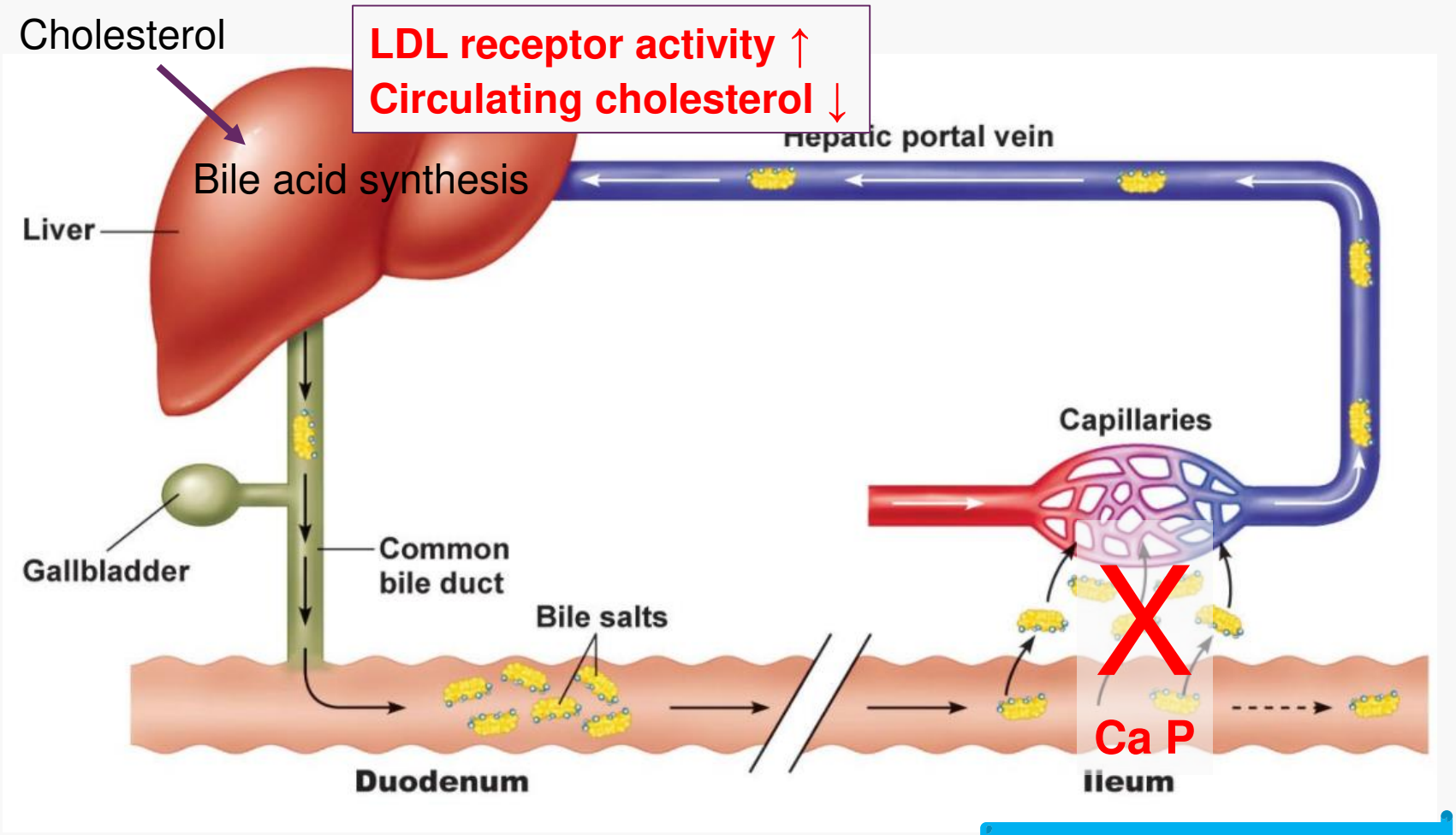

Chemical matrix effect

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

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

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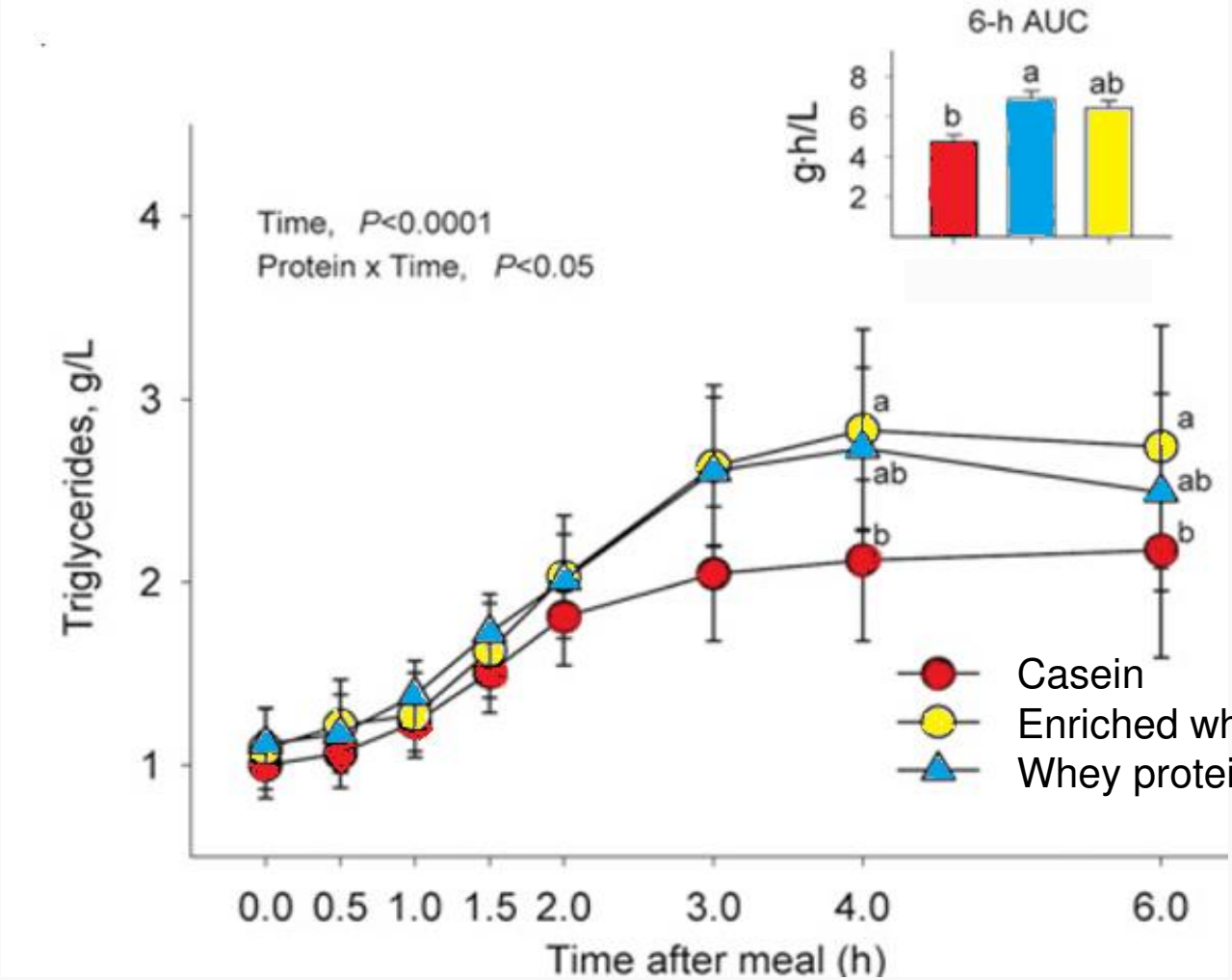
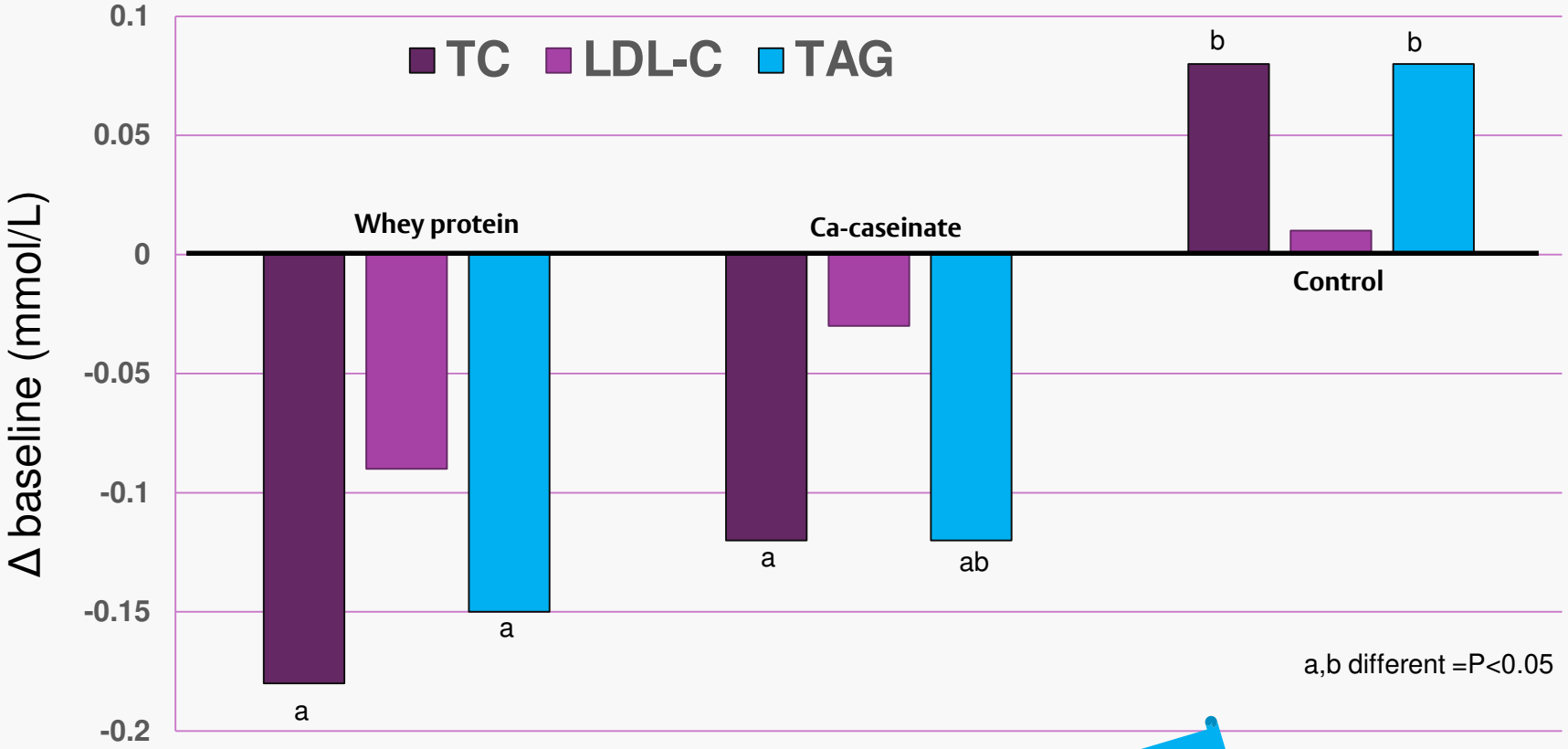
Mariotti et al. (2015)



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 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…..

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EMF
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Thank you