Cardio-metabolic health: what's the role of dairy?

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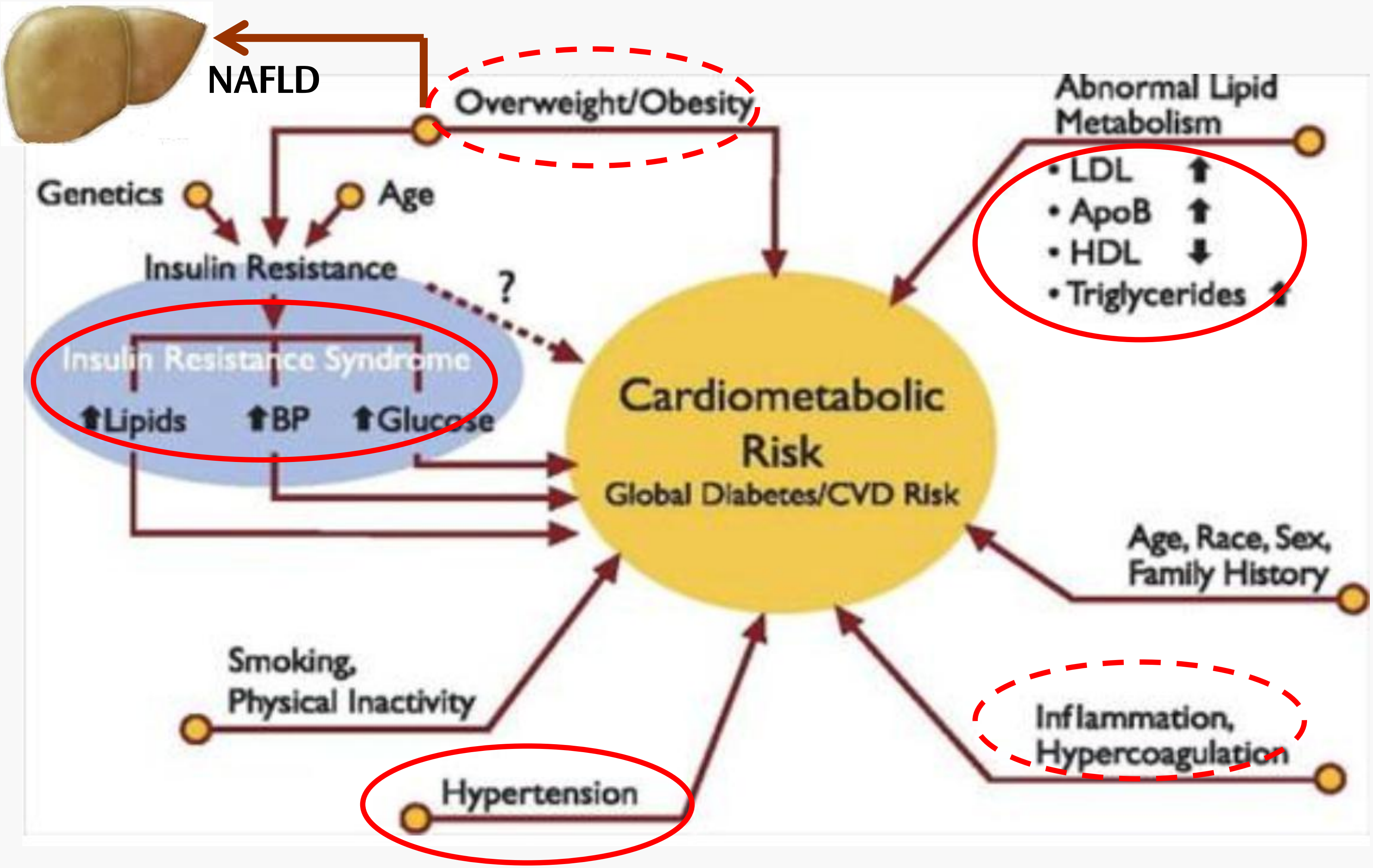
Cardio-**metabolic syndrome**

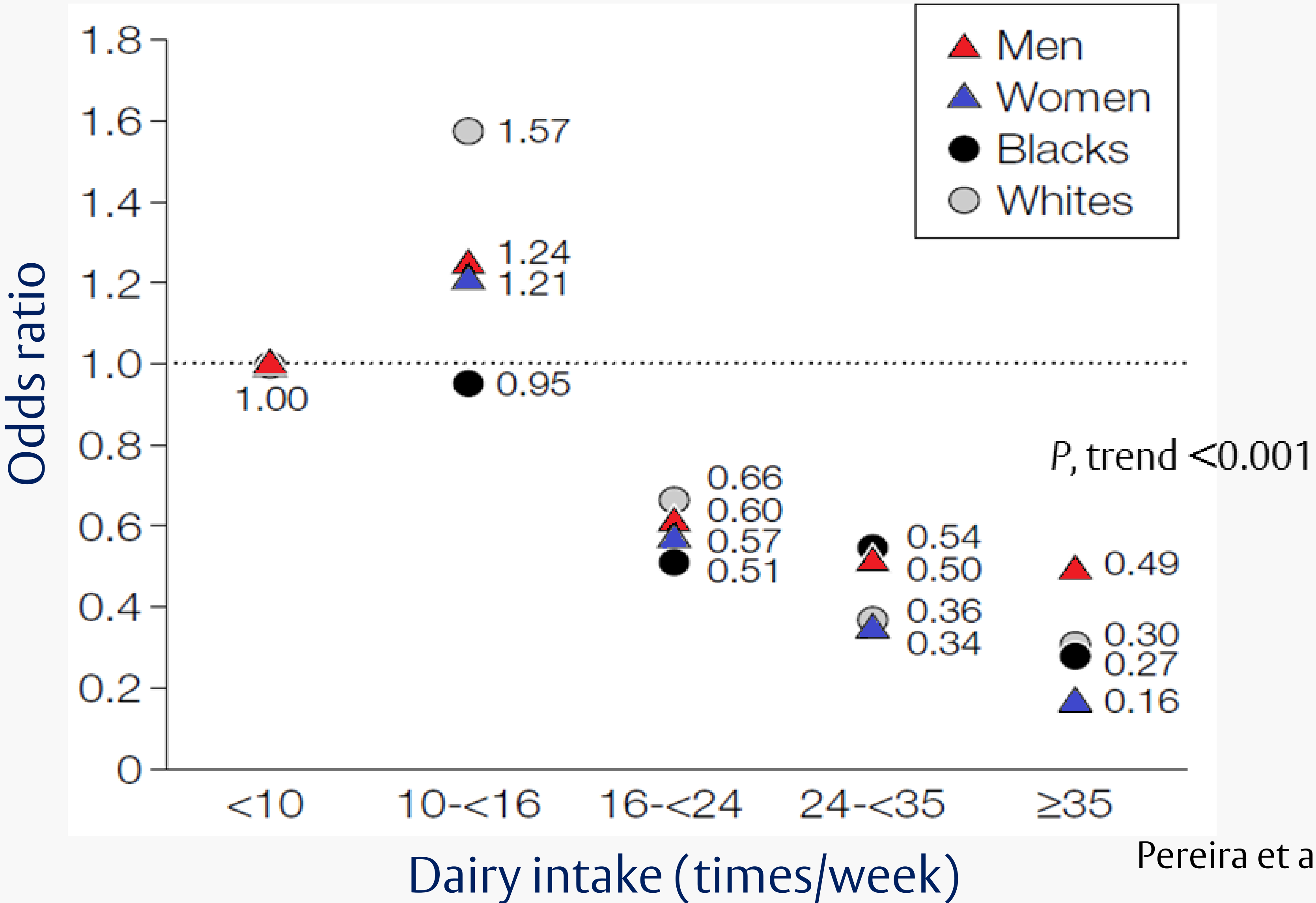


Association between milk consumption and MetS at baseline in the Caerphilly cohort

Milk consumption	No. of men	No. of men with the syndrome	Relative Odds for the metabolic syndrome (adjusted for age energy, social class and smoking)
Men with a FFQ:			
Little or none	139	30	1.00
<284ml	984	177	0.71
284-568ml	868	122	0.56
568ml+	140	13	0.38 *(0.18 to 0.78)*
Significance of trend			*P = 0.002*
Men with a WDI:			
Lowest 1/4	150	25	1.00
Next 1/4	152	30	1.04
Next 1/4	150	22	0.76
Highest 1/4	151	12	0.43 *(0.20 to 0.95)*
Significance of trend			*P = 0.026*

Elwood et al., 2007

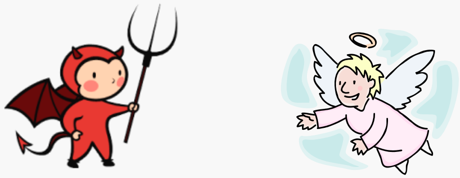
Association of dairy intake and MetS over 10 years in subjects overweight at baseline



Pereira et al., 2002

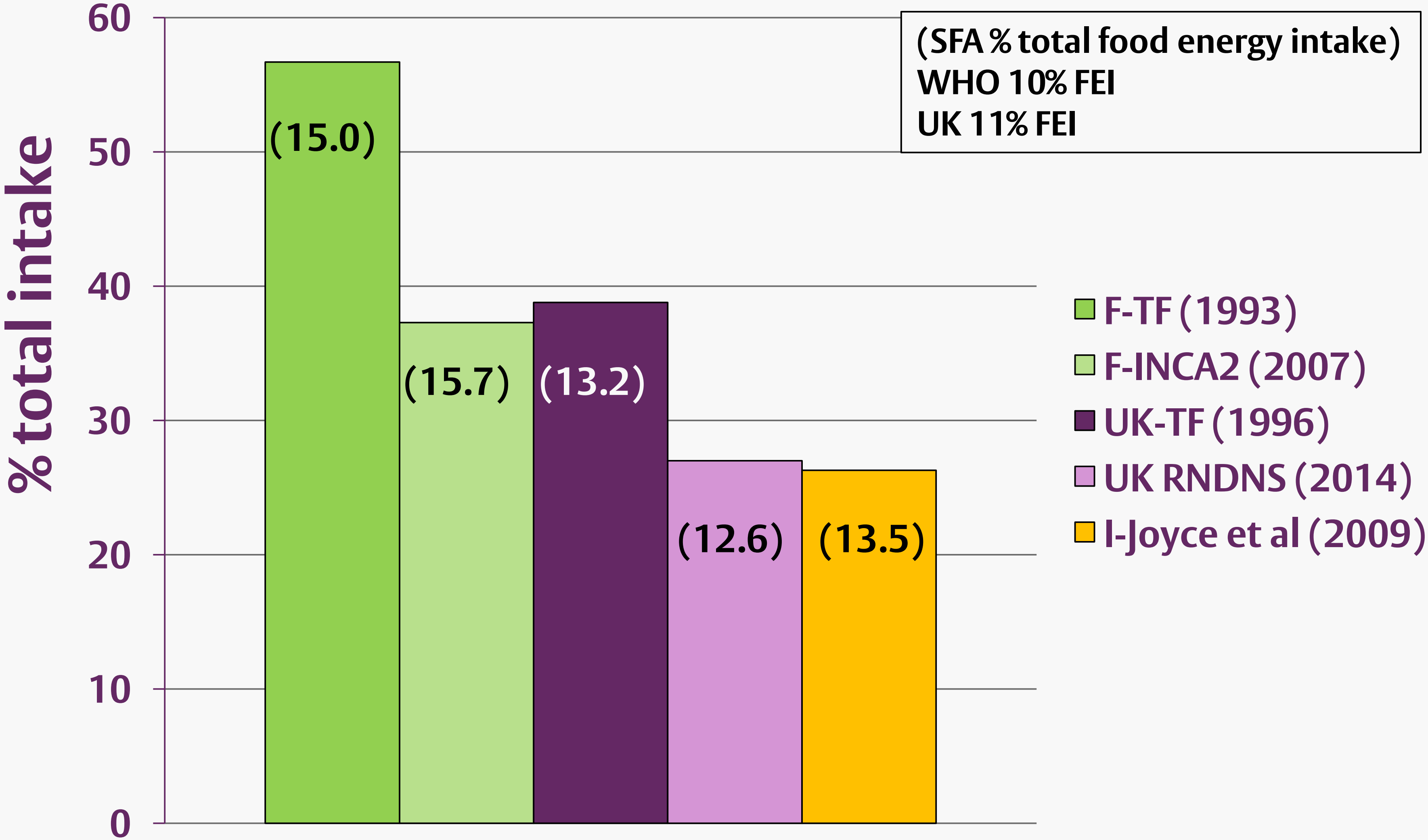
Overview

- Dairy and lipid risk factors for C-MD/CVD
- Dairy and effects on blood pressure
- Dairy and glucose homeostasis
- Using both prospective and RCT evidence
- Future foods
- Conclusions

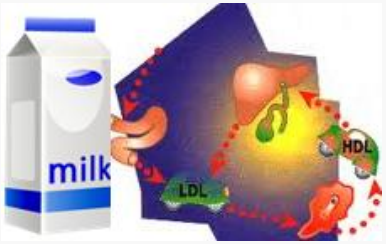


Dairy and lipid risk factors for C-MD/CVD

Contribution of milk/milk products to saturated fatty acid intake in France, UK & Ireland



Total cholesterol in lowest and highest milk drinkers

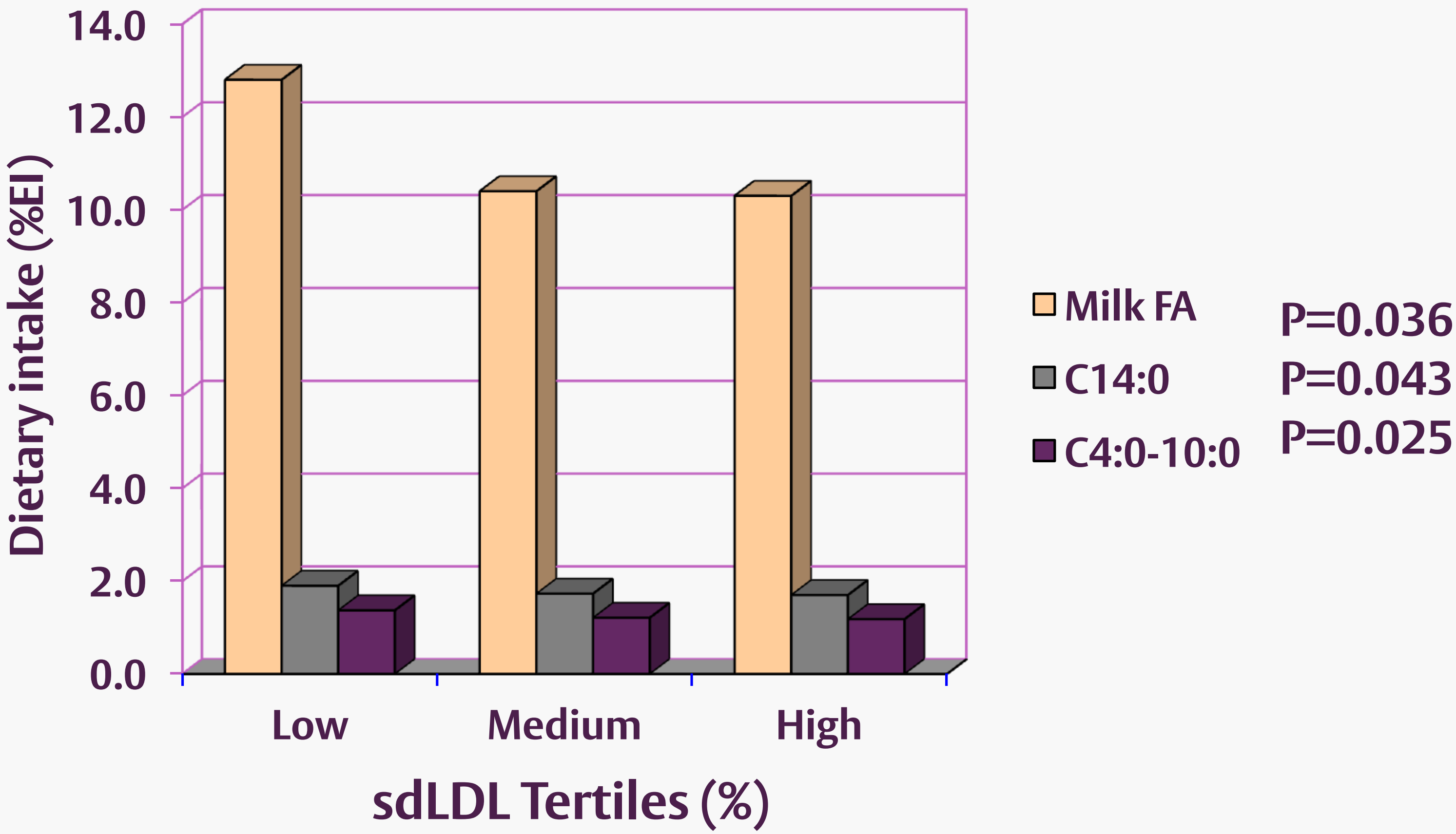


A few sample papers:

	Lowest consumers	Highest consumers		
Abbott et al. (1996)	5.60	5.70	mmol/L	***+ 8% of SD***
Ness et al. (2001)	5.87	5.90		***+10% of SD***
Nagaya et al. (1996)	5.20	5.28		***+ 6% of SD***
Caerphilly	6.05	6.14		***+ 7% of SD***

….but this may mask a more complex picture……

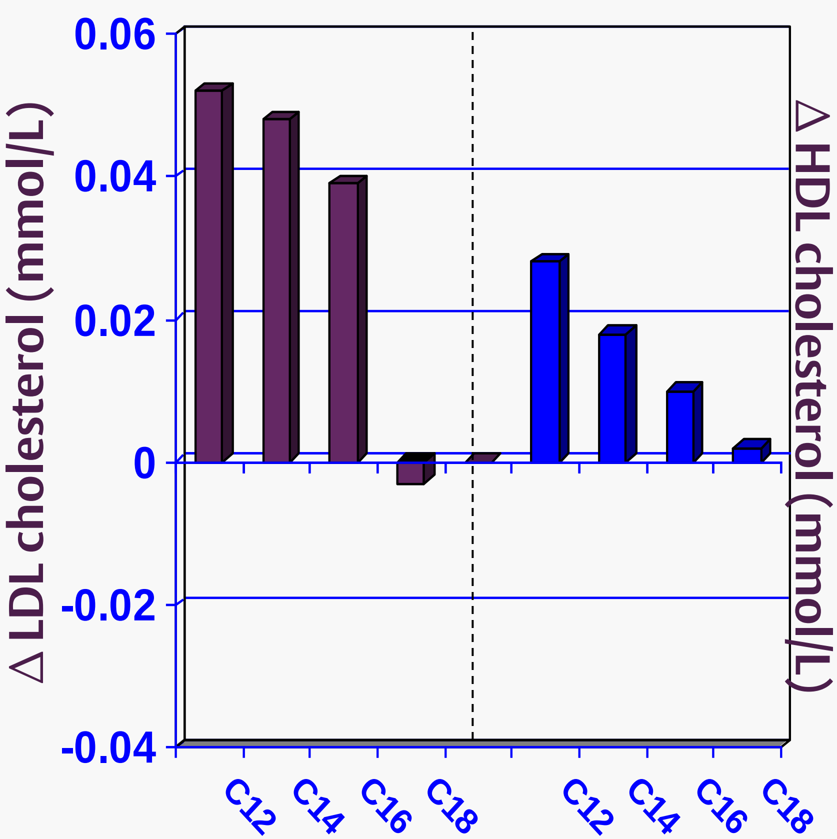
Increased intake of dairy FAs reduces proportion of small dense LDL (SG >1.04)



(Sjogren *et al.*, 2004)

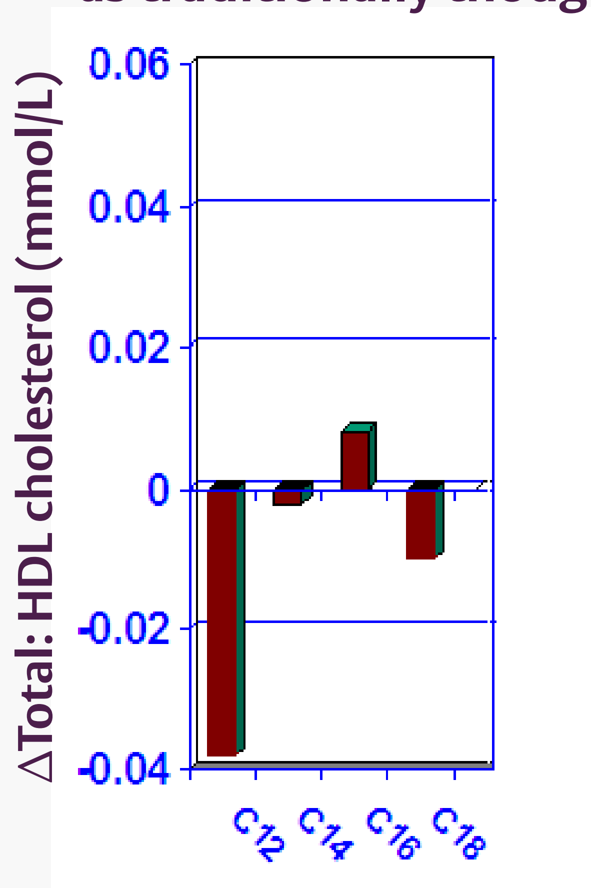
… which cholesterol?

Mensink et al. (2003)



Saturated fatty acid

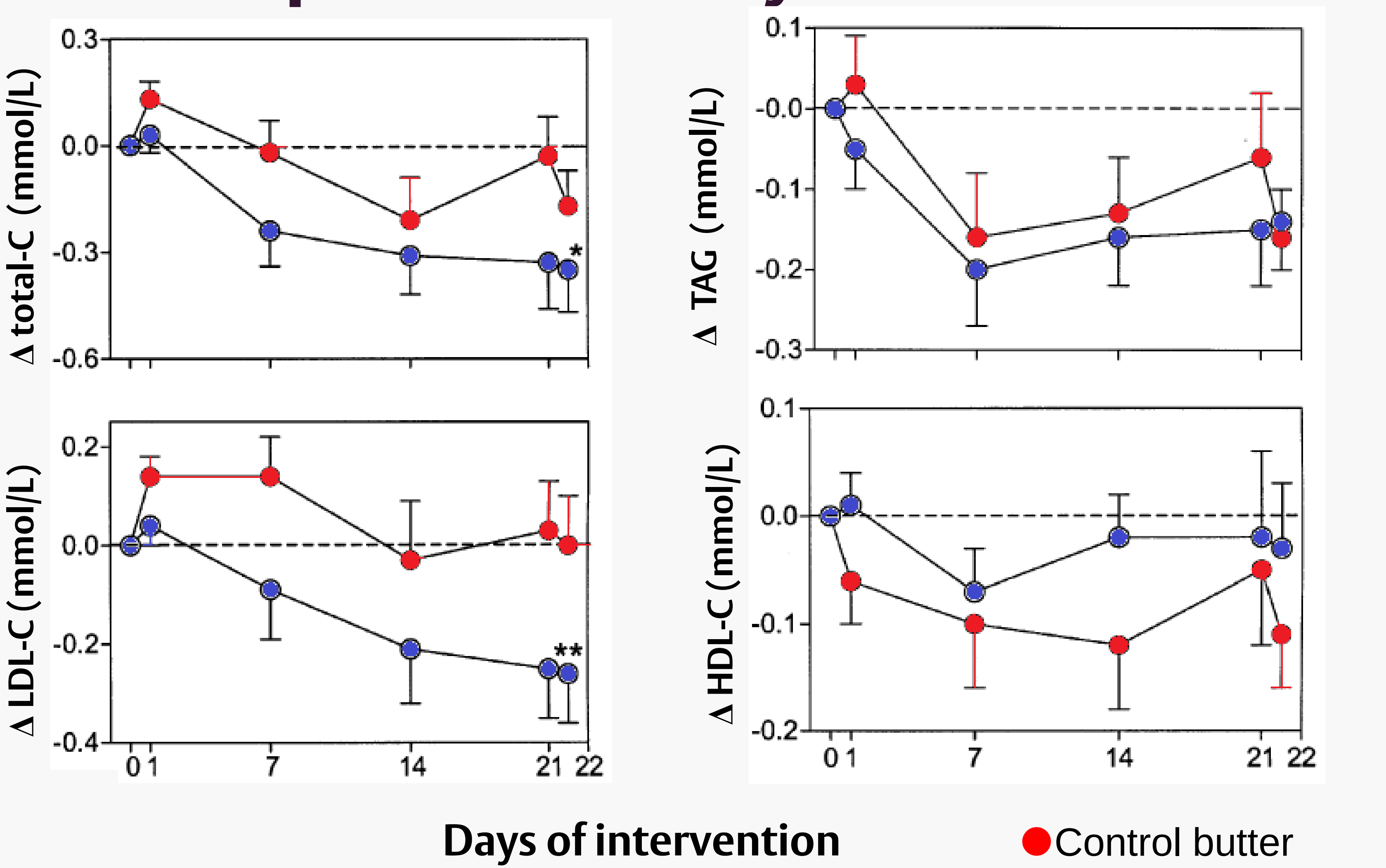
So does SFA profile of milk fat represent as great a risk as traditionally thought?



Saturated fatty acid

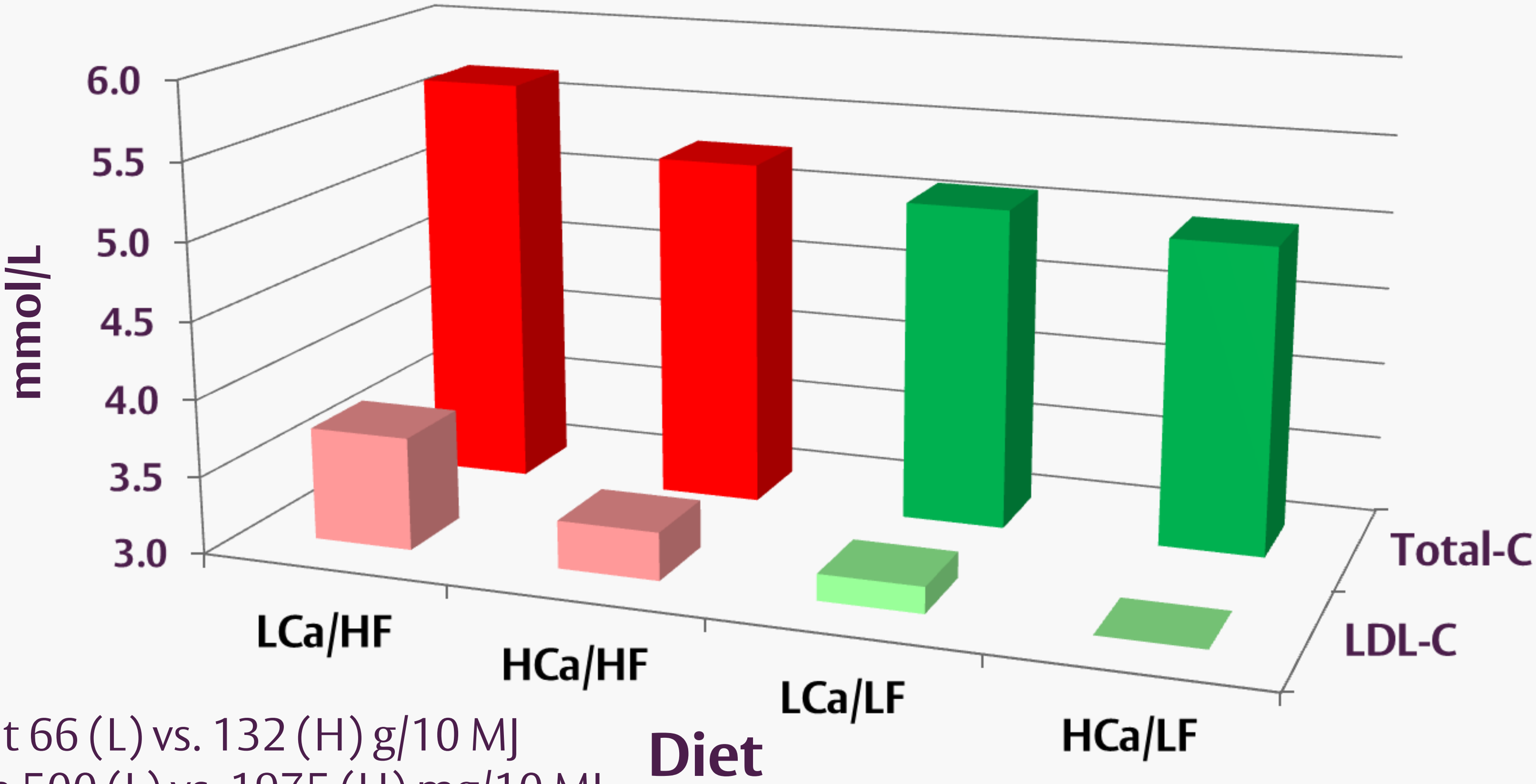
Effect of butter intervention on blood lipids in healthy men

Poppitt et al., 2002



* P<0.05 control vs. SFA reduced

Dairy calcium intake modifies responsiveness of blood lipids to a high-fat diet



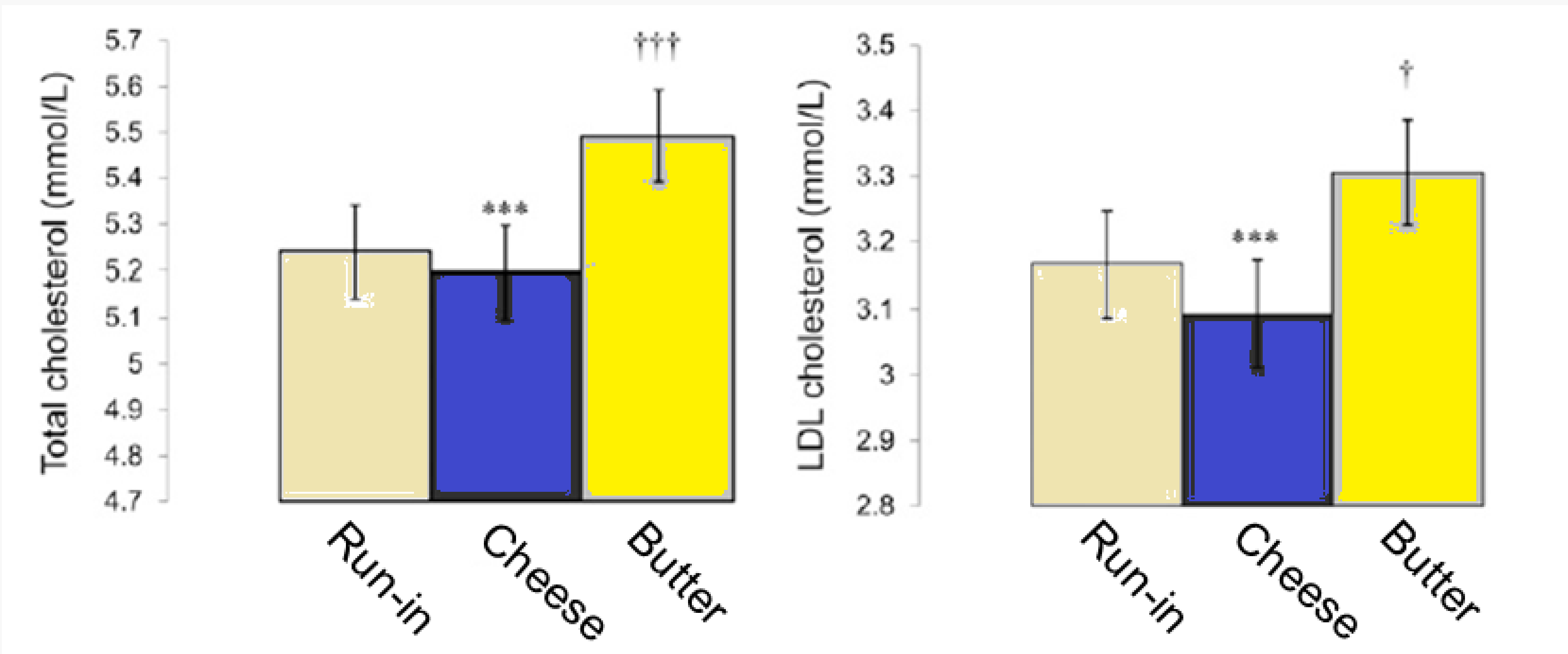
Fat 66 (L) vs. 132 (H) g/10 MJ
Ca 500 (L) vs. 1975 (H) mg/10 MJ

P fat and Ca <0.01

Lorenzen and Astrup (2011)

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

Cheese vs butter ***$P < 0.0001$. †,†††Significantly different from run-in period: †$P < 0.05$, †††$P < 0.0005$.



Hjerpsted et al. Am J Clin Nutr 2011;94:1479–84.

Meta-analysis of prospective studies for milk/dairy and IHD

Lipids (2010) 45:925–939
DOI 10.1007/s11745-010-3412-5

ORIGINAL ARTICLE

The Consumption of Milk and Dairy Foods and the Incidence of Vascular Disease and Diabetes: An Overview of the Evidence

Peter C. Elwood · Janet E. Pickering · D. Ian Givens · John E. Gallacher

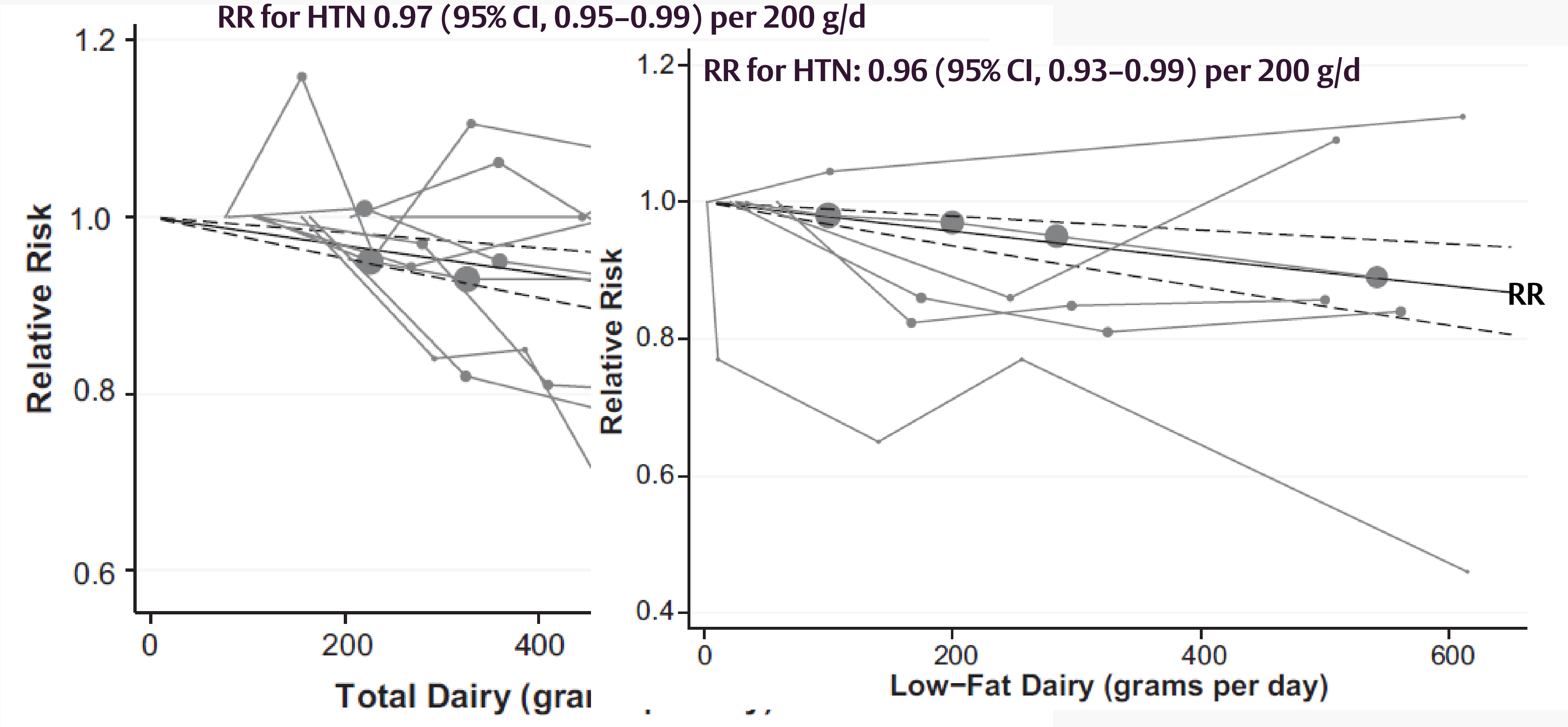
4.3M person years; 16,212 IHD events: heterogeneity between studies $P = 0.570$

Meta-analysis: risk of a heart disease event in the subjects with the highest milk/dairy intake 0.92 (0.80–0.99)

Dairy products and hypertension

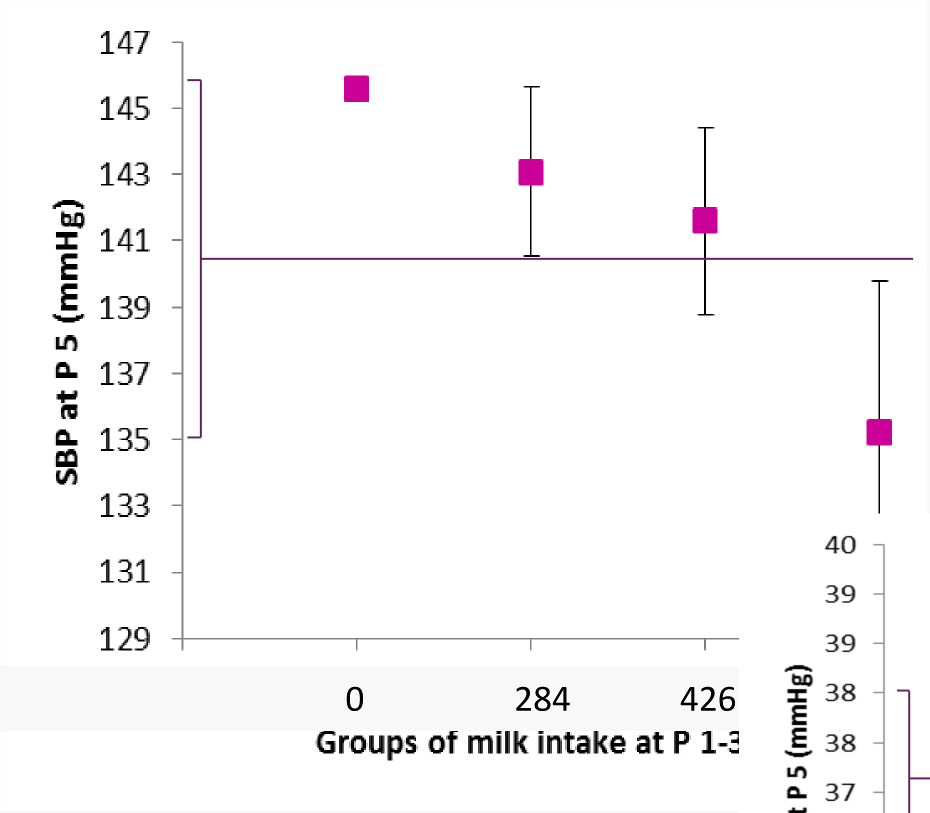
Meta-analysis of prospective studies: Dairy consumption and hypertension

Soedamah-Muthu et al., 2012

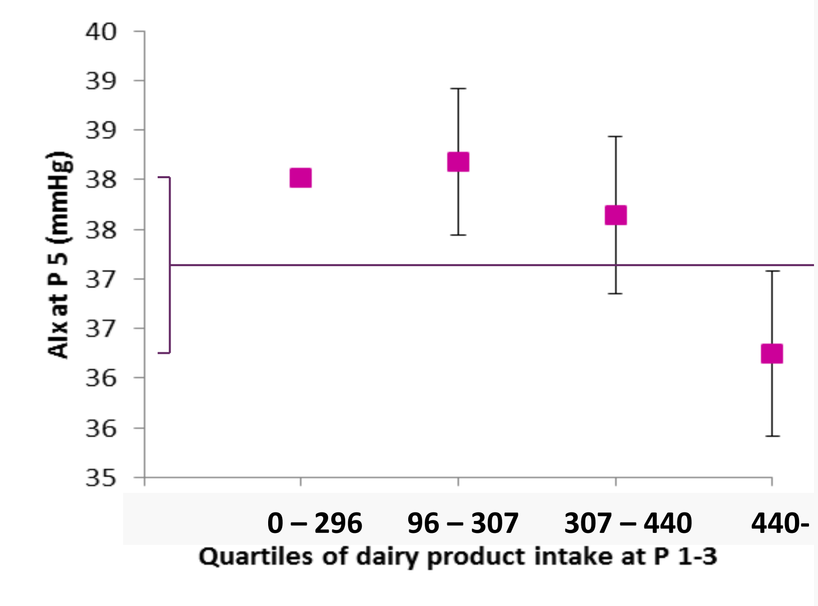


Dairy intake, systolic blood pressure and augmentation index

Livingstone et al., 2013



10.4 mmHg lower



1.8 % lower

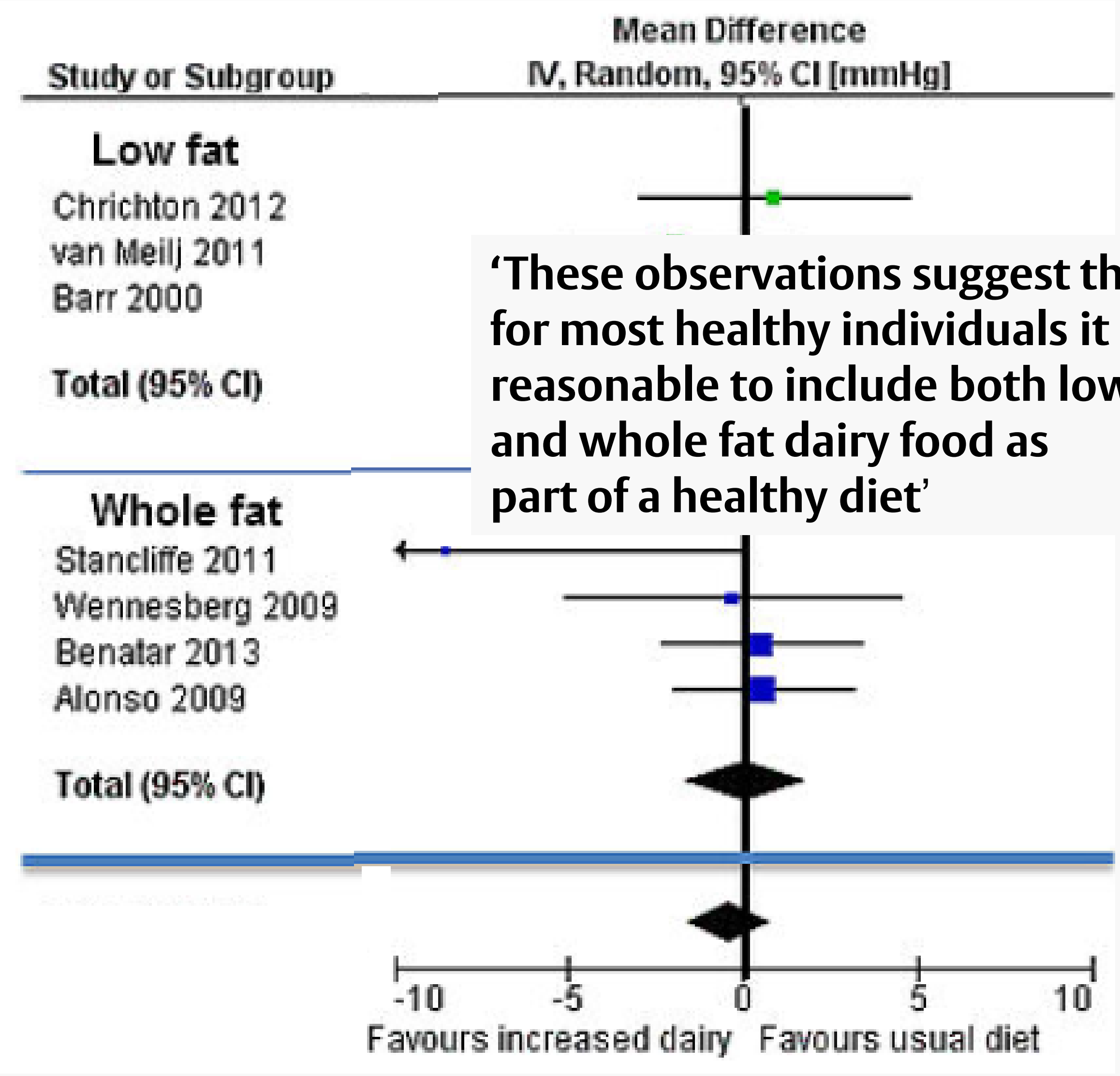
BARHAM BENEVOLANT FOUNDATION

Effect of whole vs. low fat dairy foods on SBP (m-a RCTs)

Benatar et al., 2013

Less 1% fat, inc. low fat milk

Full fat milk, cheese, butter, cream and ice cream



'These observations suggest that for most healthy individuals it is reasonable to include both low and whole fat dairy food as part of a healthy diet'

Meta-analysis of prospective studies for milk/dairy and stroke

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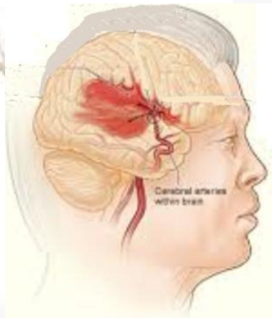
The Consumption of Milk and Dairy Foods and the Incidence of Vascular Disease and Diabetes: An Overview of the Evidence

Peter C. Elwood · Janet E. Pickering · D. Ian Givens · John E. Gallacher

8.4M person years; 9,725 strokes: heterogeneity between studies $P < 0.000$

Meta-analysis: risk of a stroke in the subjects with the highest milk/dairy intake, 0.79 (0.68–0.91)



Dairy products and glucose homeostasis/IR/T2DM

Meta-analysis of prospective studies for milk/dairy and diabetes

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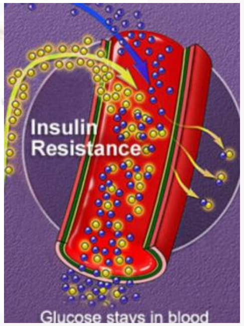
Peter C. Elwood · Janet E. Pickering · D. Ian Givens · John E. Gallacher

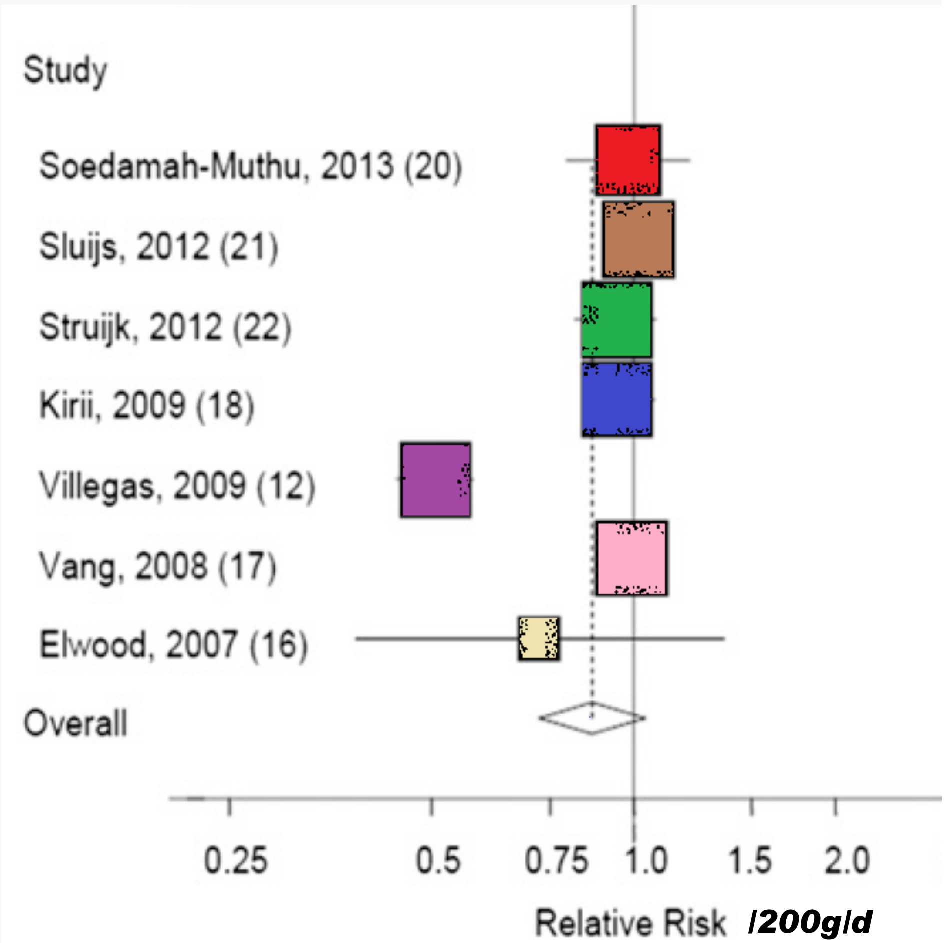
1.7M person years: 7,121 new diabetic patients: heterogeneity between studies $P = 0.122$

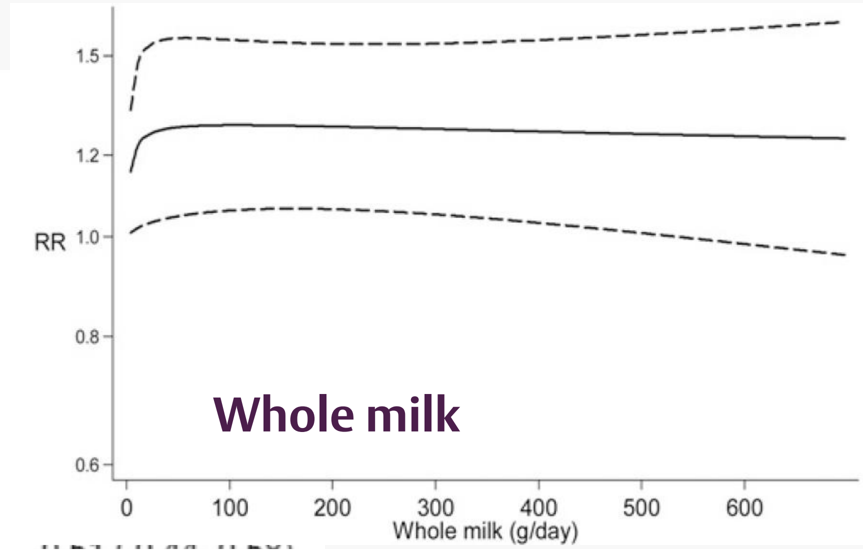
Meta-analysis (fixed effects) RR (95% CI) for highest intake groups: 0.85 (0.75–0.96)

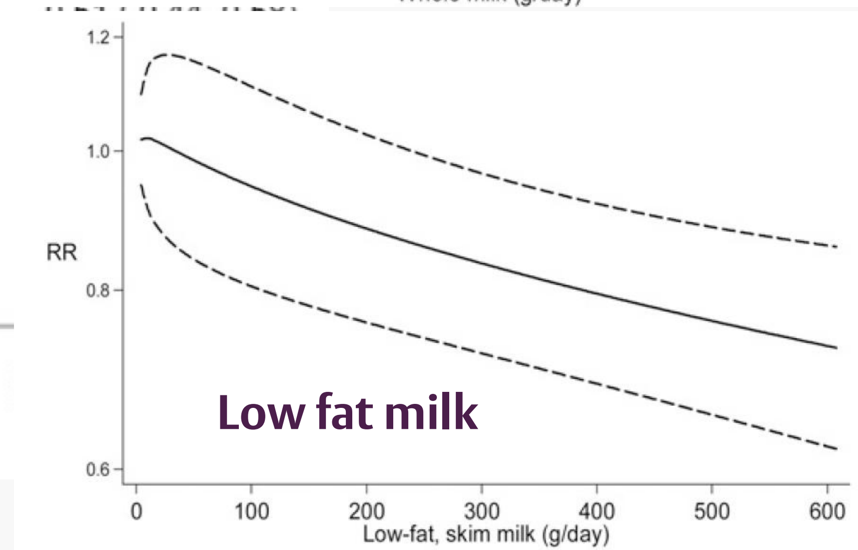


Milk and T2DM: Meta-analysis of cohort studies

Aune et al., 2013

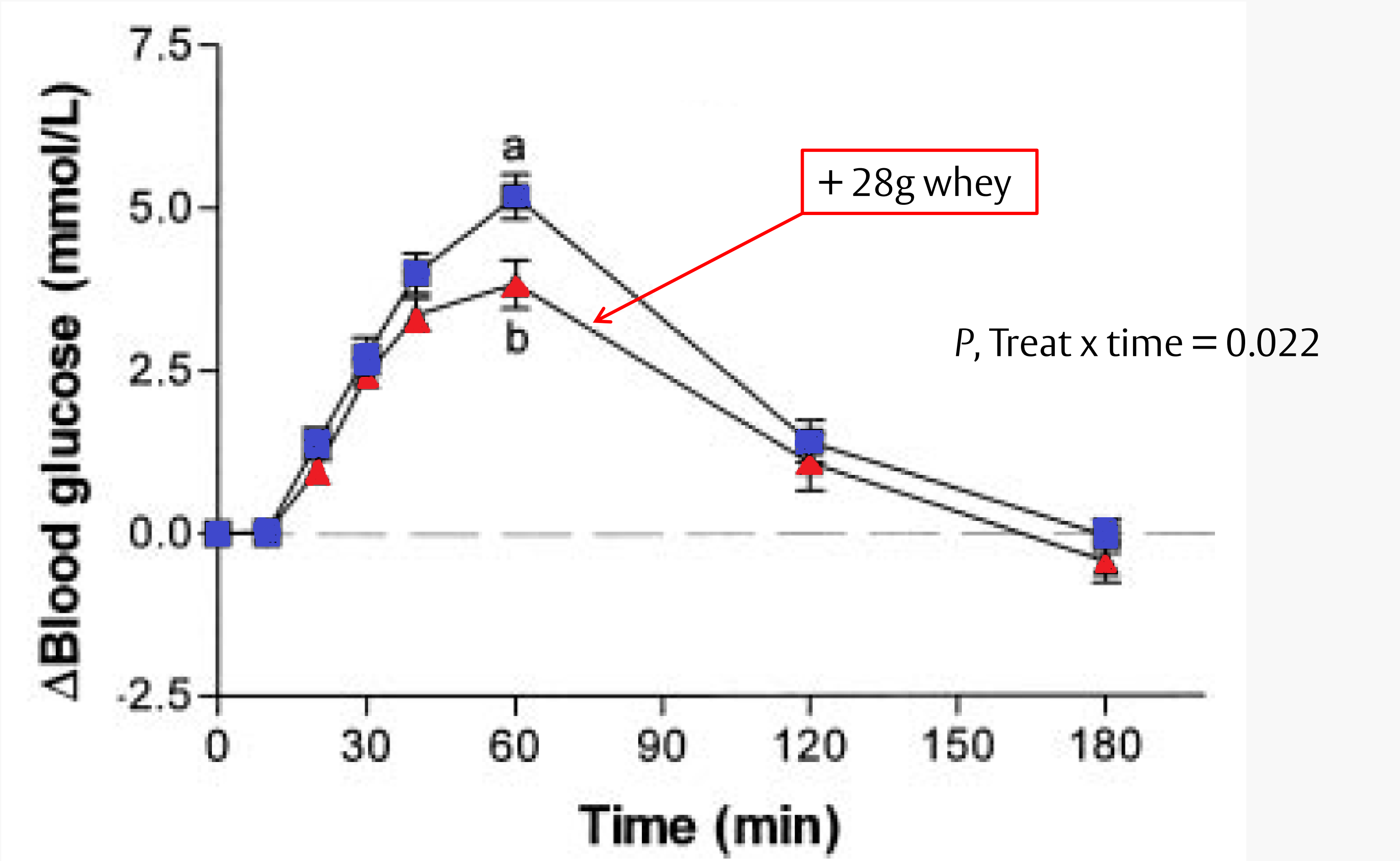






Effect of CHO rich meal +/- whey protein on blood glucose change in T2DM subjects

Frid et al., 2005



12 month randomized, crossover trial with 23 healthy subjects on low or high dairy supplements: effect on insulin sensitivity

Rideout et al., 2013

Variable	Endpoint LD	Endpoint HD	%change LD-HD
Glucose (mmol/L)	5.2	5.2	0
Insulin (µU/L)	16.2	14.8*	-9.0†
HOMA-IR	3.8	3.4*	-11.0†

*Relative to endpoint LD
†Relative to LD %change

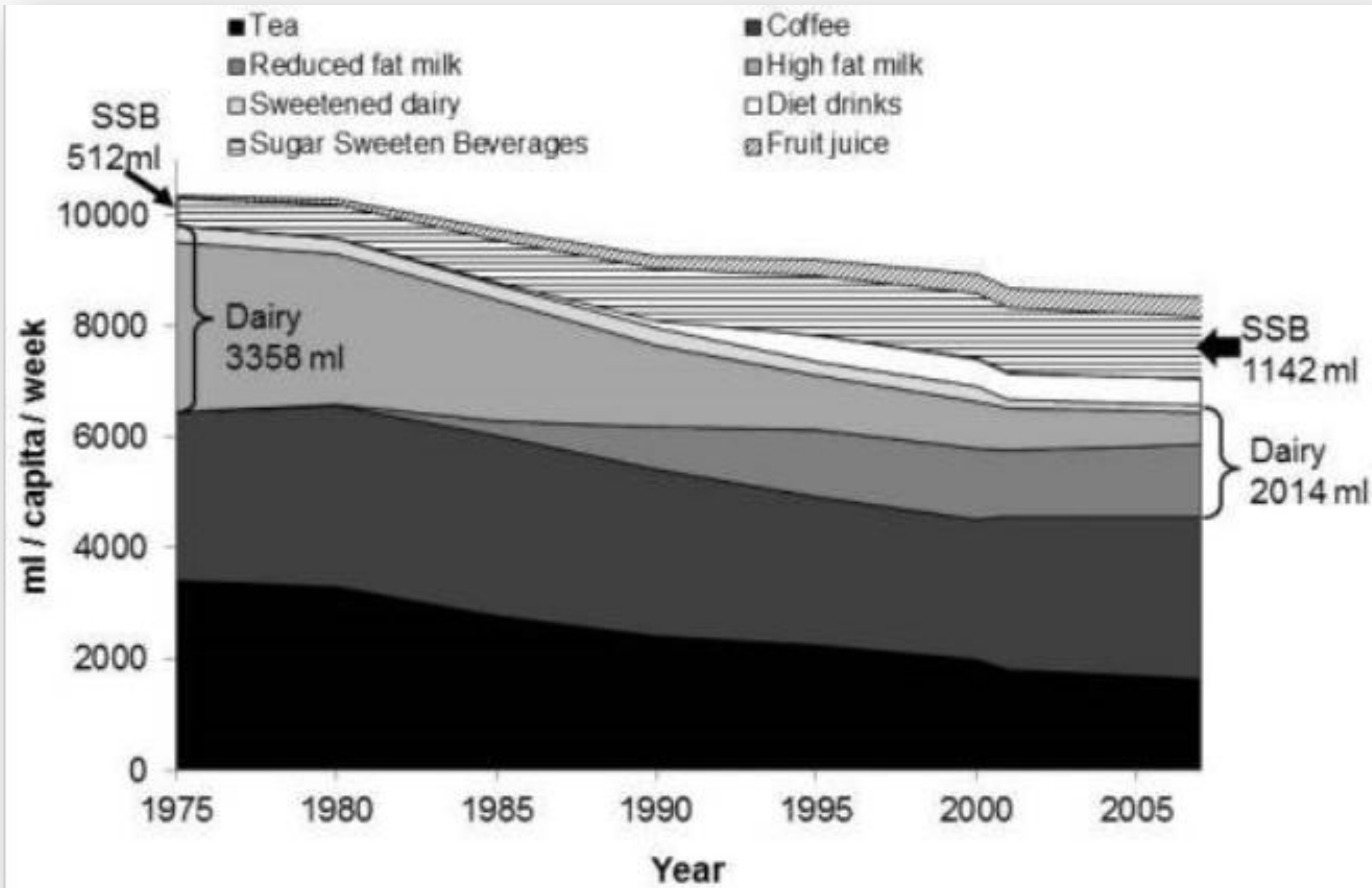
Hazard ratio for type 2 diabetes according to plasma PL *t*-palmitoleic acid

	Quintiles of trans-palmitoleic acid in plasma PL				
	1	2	3	4	5
Subjects	592	317	343	546	495
Person-years	2794	1492	1645	2575	2370
No cases	54	26	27	64	34
HR*	**1.0**	**0.77**	**0.66**	**0.89**	**0.52**

* **P for trend 0.02**

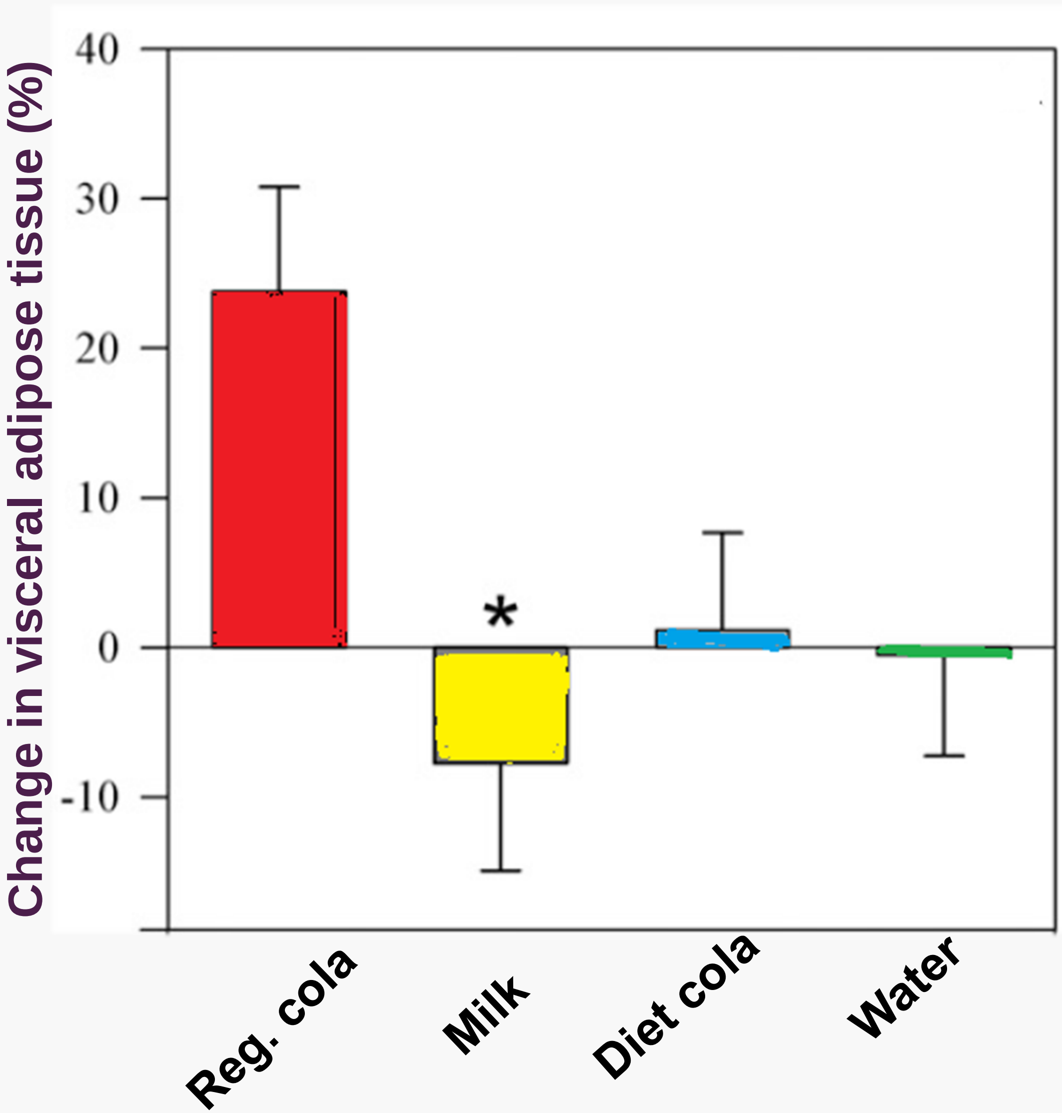
Mozaffarian et al., 2013

UK Beverage Groups Trends
(ml purchased/person/wk), 1975–2007



UK household expenditures and consumption from the 1975-2000 Family Expenditures Survey and the 2001-7 Expenditure and Food Survey

Sucrose-sweetened beverages increase fat storage in the liver, muscle, and visceral fat



Forty-seven subjects drank 1 L of 1 of 4 test drinks daily for 6 months

Maersk et al., 2011

Future Foods

New Nordic Diet

Saxe, 2014

Product categories	ADD	NND
	$kg \cdot person^{-1} \cdot y^{-1}$ (% imported)	$kg \cdot person^{-1} \cdot y^{-1}$ (% imported)
Berries (g)	9.8 (64)	147.4 (0)
Butter (j)	1.9 (43)	0.0 (0)
Cabbage (f)	7.6 (47)	12.9 (0)
Candy, sweets, etc (k)	22.3 (59)	0.0 (0)
Cheese (b)	13.5 (27)	11.3 (0)
Coffee, tea, cocoa (i)	14.6 (99)	14.6 (99)
Convenience (k)	10.4 (61)	0.0 (0)
Dairy products (b)	129.4 (1)	130.7 (0)
Fish and seafood (c)	11.7 (54)	27.9 (0)
Fruit, excluding berries (g)	242.3 (65)	345.3 (0)
Herbs and spices (f)	2.2 (37)	5.5 (0)
Jam (k)	3.8 (5)	0.0 (0)
Juice (h)	45.5 (5)	45.5 (0)
Legumes (f)	3.6 (42)	15.2 (0)
Meat, total (a)	70.8 (39)	46.0 (0)
Chicken	29.4 (27)	21.3 (0)
Beef	28.7 (55)	8.8 (0)
Lamb	1.1 (95)	7.8 (0)
Venison	0.5 (0)	4.2 (0)
Mushrooms, lettuce (f)	20.5 (47)	24.9 (0)
Nuts (f)	1.6 (94)	13.3 (0)
Oils, excluding rape seed oil (j)	9.6 (16)	0.0 (0)
Oils of rape seed (j)	0.1 (74)	8.3 (0)
Pasta, industrial (k)	10.2 (62)	0.0 (0)
Potatoes (f)	56.2 (16)	83.6 (0)
Roots, excluding potatoes (f)	19.0 (49)	89.2 (0)
Rice (f)	6.7 (100)	0.0 (0)
Soft drinks (k)	160.6 (7)	0.0 (0)
Sugar (k)	4.3 (9)	4.3 (0)
Vegetables, other (f)	79.8 (51)	91.3 (0)
Wheat, processed products (k)	38.8 (9)	0.0 (0)
Whole-grain products (e)	35.9 (9)	74.8 (0)
Wine, beer, alcohol (d)	128.2 (48)	107.2 (0)
Other ingredients (k)	1.8 (28)	1.9 (0)
Total mass (kg)	1170 (35)	1313 (1)

NDD gives:
-35% GWP
-30% S-E costs

Overall conclusions

- Dairy foods should not be judged only on plasma lipids/SFA content
- Use of single risk markers may be misleading; need valid, holistic risk markers
- Judgements need to be at food level taking into account all aspects e.g. food matrix, nutrient density, key nutrient supply etc.
- **Current evidence strongly indicates a beneficial effect of dairy consumption and risk of C-MD/CVD/T2DM**
- There remains few RCTs on dairy and C-MD/CVD/T2DM
- There remains uncertainty about:
  - ➢ The mechanisms involved in risk reduction
  - ➢ Relative effects of individual foods (e.g. cheese vs. yoghurt)
  - ➢ High vs. low fat dairy products (definition and effects)
  - ➢ The effect of dietary pattern vs. individual foods?


THANK YOU