EAAP 2010 Session 39

Food Chain and Health Research

FEED for HEALTH

cost
EUROPEAN COOPERATION
IN SCIENCE AND TECHNOLOGY

University of Reading

Milk in the Diet, Good or Bad for Health?

d.i.givens@reading.ac.uk

Professor Ian Givens, *University of Reading*

with

Professor Peter Elwood, *Cardiff University Hospital*

with Janet Pickering and Dr John Gallacher

© University of Reading 2008

University of Reading

Ban butter to save thousands of lives, says heart surgeon

By SEAN POULTER
Last updated at 8:19 AM on 19th January 2010

Comments (362) | Add to My Stories

Butter should be banned to protect the nation's health, according to a leading heart surgeon.

Shyam Kolvekar says only radical action can save growing numbers of young adults from heart attacks and clogged arteries.

Warning of the dangers of other foods high in saturated fat, he advises people to eat less red meat, take low-fat milk and switch to olive and sunflower oil.

Saturated fat is blamed for a third of the 200,000 premature deaths from heart disease a year.

Adults are eating an average of 800 grams of it a month - 20 per cent more than the recommended limit. Hitting the recommended level could save 3,500 lives a year.

Overview

- Do milk/dairy foods increase or reduce chronic (mainly vascular) disease risk?
- What type of evidence should we believe?
- Milk vs. low fat milk vs. butter/cheese?
- Can we improve these foods?
- Conclusions

What are we trying to do?

University of Reading

What evidence should we believe?

University of Reading

Sources of evidence

I. Associations with risk-factors for disease

II. Retrospective case-control studies based on patients

III. Prospective cohort studies with disease incidence as outcomes

IV. Randomised controlled trials

and, for each source,
a meta-analysis of all the available studies

BASED ON: the US agency for Health Care Policy and Research (AHCPR 1992)
and the Centre for Health Economics, University of York UK

University of Reading

I. Associations with risk-factors for disease

Effects of milk on biological mechanisms:

Cholesterol level in lowest and highest milk drinkers:

A few sample papers:

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 milk is a complex food with many nutrients and bioactive compounds.....

University of Reading

I. Associations with risk-factors for disease

Milk and blood pressure

Again, a few sample papers:

Study	Population	BP in subjects with highest milk intakes
Ackley et al 1983	5,050	- ***6.3% of SD***
Jorde & Bonas 2000	7,735	- ***5.5% of SD***
Shaper et al 1991	1,340	- ***8.3% of SD***
Vivjer et al 1992	1,265	-***10.0% of SD***
Ness et al 2001	5,765	- ***5.5% of SD***
Abbott et al 1996	3,150	- ***6.3% of SD***
Iso et al 1999	34,486	- ***7.5% of SD***
Elwood et al 2004	2,512	- ***10.0% of SD***
Djousse 2006	4,797	- ***6.4% of SD***
PREDIMED study 2009	2,290	- ***10.5% of SD***

University of Reading

I. Associations with risk-factors for disease

DETERMINANTS

Milk drinki

...and what about other mechanisms?

RISK FACTORS

olesterol *(raised)*

Blood pressure *(lowered)*

? ?

DISEASE

University of Reading

A heirarchy of evidence

BASED ON: the US agency for Health Care Policy and Research (AHCPR 1992) and the Centre for Health Economics, University of York UK

I. Associations with risk-factors for disease

II. Retrospective case-control studies based on patients

III. Prospective cohort studies with disease incidence as outcomes

IV. Randomised controlled trials

and, for each source,
a meta-analysis of all the available studies

University of Reading

II. Retrospective case-control studies based on patients

Milk consumption in patients prior to

Study	Nu	
Gramenzi et al. (1990)		
T		
		0.99)
	(107 controls)	

Limitations:

- milk drinking may be associated (positively or negatively) with other health related behaviours
- differences in recall by patients and controls may introduce bias

University of Reading

A heirarchy of evidence

BASED ON: the US agency for Health Care Policy and Research (AHCPR 1992) and the Centre for Health Economics, University of York UK

I. Associations with risk-factors for disease

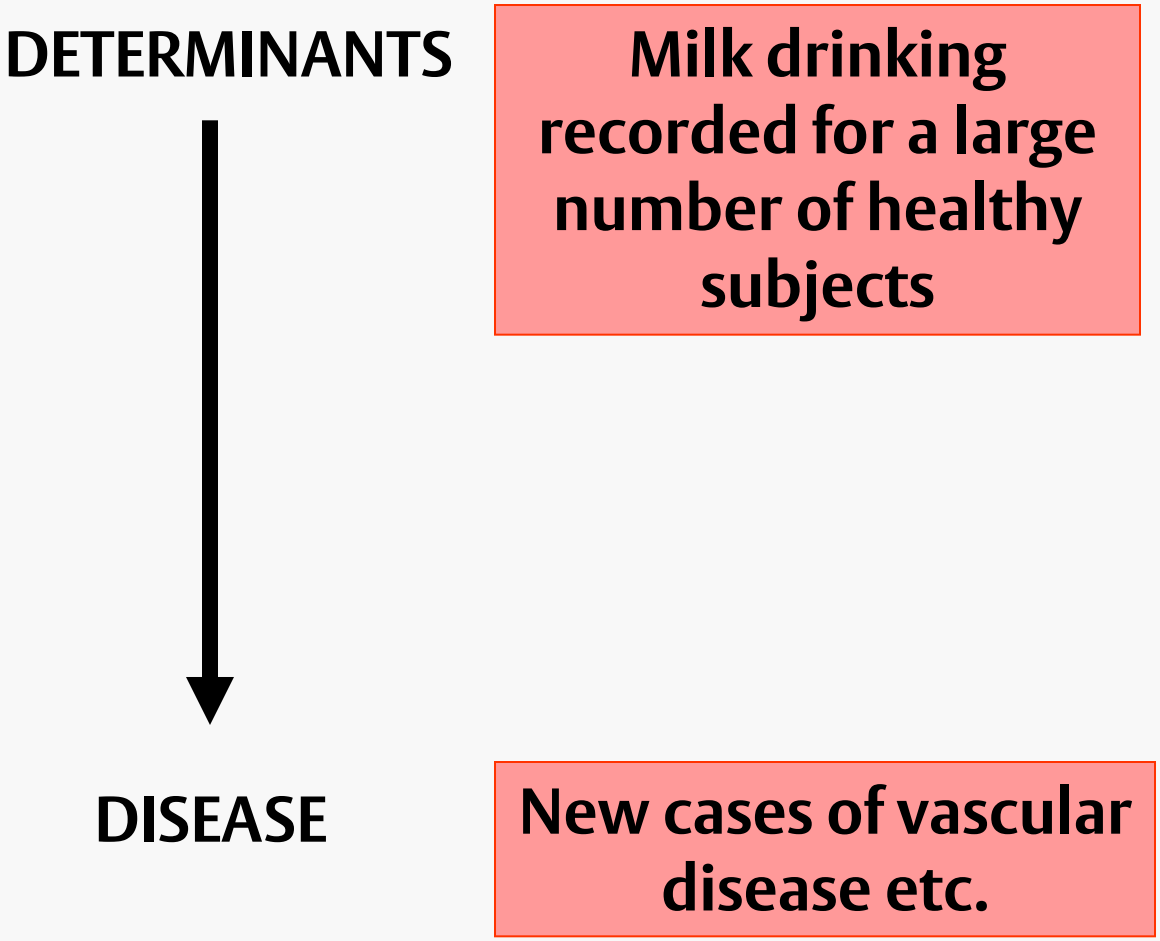
II. Retrospective case-control studies based on patients

III. Prospective cohort studies with disease incidence as outcomes

IV. Randomised controlled trials

and, for each source,
a meta-analysis of all the available studies

Dairy products and health



III. Prospective cohort studies with disease incidence as outcomes

STRATEGY

Healthy subjects questioned and dietary details etc. recorded. The subjects are then followed and new, incident disease events are related to the earlier diet.

'Overview'

The literature is searched for all relevant cohort studies, the results of these are examined for evidence of heterogeneity, and then all are combined in a meta-analysis to give an overall estimate of risk.

III. Prospective cohort studies with disease incidence as outcomes

University of Reading

Dairy foods and all-cause mortality

Study	No. of deaths	Adjusted RR
Kahn et al (1984)	6,075	0.98 (n.s.)
Van der Pols (2009)	1,468	0.77 (0.61, 0.98) 0.77 (0.61, 0.97)

Relative risk (95% CI) of death in the highest dairy intake subjects

(***the risk in the 20% of subjects with the highest dairy consumption compared with the risk in the 20% of subjects with the lowest intake***)

0.87 *(0.77, 0.98)*

Three studies with insufficient data for inclusion in a meta-analysis had to be omitted.

LIPIDS DOI 10.1007/s11745-010-3412-5

III. Prospective cohort studies with disease incidence as outcomes

University of Reading

Dairy foods and ischaemic heart disease events

Study	No. of events	Adjusted RR
Shaper et al (1991)	608	0.88
Mann et al (1997)	63	1.50
Bostic et al (1999)	387	0.94
Lamarche (2004)	217	0.73
Trichopoulou et al (2006)	46	0.95
Umesawa et al (2006)	135	0.80
Umesawa et al (2008)	322	1.09
Van der Pols et al (2009)	378	0.74

RR (95% CI) in subjects with the highest dairy intake
0.92 *(0.80, 0.99)*

Four studies with insufficient data for inclusion in meta-analysis had to be omitted.

J Intern Med 2011; 270: 123–135

III. Prospective cohort studies with disease incidence as outcomes

University of Reading

Dairy foods and new stroke events

Study	*Events*	*Adjusted RR*
Iso et al (1999)	347	0.70 (0.61, 0.97)
Kinjo et al (1999)	3,084	0.85 (0.77, 0.92)
Abbott et al (1996)	229	0.67 (0.45, 1.10)
Larsson et al (2009)	2,702	1.03 (0.96, 1.10)
Umesawa et al (2006)	284	0.53 (0.34, 0.81)
Umesawa et al (2008)	664	0.70 (0.52, 0.94
Van der Pols et al (2009)	121	0.61 (0.27, 1.38)

RR (95% CI) in subjects with the highest dairy intake
0.79 *(0.68, 0.91)*

LIPIDS DOI 10.1007/s11745-010-3412-5

III. Prospective cohort studies with disease incidence as outcomes

Dairy foods and new haemorrhagic strokes

Study	Events	Adjusted RR
Kinjo et al (1999)	4,773	0.74 (0.68, 0.80)
Larsson (2009)	383	1.01 (0.82, 1.20)

RR (95% CI) in subjects with the highest dairy intake
0.75 *(0.60, 0.94)*

LIPIDS DOI 10.1007/s11745-010-3412-5

III. Prospective cohort studies with disease incidence as outcomes

University of Reading

Dairy foods and new diabetes

Study	Events	Adjusted RR
Choi et al (2005)	1,243	0,91 (0,85, 0.97)
Liu e		67, 0.94)
van D		75, 1.15)
Elwo		20, 1.63)
Villegras et al (2009)	2,270	0.60 (0.41, 0.88)

RR (95% CI) for highest intake groups
0.85 *(0.75, 0.96)*

LIPIDS DOI 10.1007/s11745-010-3412-5

III. Prospective cohort studies with disease incidence as outcomes

University of Reading

Summary of cohort studies

Outcome	Heterogeneity	Relative Risk
Death	Not significant	0.87 *(0.77, 0.98)*
IHD	Not significant	0.92 *(0.80, 0.99)*
Stroke all Haemorrhagic stroke	Significant Significant	0.79 *(0.68, 0.91)* 0.75 *(0.60, 0.94)*
Diabetes	Not significant.	0.85 *(0.75, 0.96)*

III. Prospective cohort studies with disease incidence as outcomes

University of Reading

Other reviews of cohort studies

Gibson et al. (2009) identified 12 cohort studies:

> ***'no consistent findings to support the concept that dairy food consumption is associated with a higher risk of coronary heart disease'***

Mente et al. (2009) from 5 cohort studies:

> ***milk has 'no significant association with coronary heart disease' RR = 0.91*** *(0.73, 1.00)*

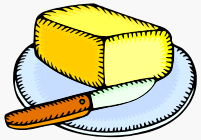
Bonthuis et al. (2010) 16 year Australian cohort:

> ***'a possible beneficial association between intake of full-fat dairy and CV mortality needs further assessment…' HR=0.31*** *(0.12-0.79)*

III. Prospective cohort studies with disease incidence as outcomes

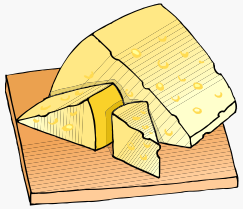
Individual dairy items

BUTTER – **Three cohort studies**: Heterogeneity 0.33; **RR 0.93** *(0.84, 1.02) for VD events*
Two cohorts could not be included: ***RR 1.03*** *and 'increase in CHD'* ***P = 0.026***



Three **case-control studies:**
106 patients, 105 controls: adjusted **OR 2.80** *(1.14, 6.85)*
287 MI women, 649 control women; **OR** adjusted for age alone: **2.3**
144 diabetics with PVD, 288 control patients: **OR 2.06** (*1.15. 3.68)*

CHEESE – **Cohorts**: Two studies (with fixed effects) **RR 0.90** *(0.79, 1.03) for VD events*
Four cohorts not included: ***RRs 0.96; 0.95; 0.97; 0.88***



Three **case-control studies:**
106 patients, 105 control: adjusted **OR 0.42** *(0.18, 1.03)*
111 MI patients, 107 controls: **OR 0.34** *(0.13, 0.91)*
144 diabetic patients with PVD, 288 controls **0.61** *(0.26, 1.45).*
Other case-control studies: **0.77** *(0.54, 1.11),* and **1.0** *(no CIs stated)*

III. Prospective cohort studies with disease incidence as outcomes

University of Reading

Summary of cohort studies

Systematic Reviews…….

- Summarise the best available evidence on an issue

- Indicate those issues on which more evidence is required

Butter	Not significant	0.93 (0.84, 1.02)
Cheese	Significant	0.90 (0.79, 1.03)

University of Reading

Sources of evidence

BASED ON: the US agency for Health Care Policy and Research (AHCPR 1992) and the Centre for Health Economics, University of York UK

I. Associations with risk-factors for disease

II. Retrospective case-control studies based on patients

III. Prospective cohort studies with disease incidence as outcomes

IV. Randomised controlled trials

and, for each source,
a meta-analysis of all the available studies

University of Reading

IV. Randomised controlled trials

There has been no randomised trial!

That is, no randomised controlled trial with death or survi
outcomes has been reported

A trial with adequate power wo *(?10,000 subjects).*

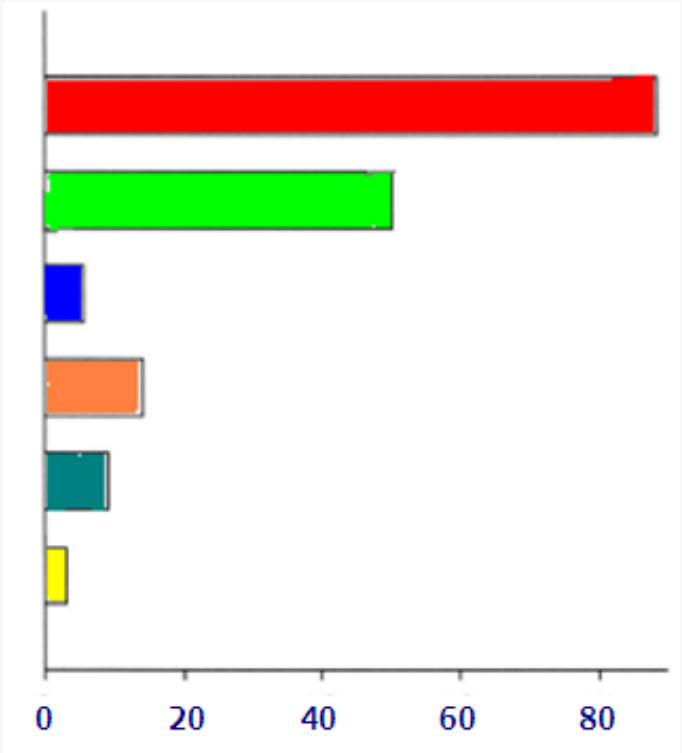
Half the subjects, sele *ve to agree to drink milk, half would have to agree t* *ntaining milk.*

The t *least 5 years.*

C *ave to be high throughout.*

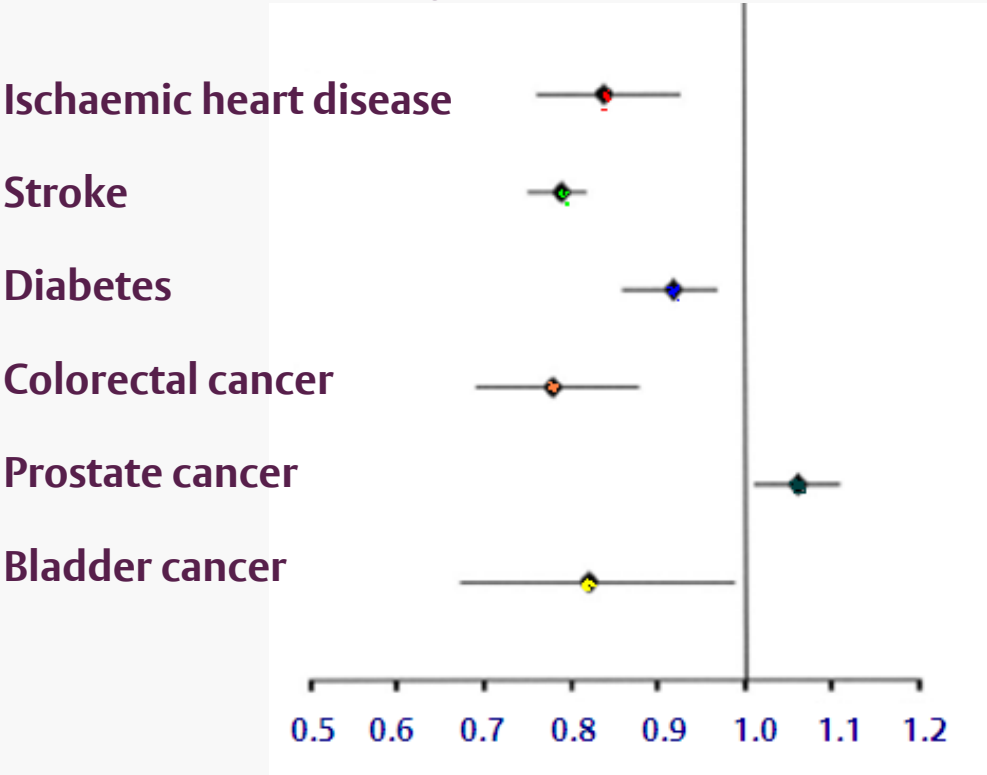
Probably unacceptable (and un-fundable!)

Survival advantage of milk consumption?



Deaths England & Wales 2005 (x1000)

Reduction in risk
In highest consumers



Relative risk (95% CI)

J. Amer Coll Nutr. 2008;27:723S-734S

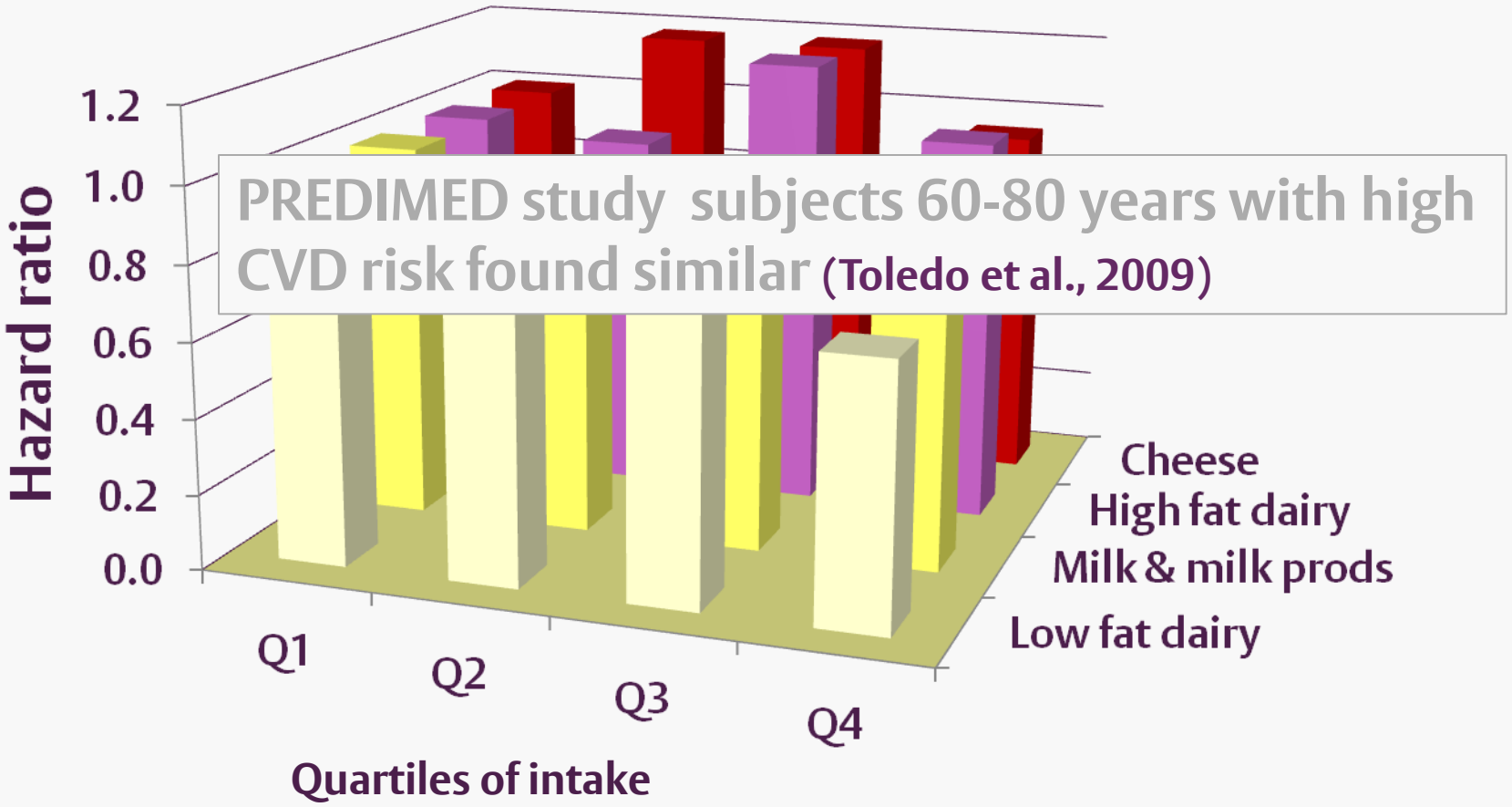
The issue of fat-reduced milk and dairy foods

The appropriate question to ask is:

Do fat-reduced milks and dairy foods provide any additional advantage…….. or does the reduction in fat reduce the benefits of whole milk?

Hazard ratios (and 95% CIs) for 2-y incidence of hypertension by quartile dairy product intake in 2245 Dutch adults aged >=55 y (Engberink et al., 2009)

University of Reading

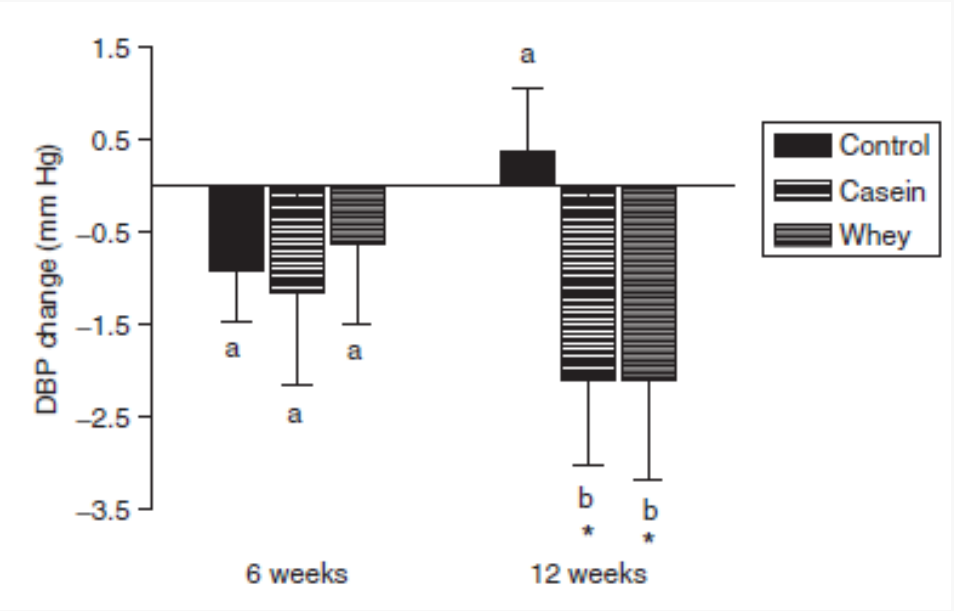


PREDIMED study subjects 60-80 years with high CVD risk found similar (Toledo et al., 2009)

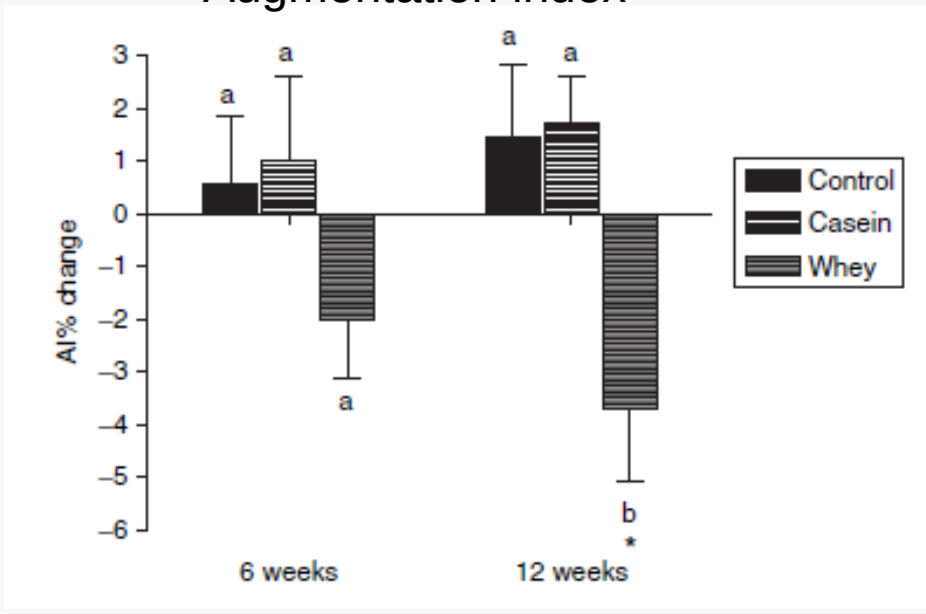
Effect of milk proteins on BP and vascular function in overweight subjects

University of Reading

Diastolic BP



Augmentation index

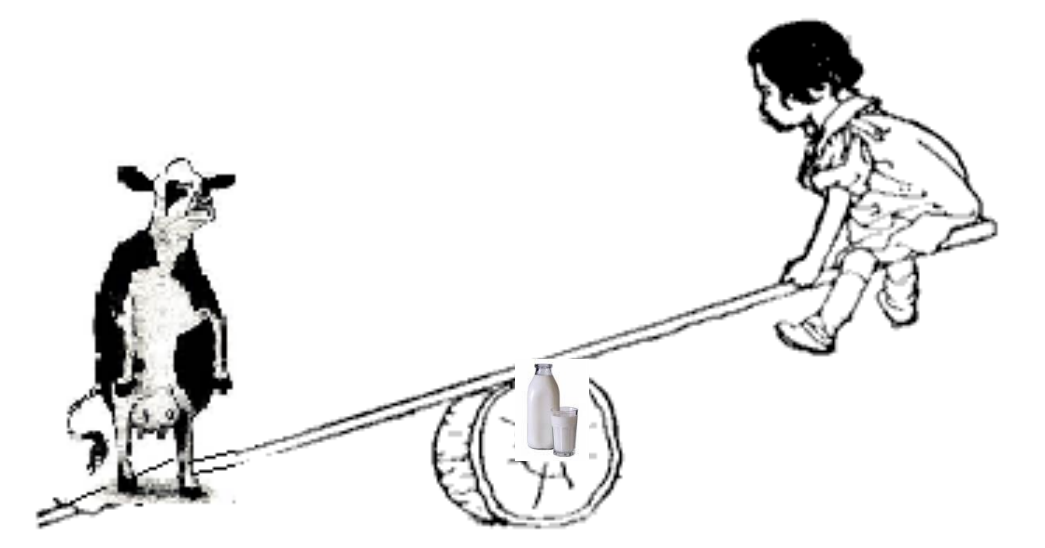


Pal & Ellis *Obesity (2010) 18, 1354–1359*

And finally, the saturated fat issue

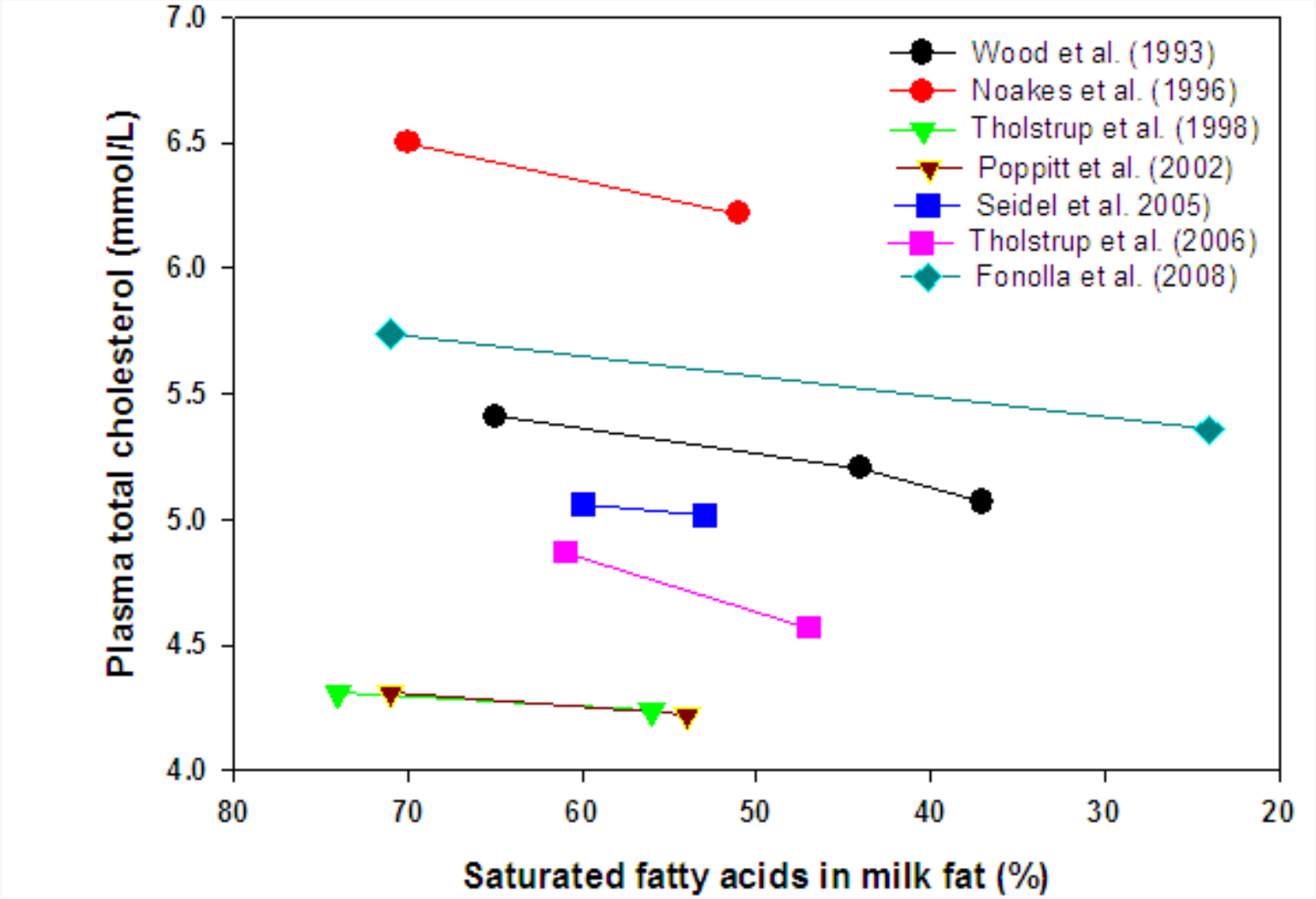
The appropriate question to ask is:

Do milks and dairy foods with reduced saturated fatty acids provide any additional advantage……..



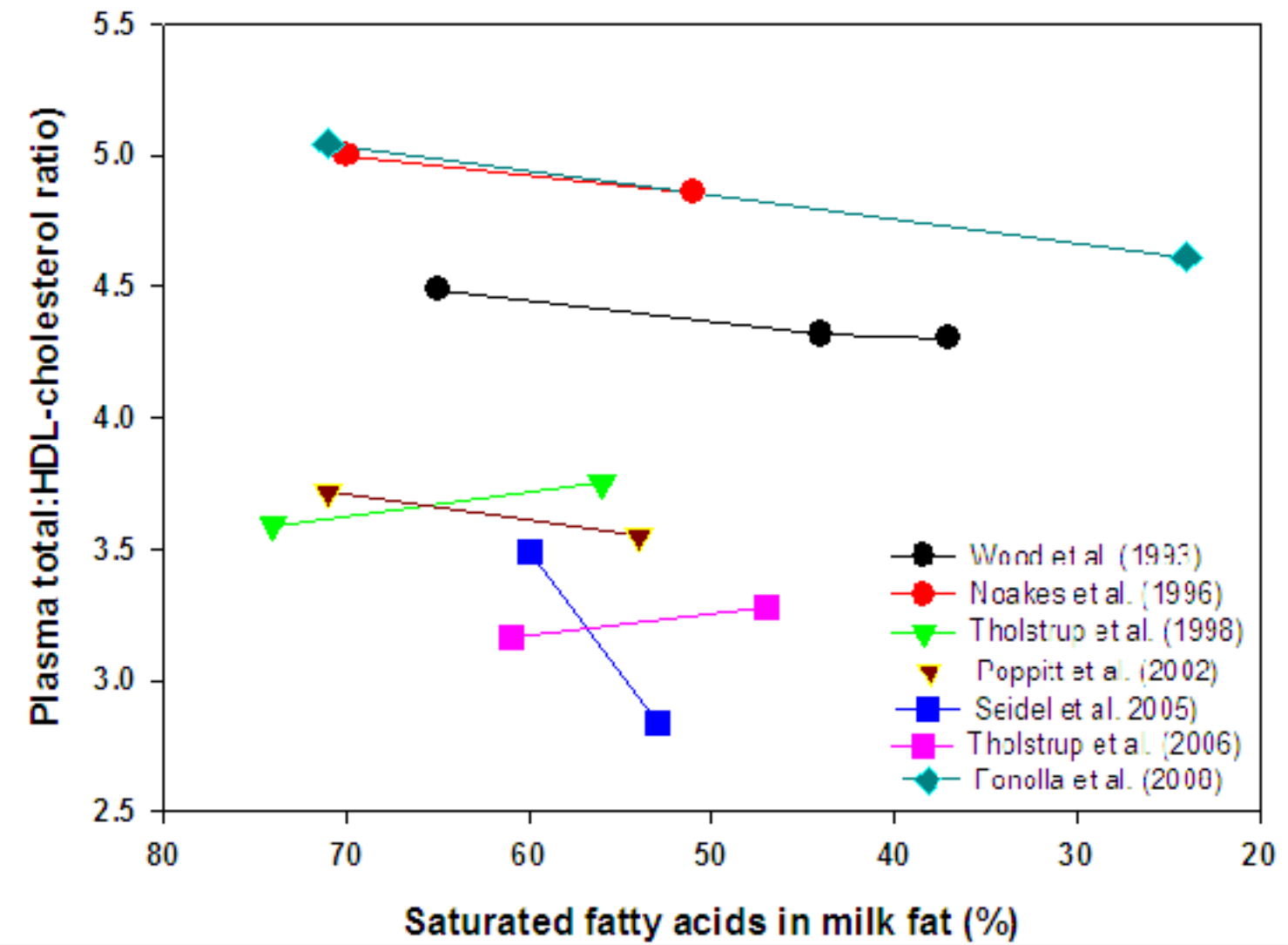
Effect of reducing SFA in milk fat on total cholesterol

University of Reading



Effect of reducing SFA in milk fat on total:HDL- cholesterol

University of Reading



Conclusions

University of Reading

- Milk appears to offer some vascular protection and overall provides a survival advantage
- Vascular benefits may be due to effects on BP and BMI control
- May not apply to cheese and butter and what about fat reduced milk?
- Epidemiology does not assess cause/mechanisms and there is always a risk of confounding factors but…
- ..it should direct and focus research effort
- Milk/dairy products are usually the single largest source of SFA and replacing some SFA with MUFA/PUFA will probably lead to benefits…
- …and milk is perhaps the most misunderstood food..

FEED for HEALTH

cost
EUROPEAN COOPERATION
IN SCIENCE AND TECHNOLOGY

University of Reading

Thank you

The survival advantage of milk and dairy consumption: An overview of evidence from cohort studies of vascular diseases, diabetes and cancer

J Amer Coll Nutr. 2008;27:723S-734S

The consumption of milk and dairy foods and the incidence of vascular disease and diabetes: an overview of the evidence

LIPIDS DOI 10.1007/s11745-010-3412-5