UNIVERSITY OF COPENHAGEN

European Milk Forum

Milk Matrix
milknutritiousbynature.eu

Metabolic Health: The impact of Dairy Matrix

Arne Astrup, MD, DMSc
Head of department & professor

DIETARY GUIDELINES 2015-2020

efsa European Food Safety Authority

Key Recommendations

Consume a healthy eating pattern that accounts for all foods and beverages within an appropriate calorie level.

A healthy eating pattern includes:[2]

- A variety of vegetables from all of the subgroups—dark green, red and orange, legumes (beans and peas), starchy, and other
- Fruits, especially whole fruits
- Grains, at least half of which are whole grains
- Fat-free or low-fat dairy, including milk, yogurt, cheese, and/or fortified soy beverages
- A variety of protein foods, including seafood, lean meats and poultry, eggs, legumes (beans and peas), and nuts, seeds, and soy products
- Oils

A healthy eating pattern limits:

- Saturated fats and *trans* fats, added sugars, and sodium

Key Recommendations that are quantitative are provided for several components of the diet that should be limited. These components are of particular public health concern in the United States, and the specified limits can help individuals achieve healthy eating patterns within calorie limits:

- Consume less than 10 percent of calories per day from added sugars[3]

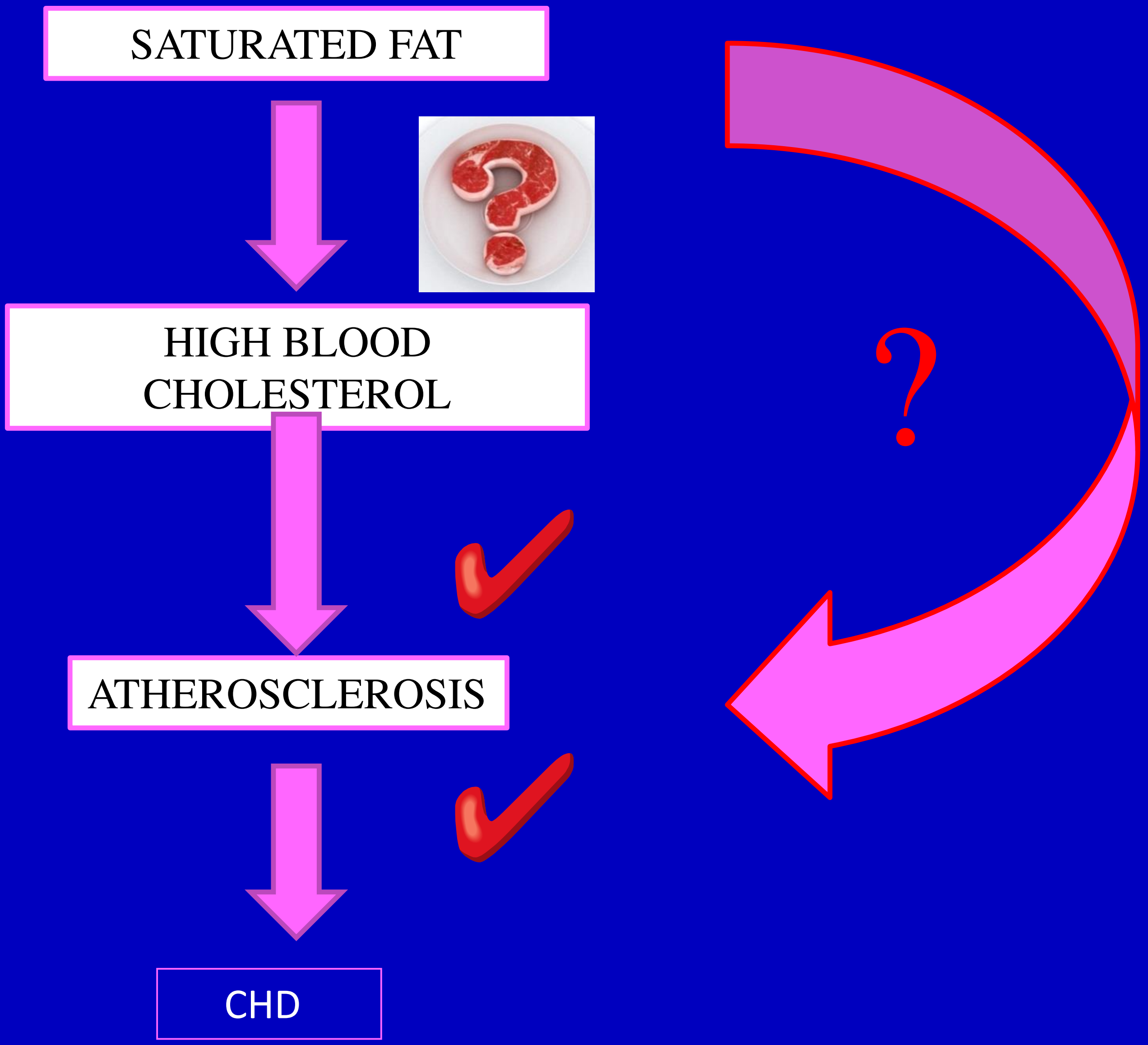
EFSA: As low as possible

- Consume less than 2,300 milligrams (mg) per day of sodium[5]
- If alcohol is consumed, it should be consumed in moderation—up to one drink per day for women and up to two drinks per day for men—and only by adults of legal drinking age.[6]

"People don't want to hear the truth because they don't want their illusions destroyed."

Friedrich Nietzsche

The lipid hypothesis and CHD



Hierarchy in Scientific Evidence

High

Level of Evidence

Low

Systematic Reviews (Meta-analysis)

Randomized Controlled Trials

Other Controlled Trials

Prospective Cohort studies

Case – Control studies

Prevalence studies

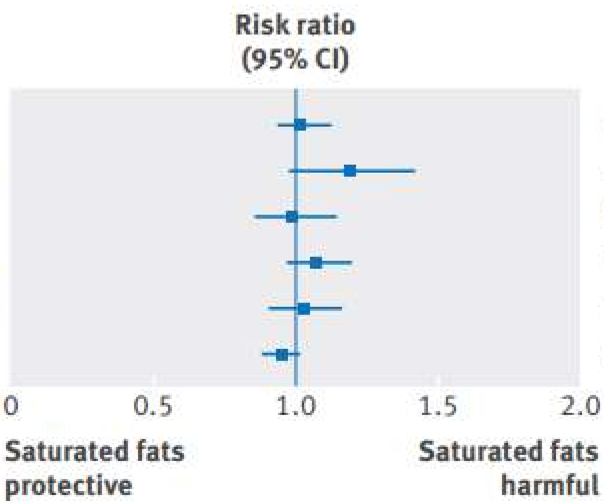
Ecological studies

Animal studies

Intake of saturated and trans unsaturated fatty acids and risk of all cause mortality, cardiovascular disease, and type 2 diabetes: systematic review and meta-analysis of observational studies

Russell J de Souza,[1,2,3,4] Andrew Mente,[1,2,5] Adriana Maroleanu,[2] Adrian I Cozma,[3,4] Vanessa Ha,[1,3,4] Teruko Kishibe,[6] Elizabeth Uleryk,[7] Patrick Budylowski,[4] Holger Schünemann,[1,8] Joseph Beyene,[1,2] Sonia S Anand[1,2,5,8]

Outcome	No of studies /comparisons	No of events /participants	Relative risk (95% CI)	P	P_{het}	I^2 (%)
All cause mortality	5/7	14 090/99 906	0.99 (0.91 to 1.09)	0.91	0.17	33
CHD mortality	11/15	2970/101 712	1.15 (0.97 to 1.36)	0.10	<0.001	70
CVD mortality	3/5	3792/90 501	0.97 (0.84 to 1.12)	0.69	0.29	19
CHD total	12/17	6383/267 416	1.06 (0.95 to 1.17)	0.29	0.02	47
Ischemic stroke	12/15	6226/339 090	1.02 (0.90 to 1.15)	0.79	0.002	59
Type 2 diabetes	8/8	8739/237 454	0.95 (0.88 to 1.03)	0.20	0.61	0



BMJ 2015;351:h3978 | doi:10.1136/bmj.h3

Similar conclusion in a previous meta-analysis of prospective cohort studies and CVD. (Siri-Tarino et al.,Am J Clin Nutr 2010;91:535–46)

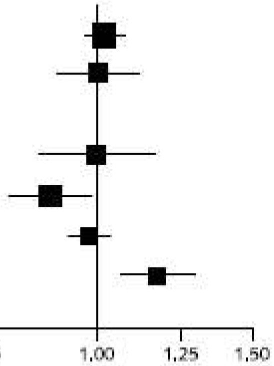
Association of Dietary, Circulating, and Supplement Fatty Acids With Coronary Risk

A Systematic Review and Meta-analysis

Rajiv Chowdhury, MD, PhD; Samantha Warnakula, MPhil*; Setor Kunutsor, MD, MSt*; Francesca Crowe, PhD; Heather A. Ward, PhD; Laura Johnson, PhD; Oscar H. Franco, MD, PhD; Adam S. Butterworth, PhD; Nita G. Forouhi, MRCP, PhD; Simon G. Thompson, FMedSci; Kay-Tee Khaw, FMedSci; Dariush Mozaffarian, MD, DrPH; John Danesh, FRCP*; and Emanuele Di Angelantonio, MD, PhD*

Figure 1. RRs for coronary outcomes in prospective cohort studies of dietary fatty acid intake.

Fatty Acid Intake	Studies, *n*	Participants, *n*	Events, *n*	RR (95% CI)*
Total saturated fatty acids	20	276 763	10 155	1.03 (0.98–1.07)
Total monounsaturated fatty acids	9	144 219	6031	1.00 (0.91–1.10)
Total ω-3 fatty acids				
α-Linolenic	7	157 258	7431	0.99 (0.86–1.14)
Total long-chain ω-3	16	422 786	9089	0.87 (0.78–0.97)
Total ω-6 fatty acids	8	206 376	8155	0.98 (0.90–1.06)
Total trans fatty acids	5	155 270	4662	1.16 (1.06–1.27)



RR (95% CI) Comparing Top vs. Bottom Thirds of Baseline Dietary Fatty Acid Intake

Size of the data marker is proportional to the inverse of the variance of the RR. RR = relative risk.
* Pooled estimate based on random-effects meta-analysis. Corresponding forest plots, I^2 estimates, and pooled RRs based on fixed-effects meta-analysis are provided in **Supplement 1**, available at www.annals.org.

www.thelancet.com Published online August 29, 2017 http://dx.doi.org/10.1016/S0140-6736(17)32252-3

Articles

Associations of fats and carbohydrate intake with cardiovascular disease and mortality in 18 countries from

Implications of all the available evidence

Removing current restrictions on fat intake but limiting carbohydrate intake (when high) might improve health. Dietary guidelines might need to be reconsidered in light of consistent findings from the present study, especially in countries outside of Europe and North America.

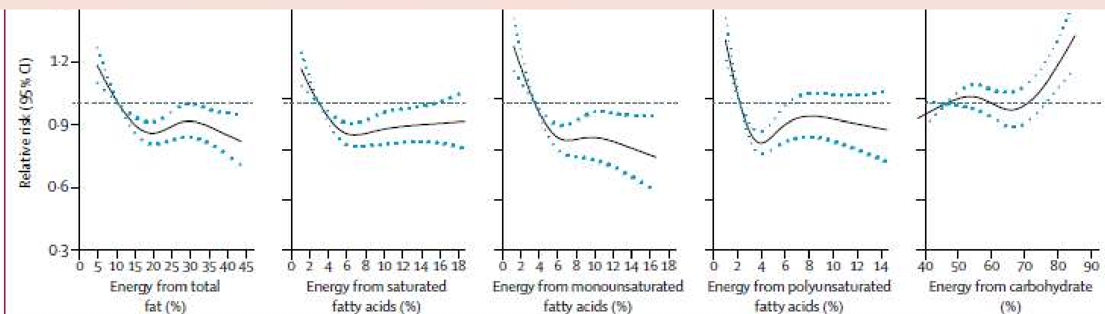


Figure 1: **Association between estimated percentage energy from nutrients and total mortality and major cardiovascular disease (n=135 335)**
Adjusted for age, sex, education, waist-to-hip ratio, smoking, physical activity, diabetes, urban or rural location, centre, geographical regions, and energy intake. Major cardiovascular disease=fatal cardiovascular disease+myocardial infarction+stroke+heart failure.

RESEARCH

Re-evaluation of the traditional diet-heart hypothesis: analysis of recovered data from Minnesota Coronary Experiment (1968-73)

Christopher E Ramsden,[1,2] Daisy Zamora,[3] Sharon Majchrzak-Hong,[1] Keturah R Faurot,[2] Steven K Broste,[4] Robert P Frantz,[5] John M Davis,[3,6] Amit Ringel,[1] Chirayath M Suchindran,[7] Joseph R Hibbeln[1]

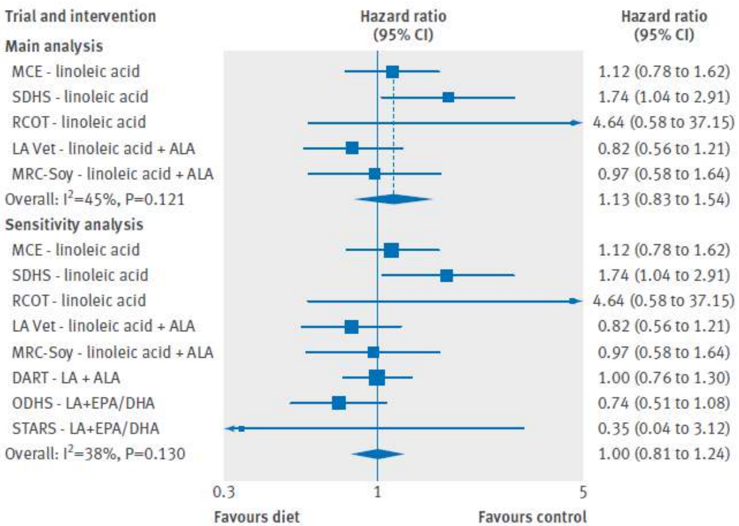


Fig 7 | Meta-analysis for mortality from coronary heart disease in trials testing replacement of saturated fat with vegetable oils rich in linoleic acid. Main analysis: trials provided replacement foods (vegetable oils) and were not confounded by any concomitant interventions. Sensitivity analysis: includes trials that provided advice only and/or were confounded by addition of n-3 EPA and DHA. Risk ratios were used as estimates of hazard ratios in MCE, RCOT, LA Vet, and MRC-Soy. MCE=Minnesota Coronary Experiment; SDHS=Sydney Diet Heart Study; RCOT=Rose Corn Oil Trial; LA Vet=Los Angeles Veterans Trial; MRC-Soy=Medical Research Council Soy Oil Trial; DART=Diet and Re-infarction Trial; ODHS=Oslo Diet Heart Study; STARS=St. Thomas Atherosclerosis Regression Study; LA=linoleic acid; SFA=saturated fat; ALA=α linolenic acid; EPA=eicosapentaenoate; DHA=docosahexaenoate

WHAT IS ALREADY KNOWN ON THIS TOPIC

The traditional diet-heart hypothesis predicts that replacing saturated fat with vegetable oils rich in linoleic acid will reduce cardiovascular deaths by lowering serum cholesterol

This paradigm has never been causally demonstrated in a randomized controlled trial and thus has remained uncertain for over 50 years

Key findings from landmark randomized controlled trials including the Sydney Diet Heart Study and the Minnesota Coronary Experiment (MCE) were not fully published

WHAT THIS STUDY ADDS

Though the MCE intervention lowered serum cholesterol, this did not translate to improved survival

Paradoxically, MCE participants who had greater reductions in serum cholesterol had a higher, rather than lower, risk of death

Results of a systematic review and meta-analysis of randomized controlled trials do not provide support for the traditional diet heart hypothesis

Cite this as: *BMJ* 2016;353:i1246
http://dx.doi.org/10.1136/bmj.i1246

Accepted: 19 February 2016

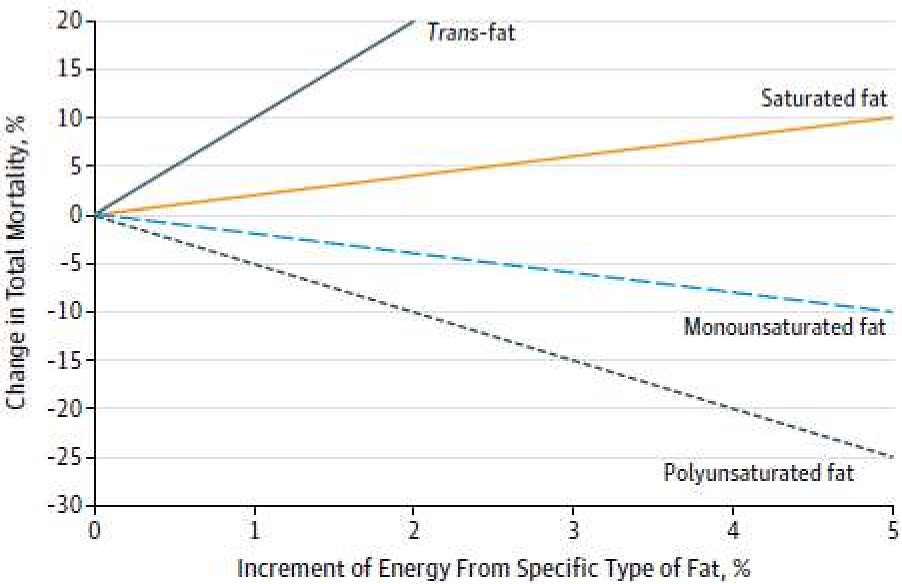
Research

Original Investigation

Association of Specific Dietary Fats With Total and Cause-Specific Mortality

Dong D. Wang, MD, MSc; Yanping Li, PhD; Stephanie E. Chiuve, ScD; Meir J. Stampfer, MD, DrPH; JoAnn E. Manson, MD, DrPH; Eric B. Rimm, ScD; Walter C. Willett, MD, DrPH; Frank B. Hu, MD, PhD

Figure 1. Change in Total Mortality Associated With Increases in the Percentage of Energy From Specific Types of Fat



Due to the very different biological effect of different saturated fatty acids, and the impact of food matrix we need to analyze foods separately, and not to lump all saturated fats into one group.

JAMA Internal Medicine Published online July 5, 2016

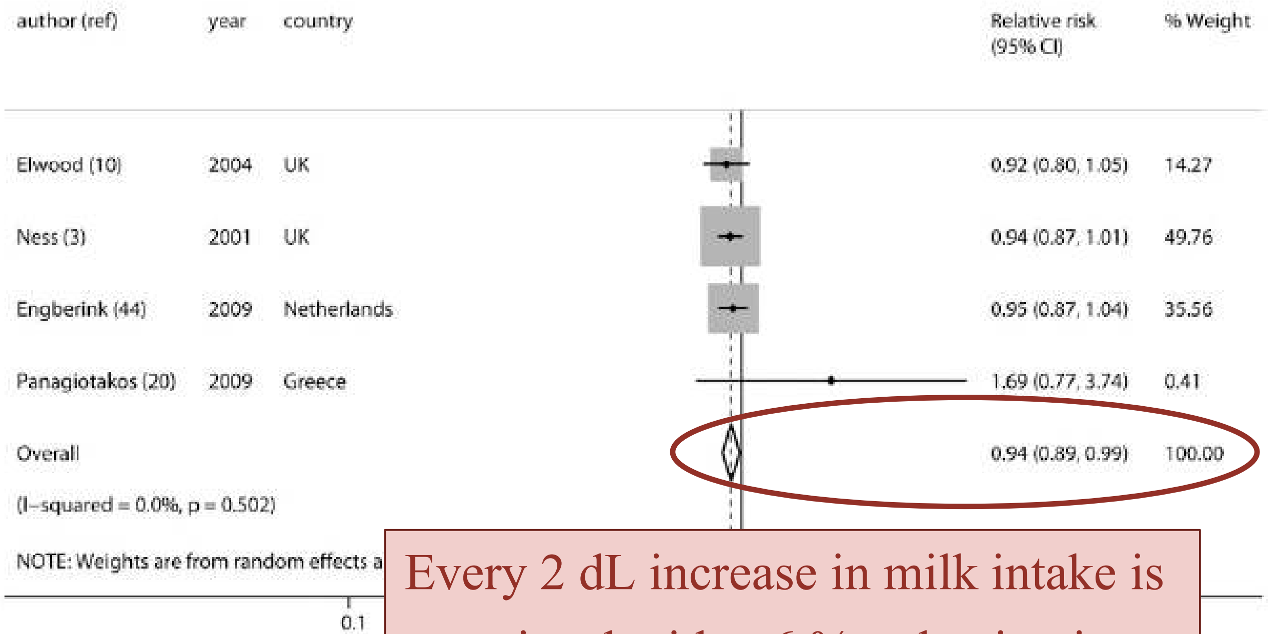
Can we predict the health effects of foods based on the information on the label ?

Or just by the content of saturated fat ?

Recognition of the food matrix

Milk and dairy consumption and incidence of cardiovascular diseases and all-cause mortality: dose-response meta-analysis of prospective cohort studies[1–3]

Sabita S Soedamah-Muthu, Eric L Ding, Wael K Al-Delaimy, Frank B Hu, Marielle F Engberink, Walter C Willett, and Johanna M Geleijnse



Every 2 dL increase in milk intake is associated with a 6 % reduction in cardiovascular disease

FIGURE 2. Relation between milk (per 200 mL/d) and … cohort studies (*n* = 13,518, no.

Am J Clin Nutr 2011;93:158–71. Printed in USA. © 2011 American Society for Nutrition

Milk and dairy consumption and incidence of cardiovascular diseases and all-cause mortality: dose-response meta-analysis of prospective cohort studies[1–3]

Sabita S Soedamah-Muthu, Eric L Ding, Wael K Al-Delaimy, Frank B Hu, Marielle F Engberink, Walter C Willett, and Johanna M Geleijnse

Milk and all-cause mortality

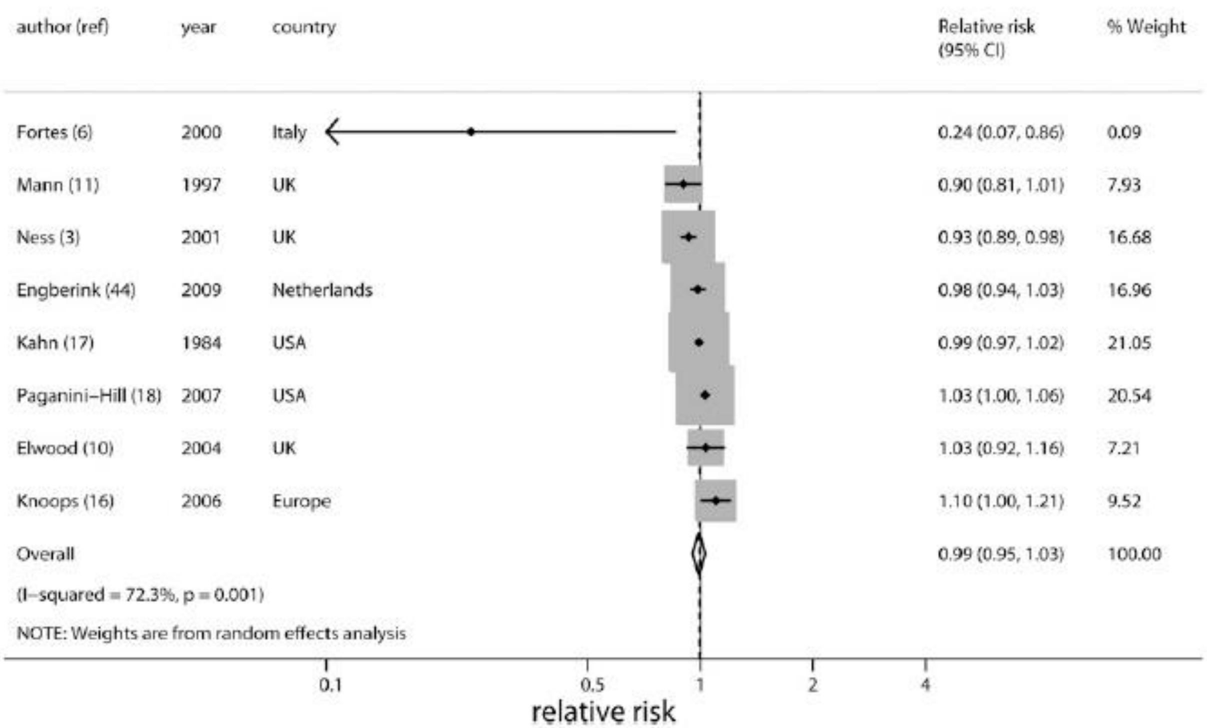


FIGURE 5. Relation between milk (per 200 mL/d) and all-cause mortality: dose-response meta-analyses of 8 prospective cohort studies (*n* = 62,779, no. of

Am J Clin Nutr 2011;93:158–71. Printed in USA. © 2011 American Society for Nutrition thebmj

BMJ 2014;349:g6015 doi: 10.1136/bmj.g6015 (Published 27 October 2014) Page 1 of 15

RESEARCH

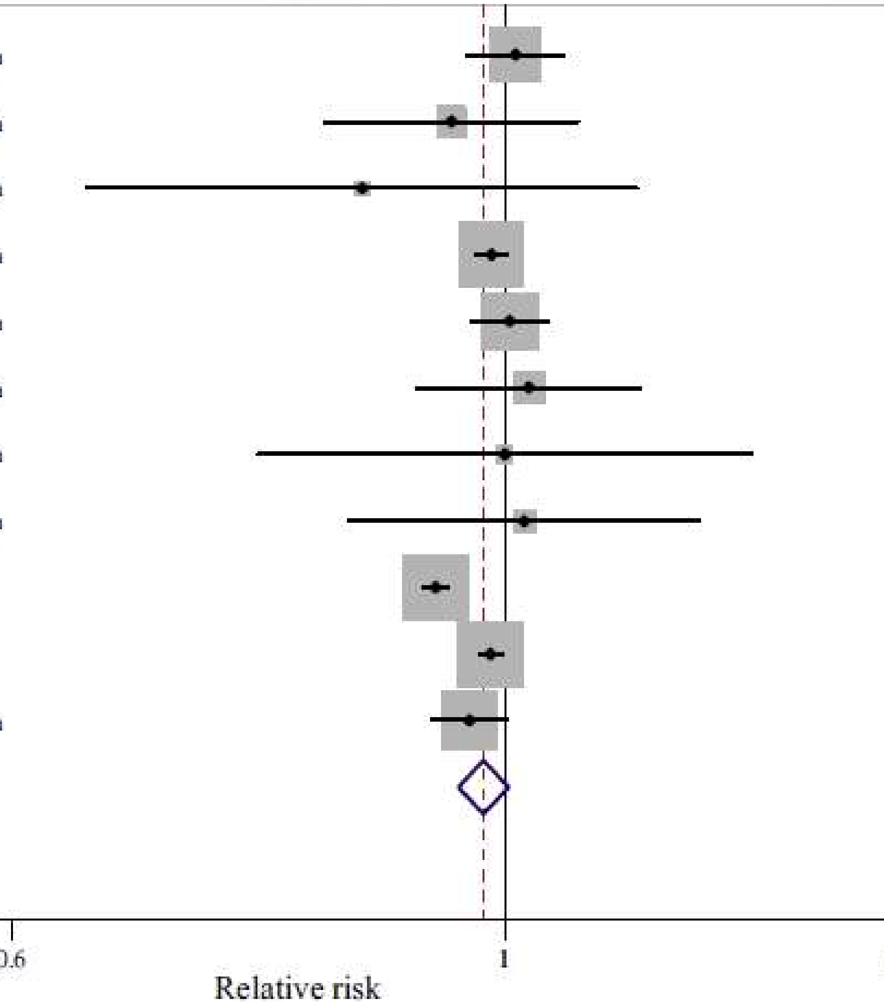
Milk intake and risk of mortality and fractures in women and men: cohort studies

Karl Michaëlsson *professor*[1], Alicja Wolk *professor*[2], Sophie Langenskiöld *senior lecturer*[3], Samar Basu *professor*[3], Eva Warensjö Lemming *researcher*[1 4], Håkan Melhus *professor*[5], Liisa Byberg *associate professor*[1]

[1]Department of Surgical Sciences, Uppsala University, SE-751 85 Uppsala, Sweden; [2]Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden; [3]Department of Public Health and Caring Sciences, Uppsala University, Uppsala, Sweden; [4]Swedish National Food Agency, Uppsala, Sweden; [5]Department of Medical Sciences, Uppsala University, Uppsala, Sweden

Milk and dairy consumption and risk of cardiovascular diseases ar

author	year	exposure	gender	Relative risk (95% CI)	% Weight
Engberink	2009	Cheese	Women/Men	1.01 (0.96, 1.06)	10.85
Panagiotakos	2009	Cheese	Women/Men	0.95 (0.83, 1.08)	3.20
Bonthuis	2010	Full-fat cheese	Women/Men	0.86 (0.65, 1.15)	0.78
Sonestedt	2011	Cheese	Women/Men	0.99 (0.97, 1.00)	17.13
Dalmeijer	2012	cheese	Women/Men	1.00 (0.97, 1.04)	12.94
Van Aerde	2013	Cheese	Women/Men	1.02 (0.91, 1.15)	3.88
Ruesten	2013	Low-fat cheese	Women/Men	1.00 (0.77, 1.29)	0.96
Ruesten	2013	High-fat cheese	Women/Men	1.02 (0.85, 1.22)	1.82
Michaelsson	2014	Cheese	Women	0.93 (0.92, 0.94)	17.65
Michaelsson	2014	Cheese	Men	0.99 (0.97, 1.00)	17.76
Praagman	2015	Cheese	Women/Men	0.96 (0.93, 1.00)	13.04
Overall (I-squared = 82.6%, p = 0.000)				0.98 (0.95, 1.00)	100.00



NOTE: Weights are from random effects analysis


SFA

?


SFA


CHO

Meat and CVD

The latest meta-analysis of observational studies on meat intake and CVD and cancer mortality found that:

- The highest category of <u>processed</u> meat consumption had a 18% higher risk of mortality from CVD
- There was no association between total red meat intake, white meat intake and CVD/cancer mortality

Dairy and CVD

The latest meta-analysis on dairy and CVD found:

- An inverse association between dairy intake and CVD and stroke
- No association between dairy intake and CHD

Qin et al., Asia Pac J Clin Nutr. 2015;24(1):90-100

We need to study foods – not nutrients!

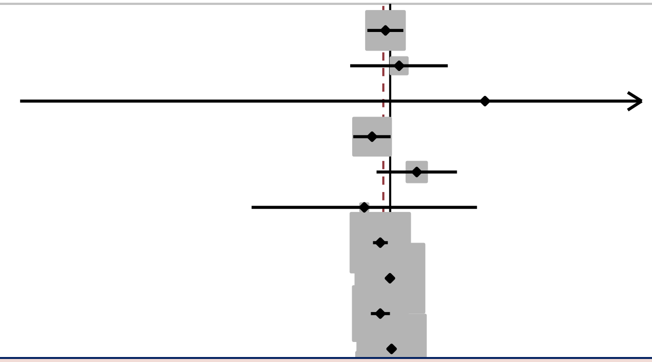
The effect of saturated fat is attenuated by cheese!

≠

Calcium
Casein (peptides and amino acids)
Bacteria (starter and <u>non-starter</u>)

Updated meta-analysis of fermented dairy and CVD and mortality

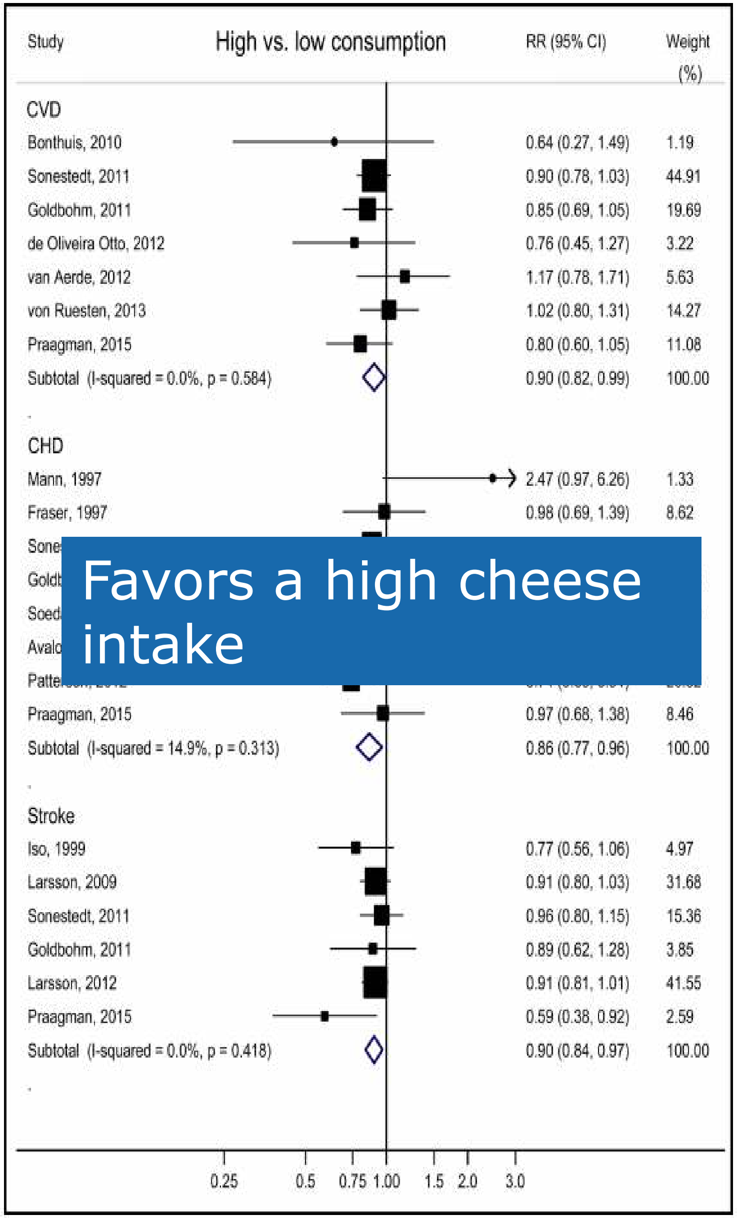
author	year	exposure	gender	Relative risk (95% CI)	% Weight
Kahn	1984	Cheese	Women/Men	0.99 (0.94, 1.04)	2.77
Mann	1997	Cheese	Women/Men	1.02 (0.90, 1.17)	0.51
Fortes	2000	Cheese	Women/Men	1.30 (0.36, 4.68)	0.01
Engberink	2009	Cheese	Women/Men	0.95 (0.90, 1.00)	2.62
Bonthuis	2010	Yoghurt	Women/Men	1.08 (0.96, 1.20)	0.73
Bonthuis	2010	High-fat cheese	Women/Men	0.93 (0.68, 1.27)	0.10
Goldbohm	2011	High-fat fermented dairy	Men	0.97 (0.95, 0.99)	6.64
Goldbohm	2011	Low-fat fermented dairy	Men	1.00 (0.99, 1.01)	8.86
Goldbohm	2011	High-fat fermented dairy	Women	0.97 (0.95, 1.00)	5.58
Goldbohm	2011	Low-fat fermented dairy	Women	1.00 (1.00, 1.01)	8.82



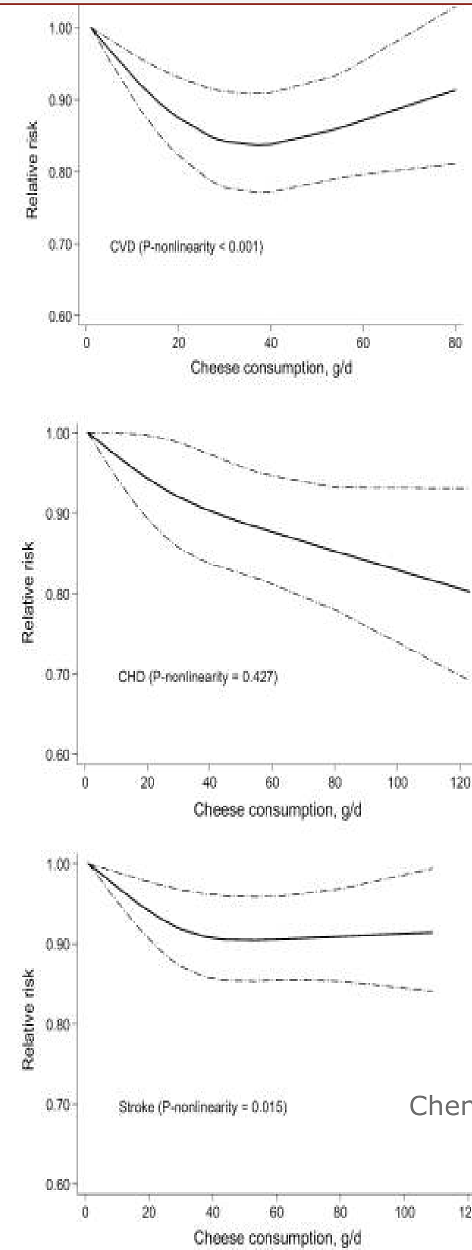
Total 29 cohort studies are available for meta-analysis. Inverse associations were found between total fermented (included sour milk products, yogurt or cheese) with mortality (RR 0.98, 95% CI: 0.97-0.99; I^2=94.4%) and risk of CVD (RR 0.98, 95% CI: 0.97-0.99; I^2=87.5%). Also stratified analysis of total fermented dairy of cheese shown a lower 2% lower risk of CVD (RR 0.98, 95% CI: 0.95-1.00; I^2=82.6%). No associations were found for total dairy, high-fat/ low-fat dairy or milk with the health outcomes.

Eur J Epidemiol
DOI 10.1007/s10654-017-0243-1

Prospective studies of cheese intake and risk of CVD, CHD and stroke



Favors a high cheese intake



Chen et al. (2016) Eur J Nutr, Aug

Effects of cheese on CVD risk factors & Mechanisms

- Obesity
- Type 2 diabetes
- Blood lipids

- The cheese food matrix and mechanisms

Cheese intake in large amounts lowers LDL-cholesterol concentrations compared with butter intake of equal fat content[1–3]

Julie Hjerpsted, Eva Leedo, and Tine Tholstrup

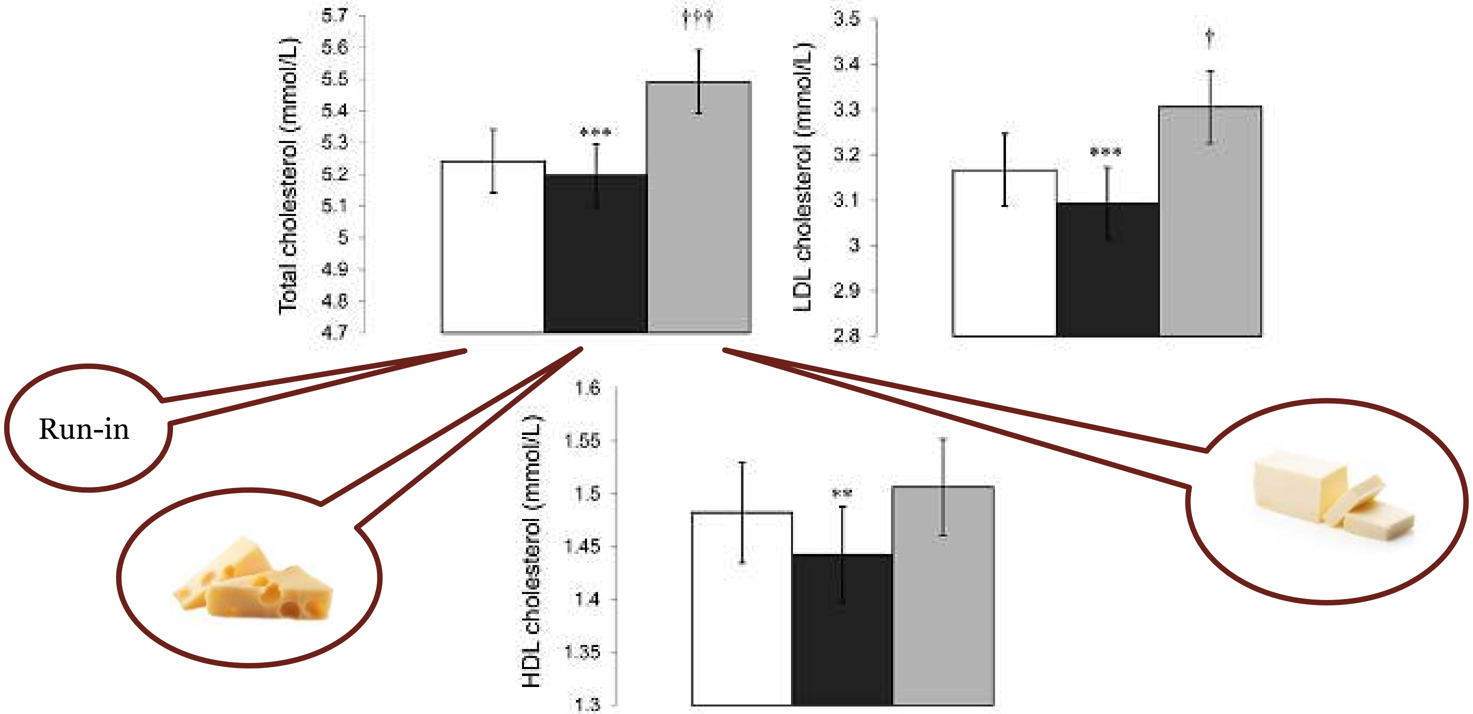


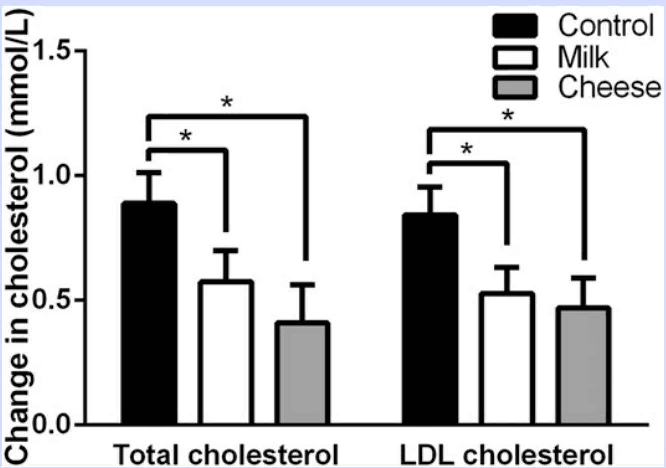
FIGURE 1. Least-squares mean (±SEM) serum concentrations of total, LDL, and HDL cholesterol in subjects after the run-in (white bars), cheese (dark-gray bars), and butter (light-gray bars) periods. Statistical differences are based on a linear mixed model with Bonferroni correction. **,***Significantly different from butter period: $^{**}P < 0.005$, $^{***}P < 0.0001$. †,†††Significantly different from run-in period: $^{\dagger}P < 0.05$, $^{\dagger\dagger\dagger}P < 0.0005$.

Am J Clin Nutr 2011;94:1479–84

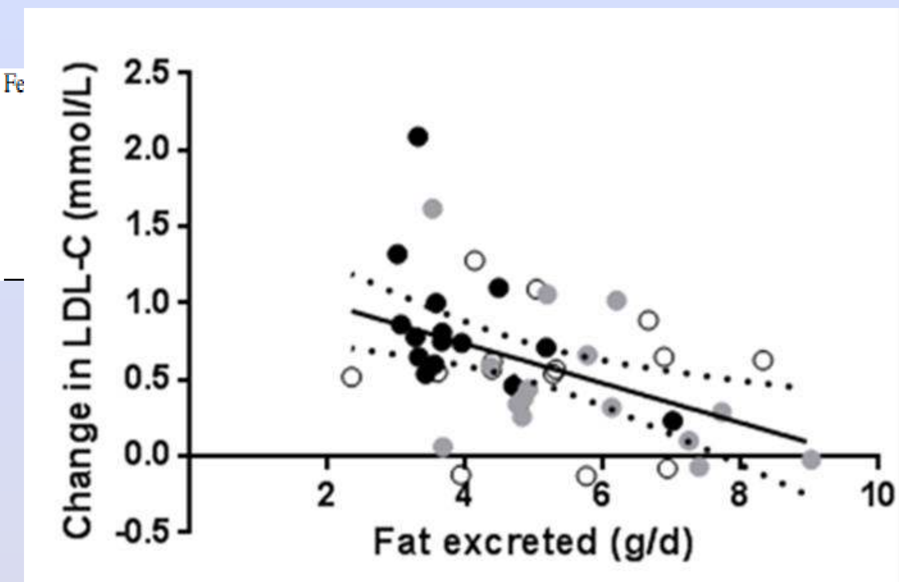
Calcium in cheese and lipid metabolism

Effect of dairy calcium from cheese and milk on fecal fat excretion, blood lipids, and appetite in young men[1–3]

Karina V Soerensen, Tanja K Thorning, Arne Astrup, Mette Kristensen, and Janne K Lorenzen

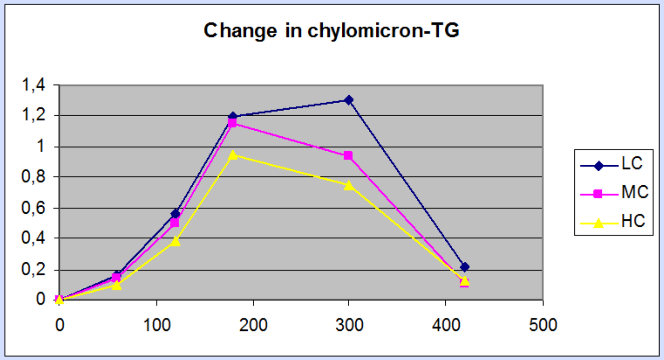


Fe	se	P diet
	3.0[b]	0.002
	60[a,b]	0.032
	0.3	NS
	0.4[b]	<0.001
	0.3[b]	0.006



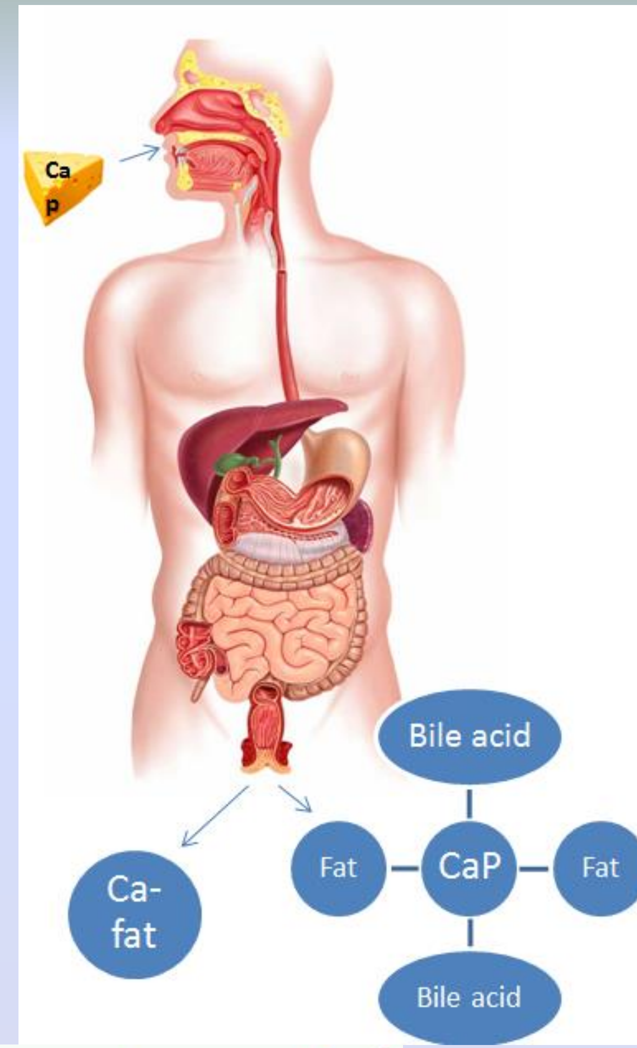
Suggested mechanisms

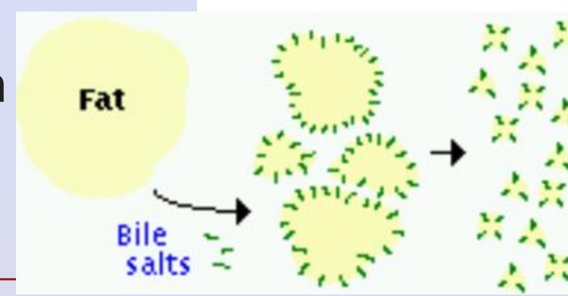
- Reduction in fat digestibility/absorption by calcium



Lorenzen JK, Astrup A. Am. J. Clin. Nutr. (2007)

- Precipitation of calcium and fatty acids in insoluble fatty acid soaps
- Precipitation of calcium and phosphate in amorphous calcium phosphate
- Possibly also increased fecal excretion of bile acids





Metabolomics investigation to shed light on cheese as a possible brick in the French paradox puzzle

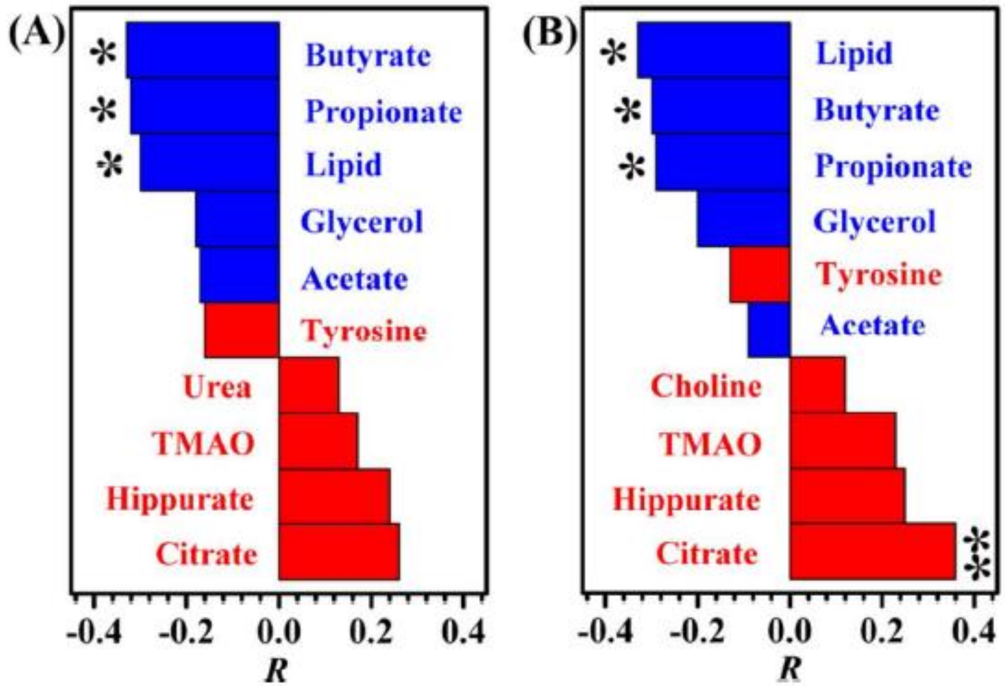


Figure 6. Top 10 metabolites correlated with the diet-induced increases in (A) total and (B) LDL cholesterol based on Pearson correlation coefficients. Red and blue bar represents urinary and fecal metabolites, respectively. *, $P < 0.05$; **, $P < 0.01$.

numbers represent the assignment of metabolites: 1, lipid (0.80, 1.22, 1.55, 1.95, 2.27 and 5.27 ppm).

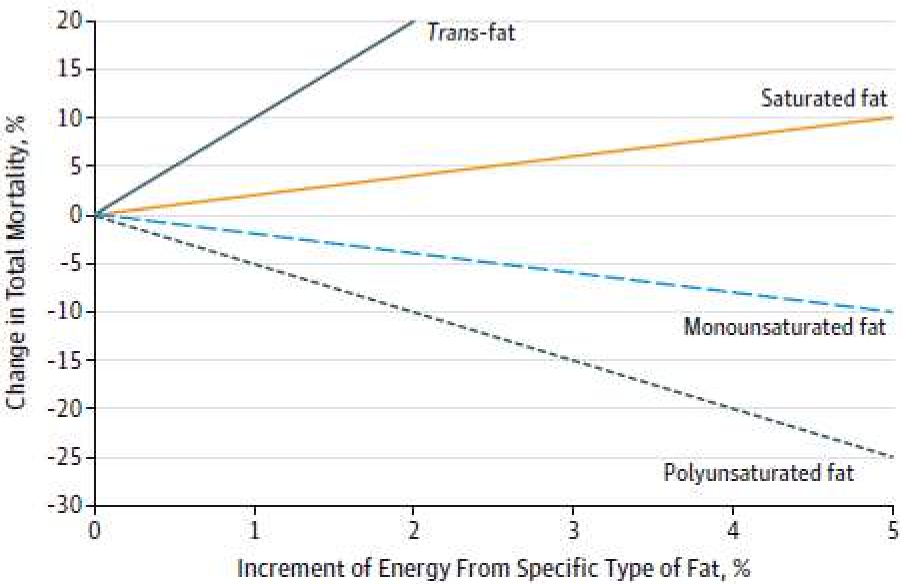
Research

Original Investigation

Association of Specific Dietary Fats With Total and Cause-Specific Mortality

Dong D. Wang, MD, MSc; Yanping Li, PhD; Stephanie E. Chiuve, ScD; Meir J. Stampfer, MD, DrPH; JoAnn E. Manson, MD, DrPH; Eric B. Rimm, ScD; Walter C. Willett, MD, DrPH; Frank B. Hu, MD, PhD

Figure 1. Change in Total Mortality Associated With Increases in the Percentage of Energy From Specific Types of Fat



Due to the very different biological effect of different saturated fatty acids, and the impact of food matrix we need to analyze foods separately, and not to lump all saturated fats into one group.

JAMA Internal Medicine Published online July 5, 2016

Conclusions

- The totality of evidence i.e. meta-analyses of both observational studies and RCT's cannot find any harmful effects of cheese on body fat, metabolic syndrome, type 2 diabetes, or CVD.
- Cheese does not exert the detrimental effects on blood lipids and blood pressure as previously predicted by its sodium and saturated fat content.
- Cheese exerts beneficial effects on LDL-cholesterol, blood pressure and postprandial triglycerides as compared to butter.
- The effects of cheese on body composition, diabetes and CVD risks can be attributed to the food matrix with nutrients i.e. protein, calcium, SCFA from fermentation, and perhaps peptides, phospholipids.
- A diet including cheese should be recommended for all to prevent and manage type 2 diabetes and cardiovascular disease.


Warning:
Cheese Can
Sack Your Health
Fat. Cholesterol. Sodium.
PCRM.ORG
TRUE
?

BACK UP SLIDES

Future dietary recommendations should look at whole foods, not single nutrients, and not be based in indirect evidence (predictions from nutrient labels labels)

Recent intervention studies from our department

British Journal of Nutrition (2014), **111**, 1412–1420 doi:10.1017/S0007114513003826

Milk minerals modify the effect of fat intake on serum lipid profile: results from an animal and a human short-term study

Janne K. Lorenzen[1], Søren K. Jensen[2] and Arne Astrup[1]*
[1]*Department of Nutrition, Exercise and Sports (NEXS), Faculty of Sciences, University of Copenhagen, Rolighedsvej 30, DK 1958 Frederiksberg C, Denmark*
[2]*Department of Animal Science, Research Centre Foulum, Aarhus University, DK 8830 Tjele, Denmark*

Table 1. Nutrient composition of the two diets used in the animal study

	MM group	Control group
Protein (E%)	19	19
Carbohydrate (E%)	50	50
Fat (E%)	32	32
SFA (E%)	11	11
MUFA (E%)	13	13
PUFA (E%)	9	9
Ca (g/kg diet)	10·8	5·1

MM, milk minerals; E%, percentage of energy.

Table 2. Nutrient composition of the two diets used in the human study*

	MM period	Control period
Protein (E%)	15	15
Carbohydrate (E%)	36	36
Fat (E%)	50	50
SFA (E%)	26	26
MUFA (E%)	15	15
PUFA (E%)	3	3
Ca (mg/10 MJ)	1990	470

MM, milk minerals; E%, percentage of energy.
* Each diet consisted of three different breakfast, lunch and dinner dishes and three different snacks, which were served on alternate days.

Modification of effects of saturated fat by calcium

Table 1 Nutrient composition of the three diets, normalized per 10 MJ. [1]

Diet	Control	Milk	Cheese
Energy (kJ)[b]	10,007 (9,266)	10,012 (10,603)	10,006 (10,651)
Energy density (kJ/g)	5.5	5.7	5.4
Weight (g)	1,838	1,742	1,859
Fat (E%)[b]	31.7 (28.9)	31.6 (28.3)	31.5 (27.5)
SFA (g)	45.1	46.5	47.1
MUFA (g)	25.1	23	24.5
PUFA (g)	6.6	5.7	6.5
Carbohydrate (E%)	52.9	52.9	52.9
Protein (E%)	15.4	15.5	15.6
Dietary fiber (g)	19.2	20.3	18.4
Total calcium (mg)	362	1,143	1,172
Dairy calcium (mg)	0	781	810

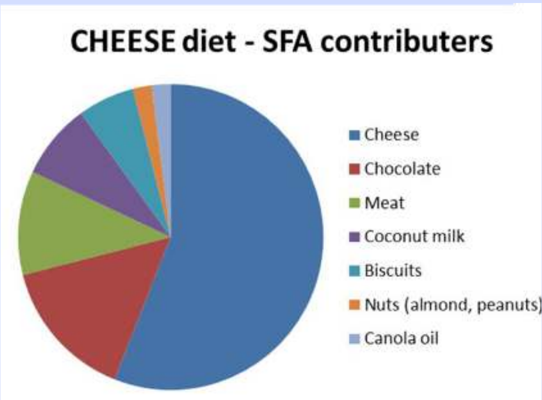
[1] The nutrient content (without water) was estimated using the Dankost 3000 dietary assessment software (Danish Catering Center, Herlev, Denmark). [b] The energy and fat contents were measured.
E%, energy percentage; SFA, saturated fatty acids; MUFA, mono unsaturated fatty acids; PUFA, poly unsaturated fatty acids.

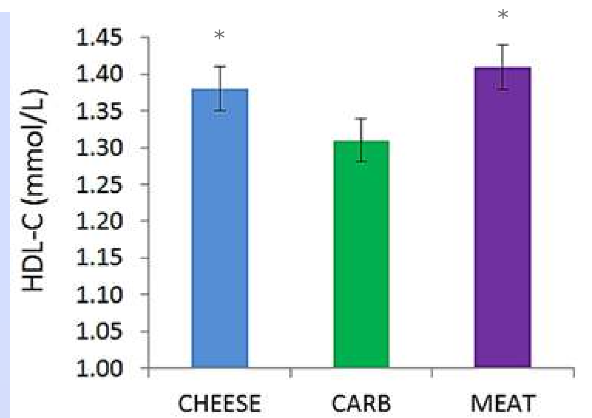
Soerensen, Thorning, Astrup, Kristensen & Lorenzen

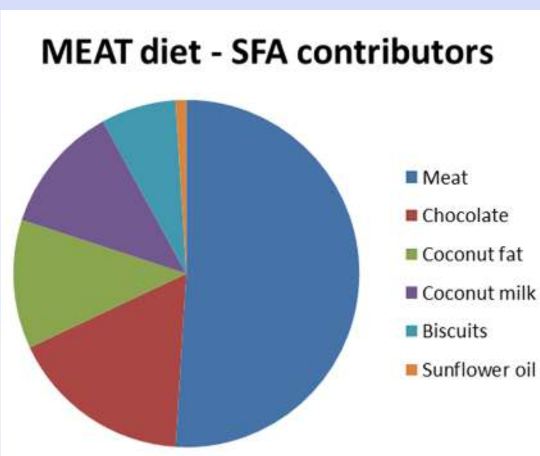
[4]Supported by The Danish Council for Strategic Research in Health, Food and Welfare, Danish Dairy Research Foundation.

Diets with high-fat cheese, high-fat meat, or carbohydrate on cardiovascular risk markers in overweight postmenopausal women: a randomized crossover trial[1,2]

Tanja K Thorning, Farinaz Raziani, Nathalie T Bendsen,[3] Arne Astrup, Tine Tholstrup, and Anne Raben*







No differences in LDL-C or triglycerides between diets

	CHEESE diet	CARB diet	MEAT diet	*P*-diet
Fecal fat excretion, g/d	5.8 ± 0.4[a]	3.9 ± 0.2[b]	4.9 ± 0.4[c]	0.001
Fecal energy excretion, kJ/d	679.6 ± 53.4	631.7 ± 36.3	736.1 ± 46.7	NS
Fecal total bile acid excretion, μmol/d	206.1 ± 24.8[a]	155.3 ± 16.2[b]	225.9 ± 30.7[a]	0.018
Taurine-conjugated bile acids	84.2 ± 15.4[a]	57.2 ± 5.7[b]	56.6 ± 5.8[b]	0.025
Glycine-conjugated	52.2 ± 10.5	50.8 ± 9.0	71.4 ± 12.8	NS
Total conjugated bile acids	133.0 ± 19.0	107.0 ± 11.2	120.1 ± 17.0	NS
Total deconjugated bile acids	73.1 ± 9.7[a]	48.3 ± 6.7[b]	105.8 ± 16.6[c]	<0.001

Am J Clin Nutr Doi:10.3945/ajcn.115.109116 food & nutrition research

co action PUBLISHING

ORIGINAL ARTICLE

Effect of a high intake of cheese on cholesterol and metabolic syndrome: results of a randomized trial

Rita Nilsen[1]*, Arne Torbjørn Høstmark[2], Anna Haug[3] and Siv Skeie[1]

[1]Department of Chemistry, Biotechnology and Food Science, Norwegian University of Life Sciences, Ås, Norway;
[2]Section of Preventive Medicine and Epidemiology, Institute of Health and Society, University of Oslo, Oslo, Norway;
[3]Department of Animal and Aquacultural Sciences, Norwegian University of Life Sciences, Ås, Norway

Design: A total of 153 participants were randomized to one of three groups: Gamalost®, a traditional fat- and salt-free Norwegian cheese (50 g/day), Gouda-type cheese with 27% fat (80 g/day), and a control group with a limited cheese intake. Blood samples, anthropometric measurements, blood pressure, and questionnaires about lifestyle and diet were obtained at inclusion and end.

Conclusions: In conclusion, cholesterol levels did not increase after high intake of 27% fat Gouda-type cheese over 8 weeks' intervention, and stratified analysis showed that participants with metabolic syndrome had reduced cholesterol at the end of the trial.

INTERNATIONAL JOURNAL OF FOOD SCIENCES and NUTRITION

http://informahealthcare.com/ijf
ISSN: 0963-7486 (print), 1465-3478 (electronic)

Int J Food Sci Nutr, Early Online: 1–6
 DOI: 10.3109/09637486.2014.945156

informa healthcare

RESEARCH ARTICLE

Effect on blood lipids of two daily servings of Camembert cheese. An intervention trial in mildly hypercholesterolemic subjects

Jean-Louis Schlienger[1], Francois Paillard[2], Jean-Michel Lecerf[3], Monique Romon[4], Cécile Bonhomme[5], Bernard Schmitt[6], Yves Donazzolo[7], Catherine Defoort[8], Cécilia Mallmann[9], Pascale Le Ruyet[5], and Jean-Louis Bresson[10]

[1]*Service de Médecine Interne, Nutrition, Endocrinologie, Diabétologie, CHU Strasbourg, Strasbourg, France,* [2]*CHU Pontchaillou, Centre de Prévention Cardio-vasculaire, Rennes, France,* [3]*Institut Pasteur de Lille, Lille Cedex, France,* [4]*Faculté de Médecine, Service de Nutrition, CHRU Lille, Lille, France,* [5]*Lactalis, Recherche et Développement, Fromy, Retiers, France,* [6]*Cernh, Lorient, France,* [7]*Optimed Clinical Research, Gières, France,* [8]*Inserm, Marseille, France,* [9]*CIC 9502, Marseille, France, and* [10]*C.I.C. Necker, Paris, France*

Diets

Table 1. Macro- and micro-nutrients composition of study products daily consumed in the two groups (mean values).

	Camembert	Full-fat yoghurt
Serving	60 g	250 g
Energy (kcal)	160.8	186.0
Proteins (g)	13.2	11.0
Carbohydrates (g)	traces	12.0
Lipids (g)	12.0	8.4
Saturated fatty acids (g)	8.0	5.4
Monounsaturated fatty acids (g)	3.2	2.2
Polyunsaturated fatty acids (g)	0.5	0.3
Calcium (mg)	270	312

Study intervention and population

[redacted] For a period of 5 weeks, subjects were instructed to consume twice-a-day either 125 g of full-fat yoghurt (Y group) or 30 g of Camembert cheese (C group), as part of their usual meals (lunch and dinner), according to randomization.

Table 2. Characteristics of volunteers before the experimental period at baseline after 2 weeks run-in with 2 full-fat yoghurt servings daily (mean values ± standard deviations).

V2 (ITT data set)	C group	Y group
M/F	43/39	42/35
Age (y)	49.6 ± 12.0	48.5 ± 10.6
Height (m)	166.7 ± 9.4	168.7 ± 9.7
Weight (kg)	69.9 ± 12.3	72.7 ± 13.3
BMI (kg/m^2)	25.2 ± 3.1	25.5 ± 3.3
Total Cholesterol (mmol/l)	6.45 ± 0.75	6.27 ± 0.79
HDL cholesterol (mmol/l)	1.55 ± 0.40	1.47 ± 0.37
LDL cholesterol (mmol/l)	4.25 ± 0.61	4.18 ± 0.62
Triglycerides (mmol/l)	1.34 ± 0.59	1.24 ± 0.50
ApoB100 (mmol/l)	1.15 ± 0.16	1.14 ± 0.16
ApoA1 (mmol/l)	1.56 ± 0.29	1.50 ± 0.25
LDL-cholesterol/HDL-cholesterol	2.93 ± 0.83	2.98 ± 0.72
Glucose (mmol/l)	5.22 ± 0.52	5.24 ± 0.54

Camenbert does not adversely affect blood lipids or blood pressure

Table 4. Values of blood lipid parameters before and during the experimental period of consumption of either Camembert or full-fat yoghurt (mean values ± standard deviations).

	V2		V4		V5		
PP data set	Y group	C group	Y group	C group	Y group	C group	ANOVA
Total Cholesterol (mmol/l)	6.26 ± 0.80	6.45 ± 0.75	6.28 ± 0.70	6.33 ± 0.86	6.29 ± 0.76	6.40 ± 0.80	NS
HDL cholesterol (mmol/l)	1.46 ± 0.36	1.55 ± 0.40	1.44 ± 0.33	1.47 ± 0.38	1.47 ± 0.37	1.50 ± 0.39	NS
LDL cholesterol (mmol/l)	4.18 ± 0.63	4.25 ± 0.61	4.19 ± 0.54	4.17 ± 0.62	4.18 ± 0.54	4.24 ± 0.61	NS
Triglycerides (mmol/l)	1.26 ± 0.50	1.34 ± 0.59	1.32 ± 0.56	1.45 ± 0.85	1.35 ± 0.61	1.40 ± 0.62	NS
ApoB100 (mmol/l)	1.14 ± 0.16	1.15 ± 0.16	1.12 ± 0.14	1.11 ± 0.17	1.12 ± 0.15	1.13 ± 0.16	NS
ApoA1 (mmol/l)	1.49 ± 0.25	1.56 ± 0.29	1.48 ± 0.24	1.50 ± 0.27	1.50 ± 0.29	1.52 ± 0.26	NS
LDL-cholesterol/HDL-cholesterol	3.00 ± 0.72	2.92 ± 0.83	3.03 ± 0.70	3.01 ± 0.87	2.99 ± 0.69	3.00 ± 0.82	NS

C group, Camembert group; Y group, full-fat Yoghurt group. PP, per protocol, $n = 156$.

"Our efforts are dramatically changing the way doctors treat chronic diseases such as diabetes, heart disease, obesity, and cancer."
(PCRM Website 5th Sept 2015)

Evidence based information ?

Conclusions on dairy and cancer

- According to WCRF reports and the latest meta-analyses, consumption of milk and dairy products probably protects against colorectal cancer, bladder cancer, gastric cancer, and breast cancer.
- Dairy intake does not seem to be associated with risk of pancreatic cancer, ovarian cancer, or lung cancer, whereas the evidence for prostate cancer risk is inconsistent.
- In women, dairy offers significant and robust health benefits in reducing the risk of the common and serious colorectal cancer and possibly also the risk of breast cancer.
- In men, the benefit of the protective effect of milk and dairy on the common and serious colorectal cancer is judged to outweigh a potentially increased risk of prostate cancer.

Thorning, Raben, Tholstrup, Soedamah-Muthu, Givens & Astrup. Unpublished data

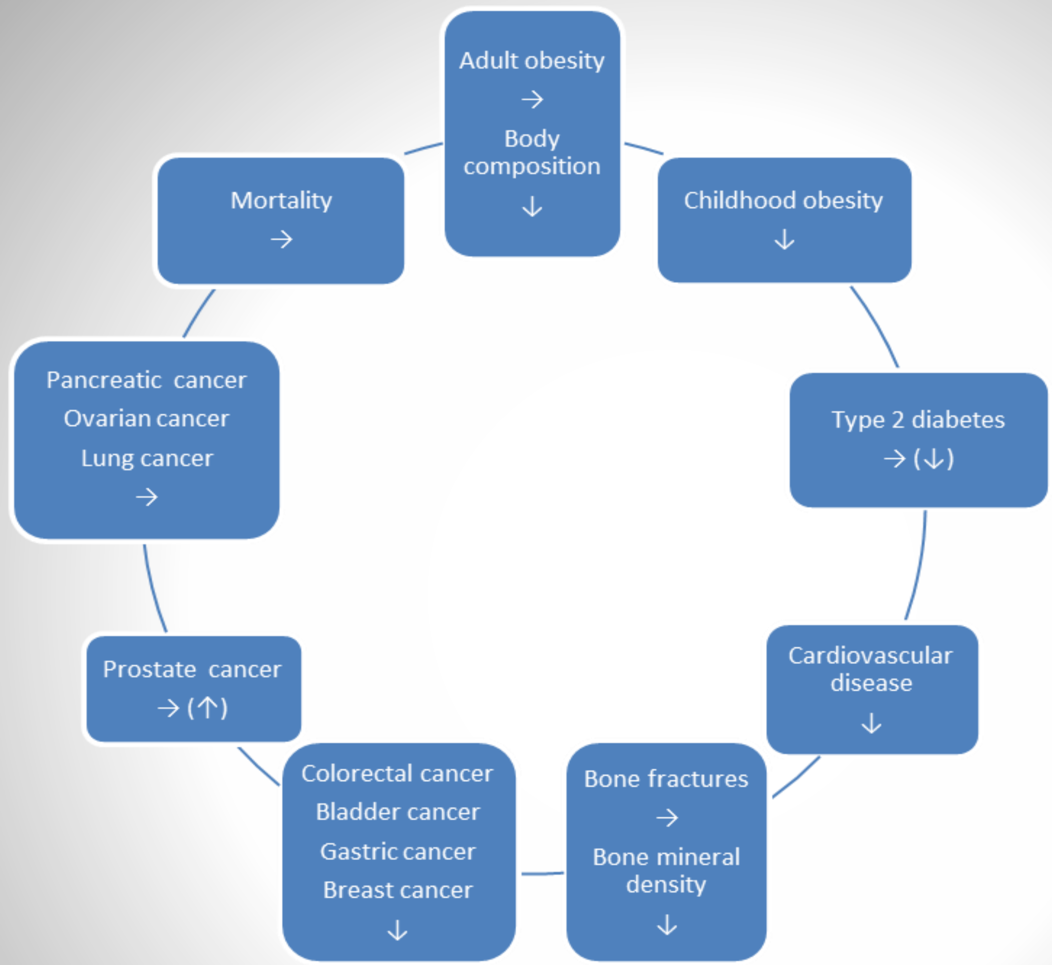


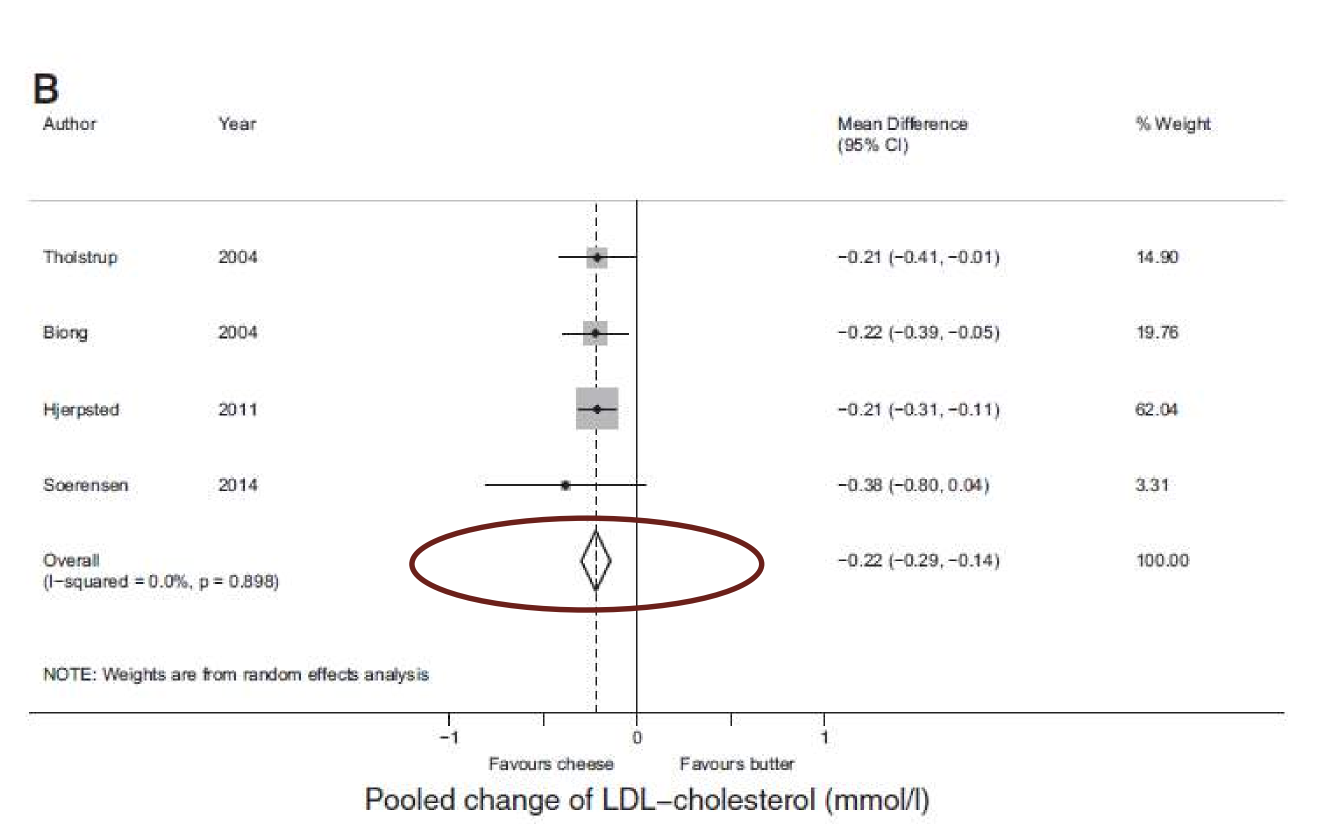
Figure 1. Overall effect/association between dairy intake and health outcomes. ↓favorable effect/association; ↑adverse effect/association; → no effect/association.

Nutrition Reviews Advance Access published March 29, 2015

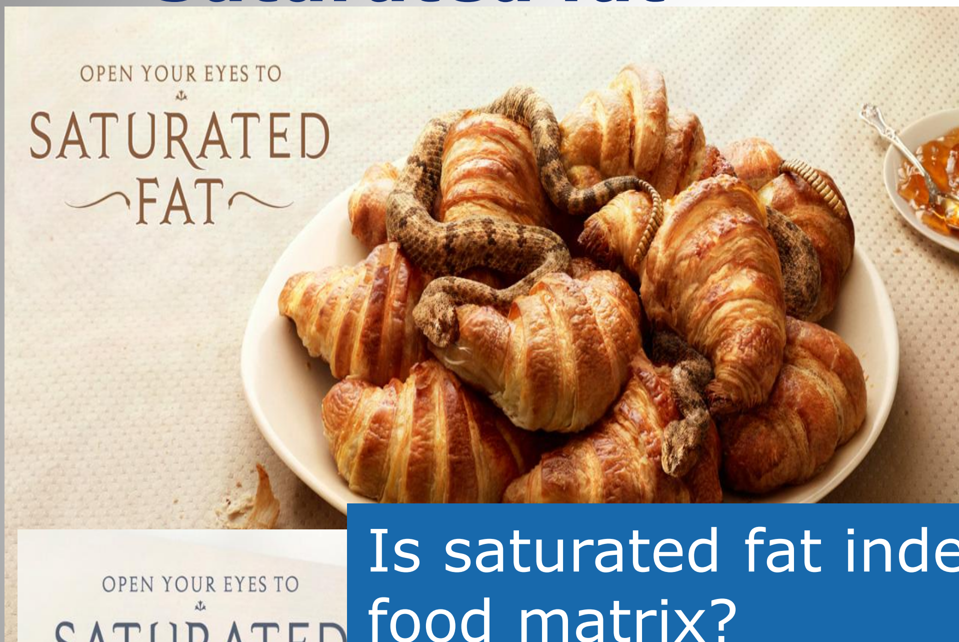
Lead Article

Effect of cheese consumption on blood lipids: a systematic review and meta-analysis of randomized controlled trials

Janette de Goede, Johanna M. Geleijnse, Eric L. Ding, and Sabita S. Soedamah-Muthu



Saturated fat



Is saturated fat independent on the food matrix?

Dairy and body weight regulation

International Journal of Obesity (2012) 1 - 9
 0307-0565/12

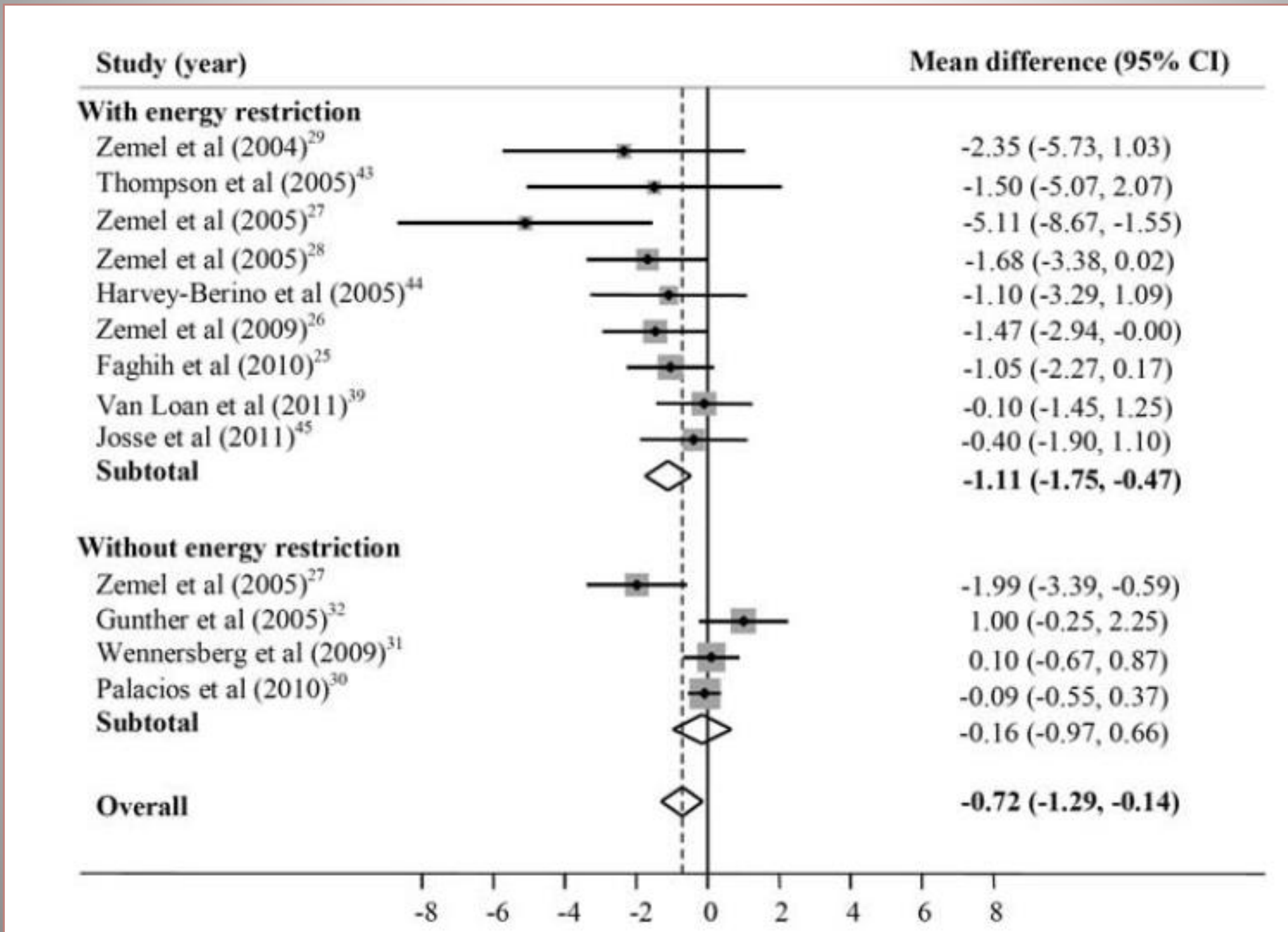
www.nature.com/ijo

ORIGINAL ARTICLE

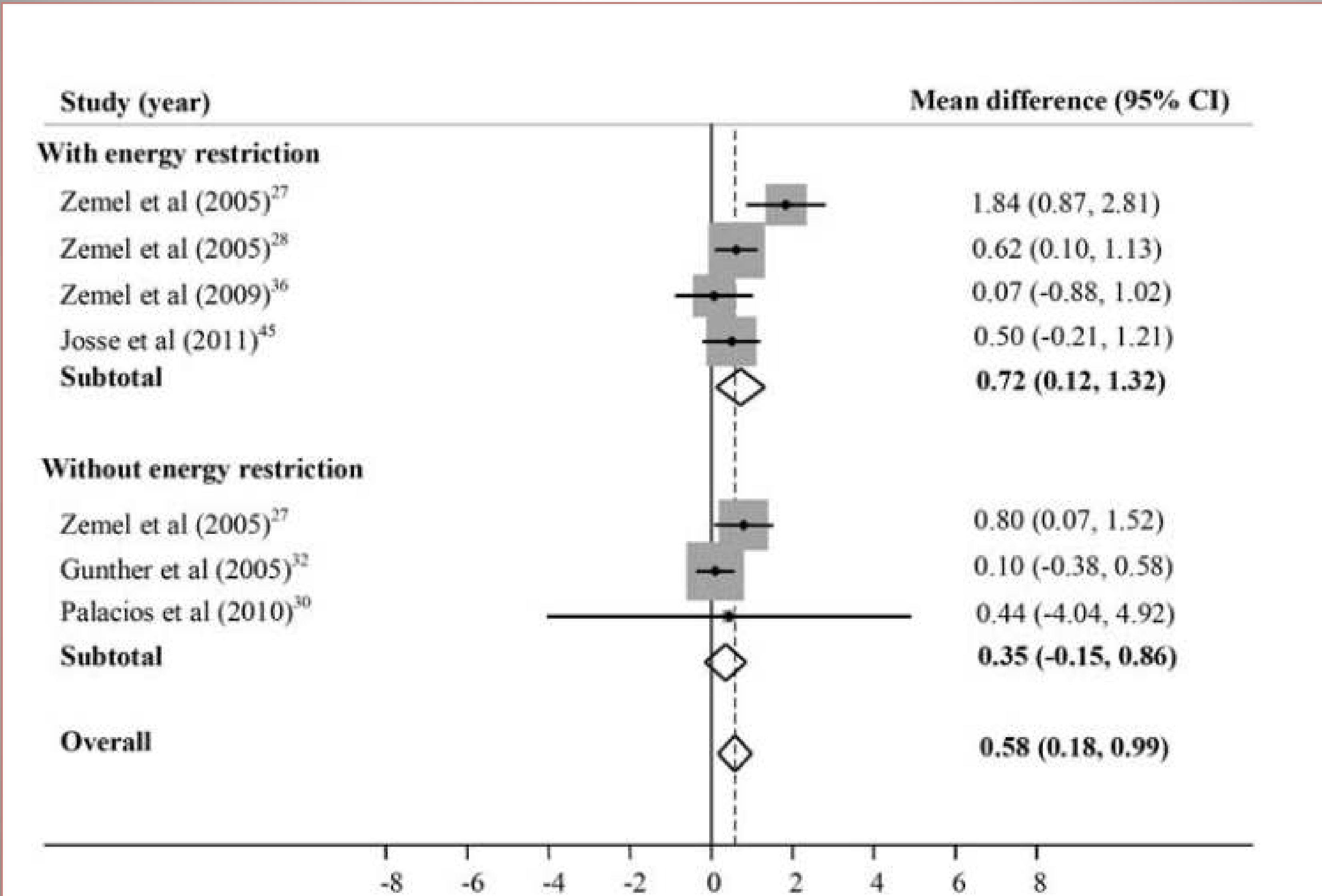
Effect of dairy consumption on weight and body composition in adults: a systematic review and meta-analysis of randomized controlled clinical trials

AS Abargouei[1,2], M Janghorbani[3], M Salehi-Marzijarani[3] and A Esmaillzadeh[1,2]

Effect of high vs low dairy on fat loss



Effect of high vs low dairy on fat free mass



Effects of cheese on CVD risk factors & Mechanisms

- Obesity
- Type 2 diabetes
- Blood lipids

- The cheese food matrix and mechanisms

Beneficial effect of cheese on HDL-cholesterol