

A young boy with blonde hair is shown from the chest up, sitting in a tree. He is holding a green apple with both hands and has a bite taken out of it. He is looking upwards and to the right with a focused expression. The background is filled with green leaves and branches, creating a natural, outdoor setting.

Saturated fat and CVD: a need for revision of current recommendations?

Arne Astrup
Professor, MD, DMSc

Senior Vice President –
Obesity and Nutritional Sciences
The Novo Nordisk Foundation, Hellerup, Denmark

Potential conflicts of interest - October 2022

Networks and Committees

- Associate Editor of American Journal of Clinical Nutrition
- Member of the International Carbohydrate Quality Consortium (ICQC) scientific network (2013-)
- Member of the Board for King Christian IX and Queen Louise's Anniversary Foundation (Kong Christian d. IX og Dronning Louises Jubilæumslegat) (2015-)

Advisory boards, scientific councils

- Chairman of Scientific Advisory Board, RNCP, Groupe Éthique et Santé, FR (2017-)
- International Egg Commission/Danske Æg, Expert Group (2020-)
- Green Leaf Medicil, SAB (2021-)

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| 01 Saturated fat and CVD

| 02 The role of the dairy matrix and cardiometabolic disease and bone health

| 03 One diet does not fit all – a role for precision medicine



Dietary Guidelines 2015-2020



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

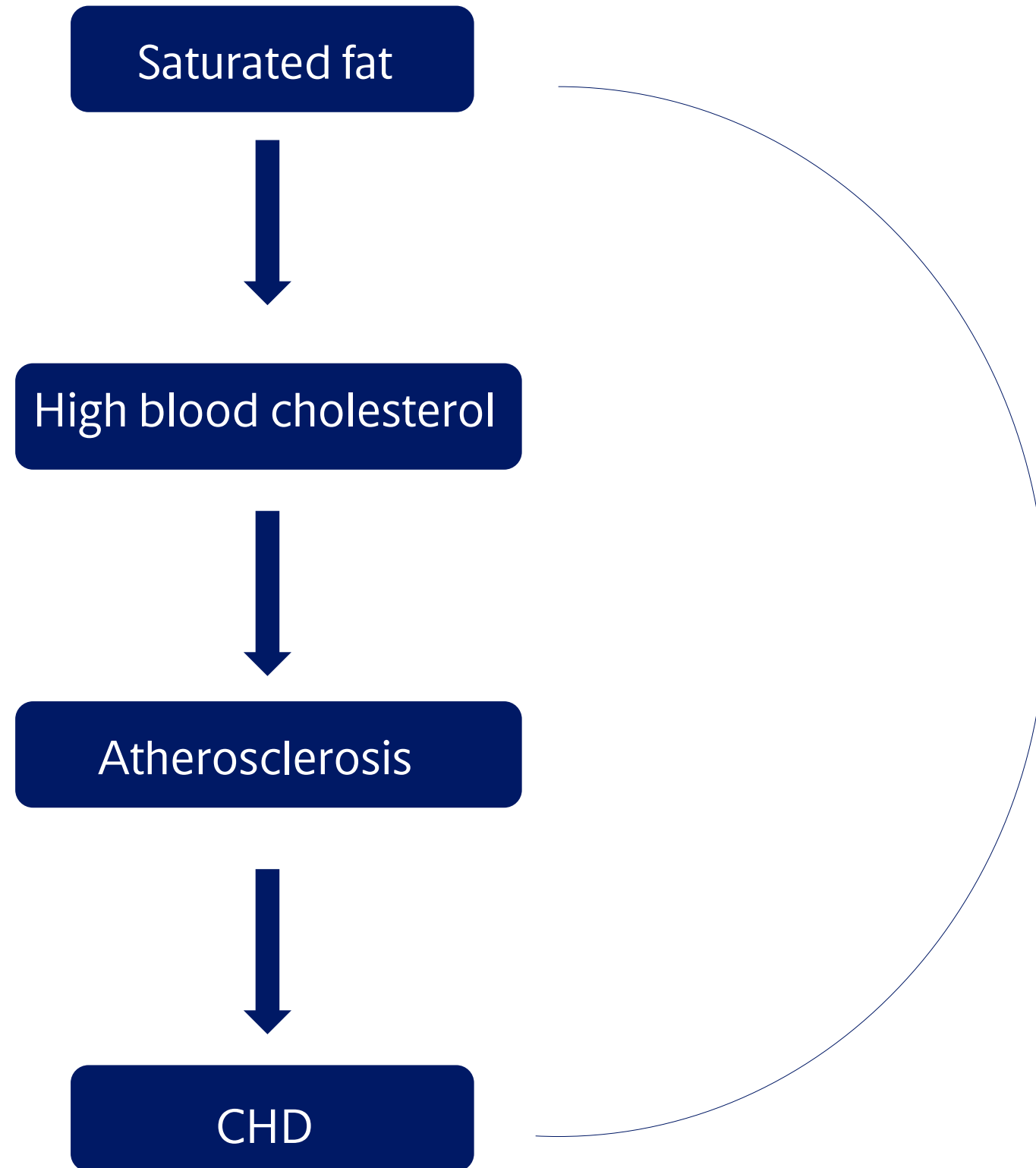
Key Recommendations that are quantitative are provided for several components of the diet that should be limited. These components are of particular public health concern in the United States, and the specified limits can help individuals achieve healthy eating patterns within calorie limits:

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

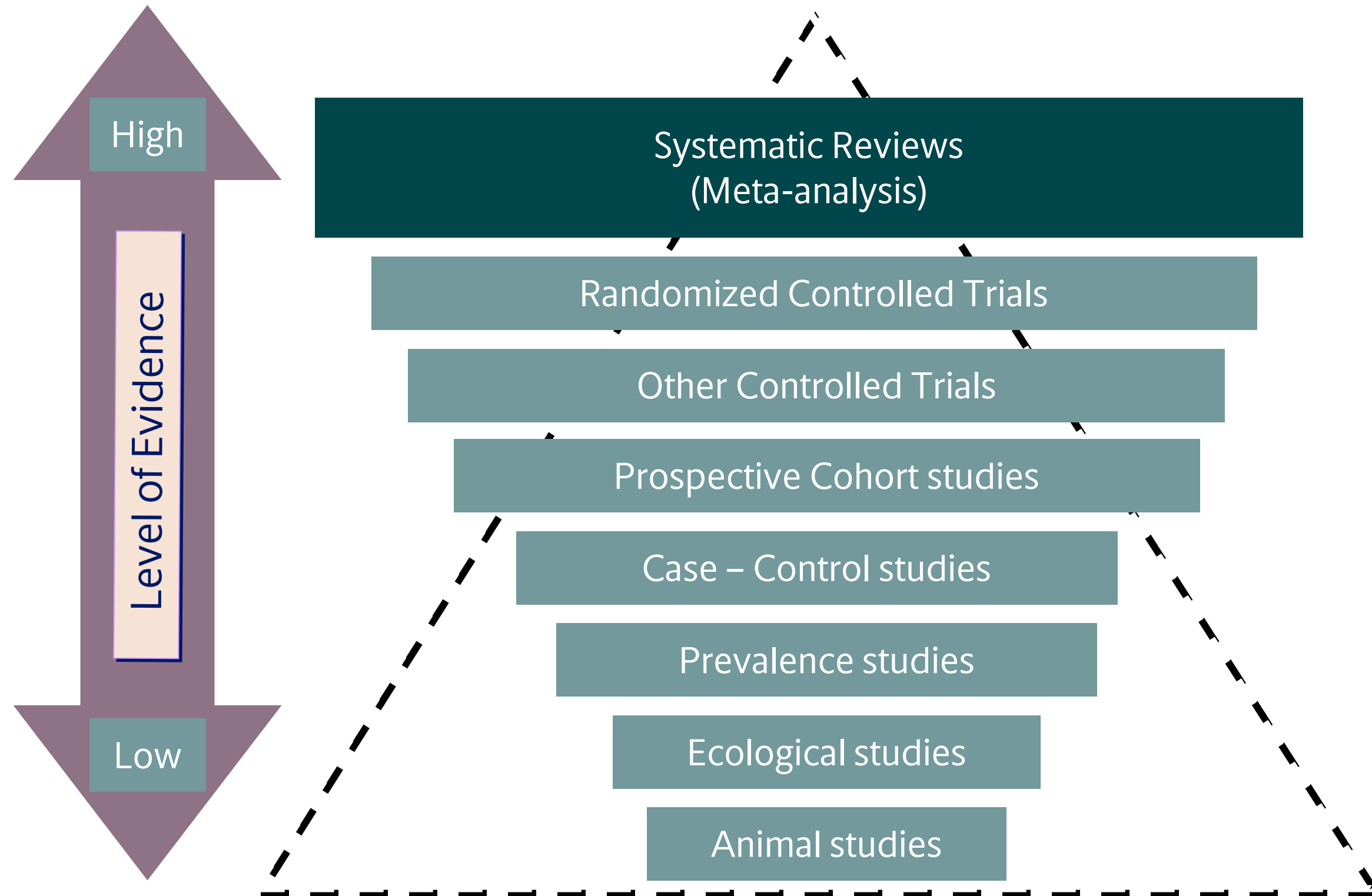
EFSA: As low as possible

- 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]

The lipid hypothesis and CHD



Hierarchy in Scientific Evidence



Saturated fat intake and CVD risk - the most recent evidence

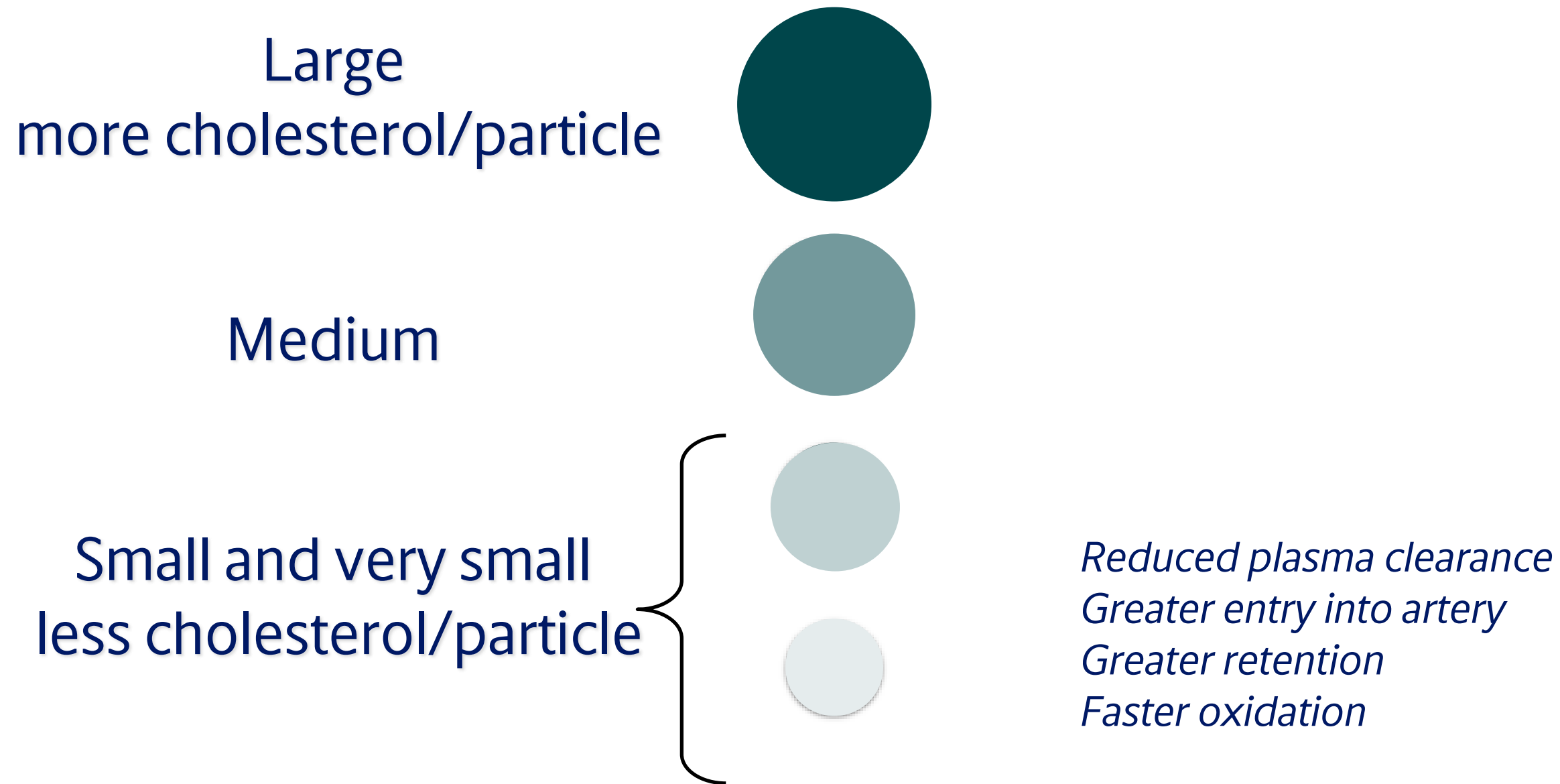


The WHO evidence

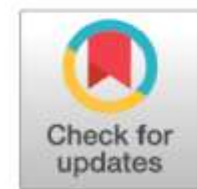
Cochrane analysis by Hooper et al 2020 reviewed RCTs with a minimum of 24 months duration. The review included 15 studies involving approximately 59,000 people and was focused on the impact of saturated fat reduction on dying, heart disease and stroke.

- There were eight main end-points. Seven of these were non-significant i.e. they found nothing. Again, this is never press-released; it should be the headline.
- 1) There was no significant effect from reducing saturated fat on total mortality.
- 2) There was no significant effect from reducing saturated fat on CVD mortality.
- 3) There was no significant effect from reducing saturated fat on CHD mortality.
- 4) There was no significant effect from reducing saturated fat on fatal heart attacks.
- 5) There was no significant effect from reducing saturated fat on non-fatal heart attacks.
- 6) There was no significant effect from reducing saturated fat on CHD events.
- 7) There was no significant effect from reducing saturated fat on strokes.
- The one significant finding was for CVD events: the risk ratio (RR) for CVD events from meta-analysis was 0.79 (95% CI 0.66 to 0.93). A sensitivity analysis for RCTs that did actually reduce saturated fat – excluding studies that aimed to reduce saturated fat but didn't – showed that the effect on CVD events was no longer significant.

LDL is comprised of subclasses of particles with differing cholesterol content and atherogenic properties



Distribution of subclasses varies widely among individuals and is independent of total LDL cholesterol



ANALYSIS

WHO draft guidelines on dietary saturated and trans fatty acids: time for a new approach?

The 2018 WHO draft guidance on fatty acids fails to consider the importance of the food matrix, argue **Arne Astrup and colleagues**

Arne Astrup *head of department*¹, Hanne CS Bertram *professor*², Jean-Philippe Bonjour *honorary professor of medicine*³, Lisette CP de Groot *professor*⁴, Marcia C de Oliveira Otto *assistant professor*⁵, Emma L Feeney *assistant professor*⁶, Manohar L Garg *director*⁷, Ian Givens *professor and director*⁸, Frans J Kok *emeritus professor of nutrition and health*⁴, Ronald M Krauss *senior scientist and Dolores Jordan endowed chair*⁹, Benoît Lamarche *chair of nutrition*¹⁰, Jean-Michel Lecerf *head of department*¹¹, Philippe Legrand *professor*¹², Michelle McKinley *reader*¹³, Renata Micha *associate professor*¹⁴, Marie-Caroline Michalski *research director*¹⁵, Dariush Mozaffarian *dean*¹⁴, Sabita S Soedamah-Muthu *associate professor*¹⁶

Questions ?

- Justification to treat Saturated fat as one group ?

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

Or just by the content of saturated fat?

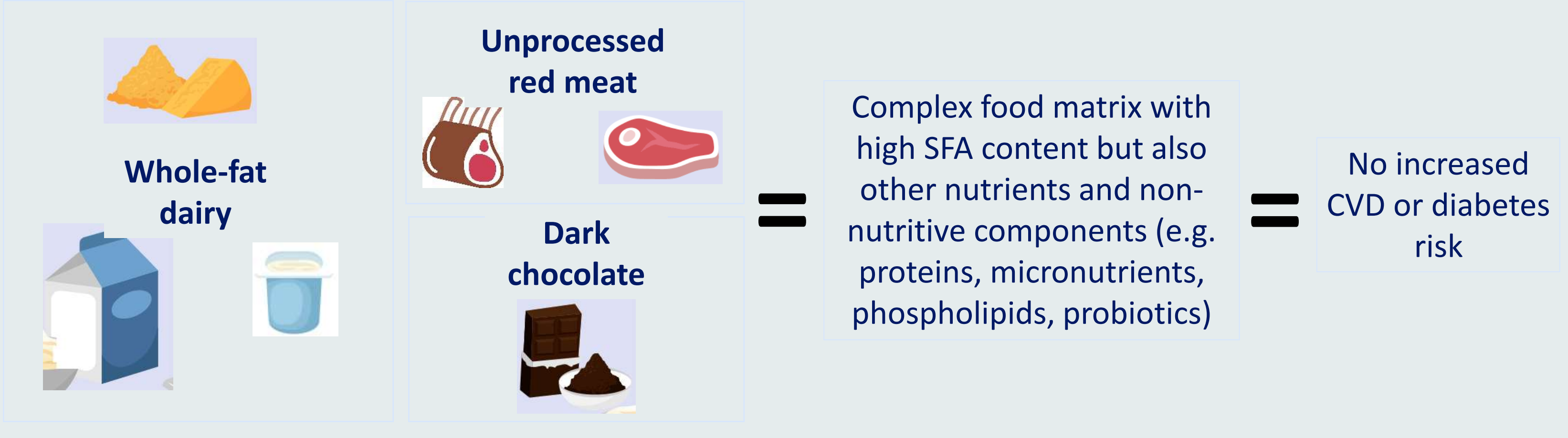


From single nutrients to whole foods: the importance of the food matrix

Previous advice: restrict SFA intake to reduce risk of CVD



Current evidence base: health effects of SFAs depend on the interacting effects from naturally occurring food components and from unhealthy compounds introduced by processing



New recommendations should emphasize food-based strategies that translate for the public into understandable, consistent, and robust recommendations for healthy dietary patterns



THE PRESENT AND FUTURE

JACC STATE-OF-THE-ART REVIEW

Saturated Fats and Health: A Reassessment and Proposal for Food-Based Recommendations



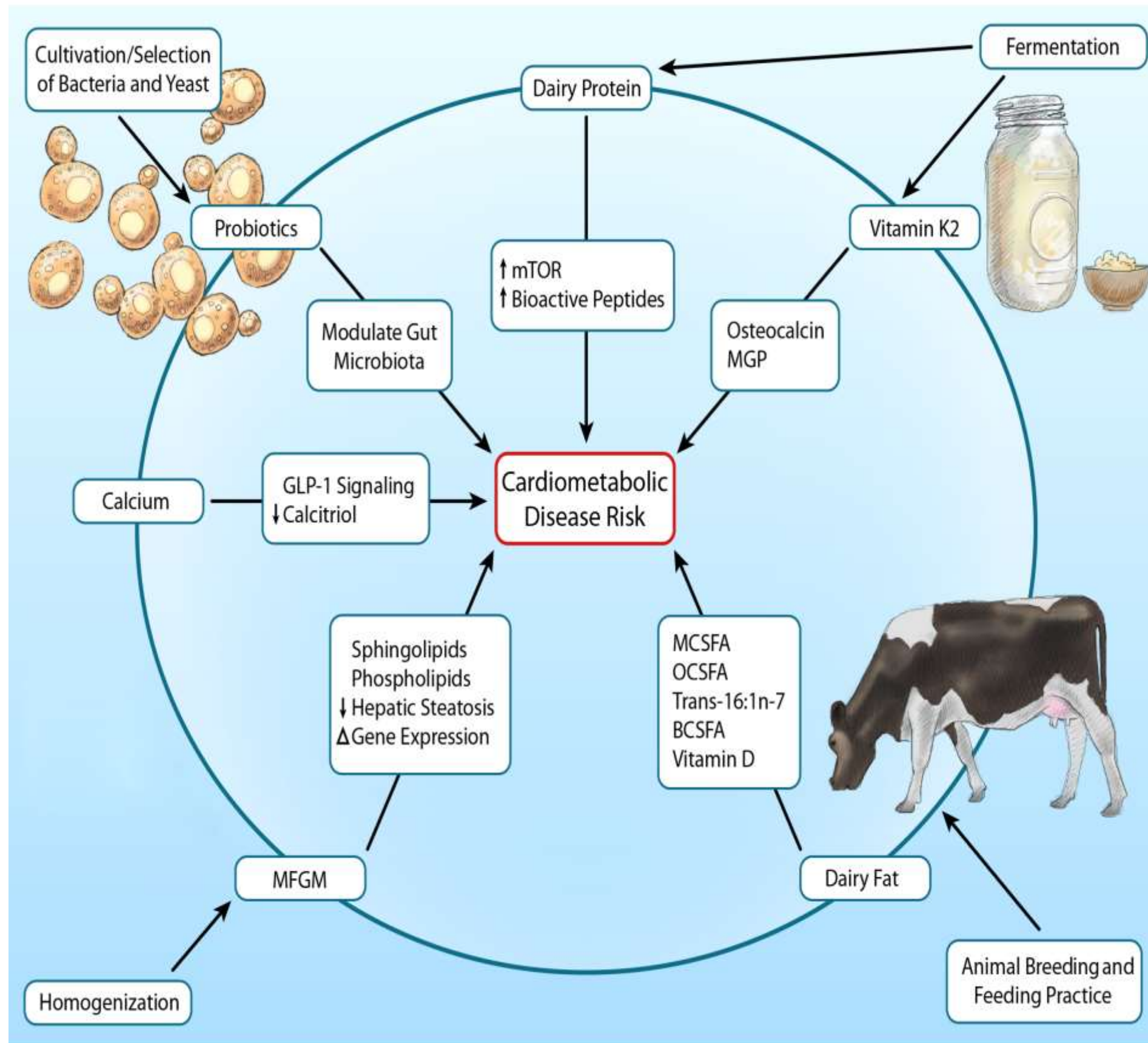
JACC State-of-the-Art Review

Arne Astrup, MD, DMSc,^a Faidon Magkos, PhD,^a Dennis M. Bier, MD,^b J. Thomas Brenna, PhD,^{c,d,e}
Marcia C. de Oliveira Otto, PhD,^f James O. Hill, PhD,^g Janet C. King, PhD,^h Andrew Mente, PhD,ⁱ Jose M. Ordovas, PhD,^j
Jeff S. Volek, PhD, RD,^k Salim Yusuf, DPHIL,ⁱ Ronald M. Krauss, MD^{l,m}

ABSTRACT

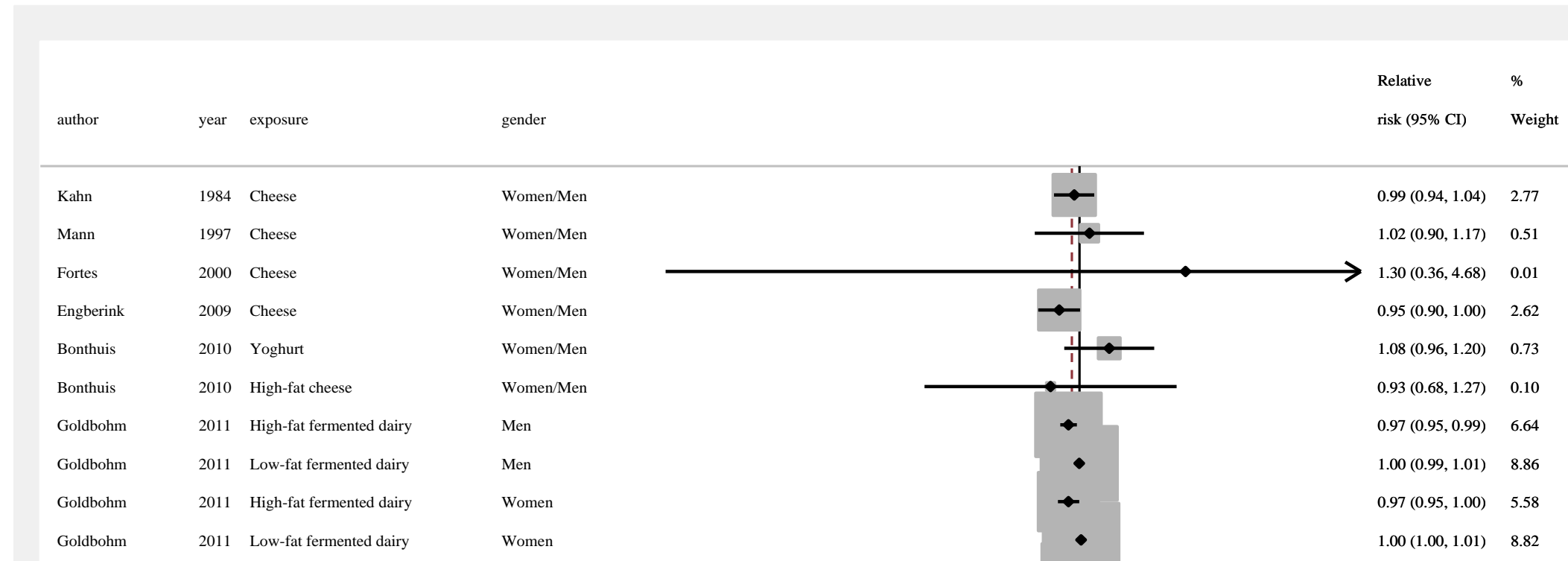
The recommendation to limit dietary saturated fatty acid (SFA) intake has persisted despite mounting evidence to the

Dairy & Cardiometabolic Health: Potential Mechanisms



*Mozaffarian & Wu,
Circulation Res 2018*

Updated meta-analysis of fermented dairy and CVD and mortality



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.

Dairy contributes to prevent obesity: Childhood and adult

Meta-analyses of observational studies and RCT's find that dairy in children reduce risk of obesity with beneficial effect on body composition



The NEW ENGLAND
JOURNAL of MEDICINE

Milk and Health

June 4, 2020
N Engl J Med 2020; 382:e86
DOI: 10.1056/NEJMc2005220
Metrics

International Journal of Obesity (2012) 1 - 9
© 2012 Macmillan Publishers Limited All rights reserved 0307-0565/12
www.nature.com/ijo

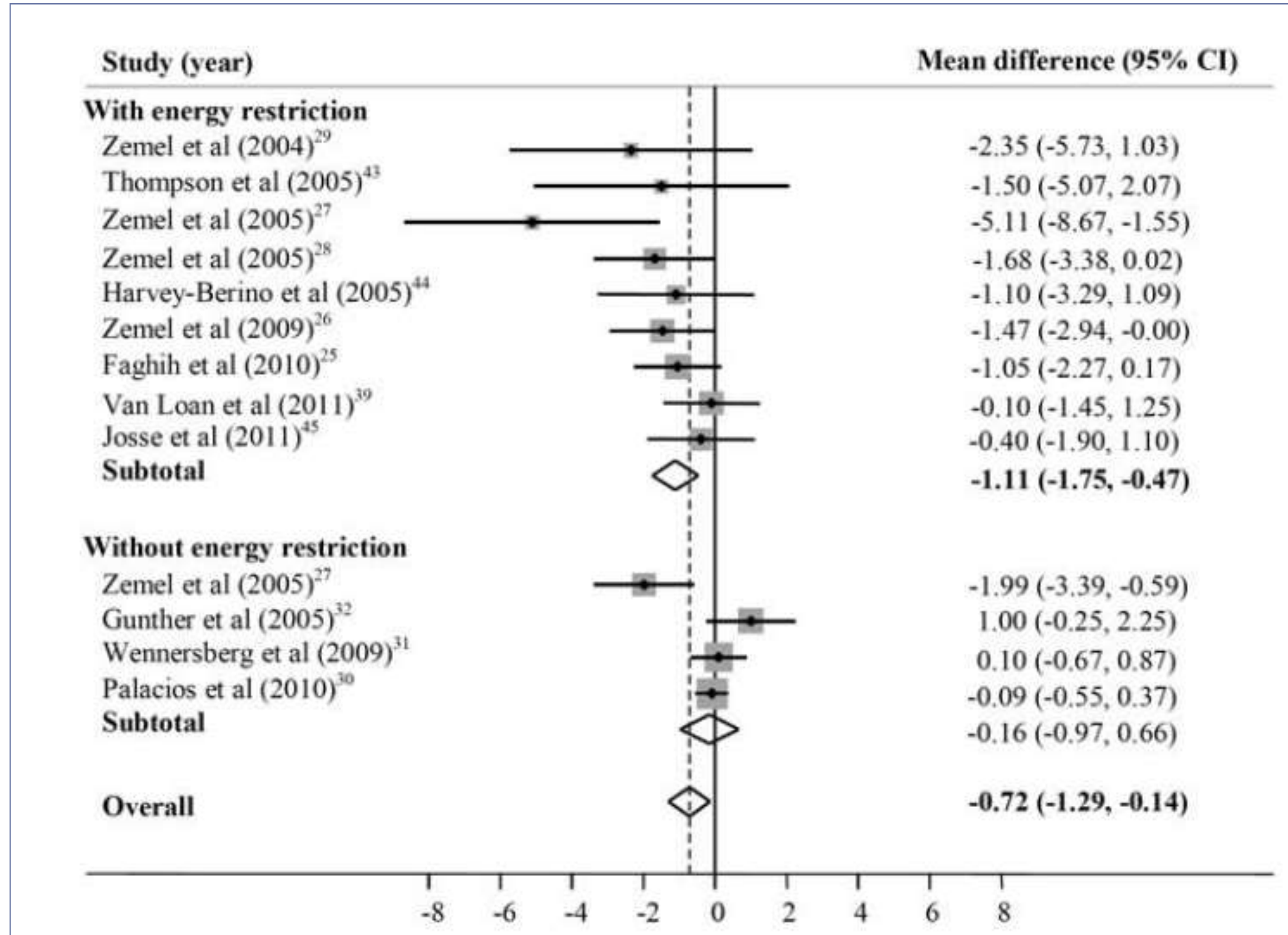


ORIGINAL ARTICLE

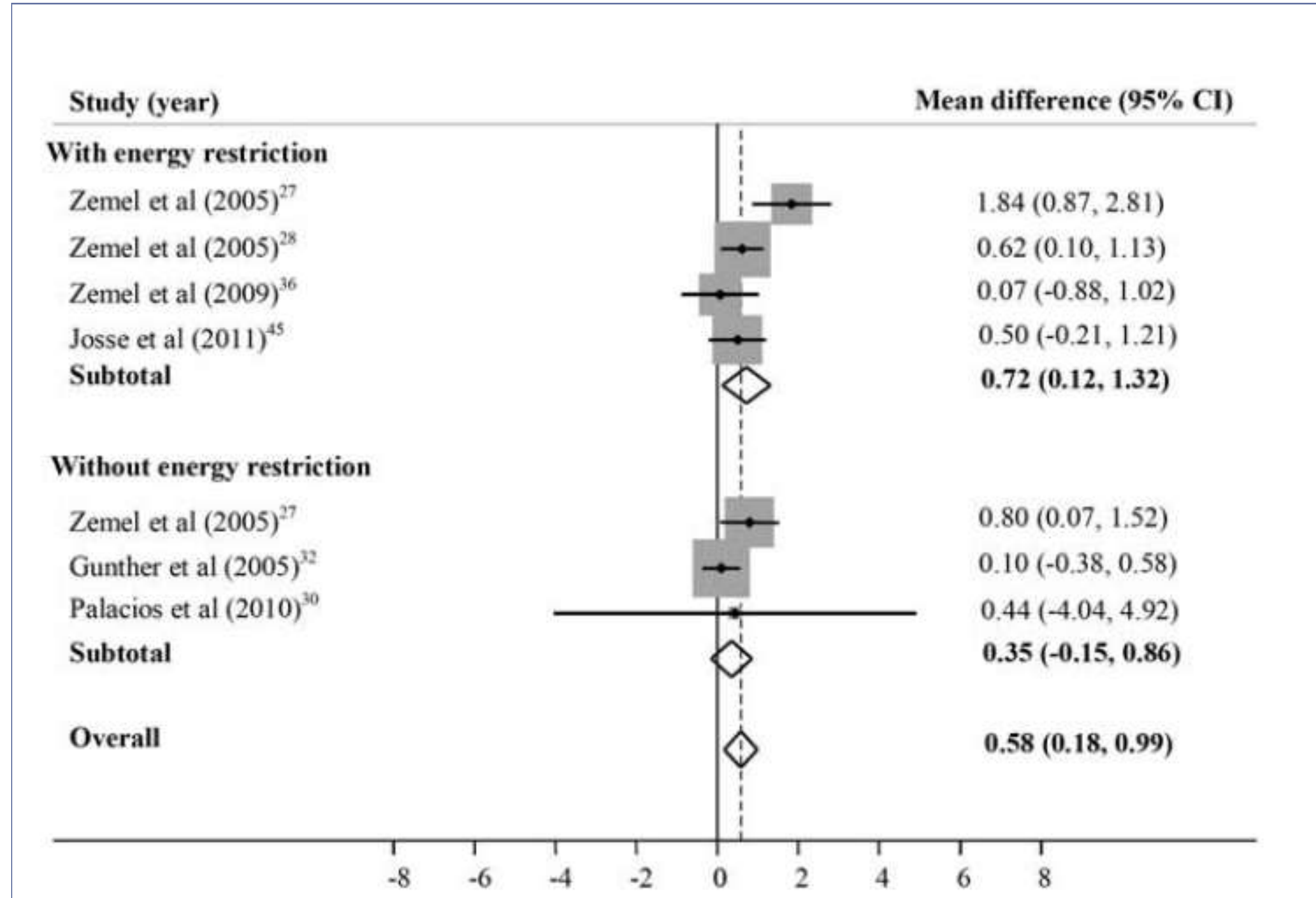
Effect of dairy consumption on weight and body composition
in adults: a systematic review and meta-analysis of randomized
controlled clinical trials

AS Abargouei^{1,2}, M Janghorbani³, M Salehi-Marzijarani³ and A Esmailzadeh^{1,2}

Effect of high vs low dairy on fat loss



Effect of high vs low dairy on fat free mass





Effect of dietary sources of calcium and protein on hip fractures and falls in older adults in residential care: cluster randomised controlled trial

S Iuliano,¹ S Poon,¹ J Robbins,¹ M Bui,² X Wang,¹ L De Groot,³ M Van Loan,⁴ A Ghasem Zadeh,¹ T Nguyen,^{5,6} E Seeman¹

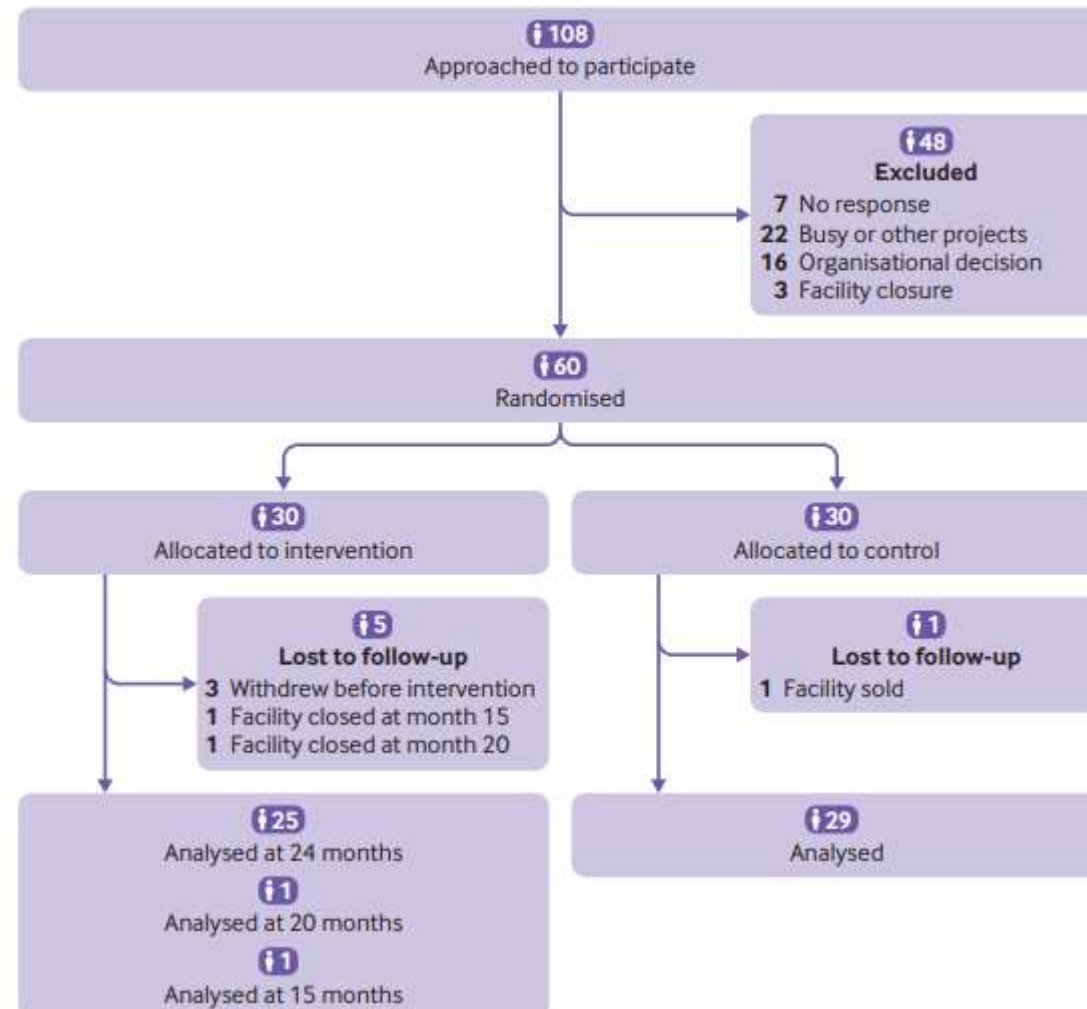
¹Departments of Medicine and Endocrinology, Austin Health, University of Melbourne, Melbourne, Australia

²School of Population and Global Health, University of Melbourne

ABSTRACT

OBJECTIVE

To assess the antifracture efficacy and safety of a nutritional intervention in institutionalised older adults replete in vitamin D but with mean intakes of



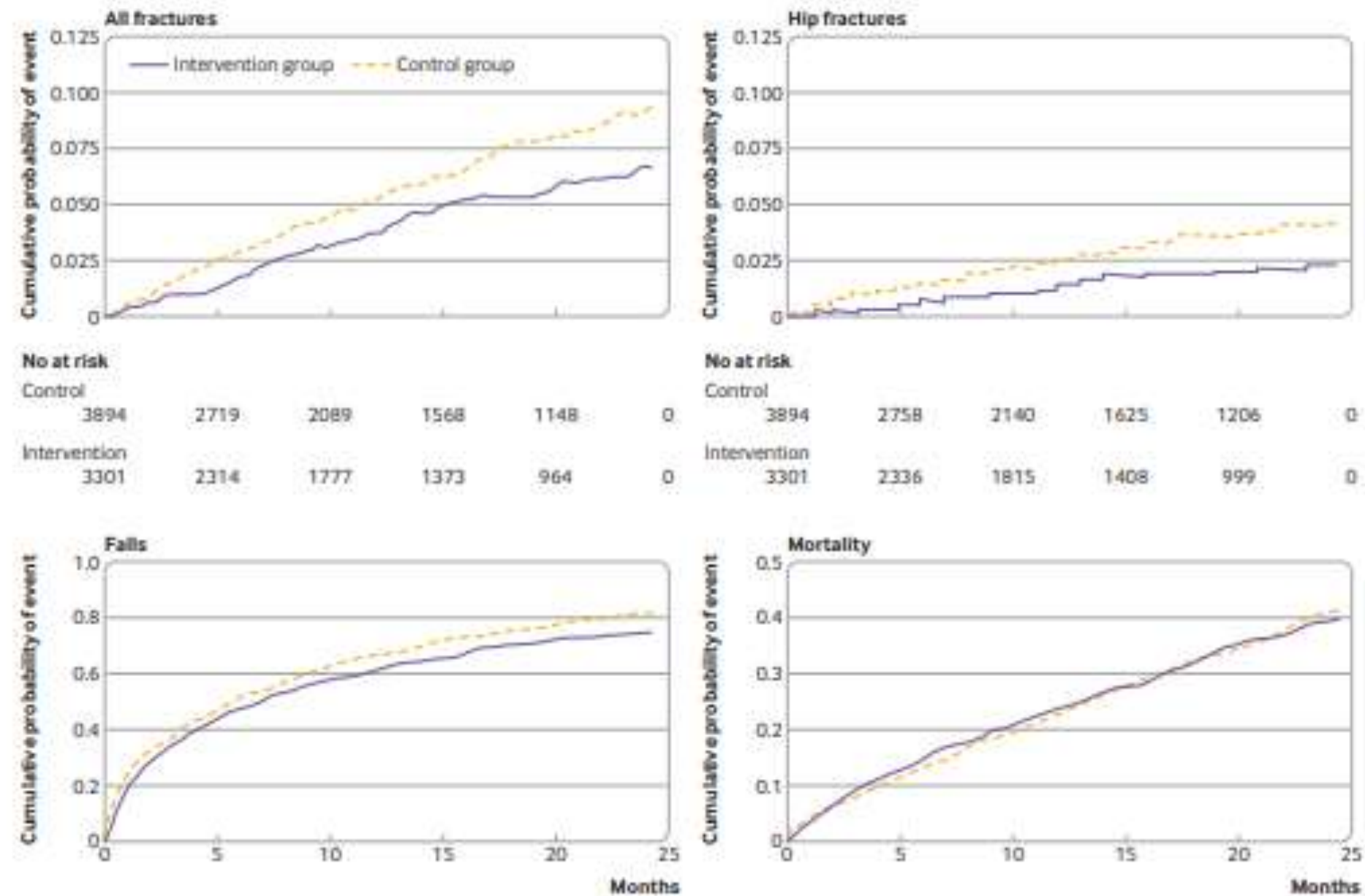
WHAT IS ALREADY KNOWN ON THIS TOPIC

Few studies have investigated the efficacy and safety of a nutritional approach to reduction of fracture risk in institutionalised older adults

One study using pharmacological doses of calcium and vitamin D reduced hip fractures in female nursing home residents with low calcium intakes and vitamin D deficiency

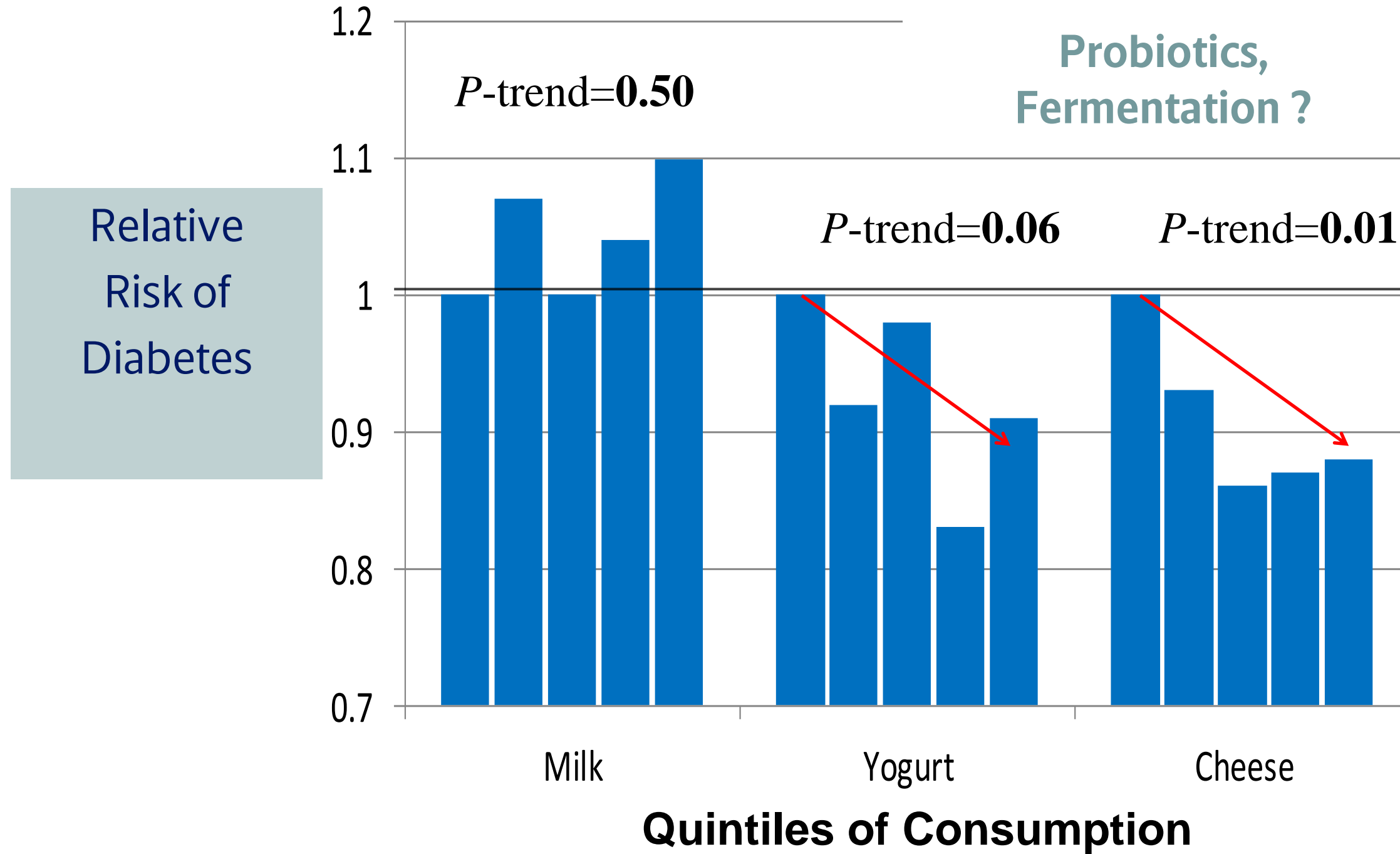
WHAT THIS STUDY ADDS

Supplementation using high calcium, high protein dairy foods reduced falls and fractures in vitamin D replete older adults in aged care



Dairy Foods and Risk of Diabetes

340,234 Europeans, 8 countries, 12,403 cases





Effects of Milk and Dairy Product Consumption on Type 2 Diabetes: Overview of Systematic Reviews and Meta-Analyses

Celia Alvarez-Bueno,¹ Ivan Caverro-Redondo,¹ Vicente Martinez-Vizcaino,^{1,2} Mercedes Sotos-Prieto,^{3,4,5} Jonatan R Ruiz,⁶ and Angel Gil^{7,8,9,10}

¹Health and Social Research Center, Universidad de Castilla-La Mancha, Cuenca, Spain; ²Facultad de Ciencias de la Salud, Universidad Autónoma de Chile, Talca, Chile; ³Department of Environmental Health, Harvard TH Chan School of Public Health, Boston, MA; ⁴Department of Food Sciences and Nutrition, School of Applied Health Sciences and Wellness, ⁵Diabetes Institute, Ohio University, Athens, OH; ⁶PROFITH (PROmoting FITness and Health through Physical Activity) Research Group, Department of Physical Education and Sport, Faculty of Sport Sciences, ⁷Department of Biochemistry and Molecular Biology II, School of Pharmacy, ⁸Institute of Nutrition and Food Technology "José Mataix," Biomedical Research Center, University of Granada, Granada, Spain; ⁹Instituto de Investigación Biosanitaria ibs GRANADA, Complejo Hospitalario Universitario de Granada, Granada, Spain; and ¹⁰CIBEROBN (CIBER Physiopathology of Obesity and Nutrition CB12/03/30028), Instituto de Salud Carlos III, Madrid, Spain

The participants' ages ranged from 20 to 88 y, and participants were followed up for from 4 to 30 y. Studies included 64,227–566,875 participants and reported 4810–44,474 cases of T2D. Most studies reported an inverse association between T2D incidence and dairy product consumption, especially for 1) total dairy products (range: 0.86–0.91), 2) low-fat dairy products (range: 0.81–0.83), 3) low-fat milk (RR: 0.82), and 4) yogurt (range: 0.74–0.86). Dose–response analyses showed a decreased T2D risk for 1) 200–400 g/d of total dairy products (range: 0.93–0.97) and 2) 200 g/d of low-fat dairy products (range: 0.88–0.91). Total dairy product consumption is associated with a lower risk of T2D, especially for yogurt and low-fat dairy consumption. The association with cheese is moderate. Moreover, dose–response analyses showed that the risk of T2D decreased by each unit increase in consumption of total dairy products and low-fat dairy products. *Adv Nutr* 2019;10:S154–S163.

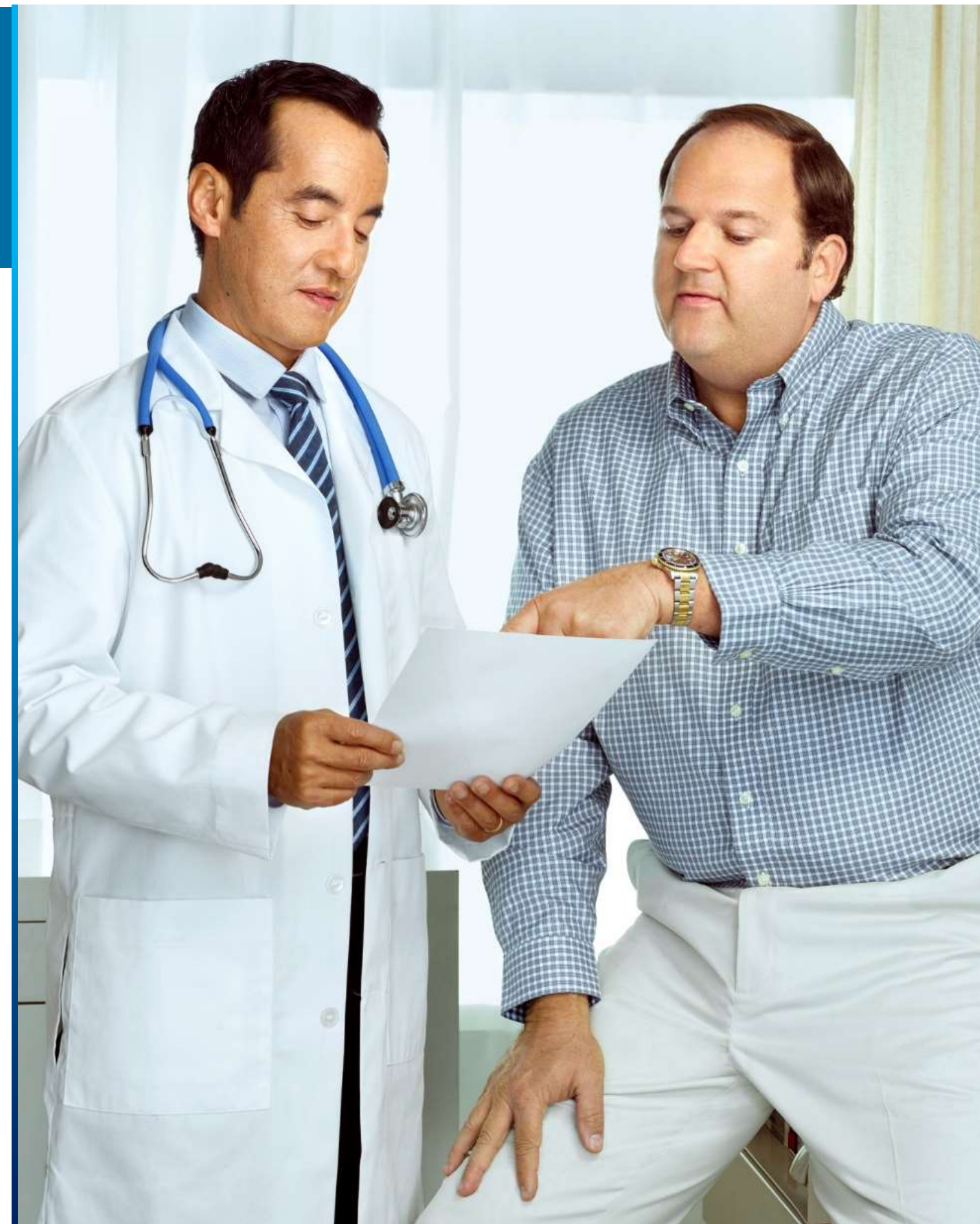
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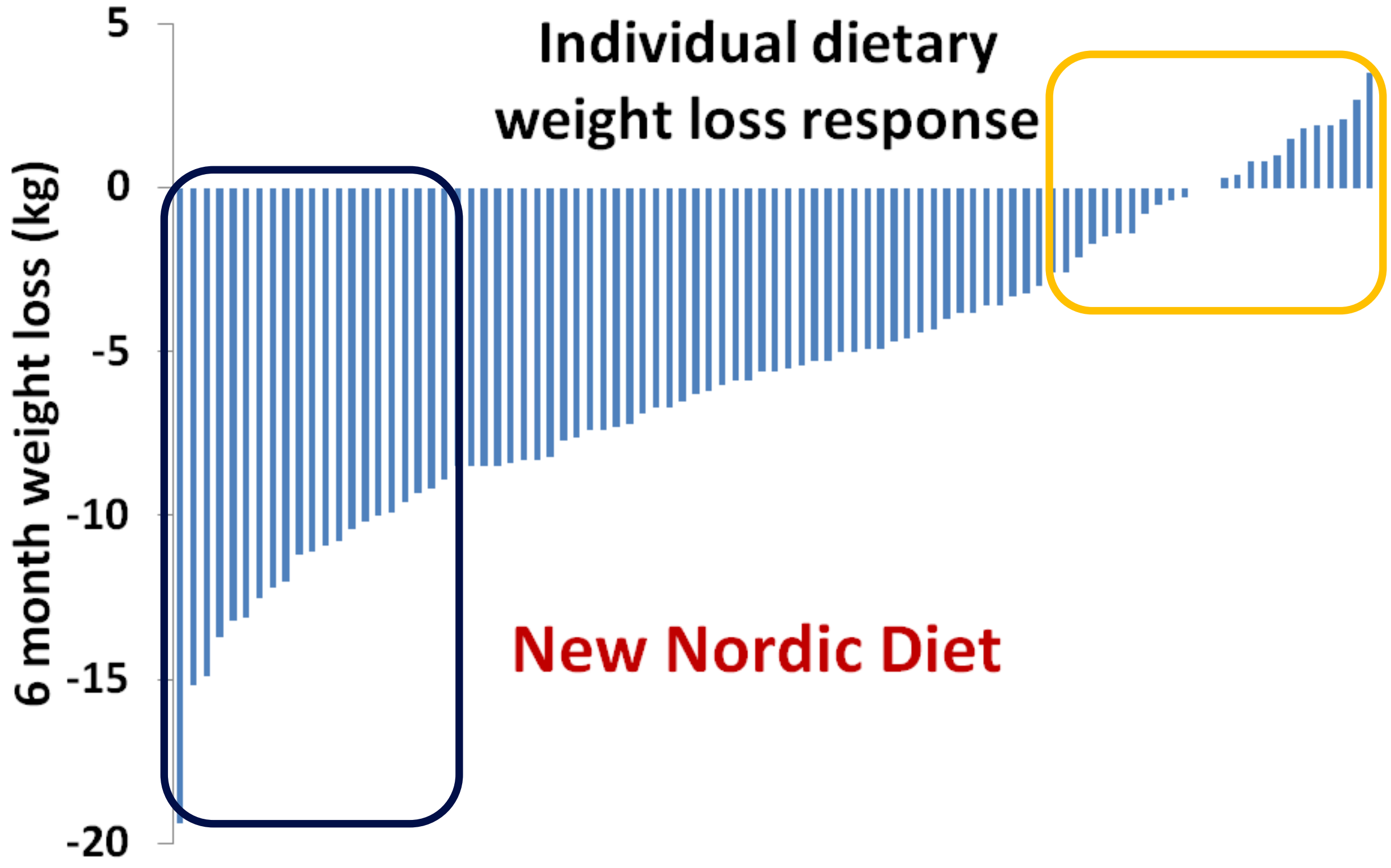
| 02

| 03

One diet does not fit all – a role for “carbohydrate tolerance” classification



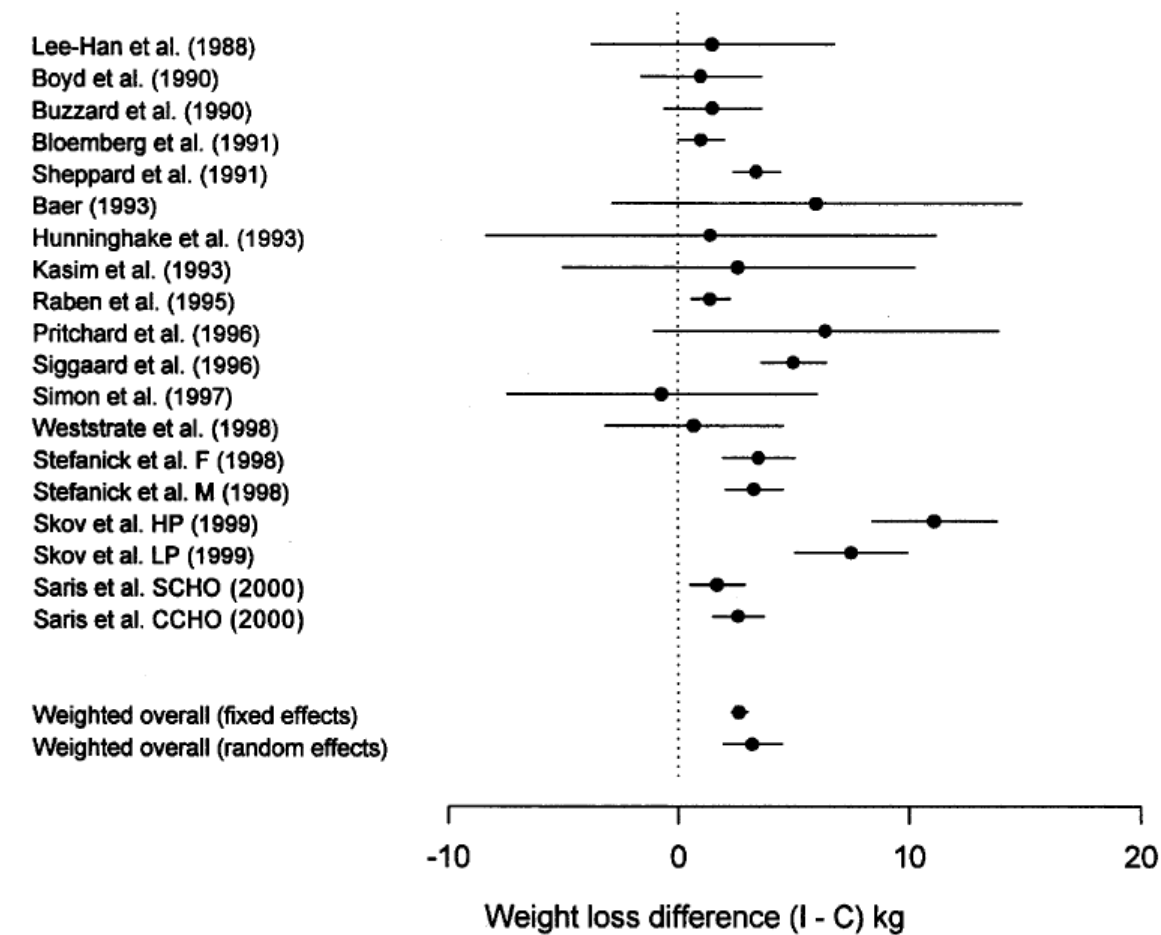
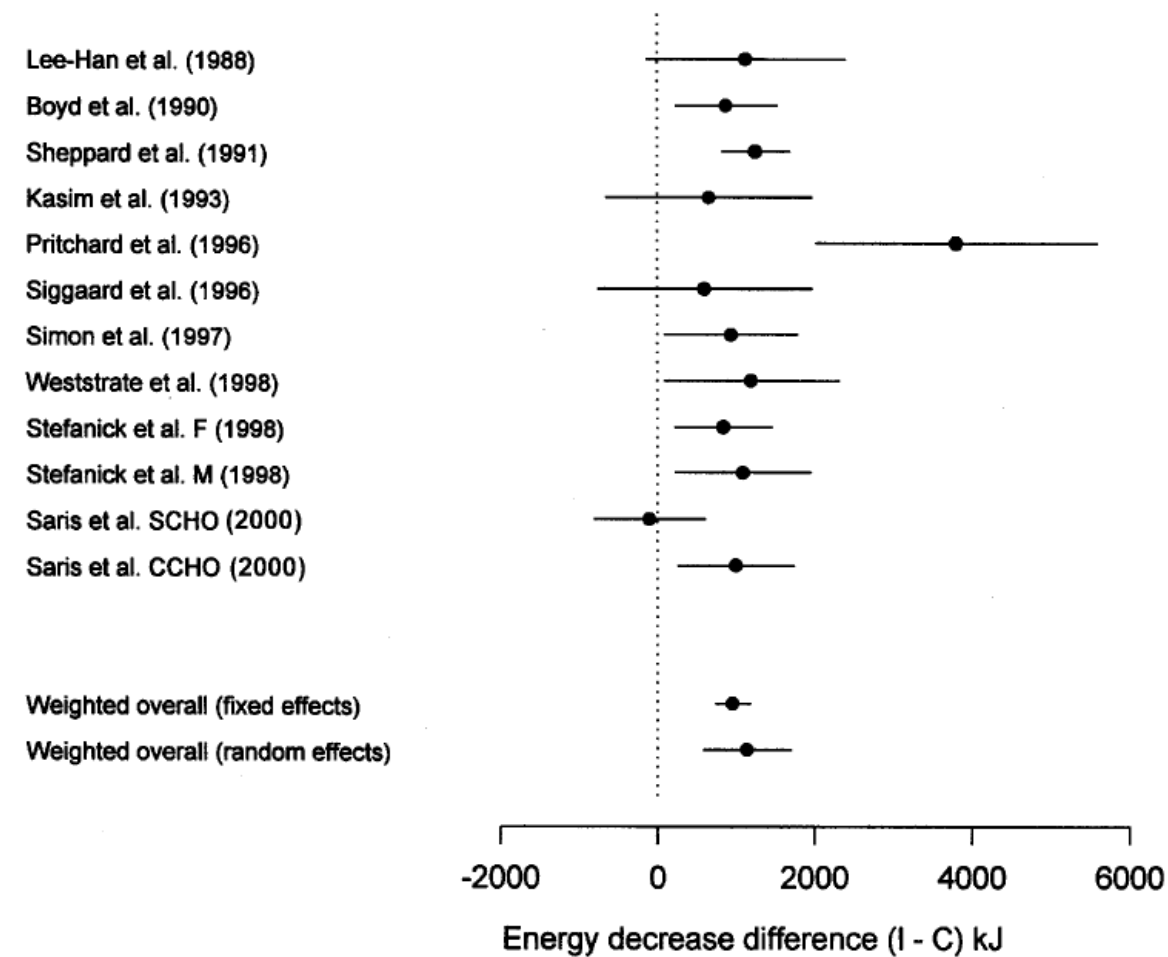
Individual weight loss when following a healthy diet – Low-GI/high in fibre and whole grain





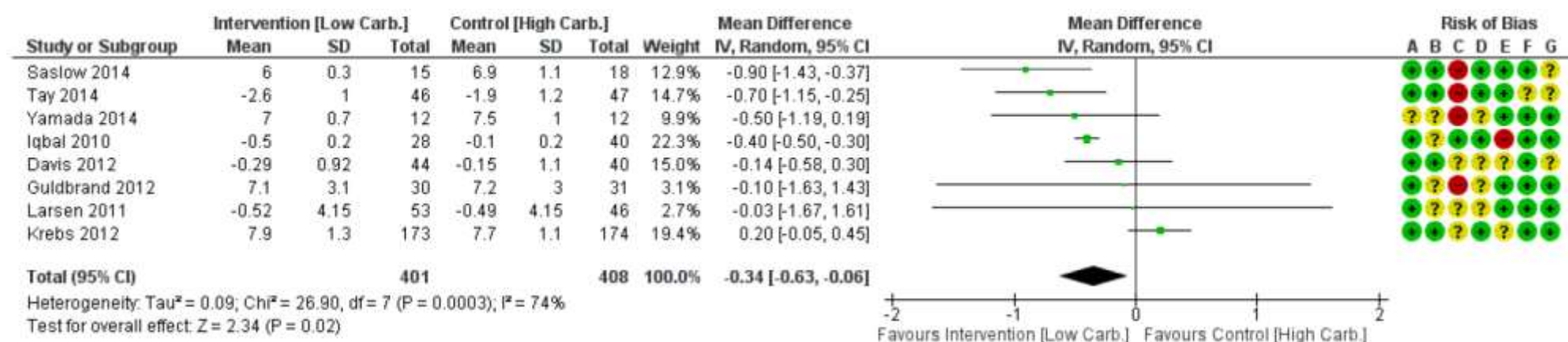
The role of low-fat diets in body weight control: a meta-analysis of *ad libitum* dietary intervention studies†

A Astrup^{1*}, GK Grunwald², EL Melanson², WHM Saris³ and JO Hill²



A Systematic Review and meta-analysis of Dietary Carbohydrate Restriction in Patients with Type 2 Diabetes

Ole Snorgaard, Grith Møller Poulsen, Henning Keinke Andersen and Arne Astrup



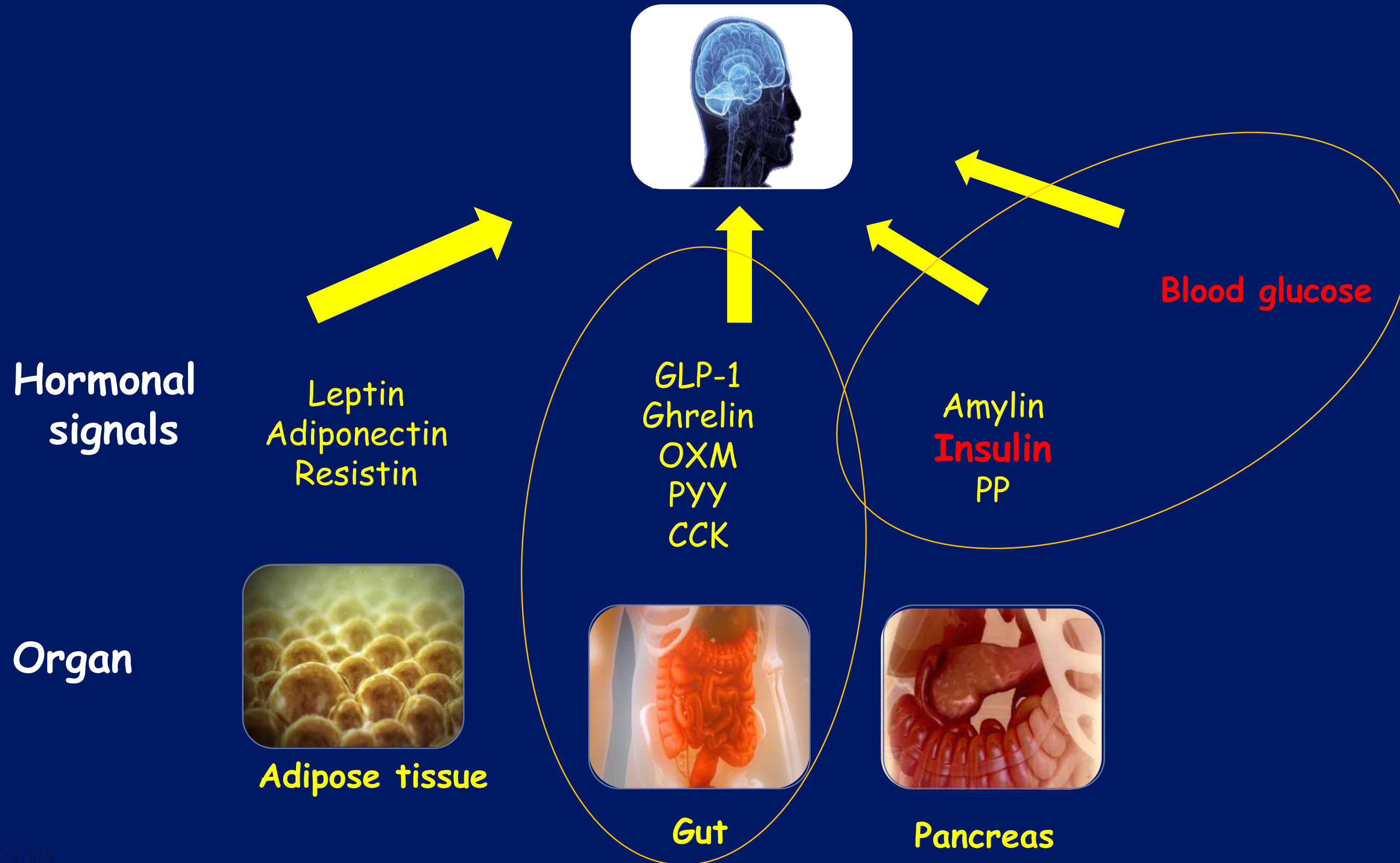
Risk of bias legend

- (A) Random sequence generation (selection bias)
- (B) Allocation concealment (selection bias)
- (C) Blinding of participants and personnel (performance bias)
- (D) Blinding of outcome assessment (detection bias)
- (E) Incomplete outcome data (attrition bias)
- (F) Selective reporting (reporting bias)
- (G) Other bias

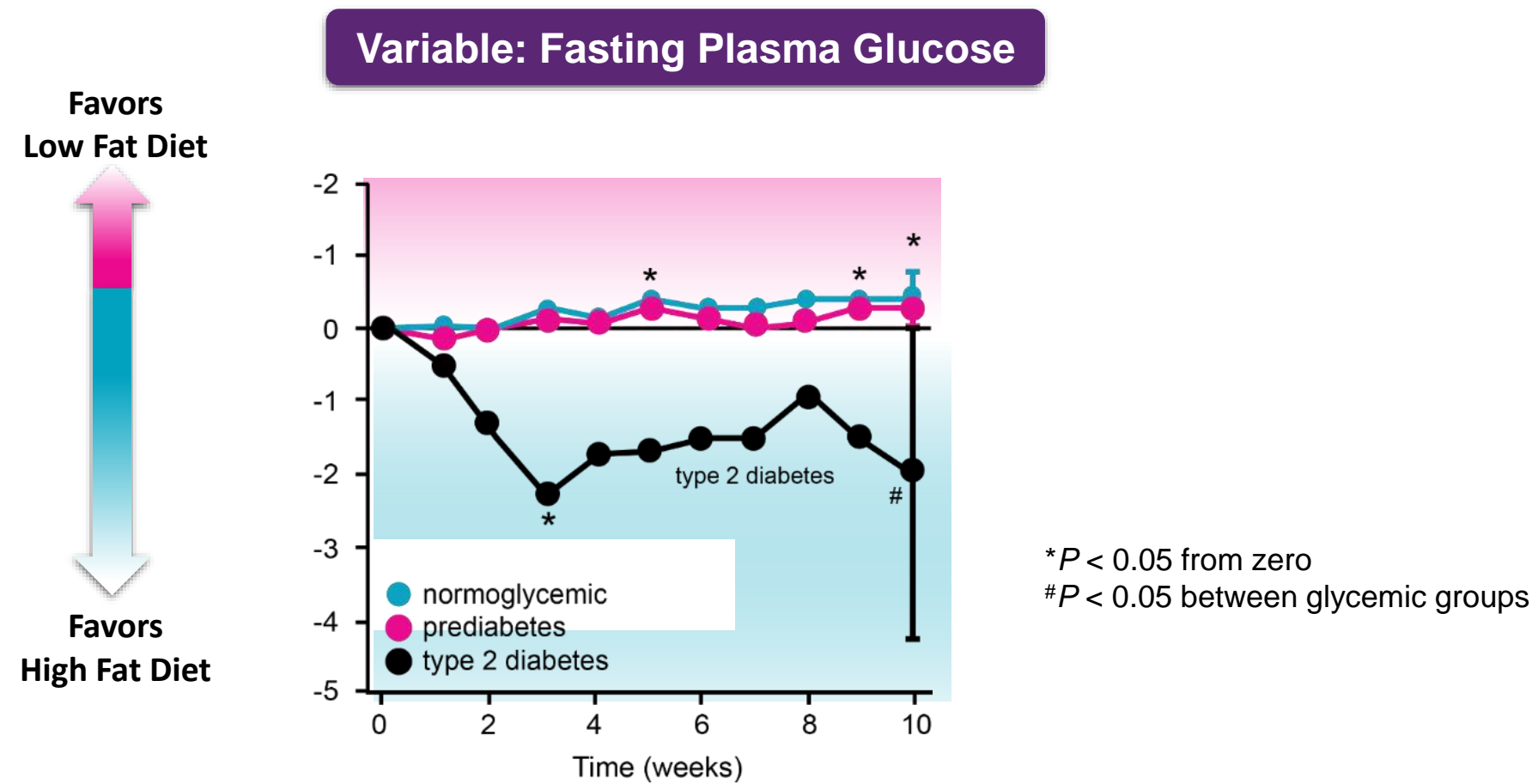
Within the first year of intervention, LCD was followed by a 0.34 %-point lower [95% CI: 0.06, 0.63] HbA1c compared to HCD. A greater reduction in carbohydrate restriction was associated with greater reduction in HbA1c (R = -0.85, P<0.01).

Snorgaard et al BMJ Open 2017

MULTIPLE HORMONAL SIGNALS INFLUENCE APPETITE



Normoglycemic Subjects Lost More Weight On A Low-Fat Diet. Subjects w/T2D More Responsive To a High-Fat Diet



Pretreatment fasting plasma glucose and insulin modify dietary weight loss success: results from 3 randomized clinical trials

Mads F Hjorth,¹ Christian Ritz,¹ Ellen E Blaak,⁴ Wim HM Saris,⁴ Dominique Langin,⁵⁻⁸ Sanne Kellebjerg Poulsen,^{1,9} Thomas Meinert Larsen,¹ Thorkild IA Sørensen,^{2,3,10} Yishai Zohar,¹¹ and Arne Astrup¹ Am J Clin Nutr 2017

Conclusions

- The totality of evidence i.e. meta-analyses of both observational studies and RCT's cannot find any harmful effects of saturated fat on body fat, metabolic syndrome, type 2 diabetes, or CVD.
- Yogurt and cheese does not exert the detrimental effects on blood lipids and blood pressure as previously predicted by its sodium and saturated fat content.
- Dairy, in particular full-fat, exerts beneficial effects on LDL-cholesterol, blood pressure and postprandial triglycerides as compared to butter.
- Meta-analysis of observational studies support that full fat yogurt and cheese (and perhaps other fermented dairy) may protect from CVD and type 2 diabetes.
- The effects of yogurt and 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.
- Whereas the low-fat version might be helpful for non-diabetic overweight and obese individuals, the full-fat versions are optimal for type 2 diabetics.
- **The totality of evidence show that “cut down on saturated fat” should be avoided, and recommendations should be food based.**

- BACK UP SLIDES

Questions ?

- Justification to treat SFA as one group ?
 - No, the different SFA have very different biological effects on cardio-metabolic health
 - SFA are rarely consumed in a pure form, and the food matrix completely alters the health effects (dark chocolate, cheese, yoghurt)
 - There is good evidence to show that dairy foods with high content of SFA reduces risk of obesity, type 2 diabetes, and CVD.

Pure fats for cooking ?





Questions ?

- Justification to treat Saturated fat as one group ? **NO**
- Does Saturated fat increase CVD ? **NO**
- **Does Saturated fat increase LDL-cholesterol ?**

Article

Dietary Saturated Fats and Health: Are the U.S. Guidelines Evidence-Based?

Arne Astrup ^{1,*} , Nina Teicholz ², Faidon Magkos ³ , Dennis M. Bier ⁴, J. Thomas Brenna ^{5,6,7} , Janet C. King ⁸, Andrew Mente ^{9,10}, José M. Ordovas ^{11,12}, Jeff S. Volek ¹³ , Salim Yusuf ^{9,14} and Ronald M. Krauss ^{15,16}

¹ Healthy Weight Center, Novo Nordisk Foundation, Tuborg Havnevej 19, 2900 Hellerup, Denmark

² The Nutrition Coalition, New York, NY 10011, USA; nina@nutritioncoalition.us

³ Department of Nutrition, Exercise and Sports, University of Copenhagen, 1958 Frederiksberg C, Denmark; fma@nove.ku.dk

Abstract: The last decade has seen nearly 20 papers reviewing the totality of the data on saturated fats and cardiovascular outcomes, which, altogether, have demonstrated a lack of rigorous evidence to support continued recommendations either to limit the consumption of saturated fatty acids or to replace them with polyunsaturated fatty acids. These papers were unfortunately not considered by the process leading to the most recent U.S. Dietary Guidelines for Americans, the country's national nutrition policy, which recently reconfirmed its recommendation to limit saturated fats to 10% or less of total energy intake, based on insufficient and inconsistent evidence. Continuation of a cap on saturated fat intake also fails to consider the important effects of the food matrix and the overall dietary pattern in which saturated fatty acids are consumed.

Potential conflicts of interest - October 2021

Academic roles

- Recipient of honoraria as Associate Editor, American Journal of Clinical Nutrition 2011-, and as member of the Editorial Board of Annals of Nutrition & Metabolism.
- Arne Astrup is not advocate or activist for specific diets and is not strongly committed to any specific diet such as veganism, Atkins diet, gluten-free diet, high animal protein diet, or dietary supplements.