The nutritional and health benefits of dairy foods in Europe: an overview

Dr Michelle McKinley

Milk, Nutritious by Nature Symposia
April 2015

Presentation Outline

- Contribution of dairy to diet in the EU
- Dairy matrix
- Health benefits dairy:
  - Weight management
  - Bone health
  - Healthy aging
- Conclusion

The nutrient package

Nutrient diversity in dairy

- Protein
- Calcium
- Phosphorous
- Potassium
- Zinc
- Iodine
- Vitamin B2
- Vitamin B12
- Vitamin A

Nutrient density

Nutrients relative to calories provided by a food

100 kcal each

Nutrient dense and affordable

The Nutrient Rich Foods Index helps to identify healthy, affordable foods[1–4]

Adam Drewnowski

ABSTRACT

Background: The Nutrient Rich Foods (NRF) Index is a formal scoring system that ranks foods on the basis of their nutrient content. When used in conjunction with a food prices database, it can help identify foods that are both nutritious and affordable.

Objective: Our aim was to identify healthy, affordable foods and food groups by using the NRF index and US Department of Agriculture (USDA) nutrient composition and food prices data sets.

Design: Foods in the USDA Food and Nutrition Database for Dietary Studies 1.0 were scored by using the NRF index. This NRF

higher consumption of foods and nutrients to encourage, higher Healthy Eating Index values, and lower energy intakes overall (4). The documented links between nutrient-rich foods, overall diet quality, and health outcomes are what distinguishes the NRF index from other food scoring systems used to create front-of-package logos or supermarket shelf labels.

The current NRF algorithm, based on 9 nutrients to encourage and 3 nutrients to limit, is known as NRF9.3. The present unique innovation lies in using the NRF index to calculate optimal nutrition per food dollar. Nutrient-profiling models are useful

Nutrition

Nutrient dense and affordable

The American Journ

scores and mean national food prices were calculated per calorie and per US Food and Drug Administration–defined serving.

Results: Each of the 9 USDA food groups offered foods of diverse nutritive value and cost. Eggs, dry beans and legumes, and meat and milk products were the lowest-cost sources of protein. Milk and milk products were the lowest-cost sources of calcium, whereas vegetables and fruit were the lowest-cost sources of vitamin C. Milk, potatoes, citrus juices, cereals, and beans had more favorable overall nutrient-to-price ratios than did many vegetables and fruit. Energy-dense grains, sweets, and fats provided most of the calories but fewer nutrients per dollar.

Conclusion: One important application of nutrient profile models is to help consumers identify foods that provide optimal nutrition at an affordable cost. *Am J Clin Nutr* 2010;91(suppl):1095S–101S.

INTRODUCTION

The concept of nutrient density was the cornerstone of the

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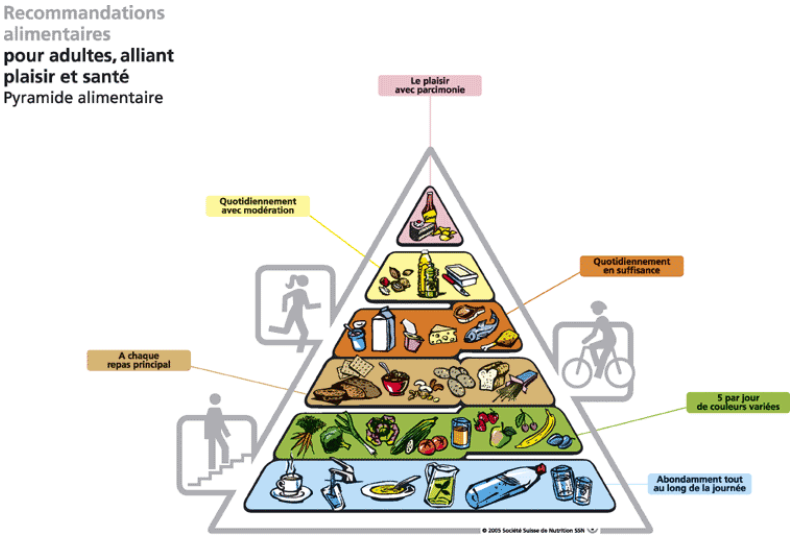
Dietary guidelines on Dairy in EU

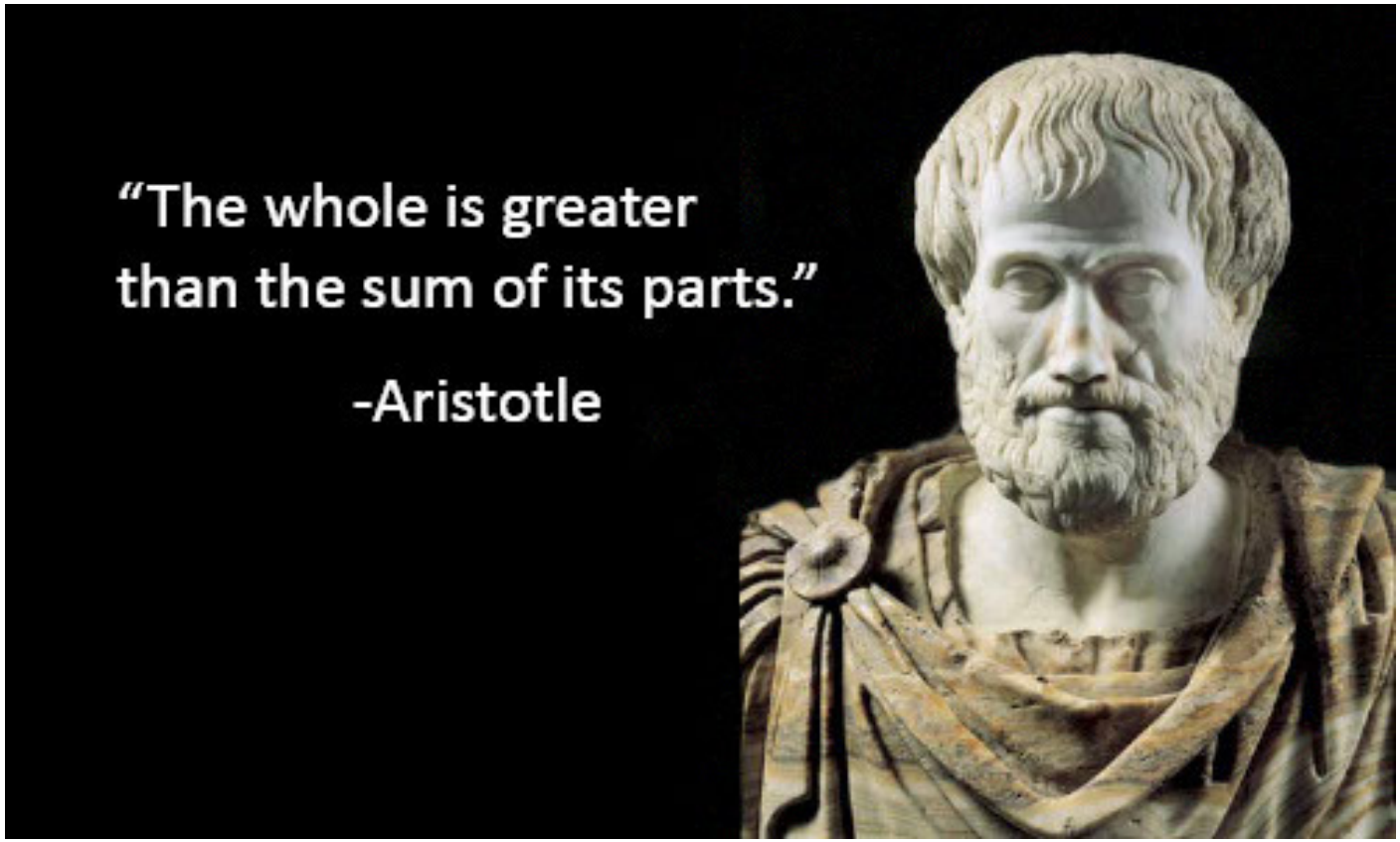


Contribution (%) of dairy to nutrient intakes in adults

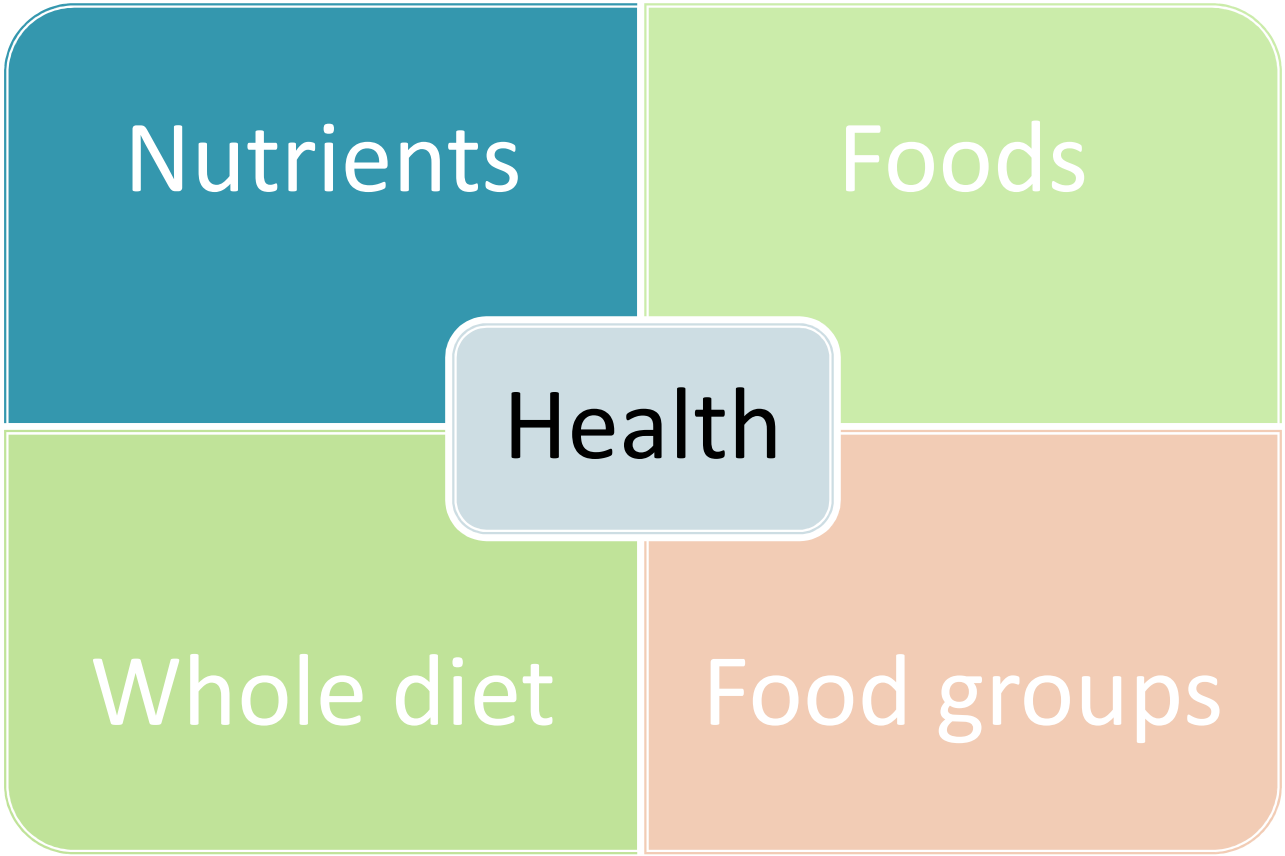
	Belgium	Denmark	Netherlands	Norway	UK
Protein	18	24	23-24	22	13
Calcium	54	59	58-62	67	36
Phosphorous		33	32-34	22	22
Iodine		30	16		33
Zinc		22	24-25	30	15
Vitamin A		11	20-21		14
Vitamins B2		41	42	37	28
Vitamin B12		30	40	25	33
Calories	11	13	14-16	18	9

Dairy matrix

New directions in nutrition



Consider the whole as well as the parts….



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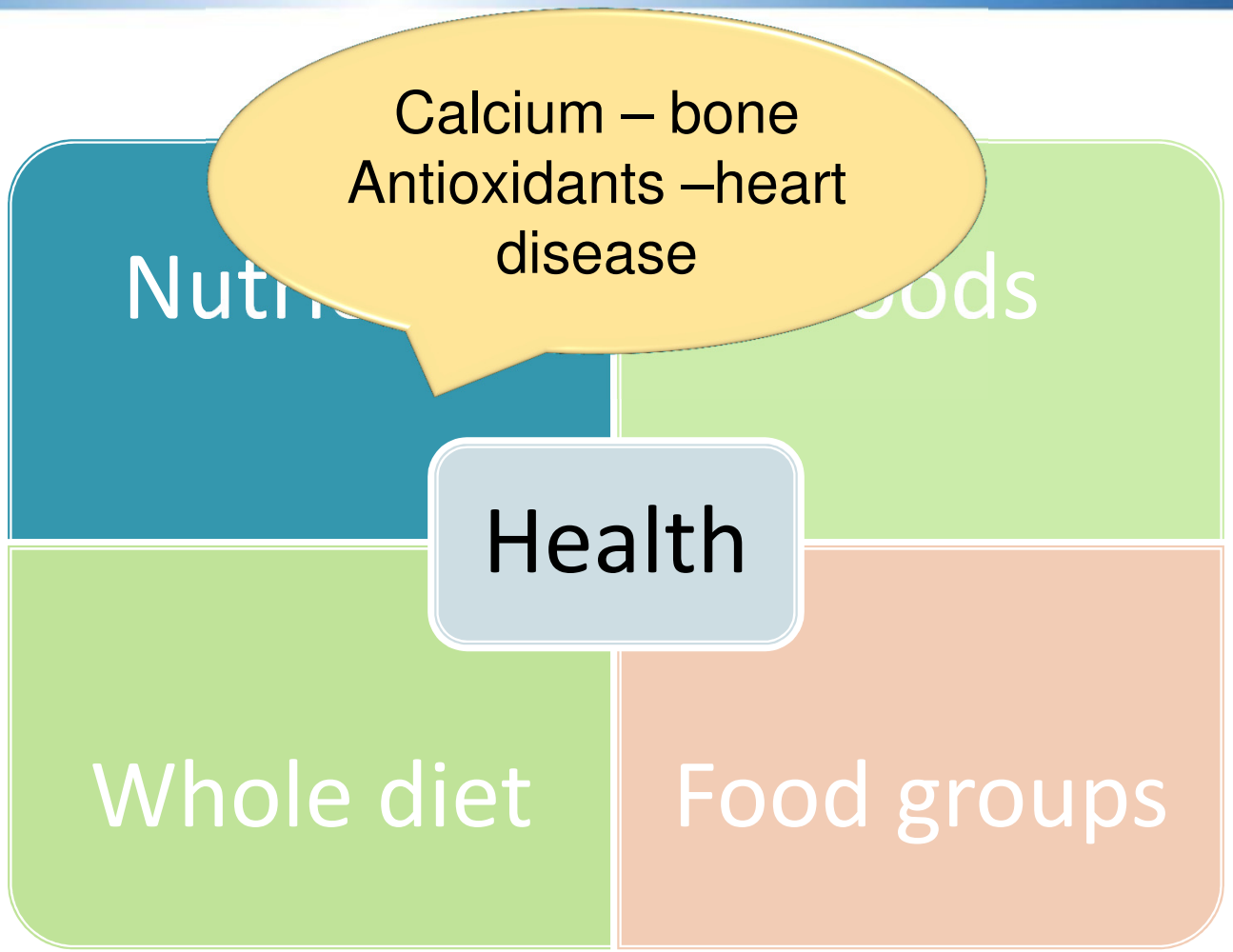

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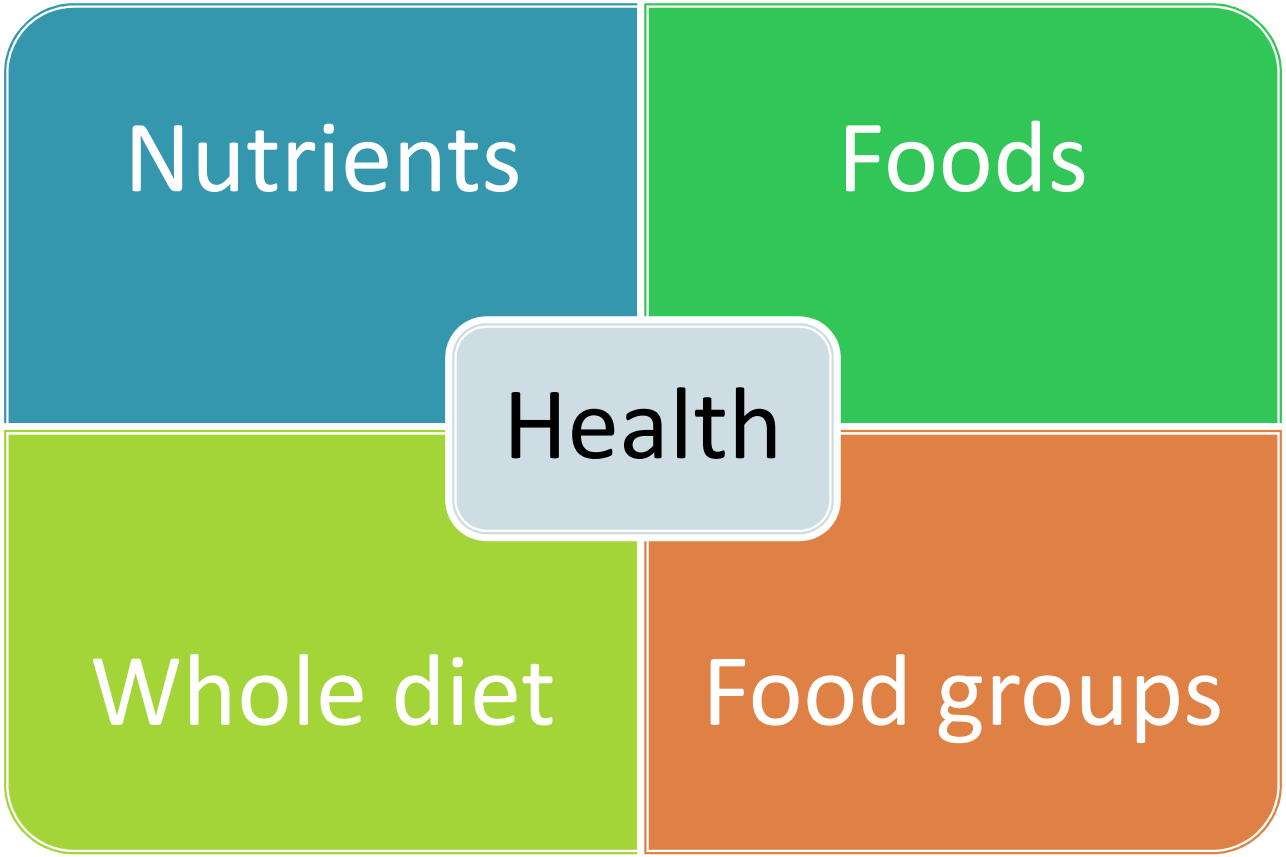


Complementary approaches

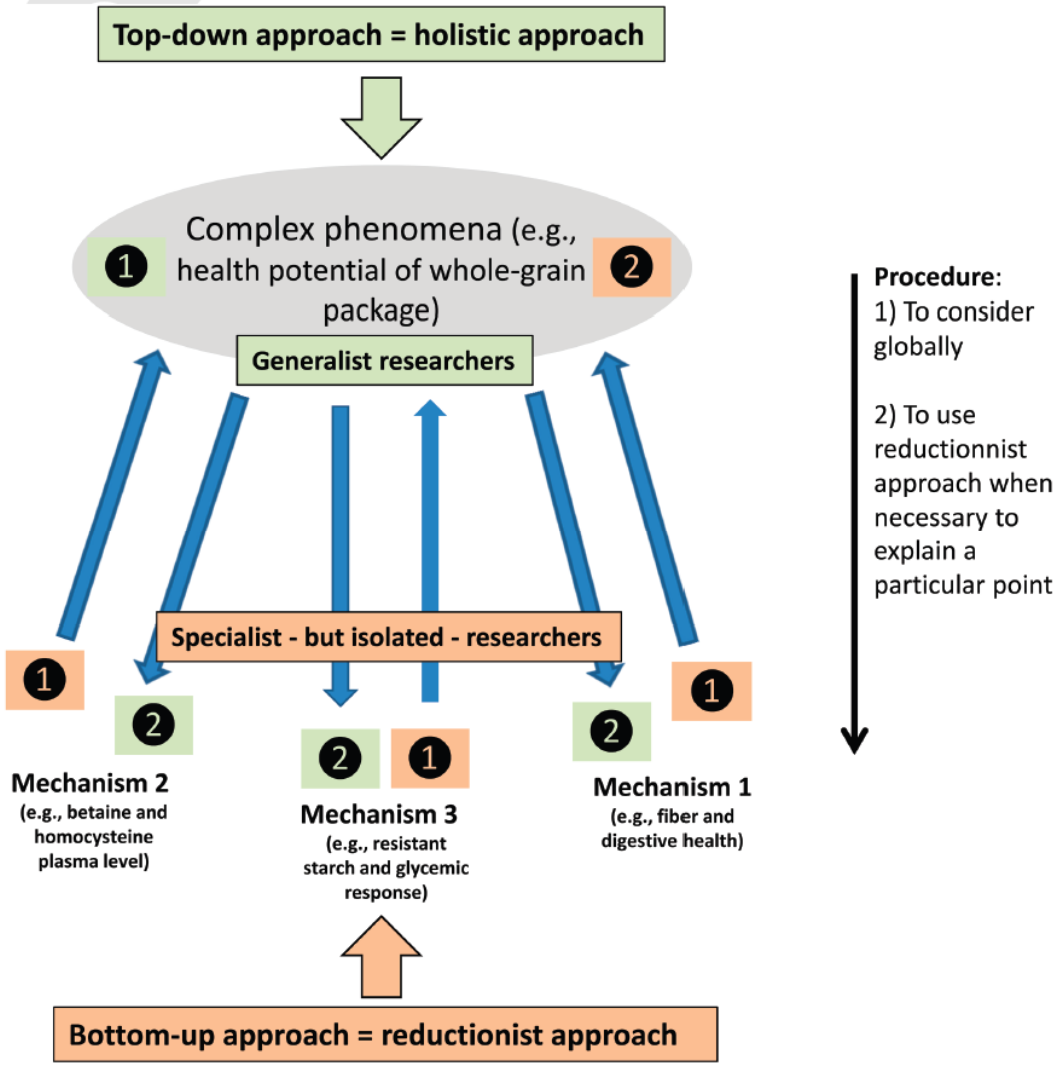


FIGURE 2 The top-down (holistic) compared with bottom-up (reductionist) approaches to research.

Fardet & Rock, Adv Nutr 2014;5:430-446

Consider the whole as well as the parts…..

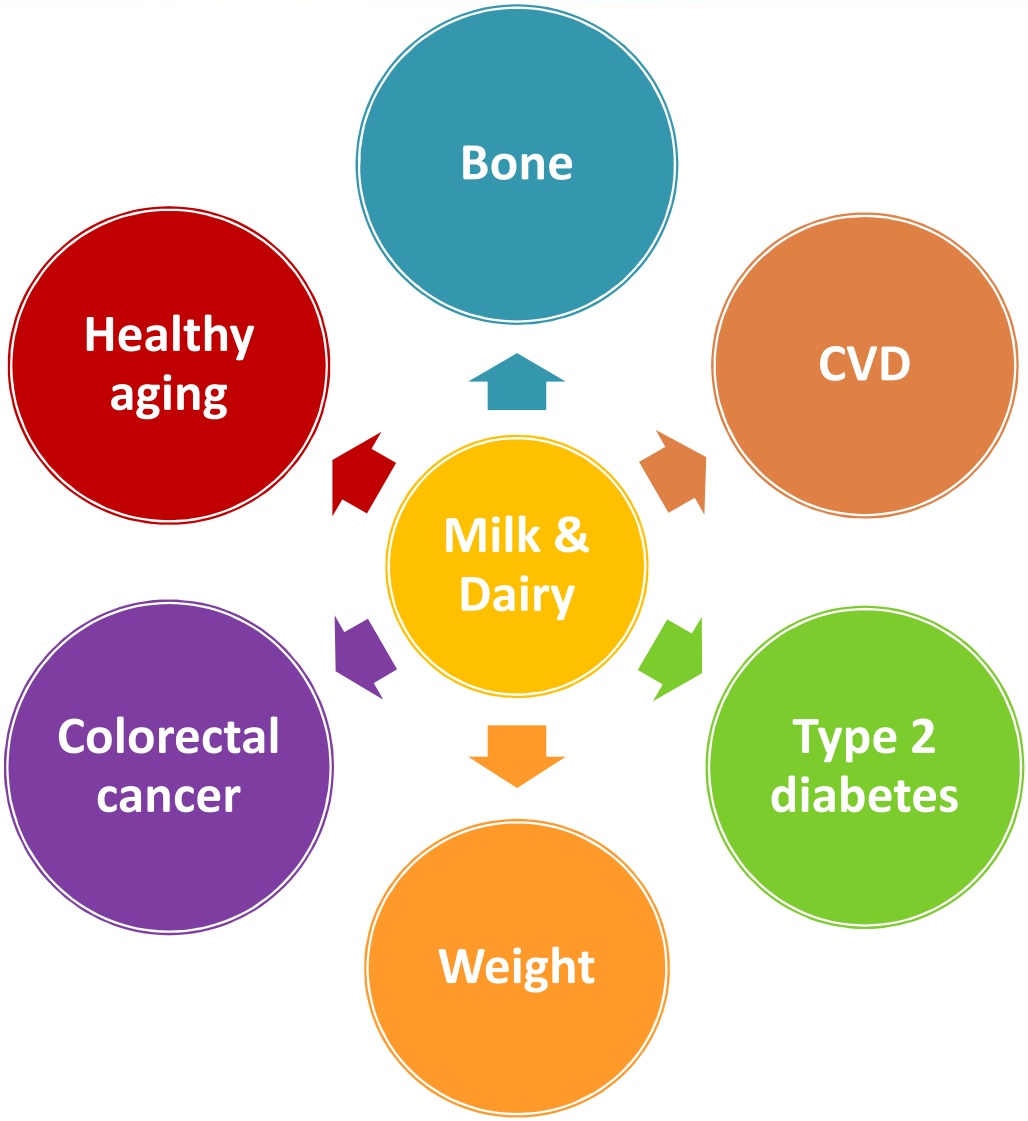
- Reductionist approach:
  - Responsible significant advances in nutrition
  - Possible limitations:
    - Public association of a food with only one nutrient
    - Oversimplification of nutrition – leading to classification of some foods as ‘negative’ or ‘super foods’ because of one piece of information
    - Discrepancy between observational and clinical trials

Fardet & Rock, Adv Nutr 2014;5:430-446

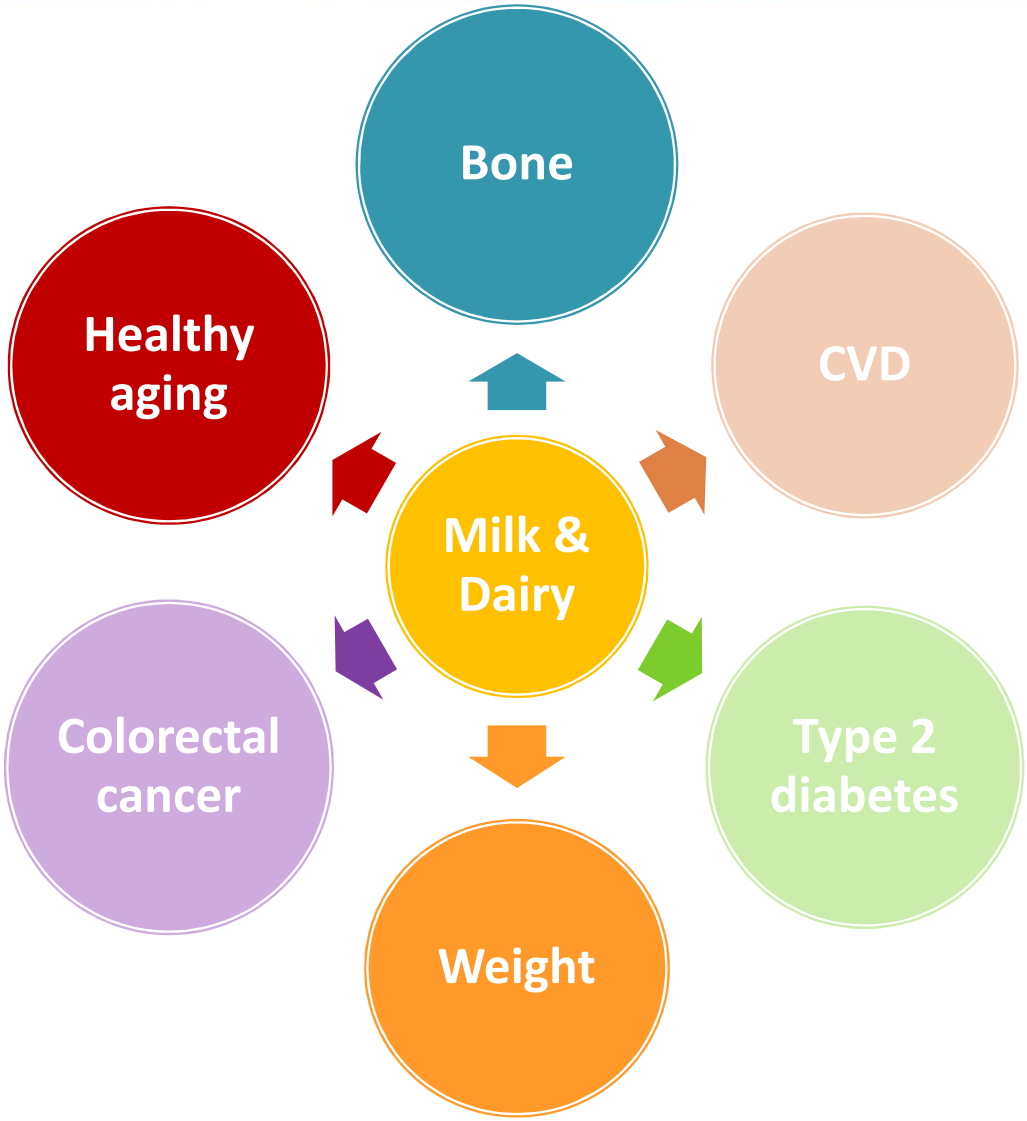
- Milk & dairy more than just calcium:
  - High quality protein
  - Bioactive peptides
  - 400 different fatty acids
  - Lactose
  - > 8 Vitamins
  - > 5 Minerals
  - Fermented products with unique composition

Health benefits

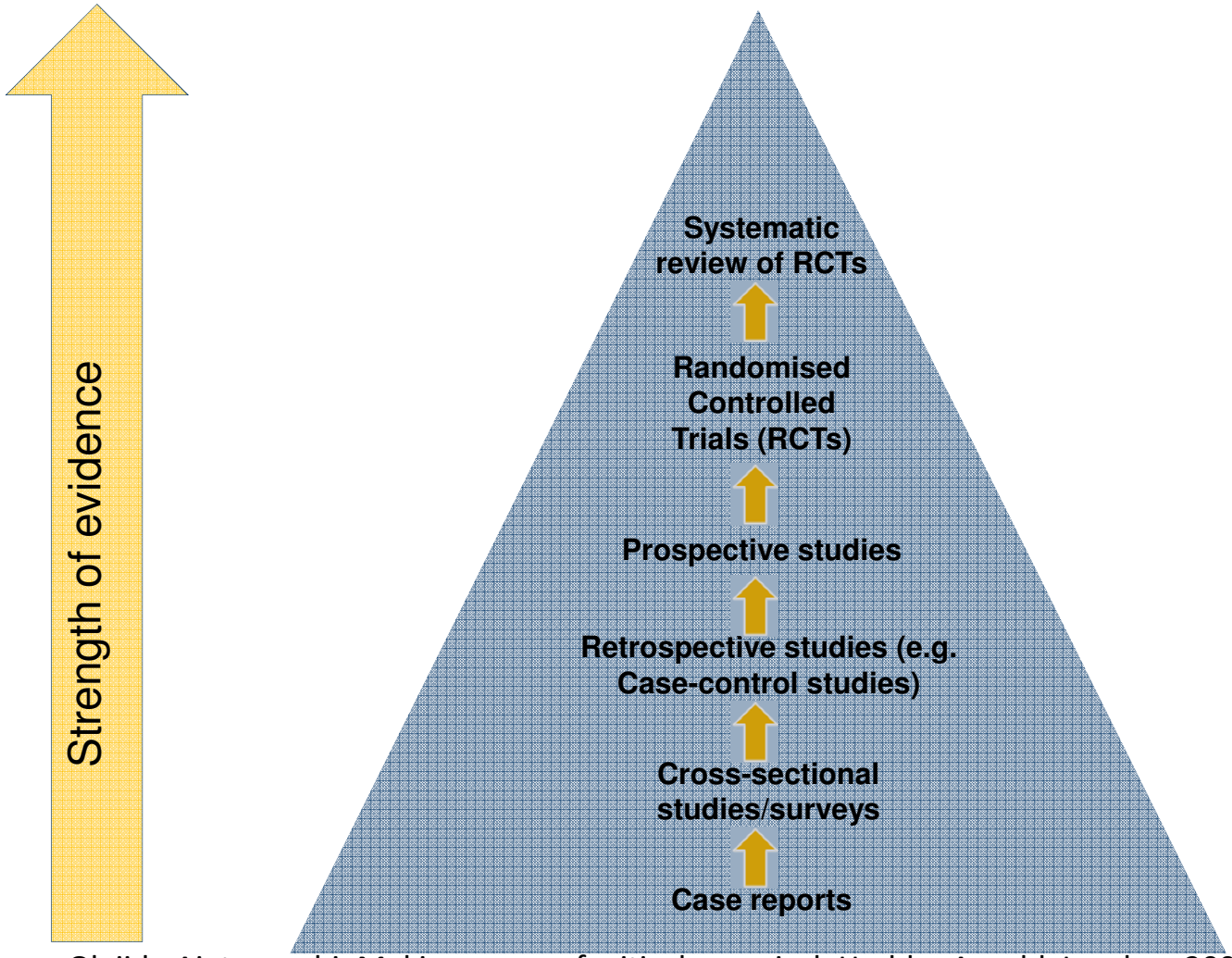
Health benefits milk and dairy



Health benefits milk and dairy

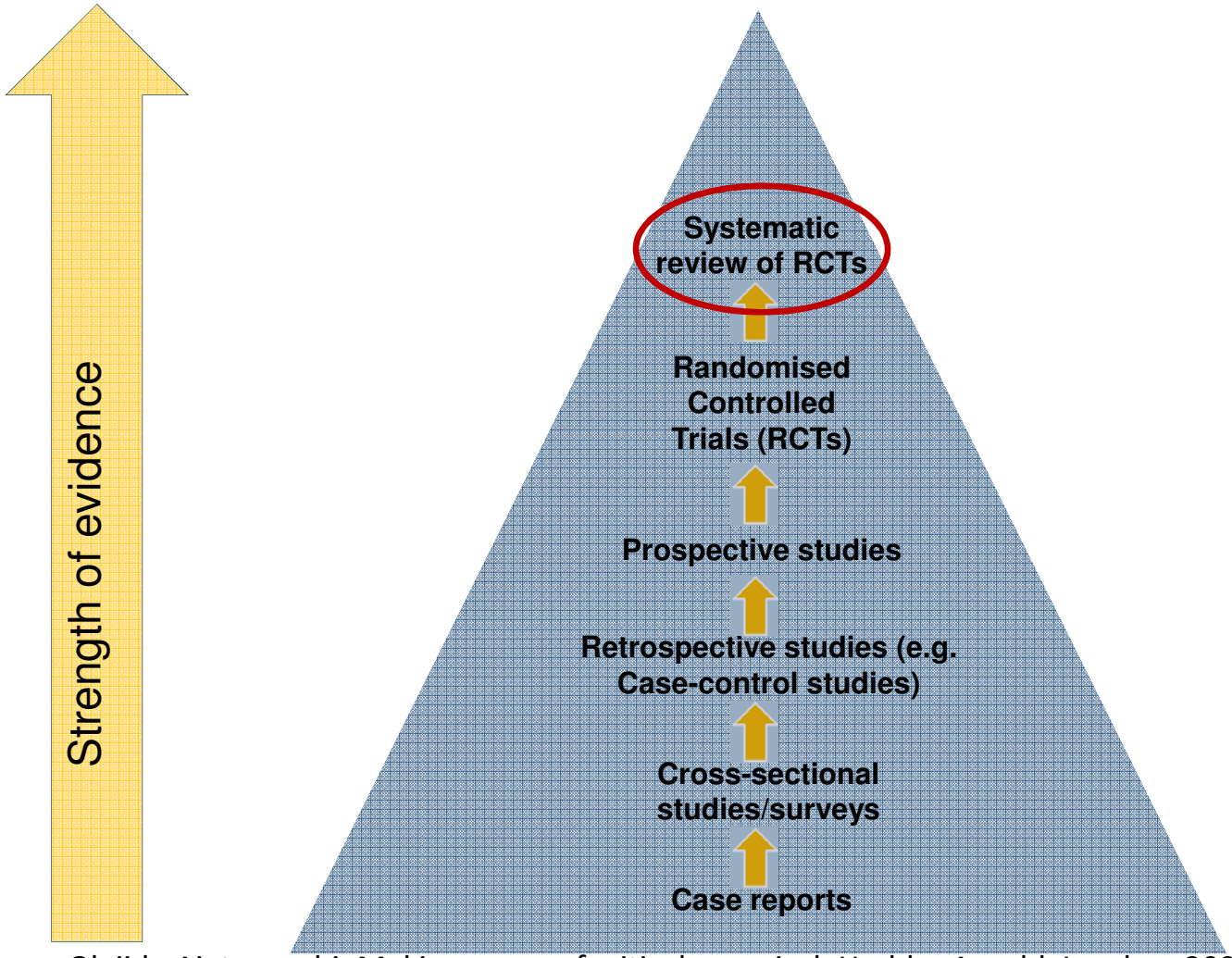


Hierarchy of evidence



From: Olajide Ajetunmobi. Making sense of critical appraisal. Hodder Arnold, London, 2002.

Hierarchy of evidence



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Weight management

Dairy and weight : systematic review & meta-analysis

International Journal of Obesity (2012) **36,** 1485 - 1493

www.nature.com/ijo

REVIEW

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

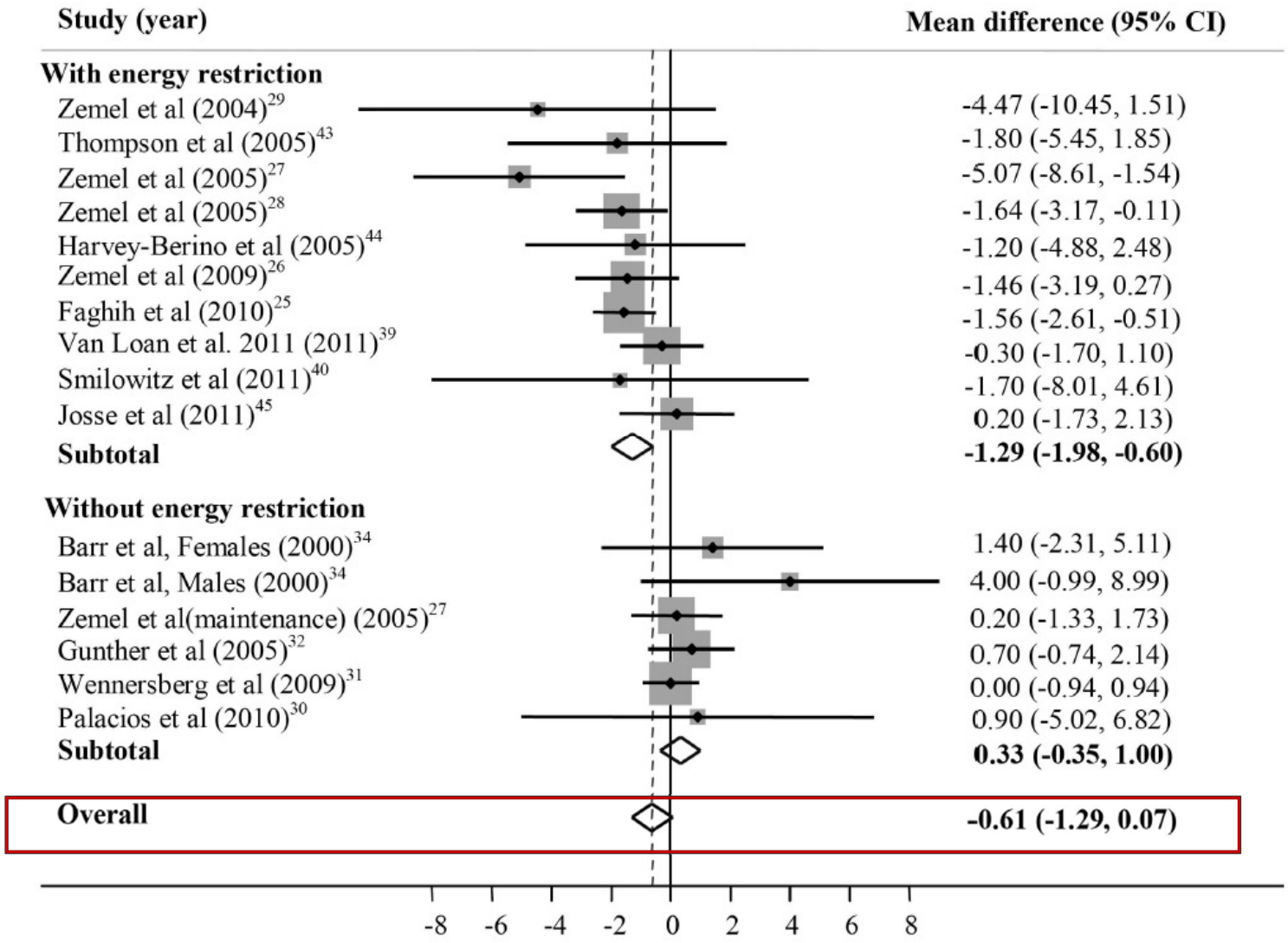
This paper has been amended from an Original Article to a Review since Advance Online Publication

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

BACKGROUND: Although several observational and experimental studies have investigated the effect of dairy consumption on weight and body composition, results are inconsistent.
OBJECTIVE: This systematic review and meta-analysis was conducted to summarize the published evidence from randomized controlled clinical trials (RCTs) regarding the effect of dairy consumption on weight, body fat mass, lean mass and waist circumference (WC) in adults.
DESIGN: PubMed, ISI Web of Science, SCOPUS, Science Direct and EMBASE were searched from January 1960 to October 2011 for relevant English and non-English publications. Sixteen studies were selected for the systematic review and fourteen studies

varied between 21 and 48 weeks. In these studies, calcium intake by 400–850 mg per day via dairy

find the source of this heterogeneity even after furth analyses based on sex, age group and meta-regressic



est plot of randomized controlled trials illustrating weighted mean difference in weight change between the dairy-su groups for all eligible studies as well as for subgroup analysis based on energy restriction. For all the studies com

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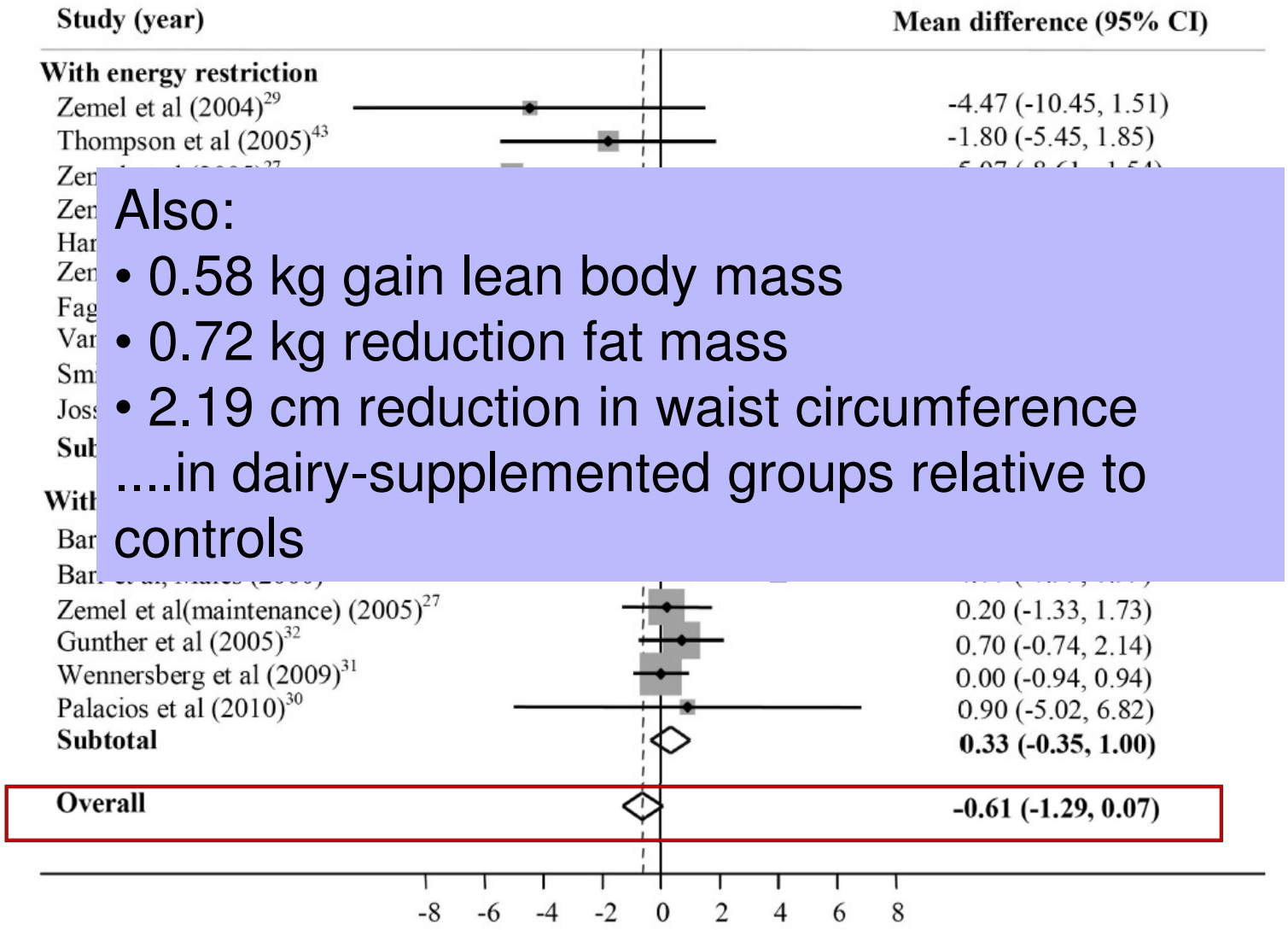


Also:

- 0.58 kg gain lean body mass
- 0.72 kg reduction fat mass
- 2.19 cm reduction in waist circumference

....in dairy-supplemented groups relative to controls

est plot of randomized controlled trials illustrating weighted mean difference in weight change between the dairy-su groups for all eligible studies as well as for subgroup analysis based on energy restriction. For all the studies com

Dairy matrix effect?

Nutrition, Metabolism & Cardiovascular Diseases (2011) 21, 499–503

available at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/nmcd

Nutrition, Metabolism & Cardiovascular Diseases

Comparison of the effects of cows' milk, fortified soy milk, and calcium supplement on weight and fat loss in premenopausal overweight and obese women

Sh Faghih [a], A.R. Abadi [b], M. Hedayati [c], S.M. Kimiagar [a,*]

[a] *Department of Nutrition, Faculty of Nutrition Sciences and Food Technology, Arghavan Ave, Farahzadi Bulv, Tehran, Iran*
[b] *Department of Statistics, Faculty of Medicine, Evin, Tehran, Iran*
[c] *Obesity Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences,*

Faghih et al, 2011

- 100 healthy OW/OB pre-menopausal women
- Randomised, 8 weeks:
  - Control diet – 500 kcal/d deficit
  - Calcium supplemented diet – 800 mg/d + 500kcal/d deficit
  - Milk diet – 3 servings/d + 500 Kcal/d deficit
  - Soy milk – 3 servings calcium fortified soy milk + 500 kcal/d deficit

Faghih et al, 2011

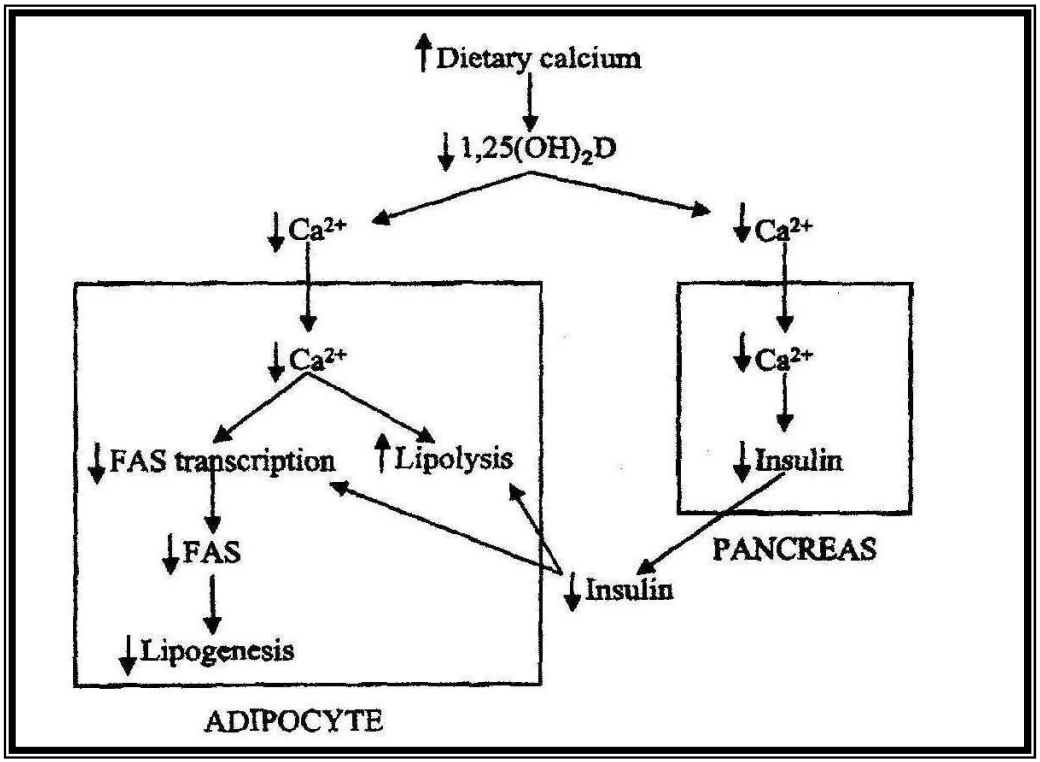
- Weight reductions after 8 weeks:

Control	Soy milk	Ca supplement	Milk diet
2.87 ± 1.55 kg	3.46 ± 1.28 Kg (0.59 kg)	3.89 ± 2.40 kg (1.02 kg)	4.43± 1.93 kg (1.56 kg)

- No significant differences in changes in body weight and BMI between the soy milk or Ca suppl & control.
- Reductions in weight and BMI were significantly greater in high milk group compared to controls.
- Greatest changes were seen in high dairy group - % weight loss in high milk group was significantly greater than in soy milk group and controls.

Mechanisms

Effect of dietary calcium on adipocytes – lipogenesis/lipolysis.



St –Ogne MP. Am J Clin Nutr 2005;81:7–15.

Mechanisms

- Formation of insoluble calcium fatty acids soaps – faecal fat excretion
- Satiety
- Likely to be a combination of factors that contribute and interactions amongst several components – calcium, CLA, protein

Bone health

Dairy and bone health in children

Bone 43 (2008) 312–321

Contents lists available at ScienceDirect

Bone

journal homepage: www.elsevier.com/locate/bone

Impact of dairy products and dietary calcium on bone-mineral content in children: Results of a meta-analysis

Michael Huncharek [a,b,*], Joshua Muscat [b,c], Bruce Kupelnick [b]

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[b] Meta-Analysis Research Group, 10 Sasanqua Circle, Columbia, SC, USA
[c] Department of Health Evaluation Sciences, Pennsylvania State University College of Medicine, Hershey, PA, USA

ARTICLE INFO

Article history:
Received 20 September 2007
Revised 27 February 2008
Accepted 28 February 2008
Available online 15 March 2008

ABSTRACT

Objective: Although calcium is essential for maintaining bone health in children, the optimum dietary intake of calcium in this age group, particularly in the form of dairy foods, is not well defined. A meta-analysis was conducted to examine the impact of dietary calcium/dairy supplementation on bone mineral content in this age group.

Methods: Data were pooled from randomized controlled intervention trials and observational studies using

Meta-analysis results

- 21 randomised controlled trials included
- Overall – no statistically significant increase in total body bone mineral content (BMC)
- Sensitivity analyses according to baseline calcium intake
- Conclusion – “Increased dietary calcium/dairy products with and without vitamin D, significantly increases total body & lumber spine BMC in children with low base-line intakes.”

Dairy matrix?

See corresponding CME exam on page 1147.

Effects of calcium, dairy product, and vitamin D supplementation on bone mass accrual and body composition in 10–12-y-old girls: a 2-y randomized trial[1–3]

Sulin Cheng, Arja Lyytikäinen, Heikki Kröger, Christel Lamberg-Allardt, Markku Alén, Arvo Koistinen, Qing Ju Wang, Miia Suuriniemi, Harri Suominen, Anitta Mahonen, Patrick HF Nicholson, Kaisa K Ivaska, Riitta Korpela, Claes Ohlsson, Kalervo H Väänänen, and Frances Tylavsky

ABSTRACT

Background: Little is known about the relative effectiveness of calcium supplementation from food or pills with or without vitamin D supplementation for bone mass accrual during the rapid growth period.

Objective: The purpose was to examine the effects of both food-based and pill supplements of calcium and vitamin D on bone mass

Calcium metabolism during childhood is complex, and the degree of positive calcium balance necessary to achieve maximum peak bone mass is not known. Recent studies have shown that calcium intake and skeletal modeling determine calcium balance during growth and that childhood is a time of high calcium requirements (1, 2). Calcium supplementation intervention studies in children have shown that daily supplementation

Study design – Cheng et al

The American Journal of Clinical Nutrition

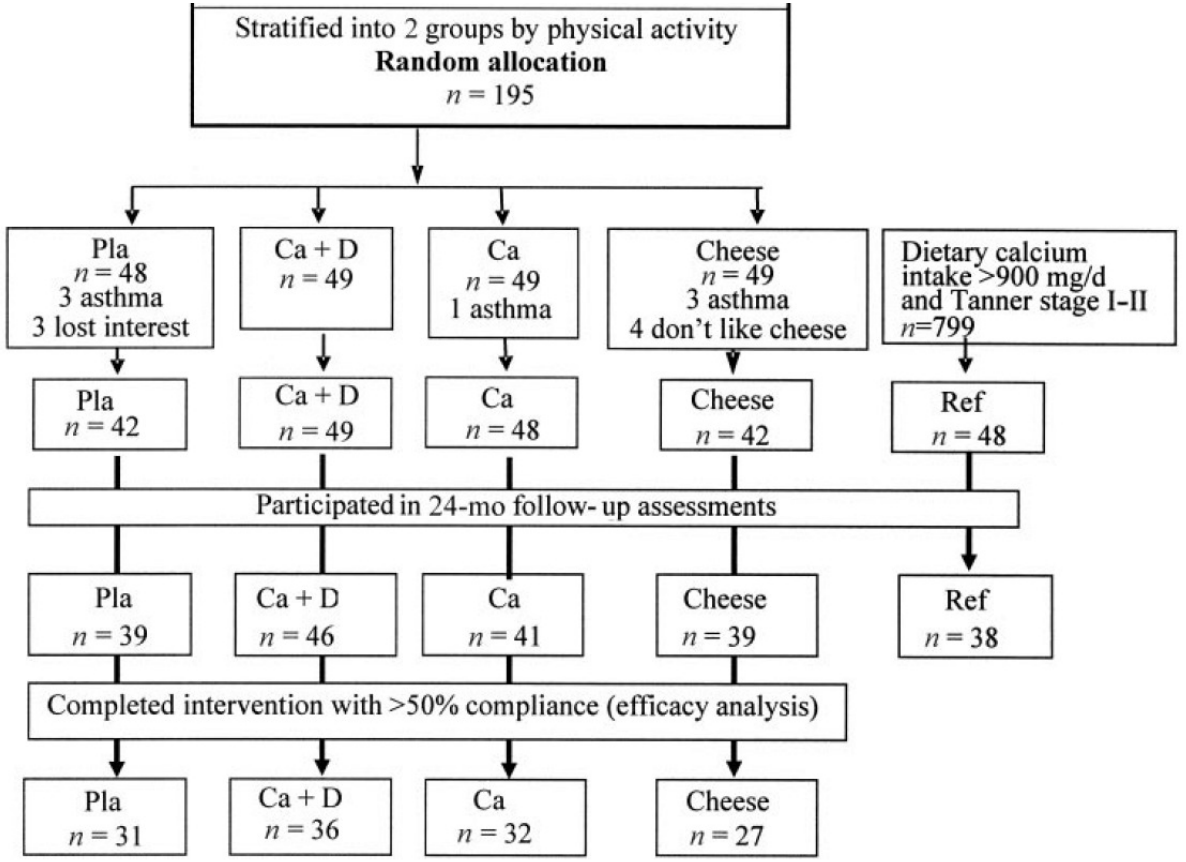
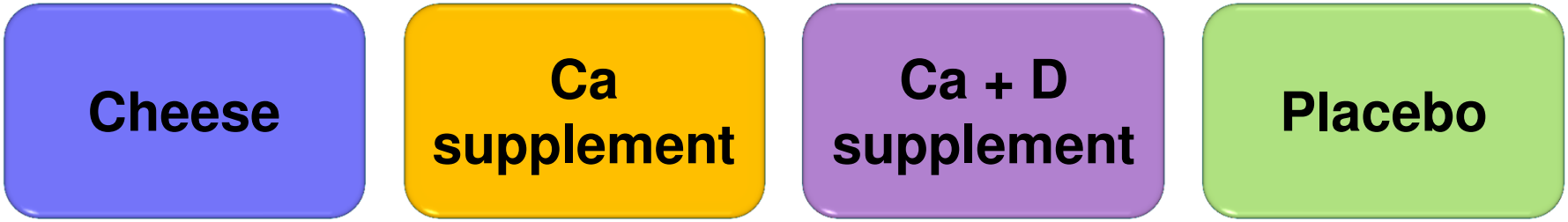


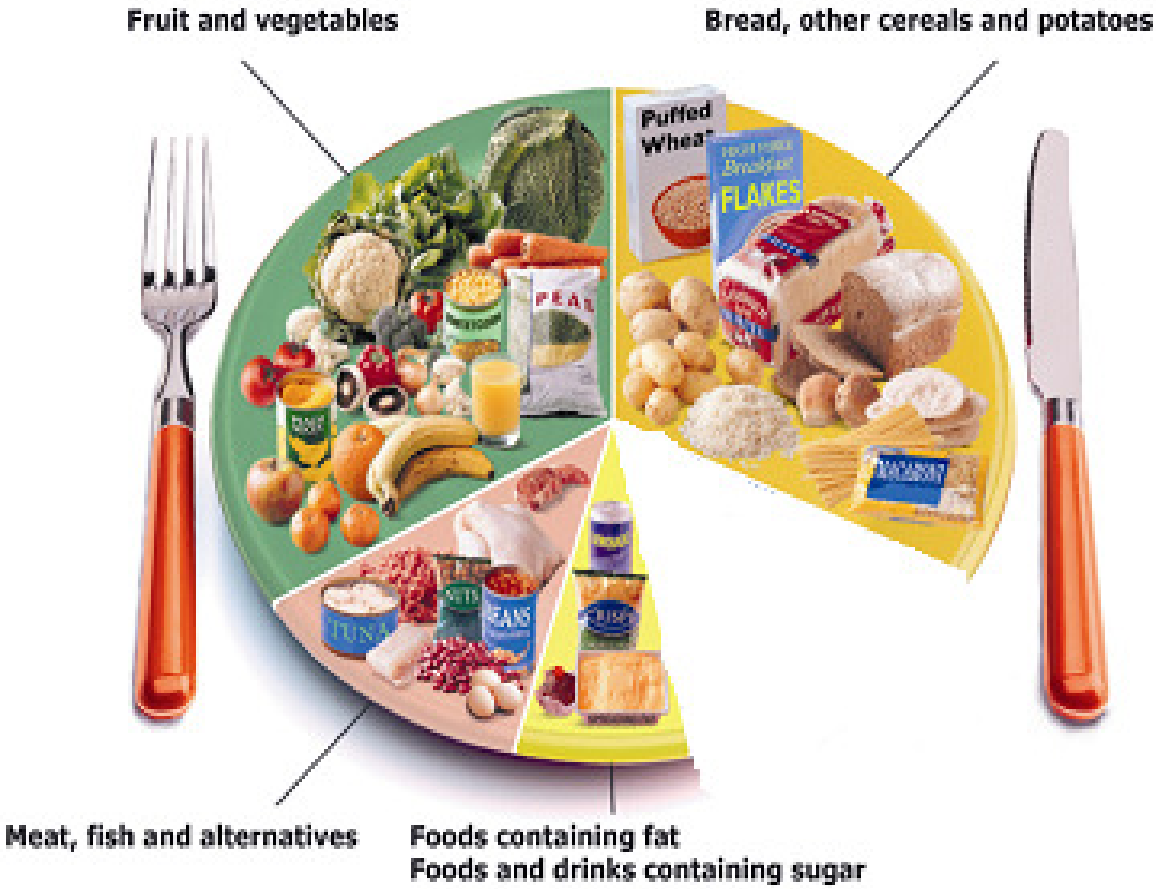
FIGURE 1. Intervention profile. Groups are as follows: Pla, calcium placebo + vitamin D placebo; Ca+D, 1000 mg Ca + 200 IU vitamin D_3; Ca, 1000 mg Ca + vitamin D placebo; cheese, 1000 mg Ca from supplemented dairy products; Ref, reference.

Results – Cheng et al



- Cheese group – significantly higher percentage change in cortical thickness of tibia than placebo *or* calcium *or* calcium + vitamin D group.
- Also higher whole-body bone mineral density than placebo.

Milk avoidance and bone health in children



Milk avoidance and bone health in children

- **Young children avoiding milk are prone to fractures**

  (Black et al. J Am Diet Assoc 2004;104:250-3):

  - Based on examination of fracture history of 50 children who had avoided milk for prolonged periods compared with a birth cohort of >1000 children from same city.

- **Risk factors for fractures and recurrent fractures in children (50 children RF; 50 children 1st; 50 fracture-free controls):**

  - Children with recurrent factures had a significantly lower milk intake, lower physical activity, higher BMI, higher intake carbonated drinks

  (Manias et al. Bone 2006;652-657)

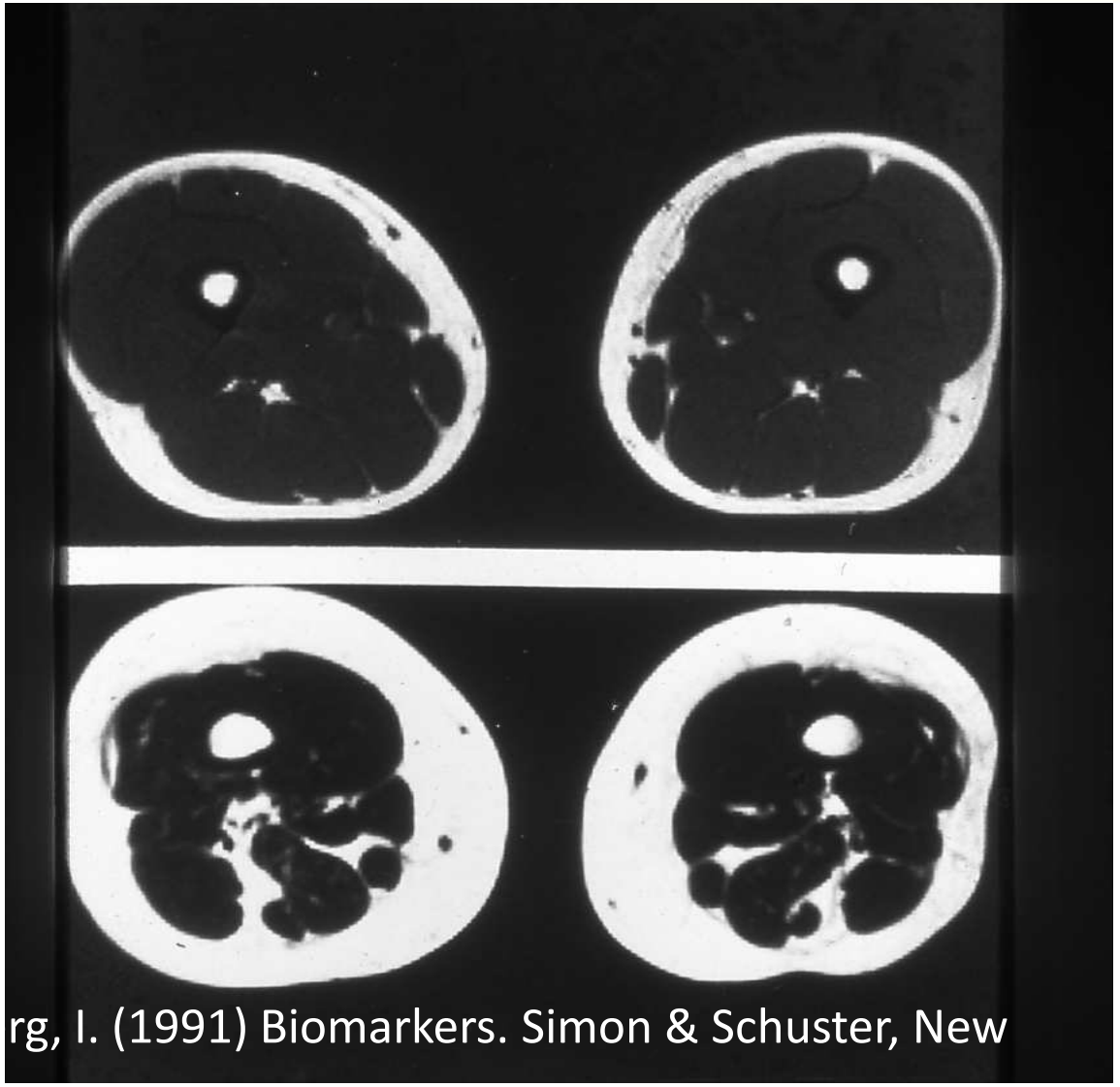
Maintenance muscle mass

Healthy ageing – living well for longer

Sarcopenia

- Sarcopenia – the progressive decrease in lean body mass and strength with age
- Affects up to 45% of those aged over 60y

MRI cross-sectional mid-thigh image of 20 y active old woman v 64 y old sedentary woman



rg, I. (1991) Biomarkers. Simon & Schuster, New

Sarcopenia

- Sarcopenia – the progressive decrease in lean body mass and strength with age
- Affects up to 45% of those aged over 60y

↑ fatigue, ↓ appetite, ↓QoL

Physical impairment, disability and dependence on others

Impairs the metabolic adaptation to illness & disease

Minimising sarcopenia

- Increased protein intake has been suggested for older adults to minimise risk of sarcopenia – more evidence required before definitive recommendations can be made.
- Milk protein – attractive candidate for increasing muscle protein synthesis in older people (& nutrient density also generally beneficial for older people).....

Dairy protein & muscle mass older men RCT

Clinical Interventions in Aging

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ORIGINAL RESEARCH

Nutrient-rich dairy proteins improve appendicular skeletal muscle mass and physical performance, and attenuate the loss of muscle strength in older men and women subjects: a single-blind randomized clinical trial

This article was published in the following Dove Press journal:
Clinical Interventions in Aging
12 September 2014
Number of times this article has been viewed

Heliodoro Alemán-Mateo[1]
Virginia Ramírez Carreón[1]
Liliana Macías[1]

Background: At present, it is unknown whether the use of nutrient-rich dairy proteins improves the markers of sarcopenia syndrome. Therefore, our proposal was to investigate whether adding 210 g of ricotta cheese daily would improve skeletal muscle mass, handgrip strength, and

Dairy protein & muscle mass older men RCT

Table 2 Relative changes in body weight, and markers of sarcopenia at baseline and 12 weeks of follow-up

	IG/HD + RCH (Ricotta cheese)			CG/HD (Control)			*P*-value
	Baseline	**Follow-up**	**Relative change (%)**	**Baseline**	**Follow-up**	**Relative change (%)**	
Men/women, n	25/24	25/24		24/25	24/25		
Weight, kg	70.3±11.7	70.8±12.0	0.6±2.6	71.6±10.8	71.4±10.8	−0.3±2.5	0.06
Fat, kg	25.6±7.9	26.0±8.5	1.6±6.1	25.7±7.9	26.1±8.0	1.7±6.5	0.91
Truncal fat, kg	14.9±4.6	15.2±4.8	1.5±7.4	15.3±4.7	15.5±4.6	1.2±6.4	0.81
TLT, kg	40.6±8.6	40.7±8.4	0.4±3.0	41.7±8.4	41.3±8.7	−0.9±2.7	0.02
LTA, kg	4.4±1.2	4.4±1.2	−1.2±3.5	4.5±1.1	4.4±1.1	−3.2±4.2	0.02
LTL, kg	13.1±3.0	13.3±2.9	1.3±4.1	13.4±3.1	13.4±3.0	−0.28±3.2	0.03
ASMM, kg	17.6±4.2	17.6±4.1	0.6±3.5	18.0±4.1	17.8±4.1	−1.0±2.6	0.009
ASMMI, kg/m^2	6.6±1.0	6.7±0.9	0.7±3.43	6.8±1.0	6.7±1.0	−1.1±2.6	0.004
Total mass, kg	68.6±11.6	69.2±11.9	0.9±2.6	70.1±10.7	70.0±10.8	−0.2±2.6	0.05
Strength, kg	24.1±9.5	23.8±9.3	−0.6±10.8	24.1±8.7	23.1±8.8	−4.5±10.8	0.07
SPPB, score	10.7±1.7	10.8±1.5	2.4±9.9	10.9±1.4	11.0±1.3	1.2±9.3	0.55
Balance, score	2.9±0.4	2.9±0.3	3.7±17.1	3.0±0.2	2.9±0.3	−2.4±12.7	0.05
Gait speed, m/s	5.1±1.0	4.6±1.0	6.3±23.7	5.2±1.2	4.5±0.8	8.6±22.3	0.63
Five chair rise, seconds	10.5±3.7	10.6±3.2	−0.8±16.0	11.4±2.6	11.3±2.4	−0.2±15.1	0.83
SCPT, W	204.2±60.4	203.5±57.1	0.5±9.8	211.3±54.6	203.9±52.2	−2.8±11.4	0.10

Notes: Data are presented as means ± standard deviation. SPPB score ranges from 0 to 12. The score for each SPPB component ranges from 0 to 4.
Abbreviations: TLT, total lean tissue; LTA, lean tissue in arms; LTL, lean tissue in legs; ASMM, appendicular skeletal muscle mass; ASMMI, ASMM index; SPPB, short physical performance battery; SCPT, stair-climb power test; IG/HD + RCH, intervention group – ricotta cheese + habitual diet; CG/HD, control group – habitual diet.

Minimising sarcopenia

- Protein:
  - Dose
  - Spacing - consuming roughly equal distribution of protein intake across the day
  - Protein quality – whey protein, specific amino acids
  - Synergistic effects
    - protein + resistance exercise?
    - whey component of milk *vs* whole food
    - other dietary components – vitamin D, omega 3 fatty acids?
- More research - milk and dairy foods and protein synthesis and other indicators of healthy ageing

Conclusion

Conclusion

- Milk and dairy foods make a large contribution to dietary intake of European consumers.
- The benefit of milk and dairy foods extends beyond simply helping people to reach their nutrient recommendations.
- Health benefits for bone, muscle, cardiovascular & metabolic health, weight management.
- ‘The dairy matrix’ - Important to consider that the health effects of milk and dairy foods are attributable to the whole food package, rather than just attributable to its component parts.