La dieta chetogenica in pediatria

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possibili indicazioni dieta chetogenica
In età evolutiva

- alcune malattie neurologiche
- neoplasie cerebrali
- obesità

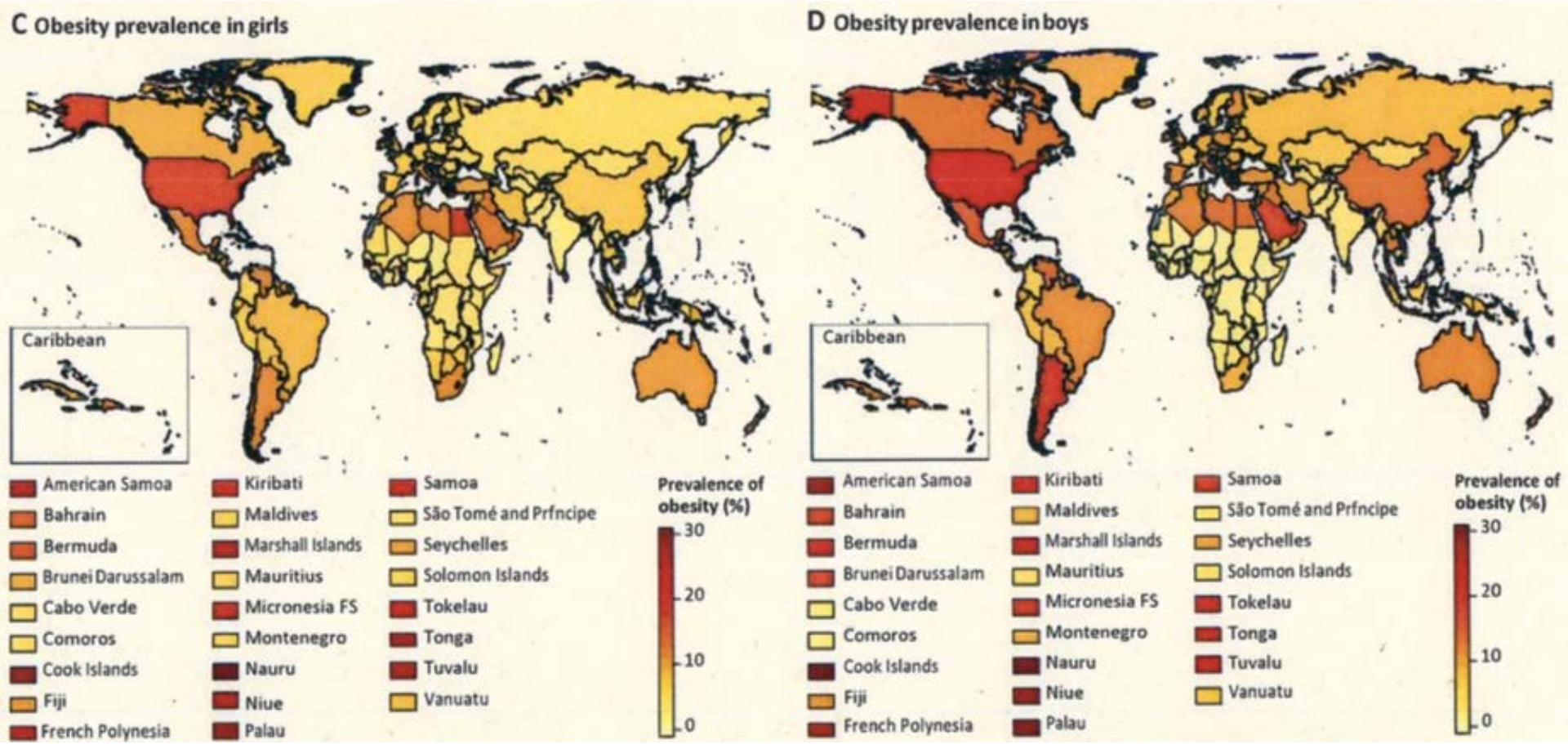
Indagine Okkio alla Salute
Prevalenza obesità bambini 8-9 anni

minore uguale 25 | maggiore di 25 e minore 35 | maggiore uguale 35

THE LANCET

Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128·9 million children, adolescents, and adults

*NCD Risk Factor Collaboration (NCD-RisC)**



THE LANCET

Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128·9 million children, adolescents, and adults

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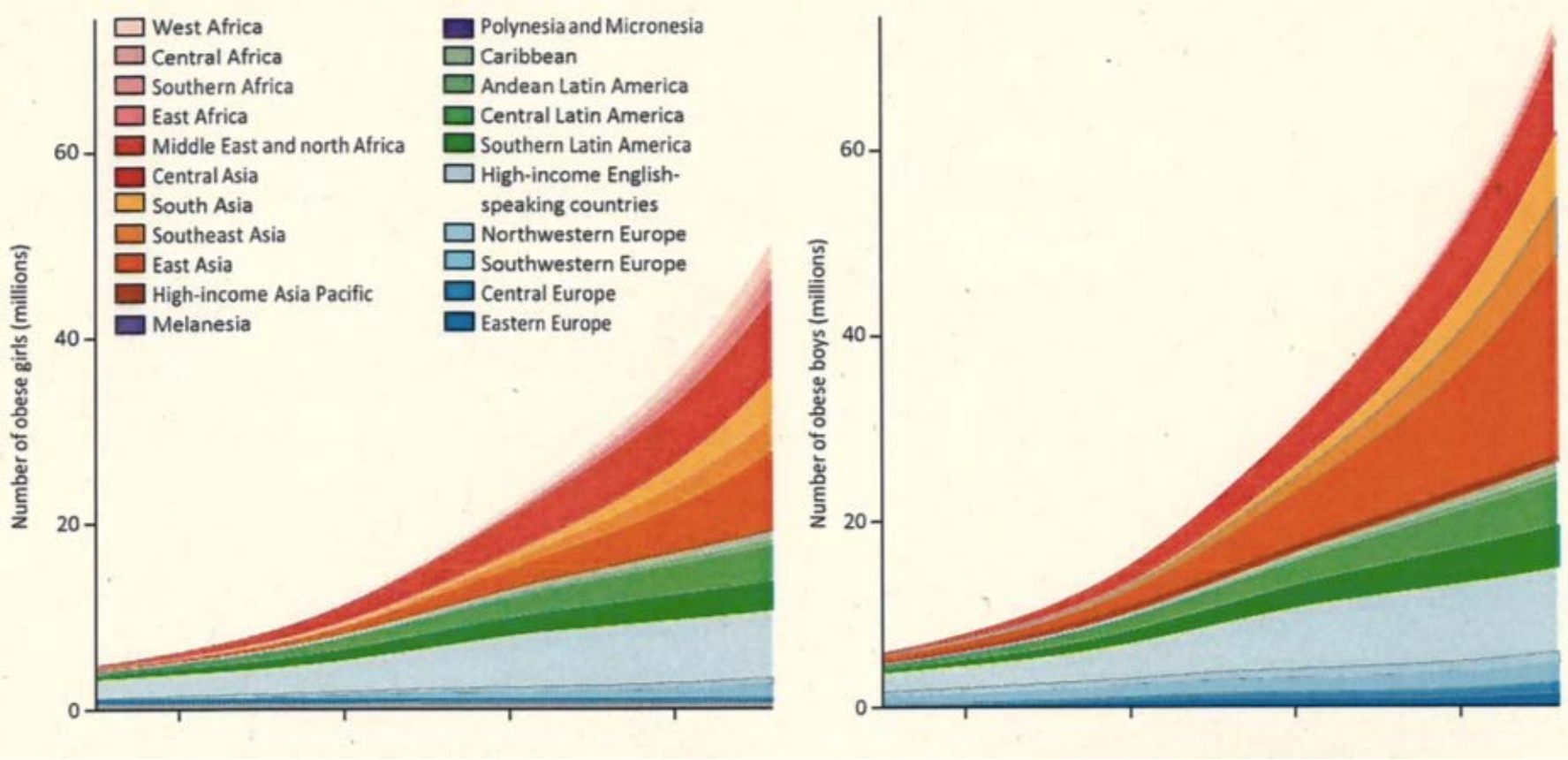
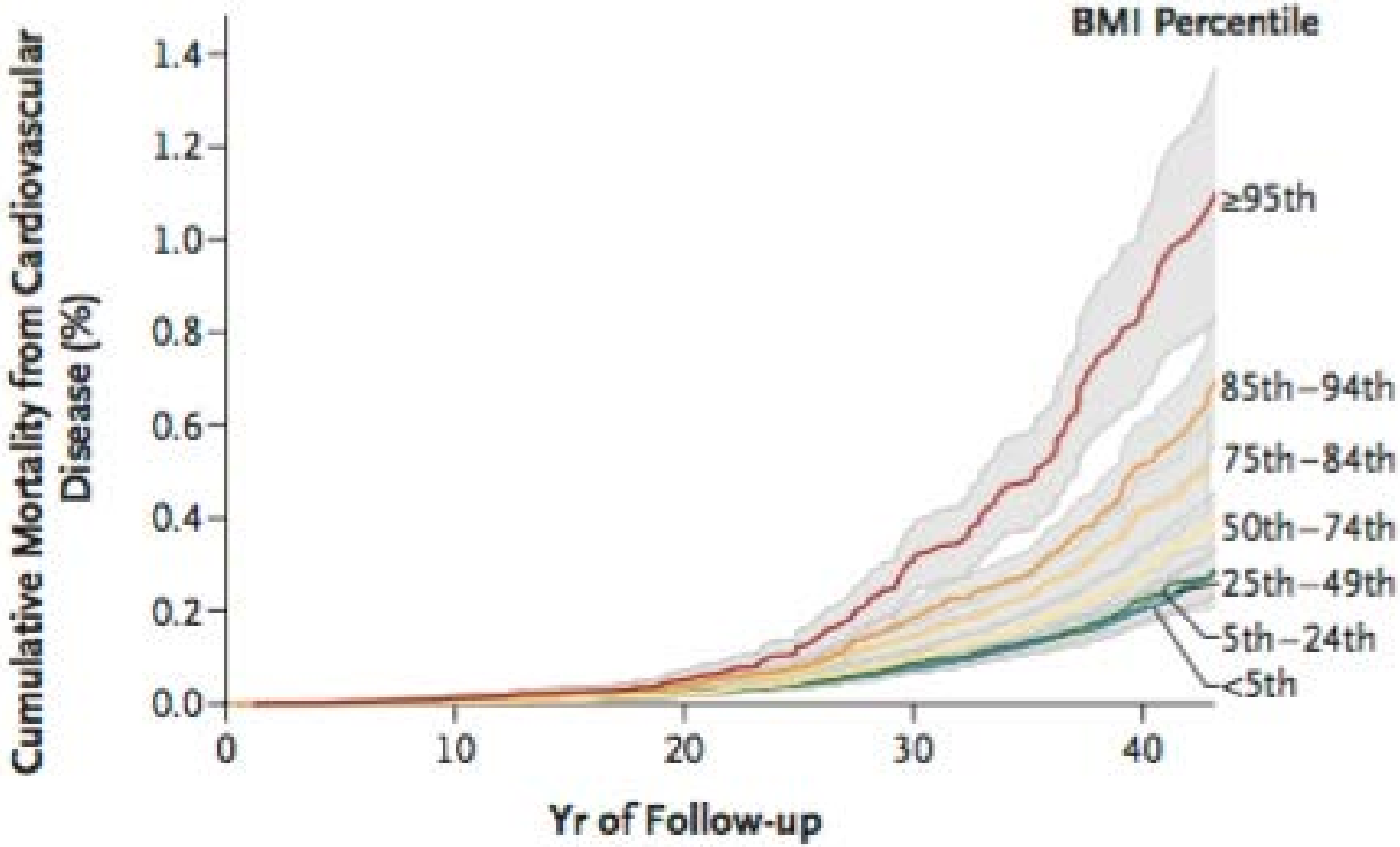


Body-Mass Index in 2.3 Million Adolescents and Cardiovascular Death in Adulthood



No. at Risk

Participants at risk	1,712,018	1,042,018	540,636	160,145
Cumulative person-yr	17,201,301	30,718,320	38,472,521	41,926,636
Cumulative cardio-vascular deaths	185	609	1,577	2,676

Twig G, *et al.* NEJM 2016

REPORT OF THE COMMISSION ON

ENDING CHILDHOOD OBESITY

IMPLEMENTATION PLAN: EXECUTIVE SUMMARY

World Health Organization

Valerio et al. Italian Journal of Pediatrics (2018) 44:88
https://doi.org/10.1186/s13052-018-0525-6

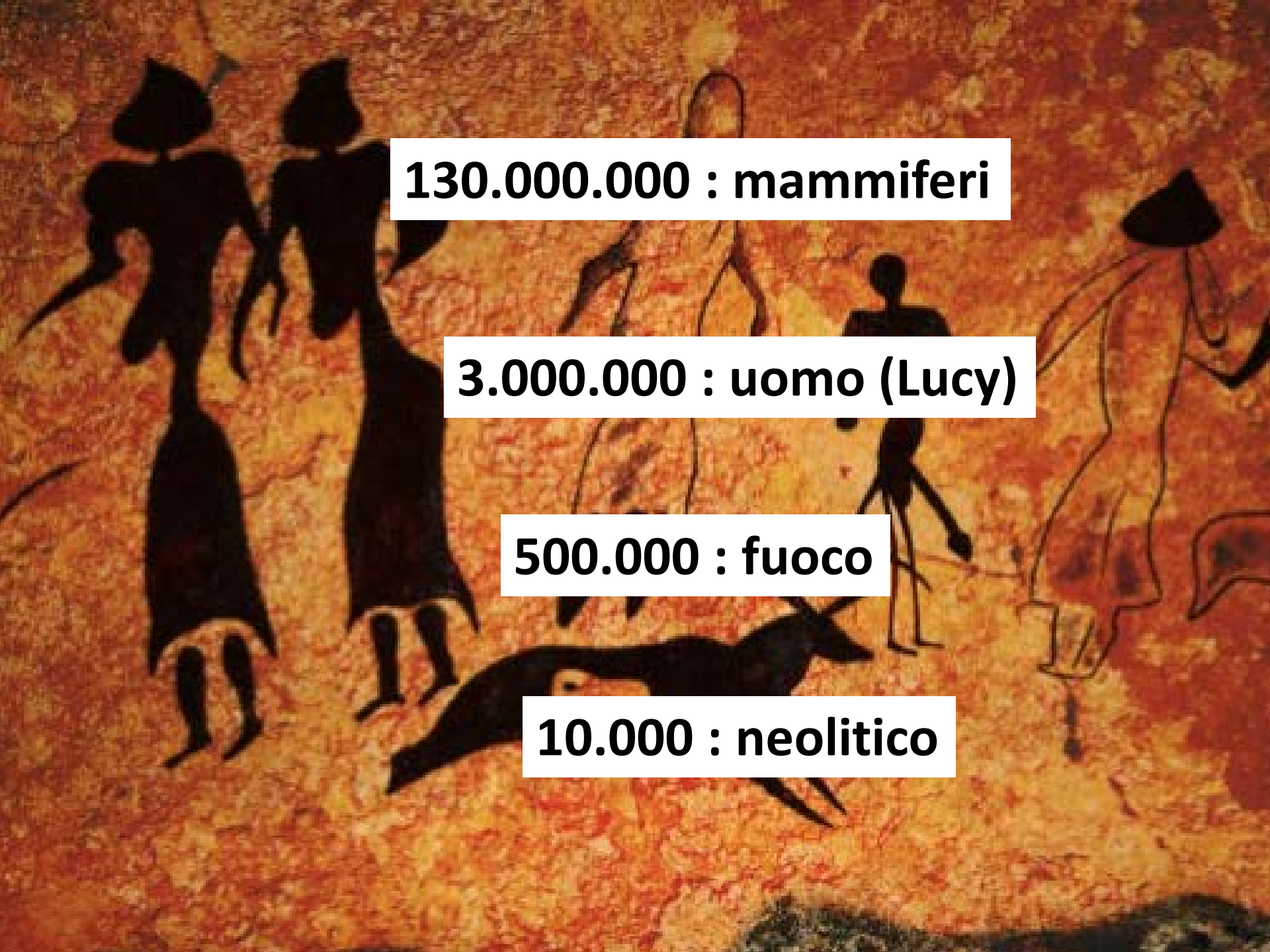
Italian Journal of Pediatrics

REVIEW

Open Access

Diagnosis, treatment and prevention of pediatric obesity: consensus position statement of the Italian Society for Pediatric Endocrinology and Diabetology and the Italian Society of Pediatrics

Giuliana Valerio[1*†], Claudio Maffeis[2†], Giuseppe Saggese[3], Maria Amalia Ambruzzi[4], Antonio Balsamo[5], Simonetta Bellone[6], Marcello Bergamini[7], Sergio Bernasconi[8], Gianni Bona[6], Valeria Calcaterra[9], Teresa Canali[10], Margherita Caroli[11], Francesco Chiarelli[12], Nicola Corciulo[13], Antonino Crinò[14], Procolo Di Bonito[15], Violetta Di Pietrantonio[16], Mario Di Pietro[17], Anna Di Sessa[18], Antonella Diamanti[19], Mattia Doria[20], Danilo Fintini[21], Roberto Franceschi[22], Adriana Franzese[23], Marco Giussani[24], Graziano Grugni[25], Dario Iafusco[18], Lorenzo Iughetti[26], Adima Lamborghini[27], Maria Rosaria Licenziati[28], Raffaele Limauro[29], Giulio Maltoni[5], Melania Manco[30], Leonardo Marchesini Reggiani[31], Loredana Marcovecchio[12], Alberto Marsciani[32], Emanuele Miraglia del Giudice[18], Anita Morandi[33], Giuseppe Morino[34], Beatrice Moro[35], Valerio Nobili[36,37], Laura Perrone[18], Marina Picca[24], Angelo Pietrobelli[38], Francesco Privitera[39], Salvatore Purromuto[40], Letizia Ragusa[41], Roberta Ricotti[6], Francesca Santamaria[23], Chiara Sartori[42], Stefano Stilli[31], Maria Elisabeth Street[42], Rita Tanas[43], Giuliana Trifiró[44], Giuseppina Rosaria Umano[18], Andrea Vania[36], Elvira Verduci[45] and Eugenio Zito[46]


130.000.000 : mammiferi
3.000.000 : uomo (Lucy)
500.000 : fuoco
10.000 : neolitico

cacciatore - raccoglitore

Paleodiet

Attività fisica
Alimenti integrali
Pochi carboidrati
Ricca in nutrienti
(vitamine, minerali, fibra)

Neolitico

Mediterranean diet pyramid: a lifestyle for today
guidelines for adult population

Serving size based on frugality
and local habits

Wine in moderation
and respecting social beliefs

© 2010 Fundacion dieta mediterranea the use and promotion of this pyramid is recommended without any restriction

2010 edition

s = Serving

Fundación
Dieta Mediterránea

ICAF
International Commission on the
Anthropology of Food and Nutrition

FORUM ON MEDITERRANEAN FOOD CULTURES

Predimed

Ciiscam

H.H.F.
HELLENIC HEALTH FOUNDATION

IUNS

CIHEAM

fenc

Mediterranean Diet and Health in Children and Adolescents

Inverse association with obesity

Nutrition, Metabolism & Cardiovascular Diseases (2014) 24, 205–213

Available online at www.sciencedirect.com

SciVerse ScienceDirect

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

ELSEVIER

Nutrition, Metabolism & Cardiovascular Diseases

Mediterranean diet, overweight and body composition in children from eight European countries: Cross-sectional and prospective results from the IDEFICS study

G. Tognon [a,*,1], A. Hebestreit [b,1], A. Lanfer [b,1], L.A. Moreno [c,1], V. Pala [d,1], A. Siani [e,1], M. Tornaritis [f,1], S. De Henauw [g,1], T. Veidebaum [h,1], D. Molnár [i,1], W. Ahrens [b,j,1], L. Lissner [a,1]

Decreases waist circumference

European Journal of Clinical Investigation

ESCI

Explore this journal >

Original Article

Mediterranean diet decreases adolescent waist circumference

Flora Bacopoulou, Georgios Landis, Anastasios Rentoumis, Artemis Tsitsika, Vasiliki Efthymiou

Accepted manuscript online: 13 April 2017 Full publication history

DOI: 10.1111/eci.12760 View/save citation

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Increases academic performances

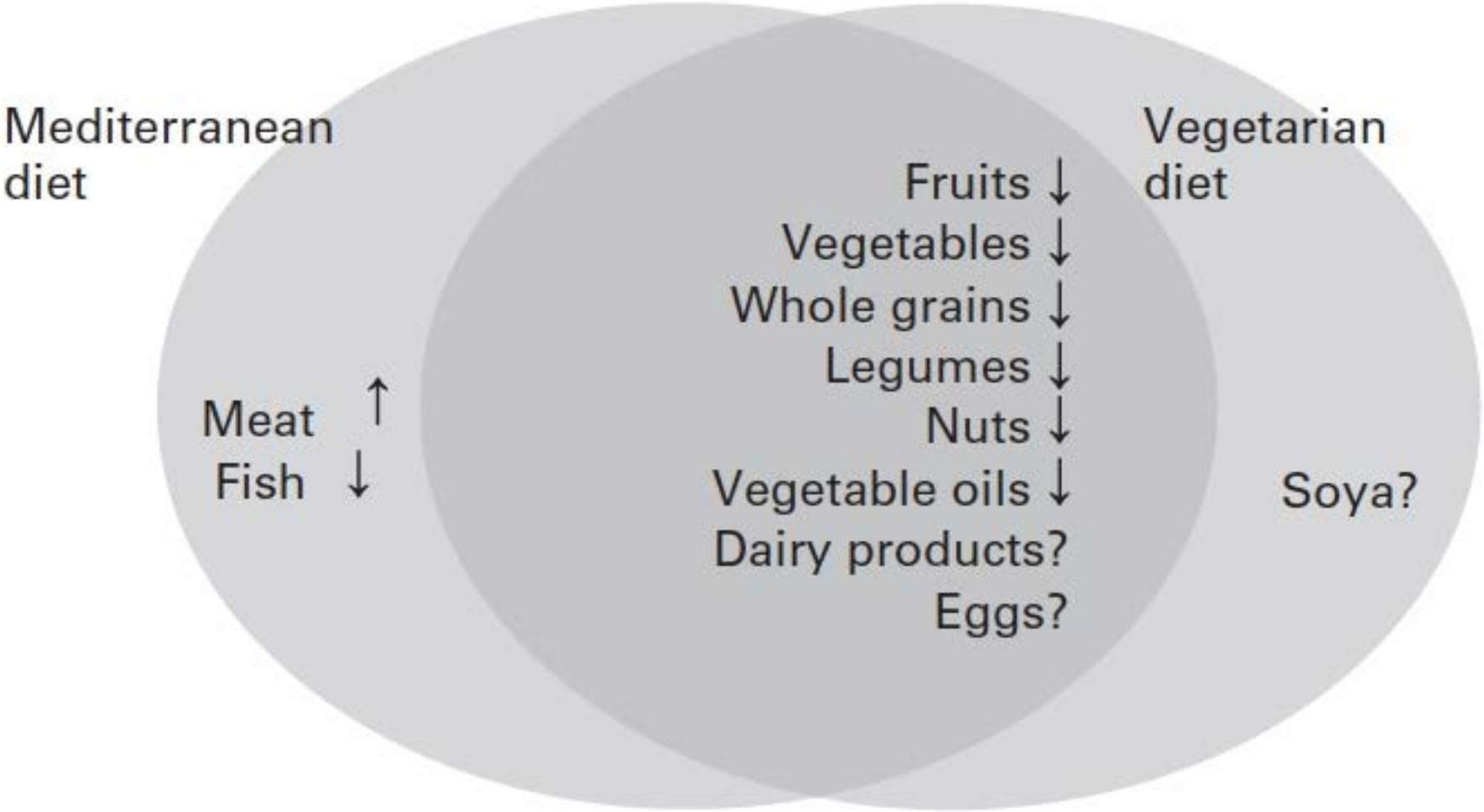
Eur J Nutr (2016) 55:1133–1140
DOI 10.1007/s00394-015-0927-9

ORIGINAL CONTRIBUTION

Adherence to the Mediterranean diet and academic performance in youth: the UP&DOWN study

Irene Esteban-Cornejo[1] · Rocio Izquierdo-Gomez[1] · Sonia Gómez-Martínez[2] · Carmen Padilla-Moledo[3] · Jose Castro-Piñero[3] · Ascensión Marcos[2] · Oscar L. Veiga[1]

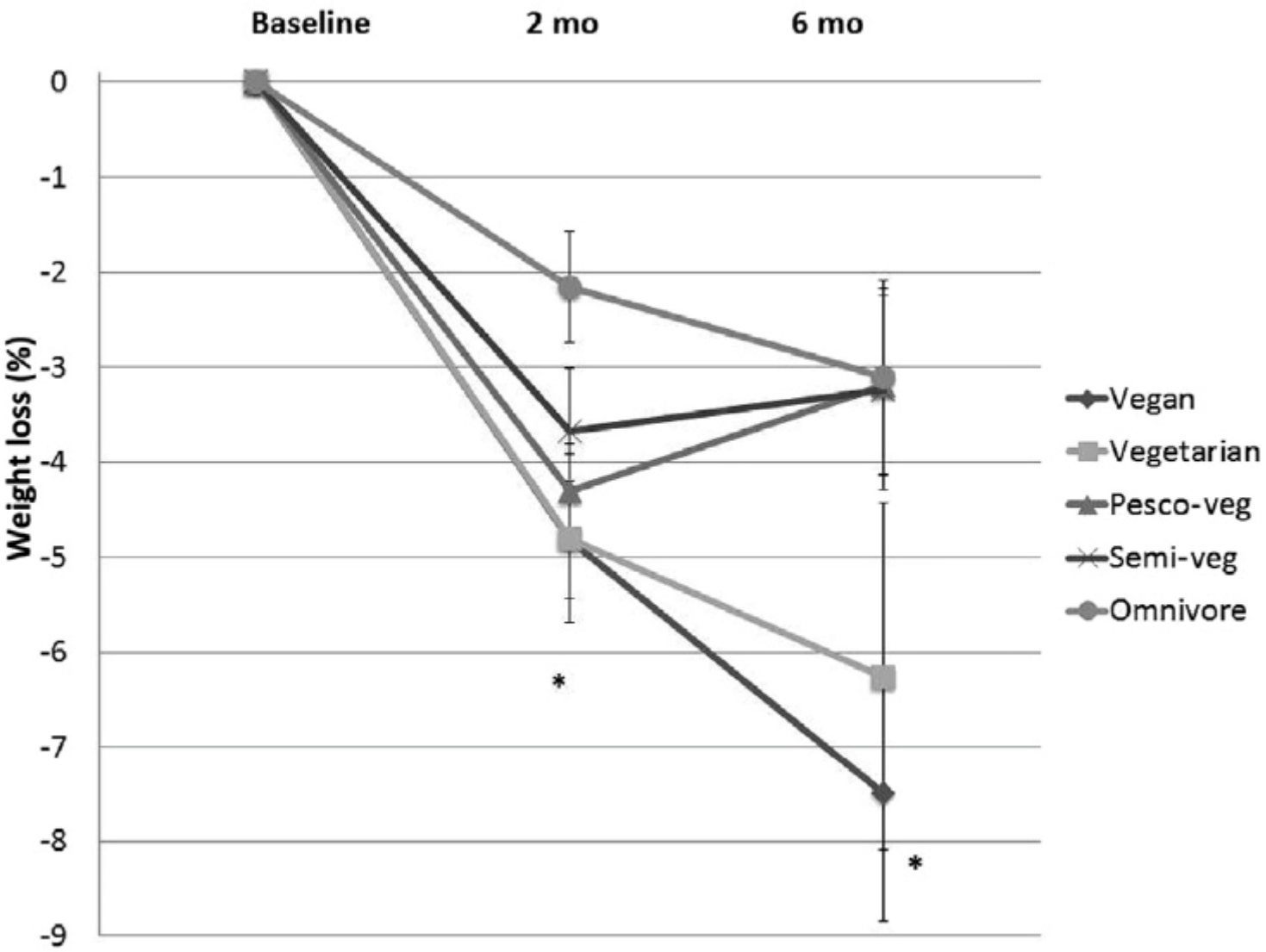
Foods related to the metabolic syndrome in two plant-based diets



↑ = increases the risk of MetS; ↓ = decreases the risk of MetS; ? = uncertain relation to MetS

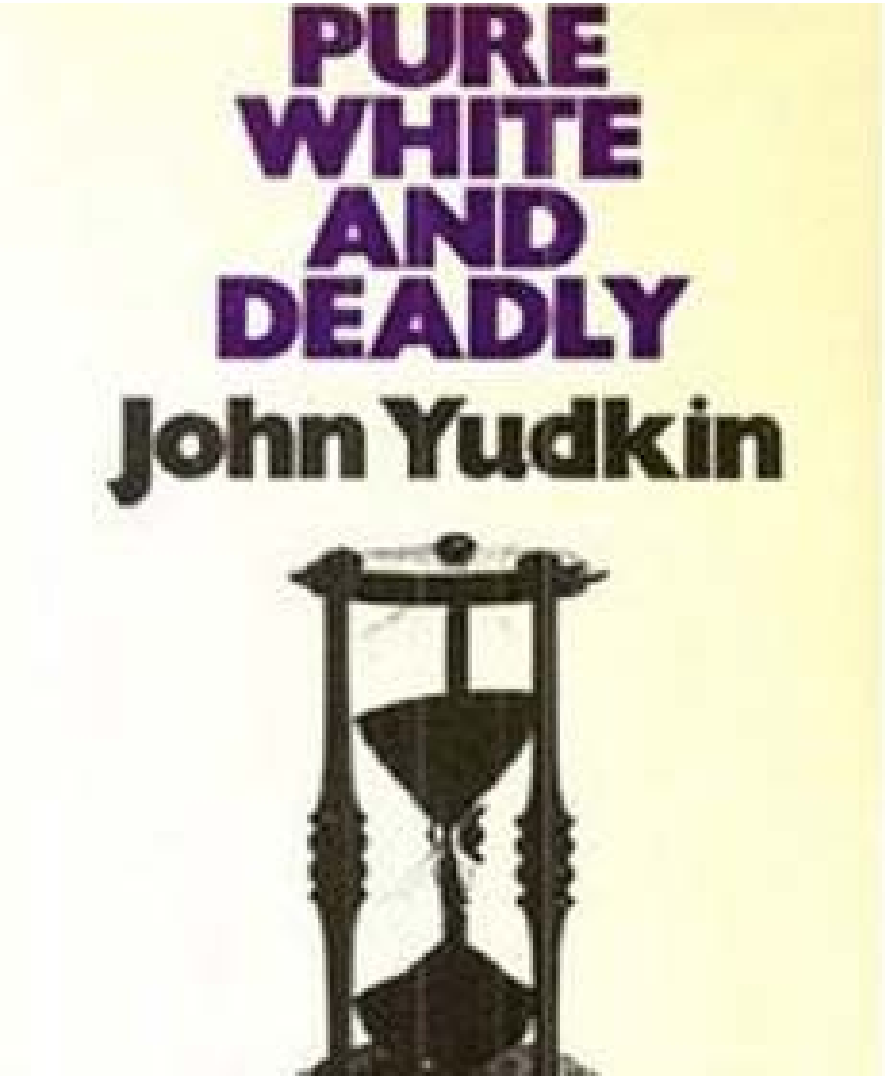
Sabaté J & Wien M. Br J Nutr 2015;113:S136-S143

Comparative effectiveness of plant-based diets for weight loss: A randomized controlled trial of five different diets



Turner-McGrievy GM, *et al.* Nutrition 2015;31:350-8.

IL FUTURO E' VEG?


PURE
WHITE
AND
DEADLY
John Yudkin

World Health Organization

WHO recommendations:

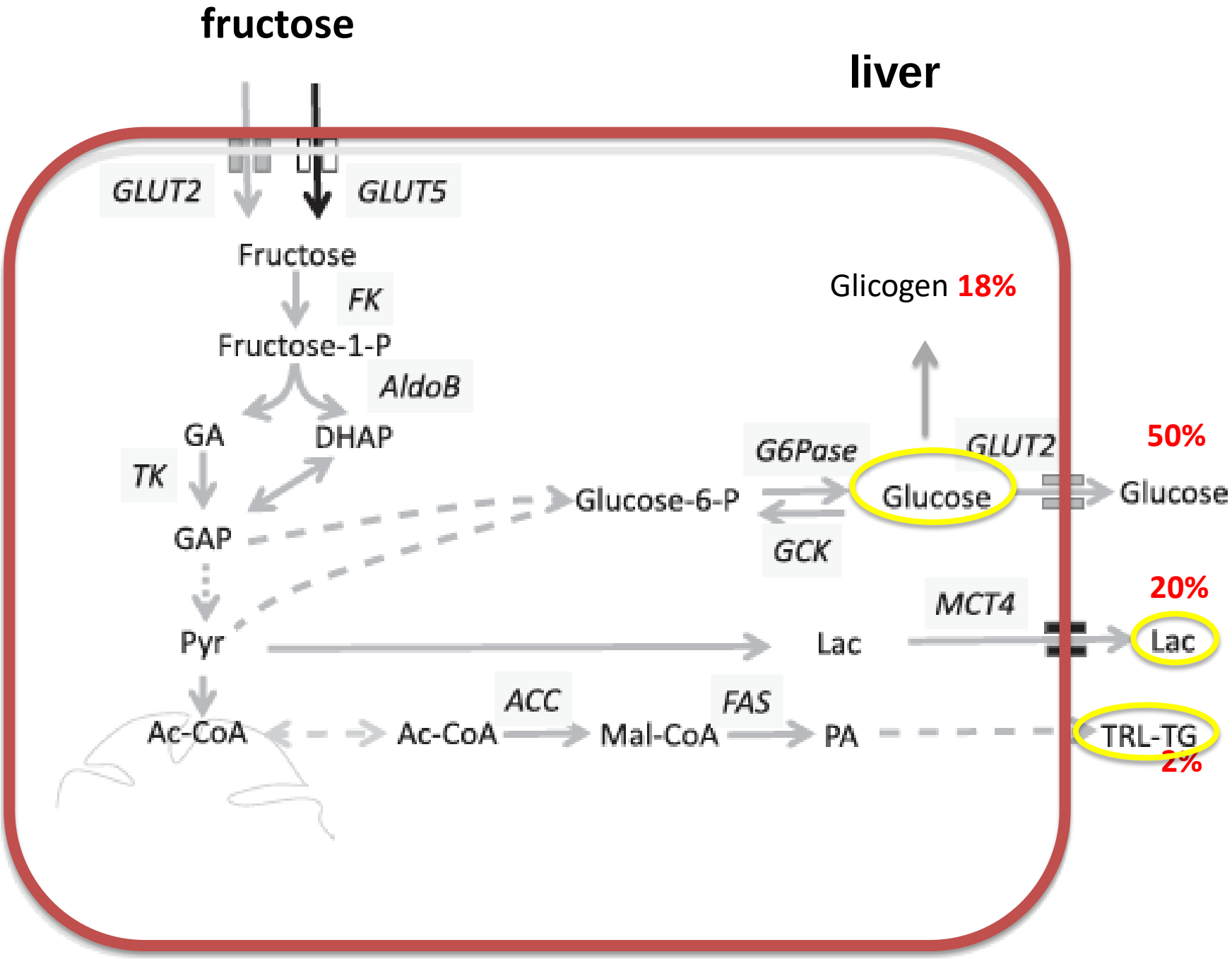
1. reduce the intake of free sugars throughout the life-course (strong recommendation 1).

2. do not exceed 10% of total energy from free sugars (in both adults and children) (strong recommendation 2).

3. further reduction to below 5% of total energy (conditional recommendation 3).

Remarks

• Free sugars include monosaccharides and disaccharides added to foods by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit concentrates.



Campos & Tappy Int J Obes 2016;40:S6-S11

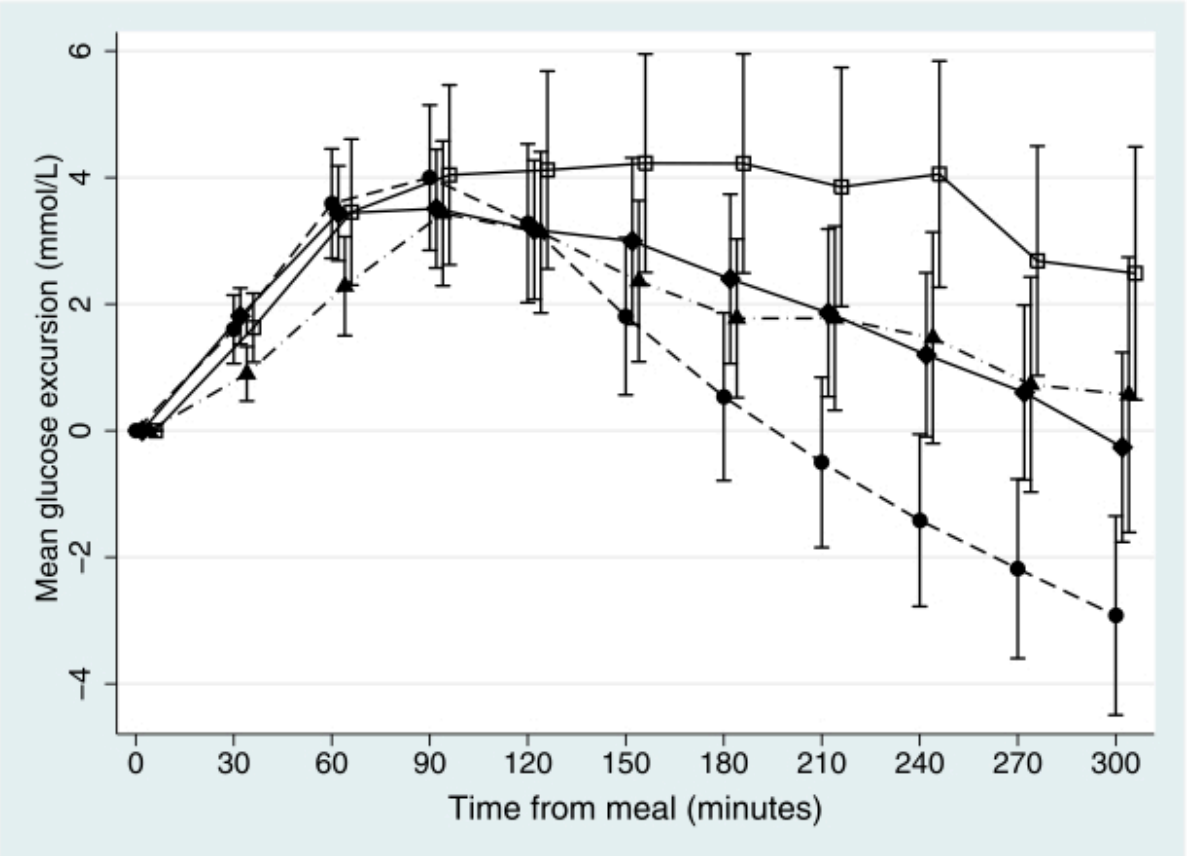
Sir Harold Heimsworth

High fat/low carbohydrate diet is associated with poorer glucose tolerance and insulin resistance.

The dietetic factor determining the glucose tolerance and sensitivity to insulin of healthy men.

Clin Sci 1935;2:67-94.

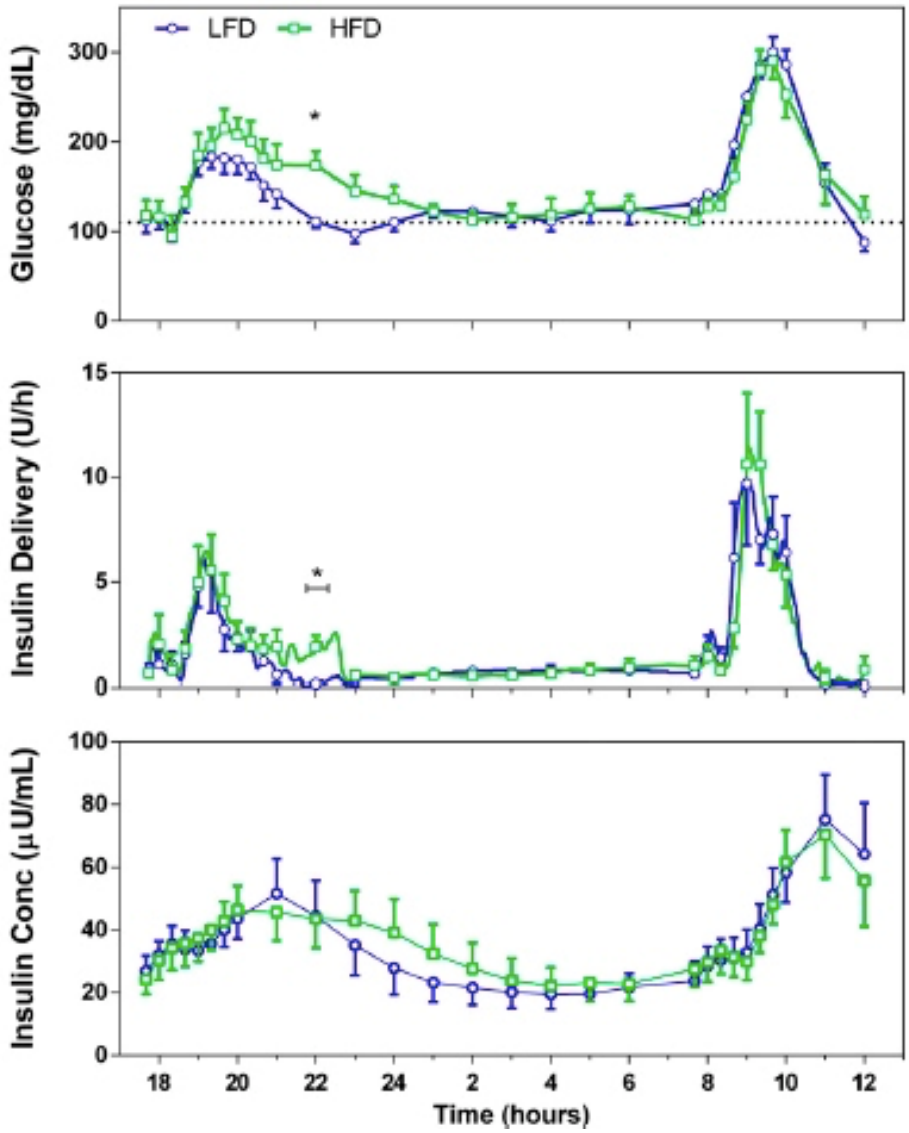
Proteine e grassi nel pasto influenzano la glicemia postprandiale



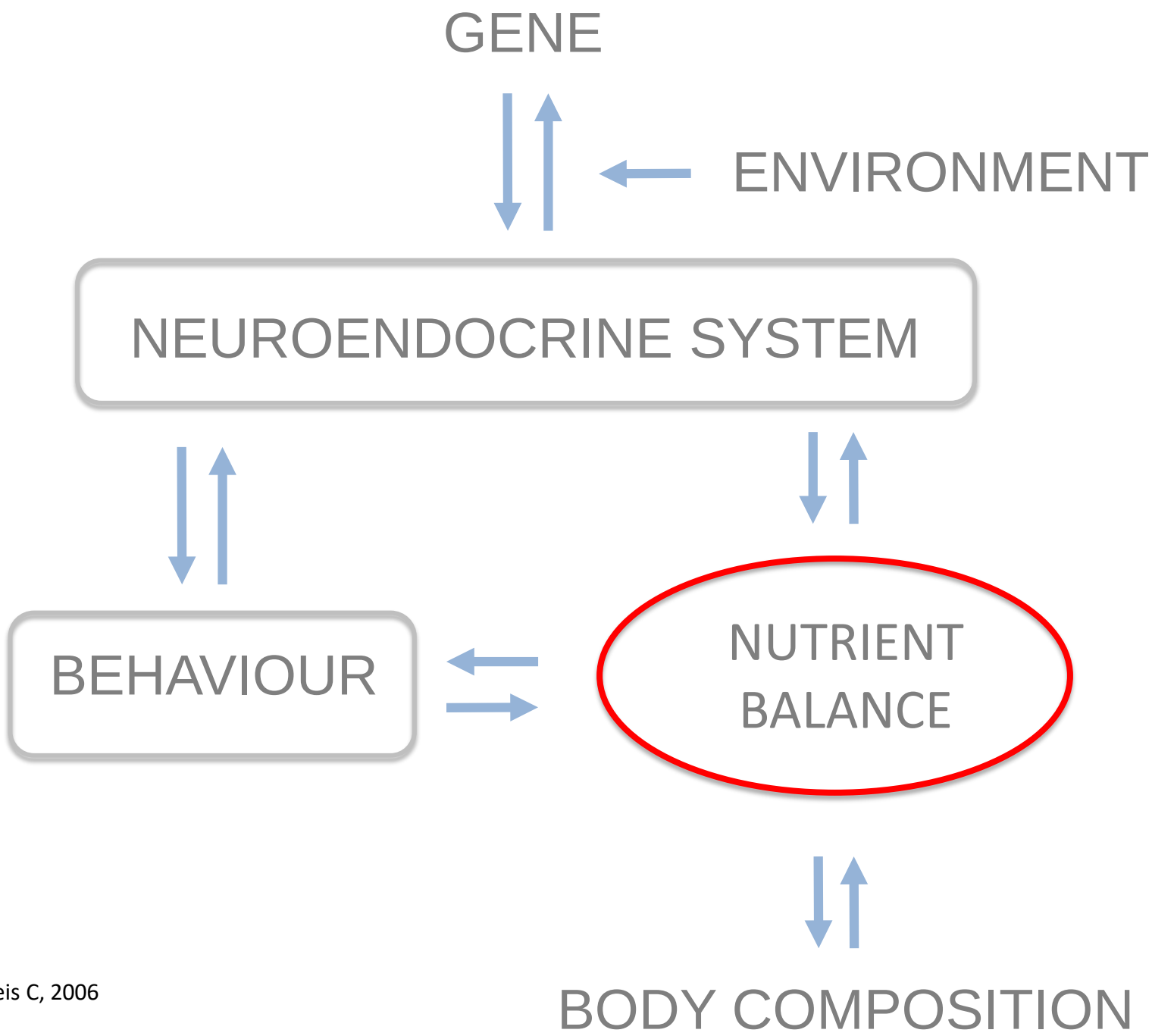
Le proteine e i grassi nella dieta influenzano in modo significativo il profilo glicemico post-prandiale e l'effetto è esponenziale

Smart CEM, *et al.* Diabetes Care 2013;36:3897-3902

Dietary Fat Acutely Increases Glucose Concentrations and Insulin Requirements in Patients With T1D

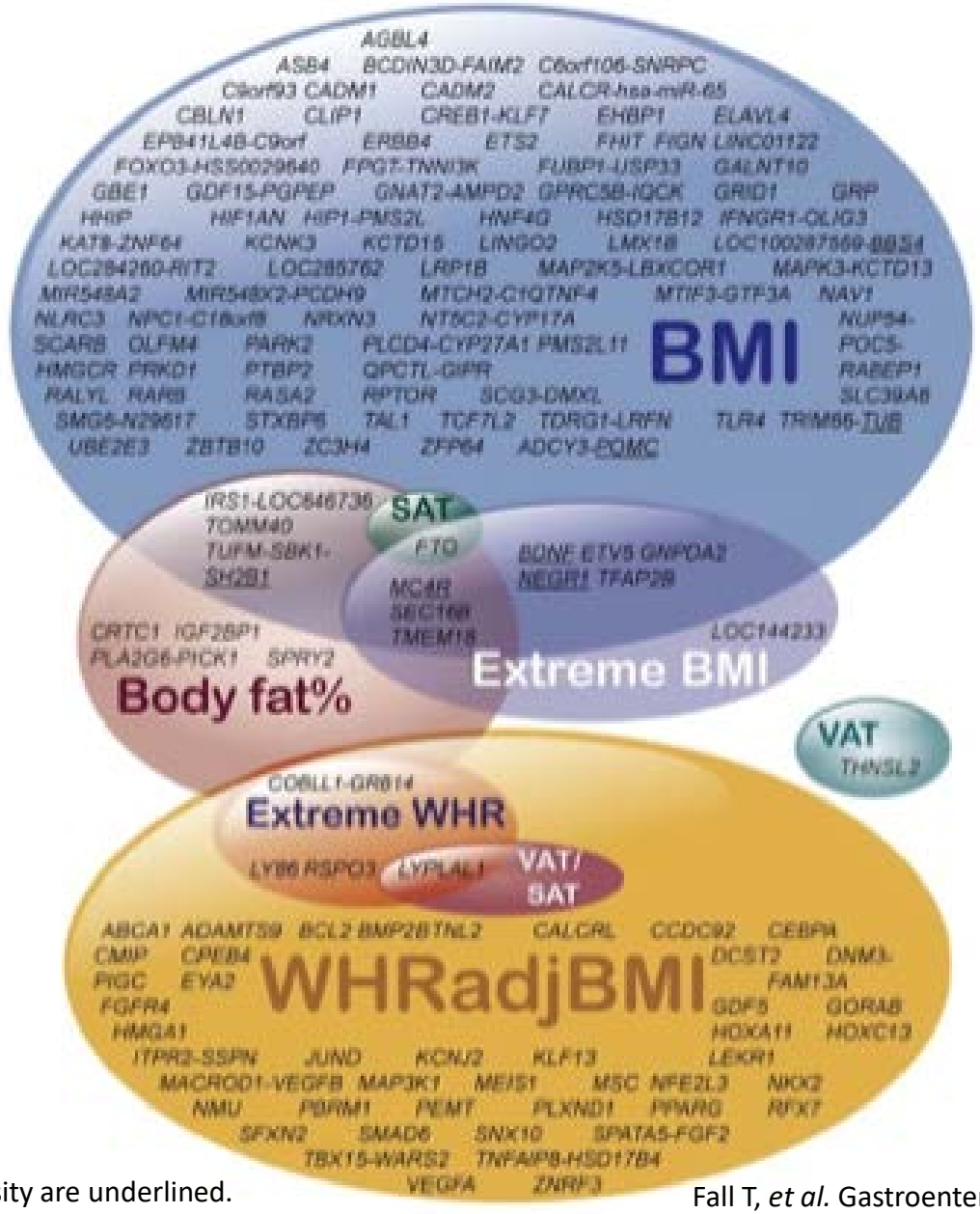


Wolpert HA, *et al.* Diabetes Care 2013;36:810-6



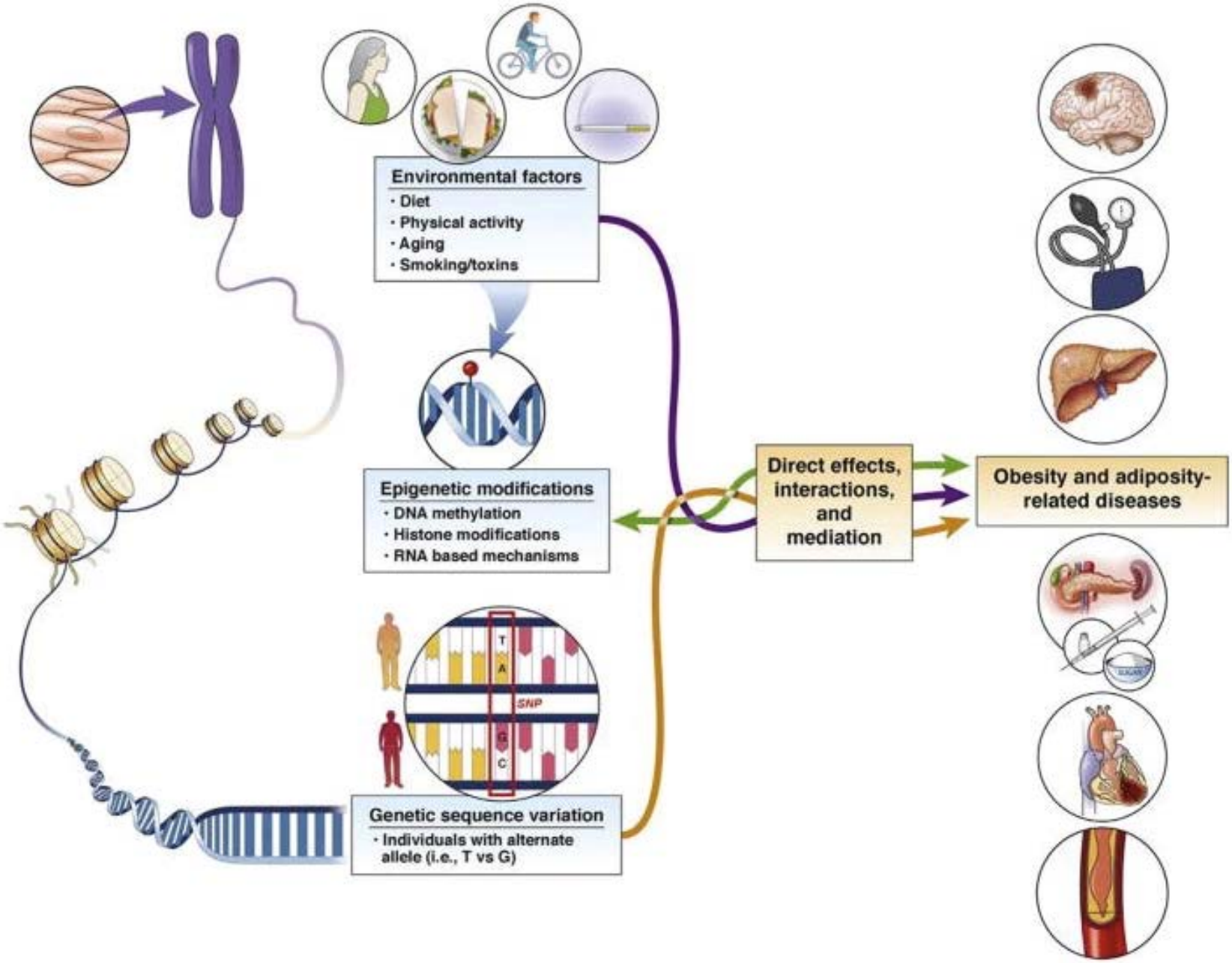
Maffeis C, 2006

Loci associated with BMI, body fat percentage , waist-hip-ratio adjusted for BMI, VAT, SAT, and their ratio (VAT/SAT), and extremes of body mass index and waist-hip-ratio. *



*Genes implicated in monogenic obesity are underlined.

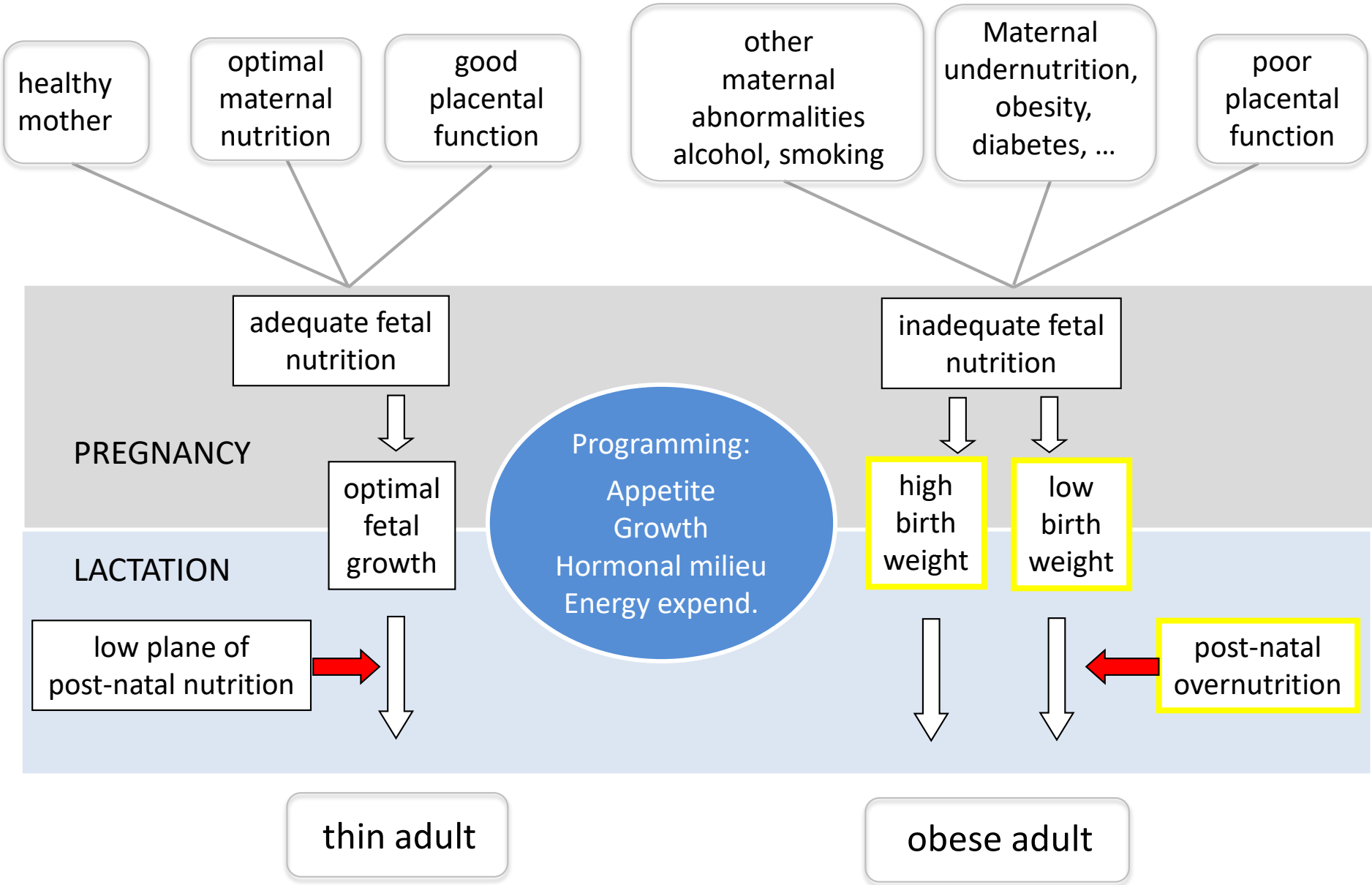
Fall T, *et al.* Gastroenterology. 2017; 152: 1695–1706



Genetic and epigenetic variation influences gene expression.

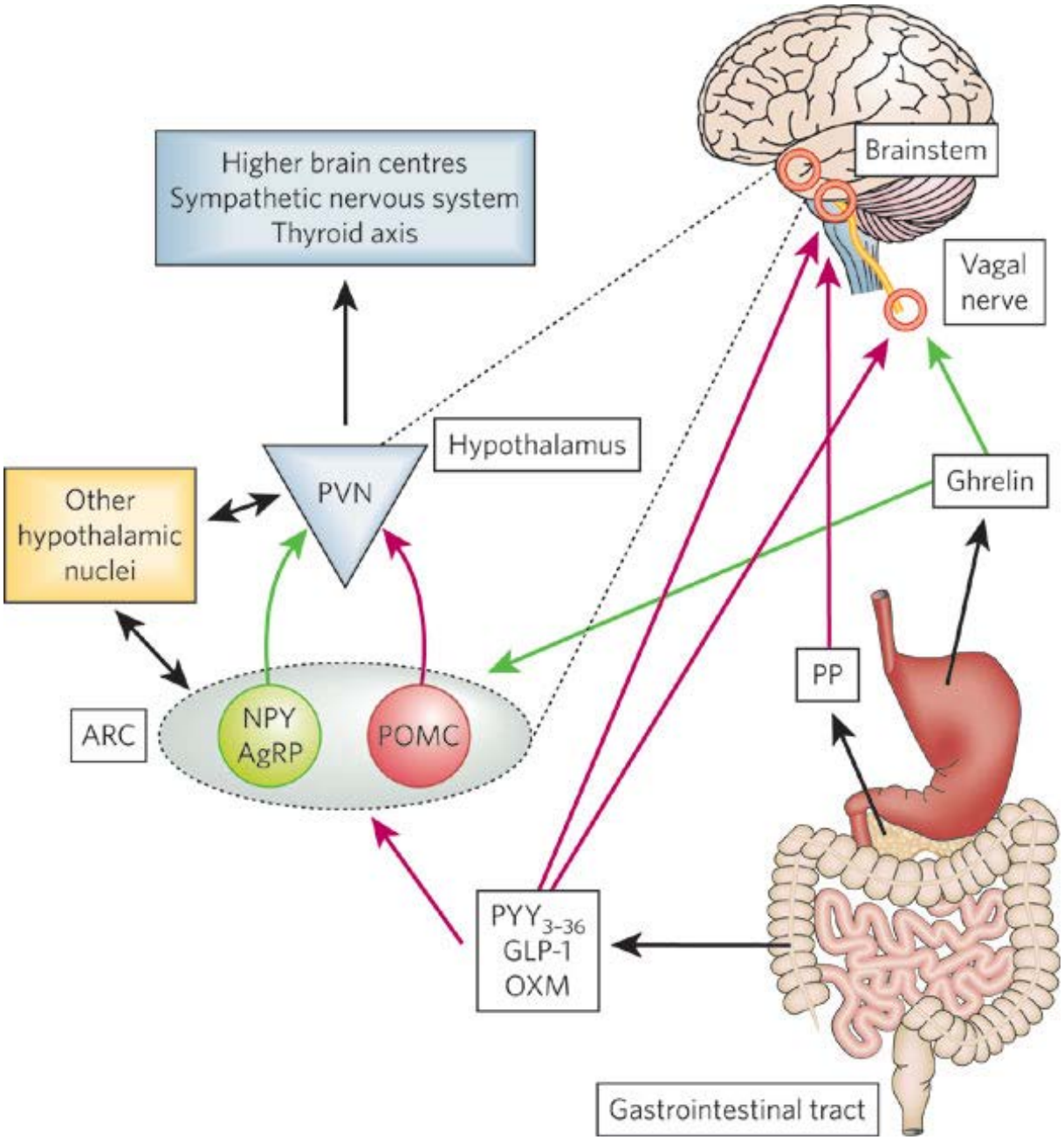
Fall T, *et al*. Gastroenterology. 2017; 152: 1695–1706

fetal & perinatal programming



Cripps *et al.* Clin Sci 2005, modified

the pathways by which gut hormones regulate energy homeostasis



Murphy KG & Bloom SR Nature 2006

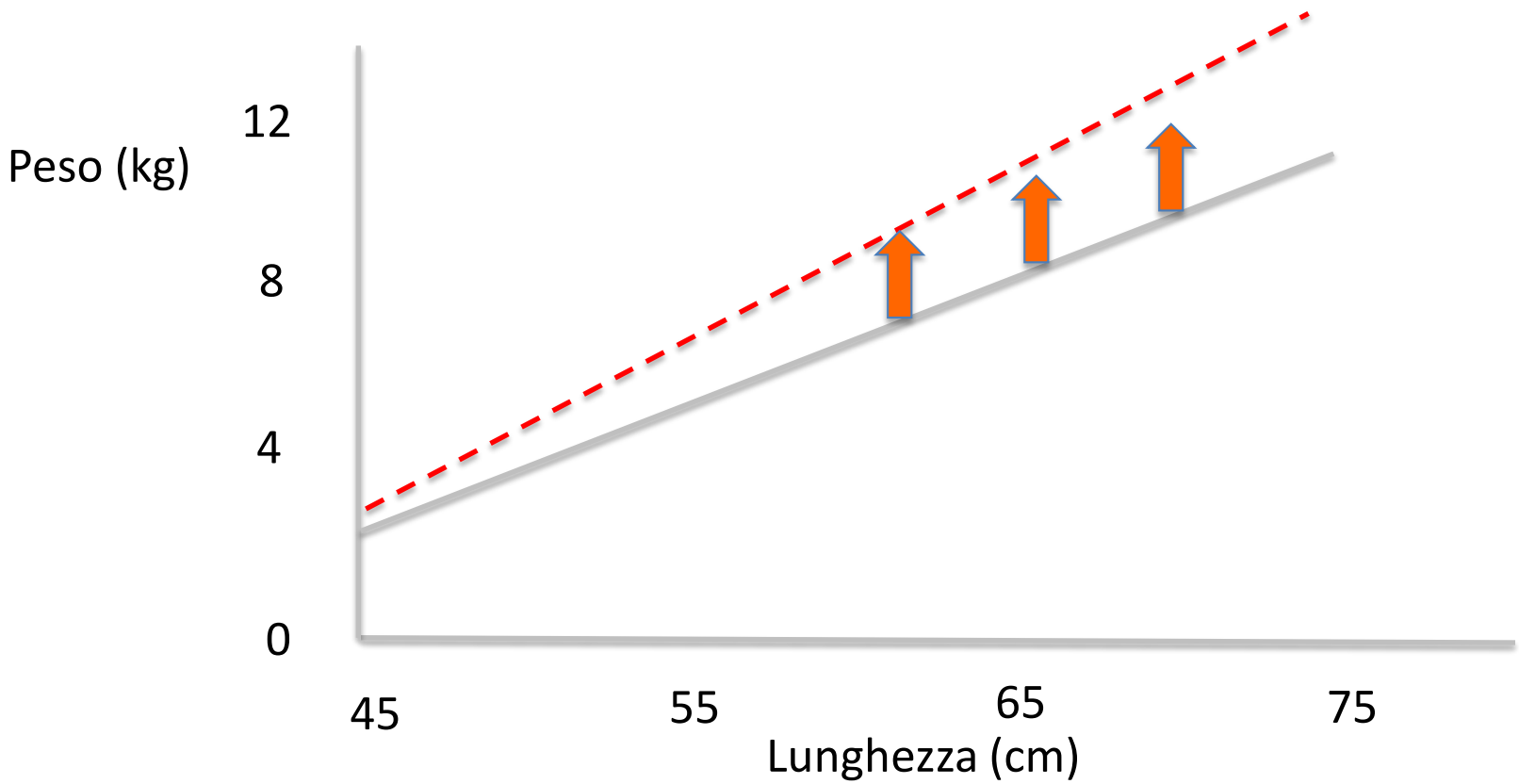
parental and perinatal factors associated with childhood obesity in north-east Italy

"… When parental and perinatal variables were included as independent variables in a multiple logistic regression model controlling for the effect of age, *parental body mass index* and *children's birth-weight* remained independently associated with childhood obesity. "

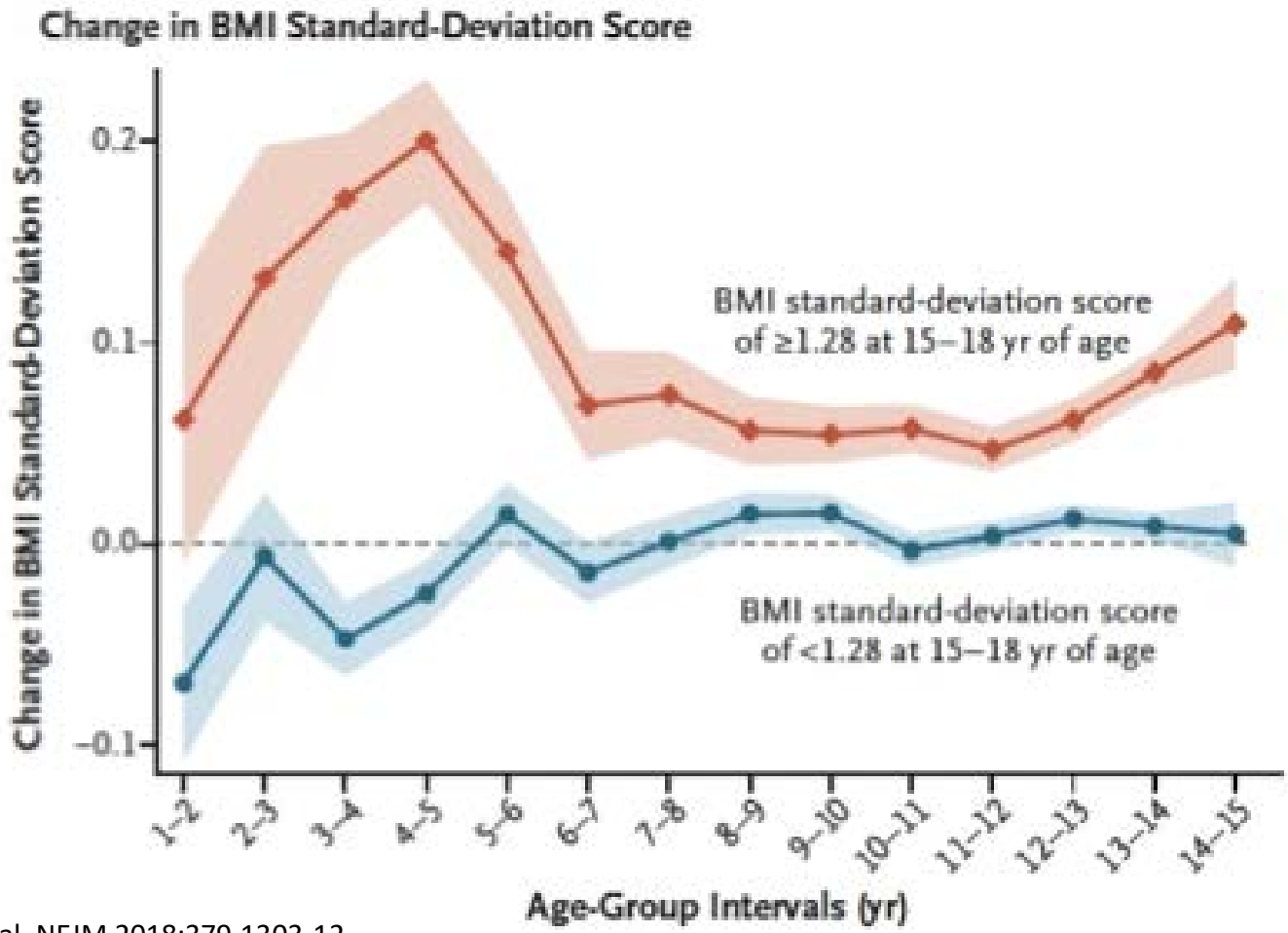
Maffeis C, *et al.* Int J Obes 1994;18:301-5.

Morandi A, …Maffeis C, *et al.* PLoS ONE 2012;e49919

Velocità di crescita primo anno

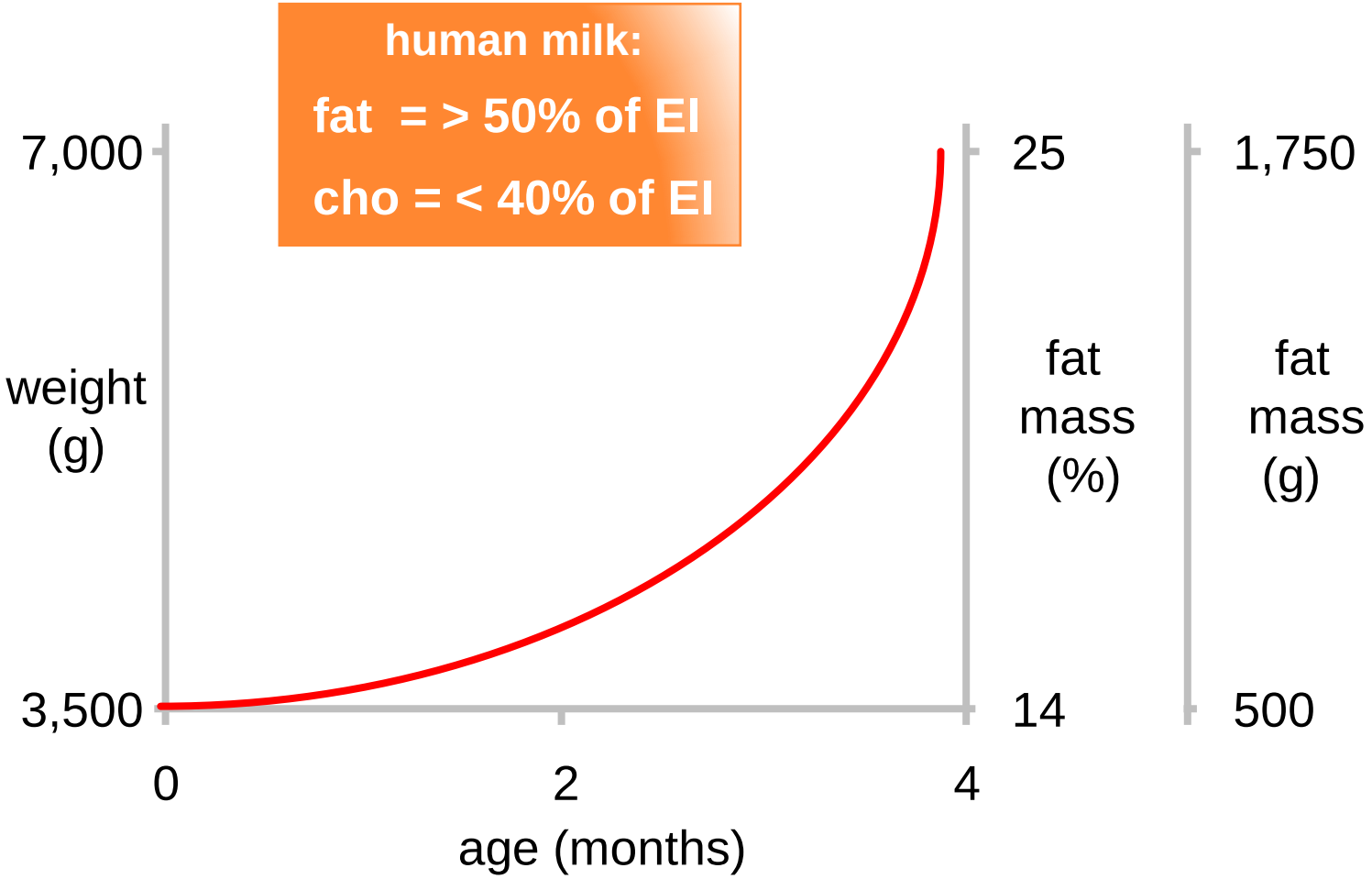


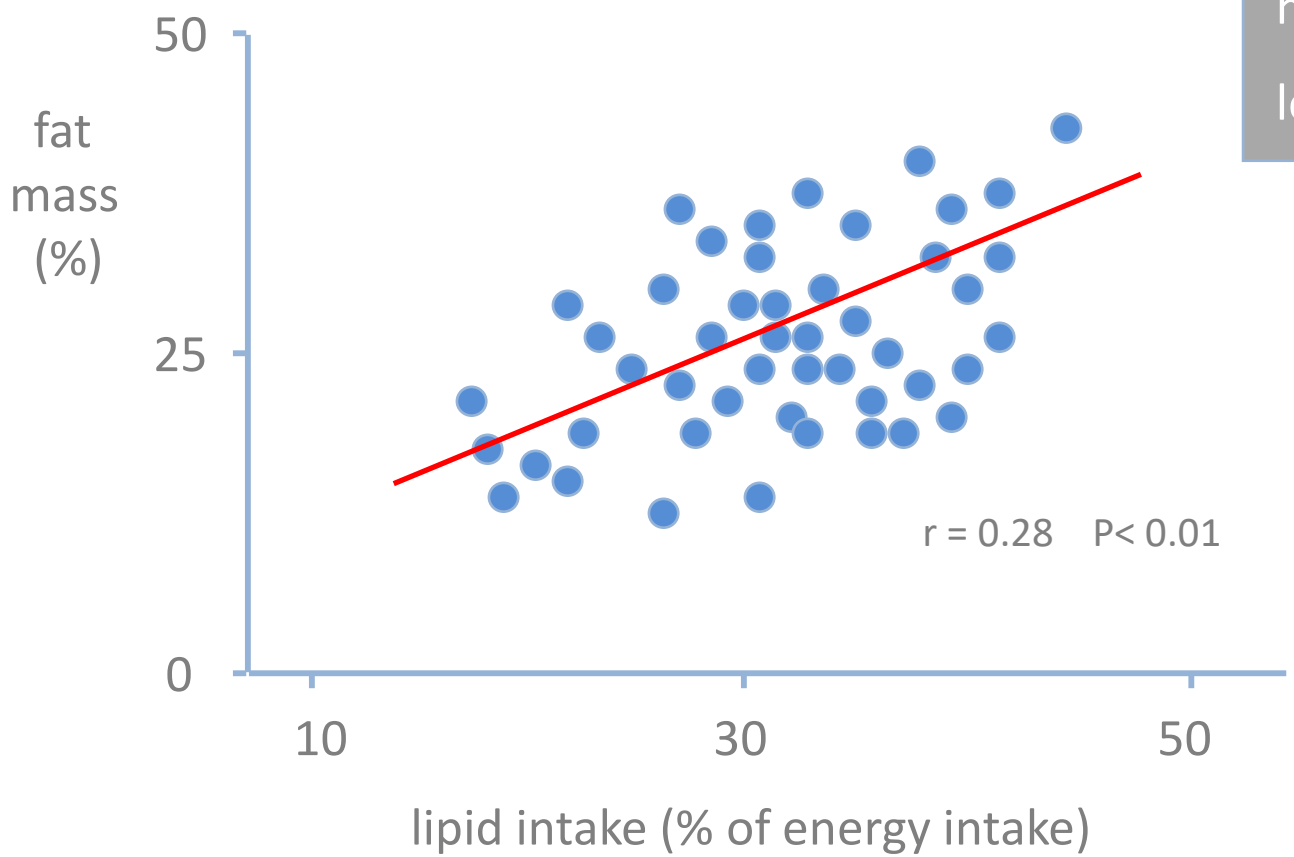
Dynamics of BMI Changes during Childhood



Geserick M, et al. NEJM 2018;379.1303-12

the infant: a model of physiological overfeeding





fatty food

more palatable

high energy density

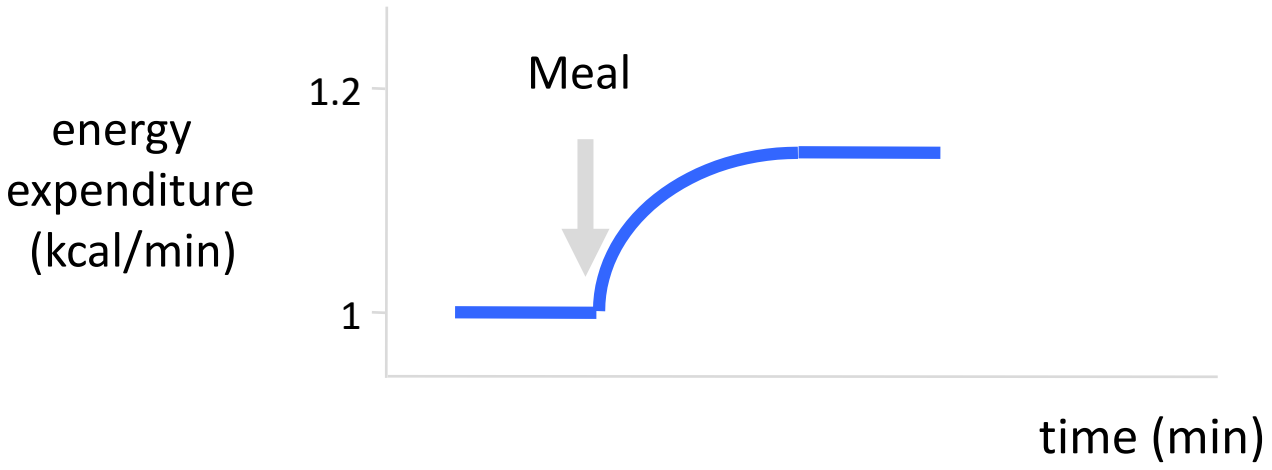
less satiating

Klesges RC *et al.* AJCN '94

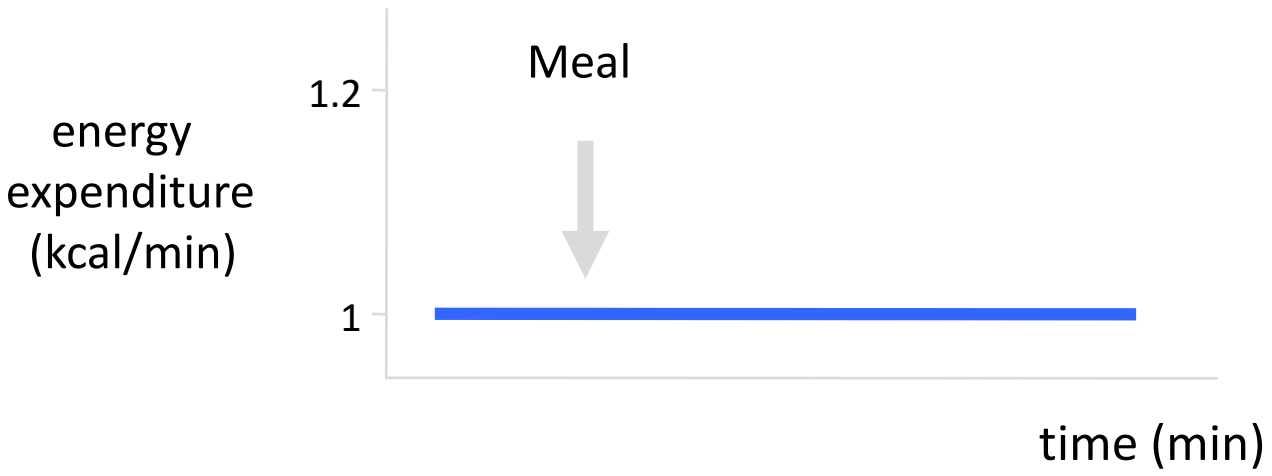
Gazzaniga JM, *et al.*AJCN '93

Maffeis C *et al.* Int J Obes '96

carbohydrate and protein

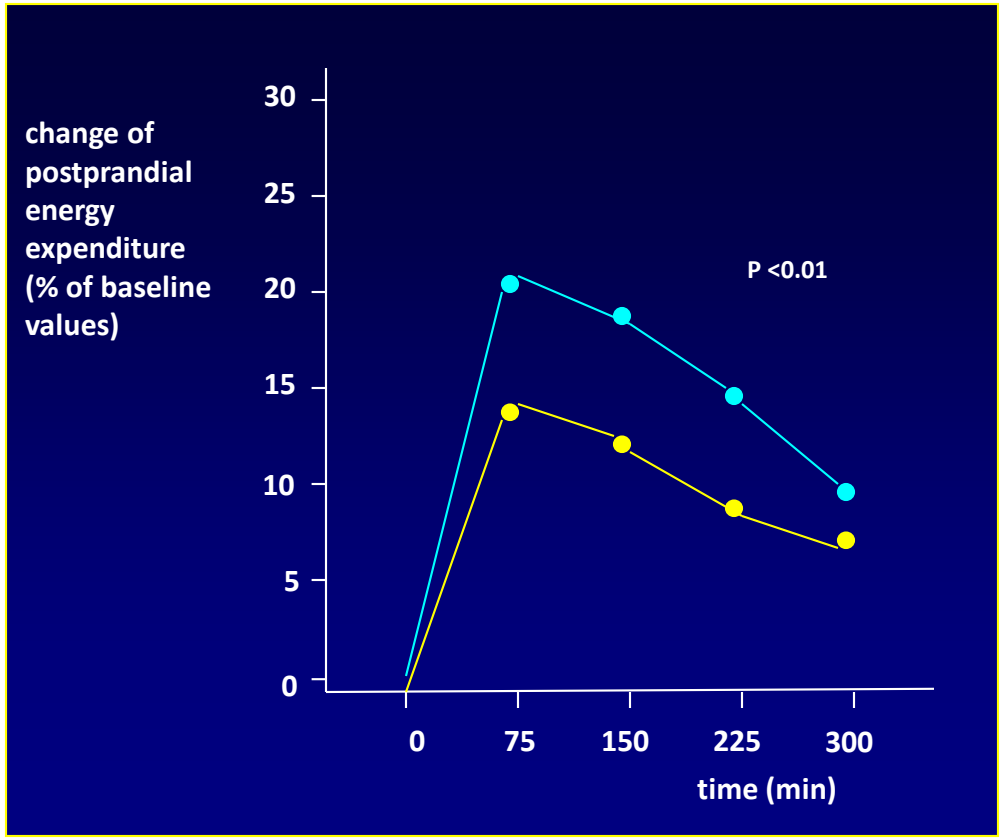


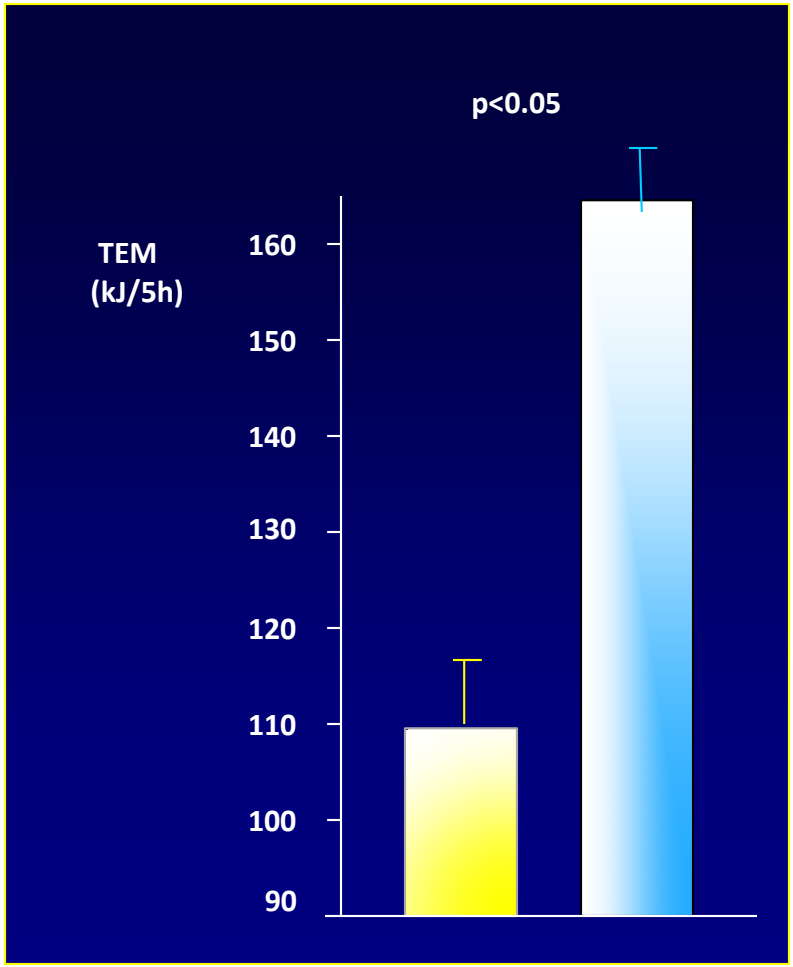
lipid



Schutz Y *et al.* AJCN ‘89.

meal-induced thermogenesis after two isocaloric, isoproteic meals with a different fat/carbohydrate ratio in 10-year-old girls





lipid/carbohydrate

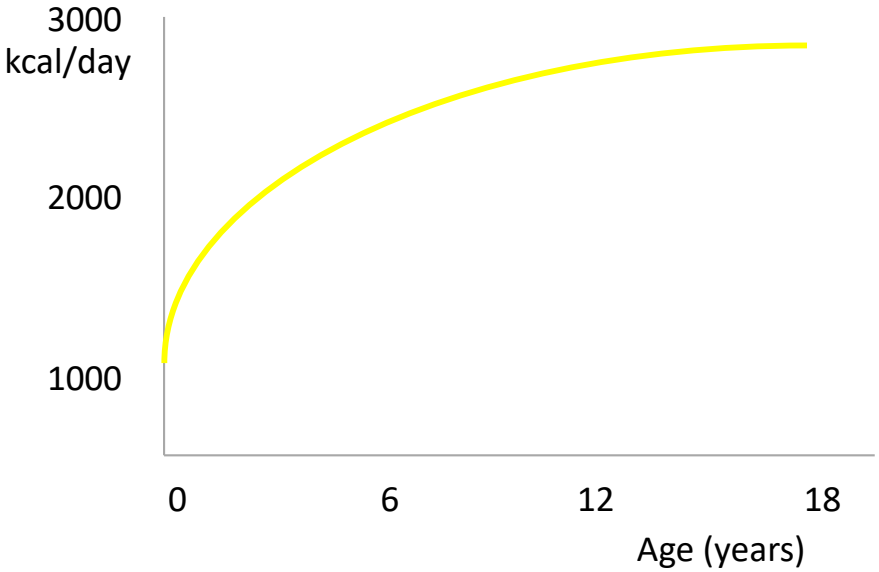
lipid/carbohydrate

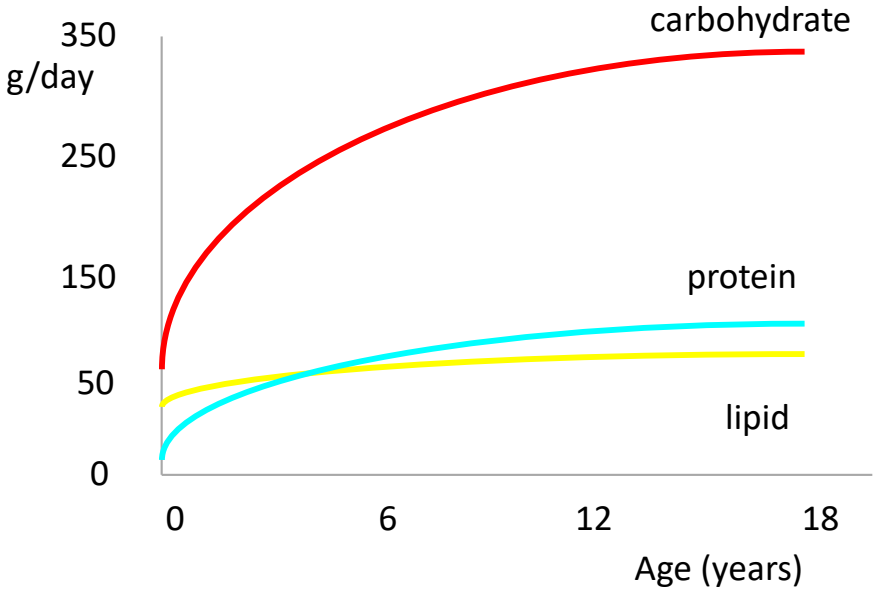
Maffeis C *et al*. JCEM 2001; 86:214-9.

energy and nutrient requirements

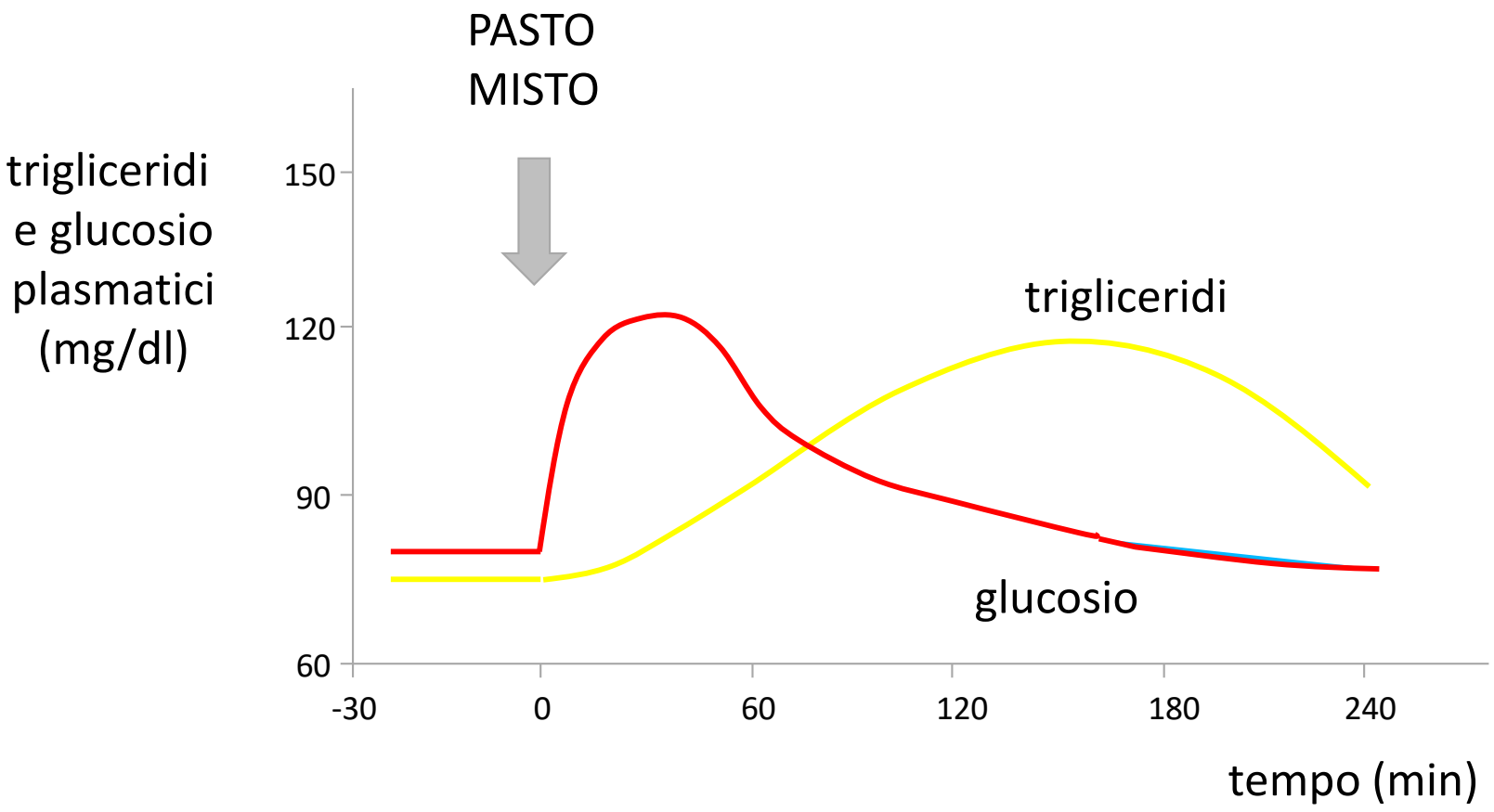
energy

nutrients





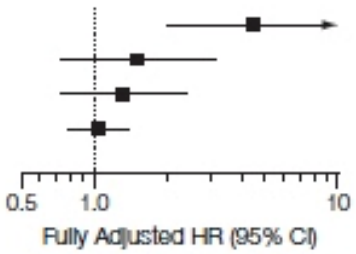
VARIAZIONE POST-PRANDIALE TRIGLICERIDEMIA E GLICEMIA



Fasting Compared With Nonfasting Triglycerides and Risk of Cardiovascular Events in Women

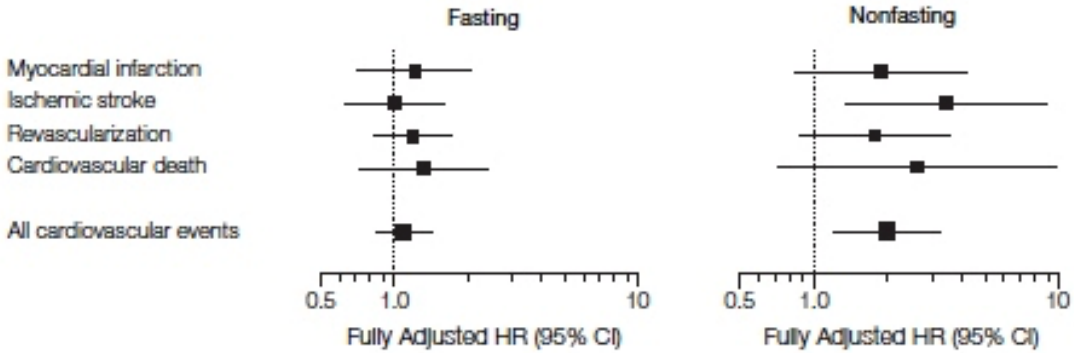
Figure 1. Association of Triglyceride Levels With Future Cardiovascular Events, Stratified by Time Since Last Meal

Time From Last Meal, h	No. of Participants	No. of Events	Hazard Ratio (95% Confidence Interval)
2 to <4	2797	98	4.48 (1.98-10.15)
4 to <8	2594	92	1.50 (0.72-3.13)
8 to <12	4846	177	1.31 (0.73-2.36)
≥12	15272	609	1.04 (0.79-1.38)



Hazard ratio (HR) and 95% confidence interval (CI) for highest vs lowest tertiles of triglyceride level (see Table 3 for values), adjusted for age, blood pressure, smoking, hormone use, levels of total and high-density lipoprotein cholesterol, diabetes mellitus, body mass index, and high-sensitivity C-reactive protein level.

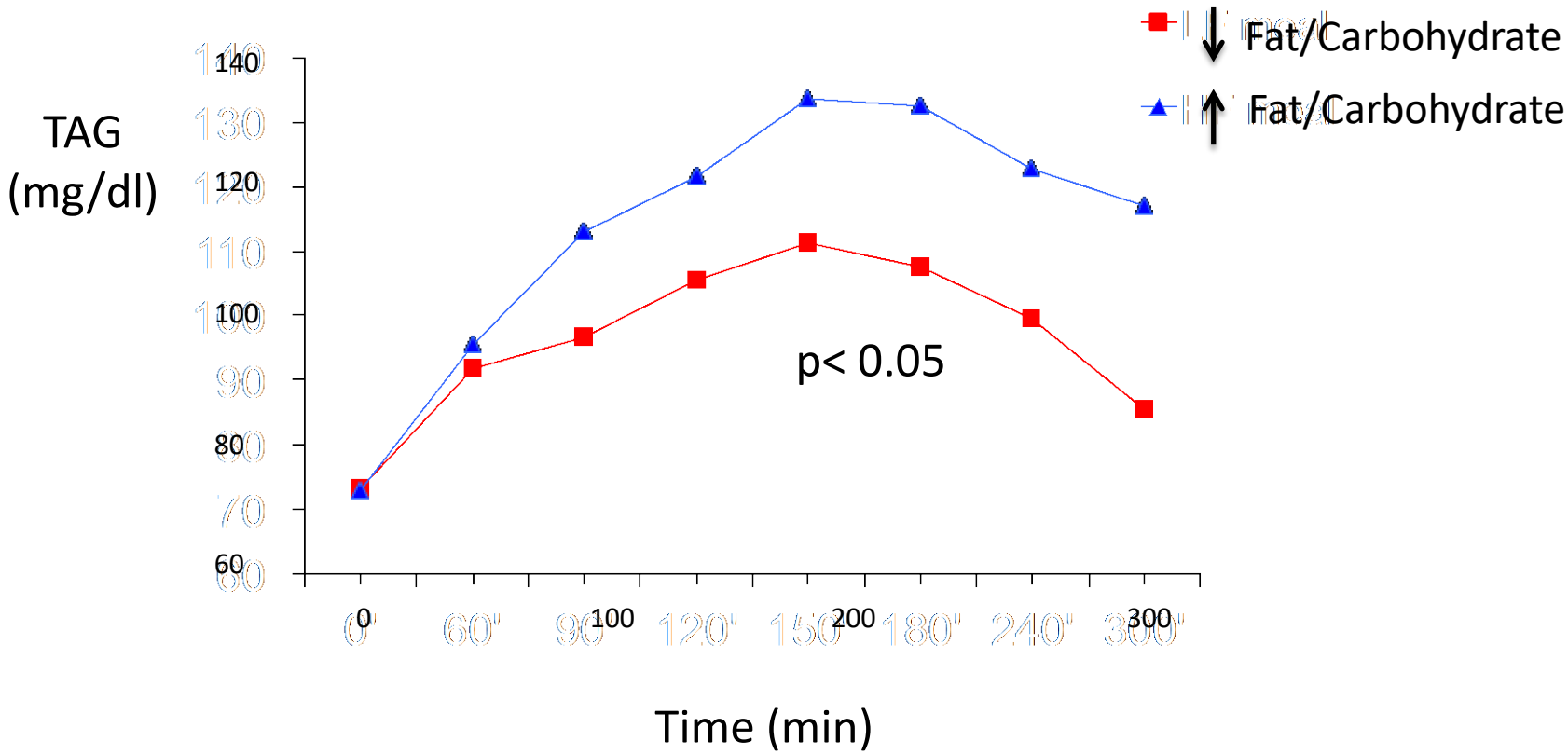
Figure 2. Association of Triglyceride Levels With Individual Cardiovascular End Points, According to Fasting Status



Hazard ratio (HR) and 95% confidence interval (CI) for highest vs lowest tertiles of triglyceride level (see Table 3 for values), adjusted for age, blood pressure, smoking, hormone use, levels of total and high-density lipoprotein cholesterol, diabetes mellitus, body mass index, and high-sensitivity C-reactive protein level.

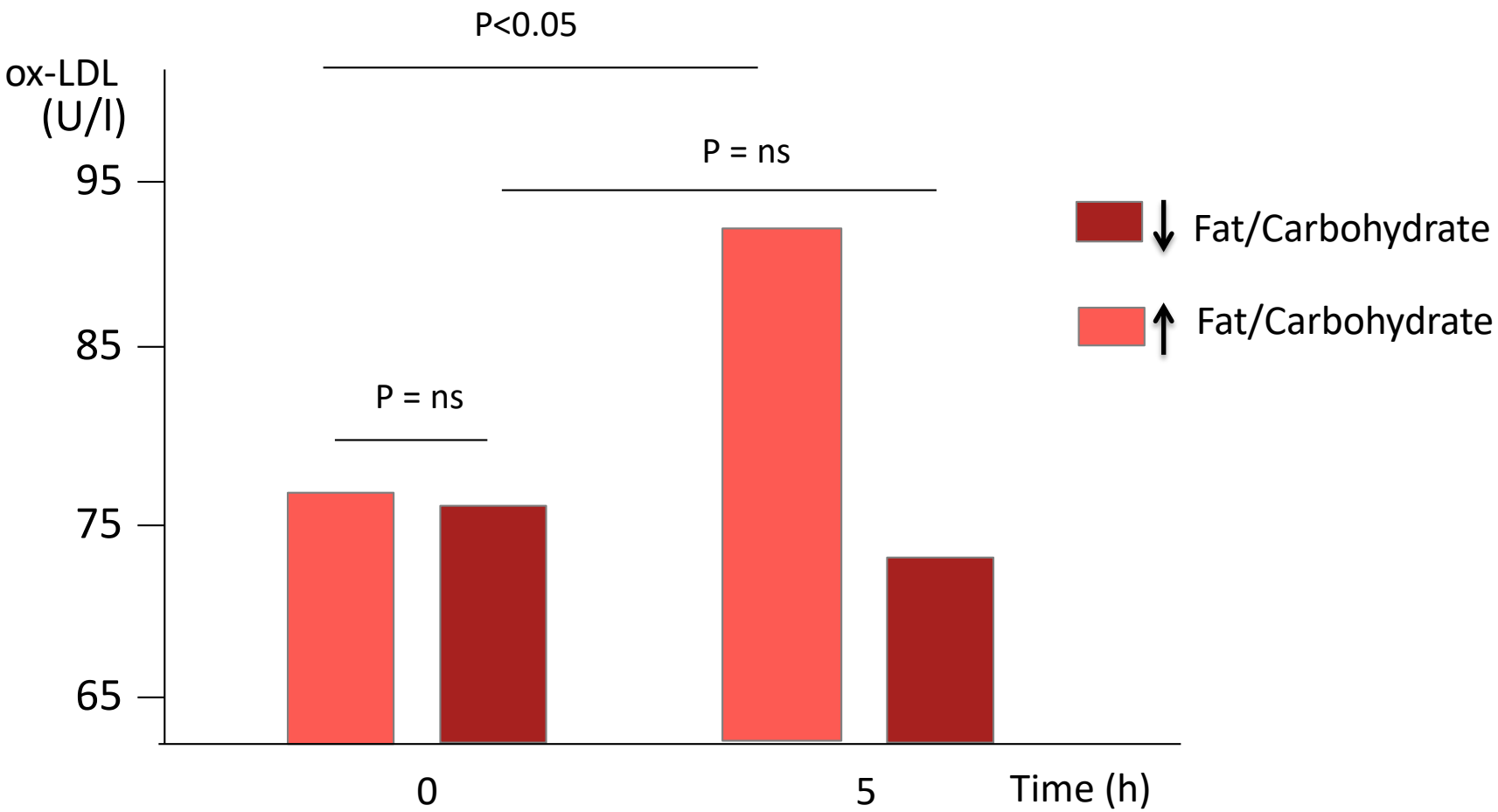
Bansal S, *et al.* JAMA 2007;298:309-16

Postprandial triacylglycerol profile after two isocaloric, isoproteic meals with different fat and carboidrate content in obese children



Maffeis C, *et al*. Obesity 2010

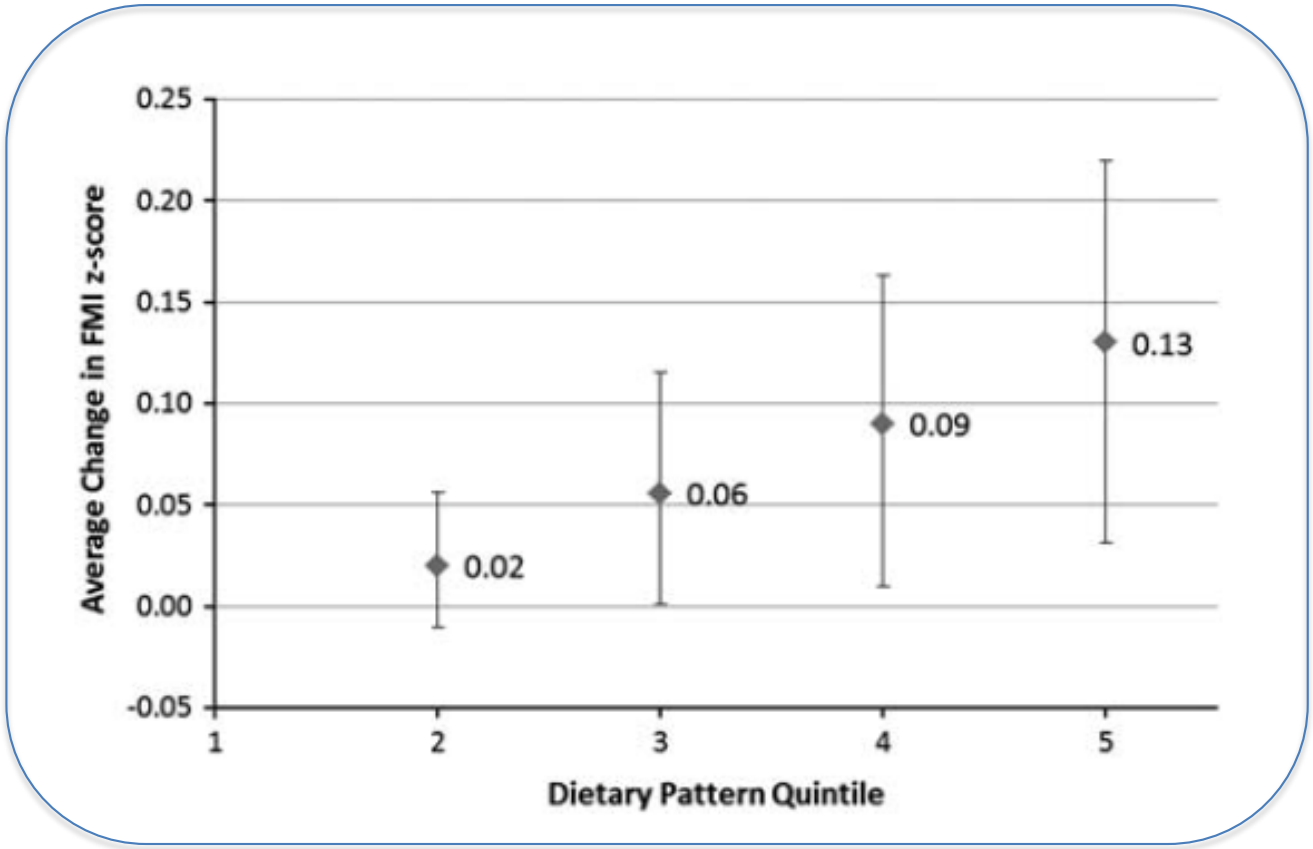
POSTPRANDIAL PRO-ATEROGENIC PROFILE:
change of oxidized lipoprotein concentration in obese children after two isocaloric, isoproteic meals with a different fat and carbohydrate content



Maffeis C, *et al.* Nutr Metab Cardiovasc Dis 2011

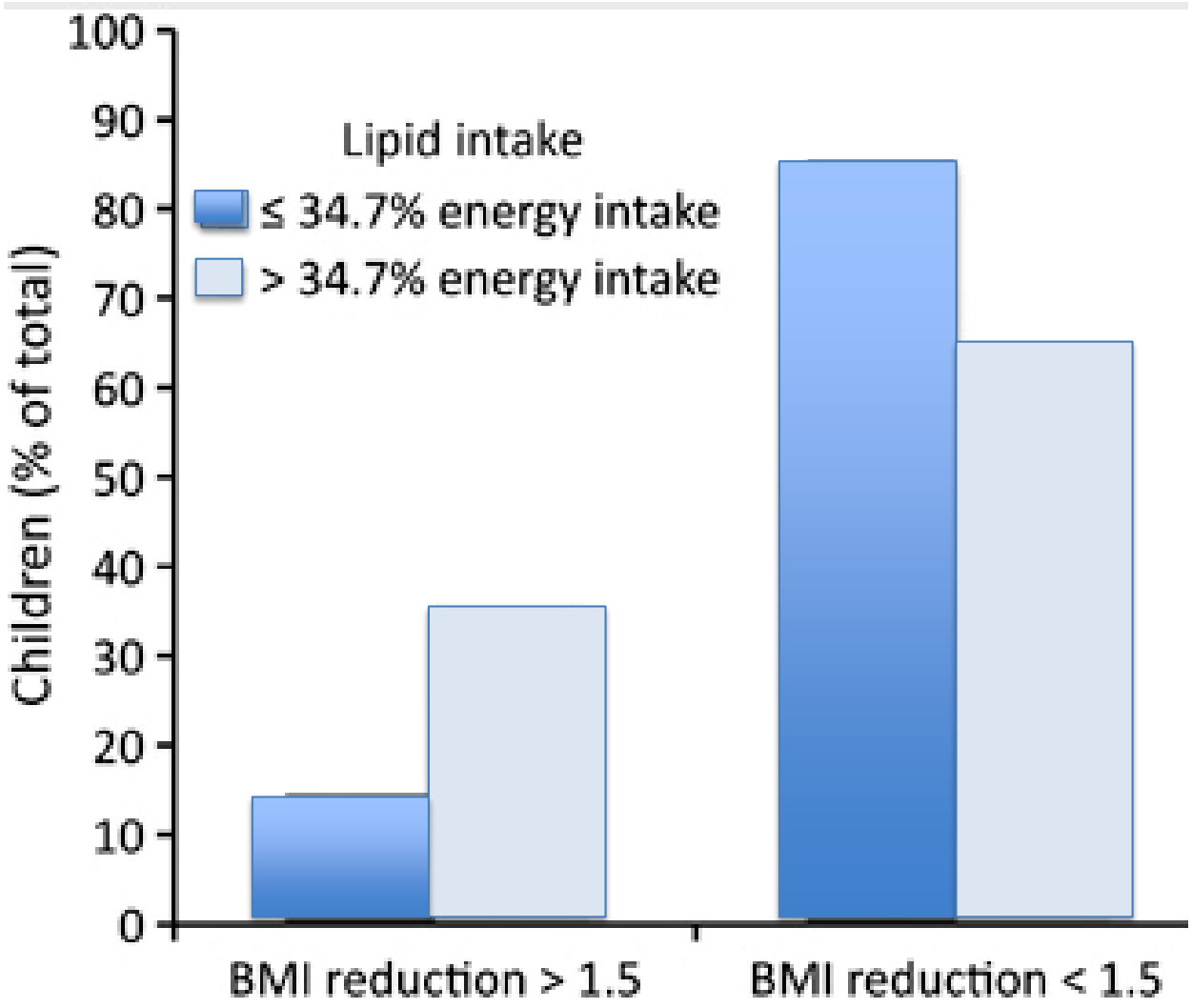
dietary pattern prospectively associated with increased adiposity during childhood and adolescence

High Risk Dietary Pattern
Energy-dense High-fat Low-fiber



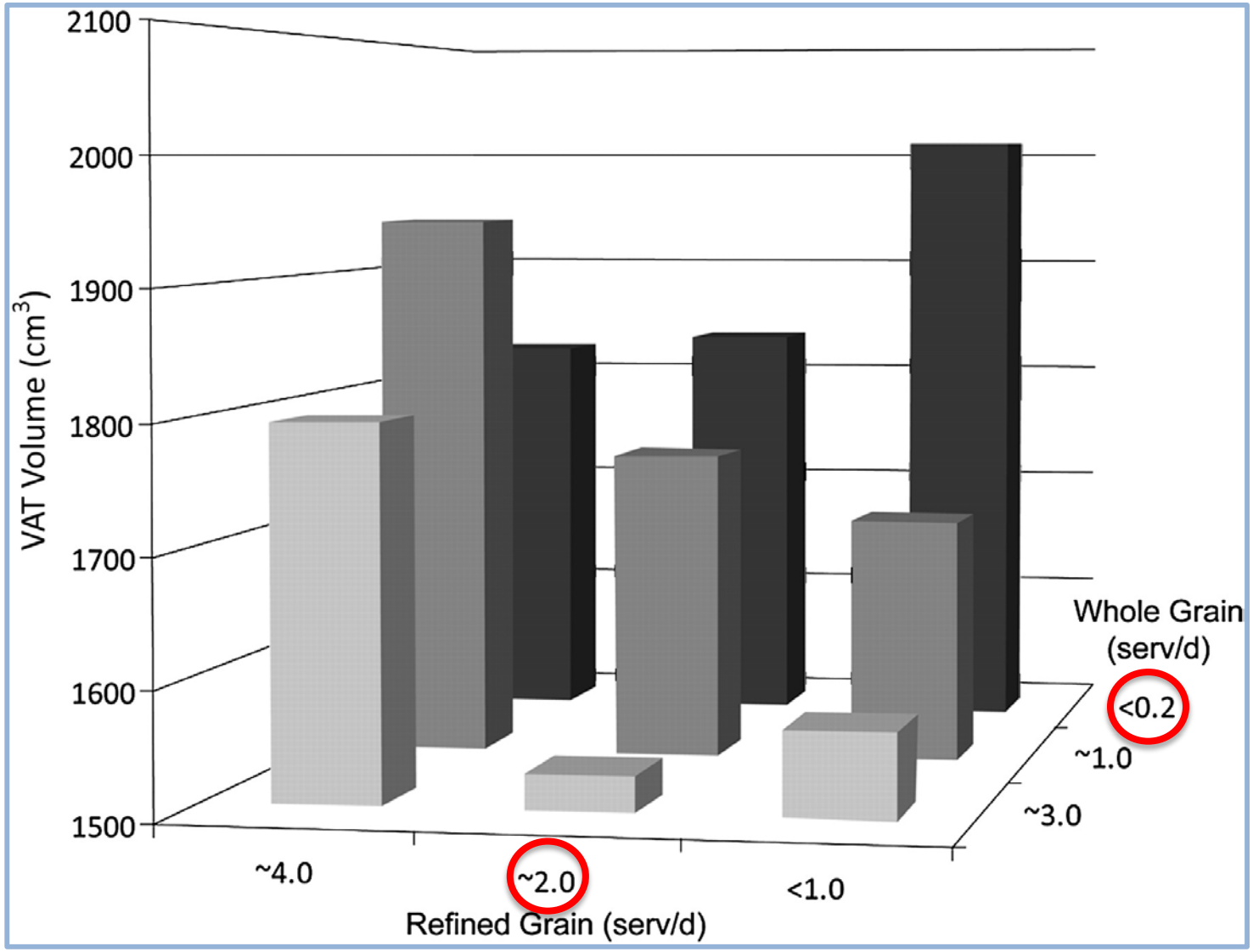
Ambrosini GL, *et al.* Int J Obes 2012;36:1299-1305

Diet macronutrient composition reported before treatment predicts BMI change in obese children: the role of lipids

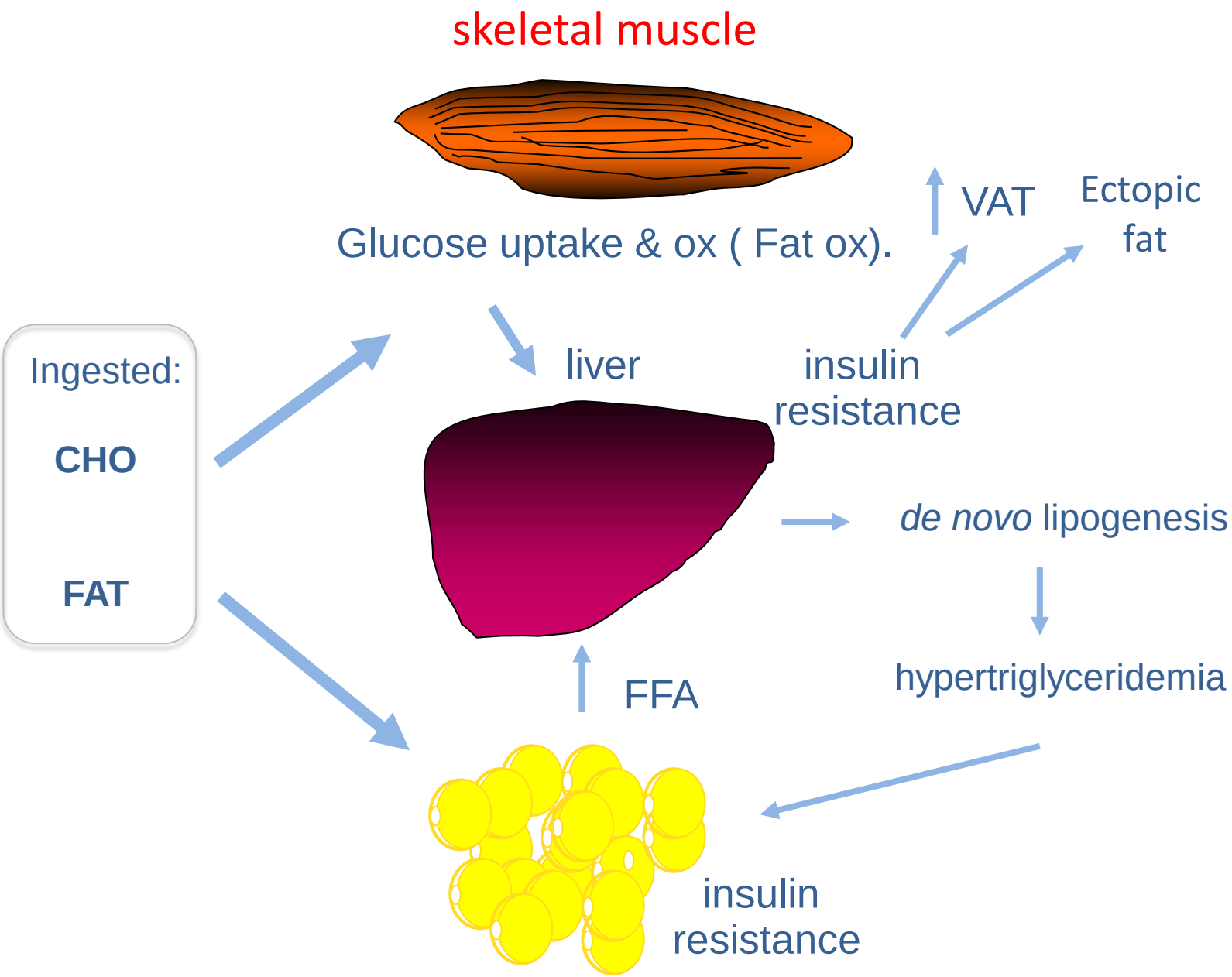


Maffeis C, *et al.* Eur J Clin Nutr 2012;66:1066-8.

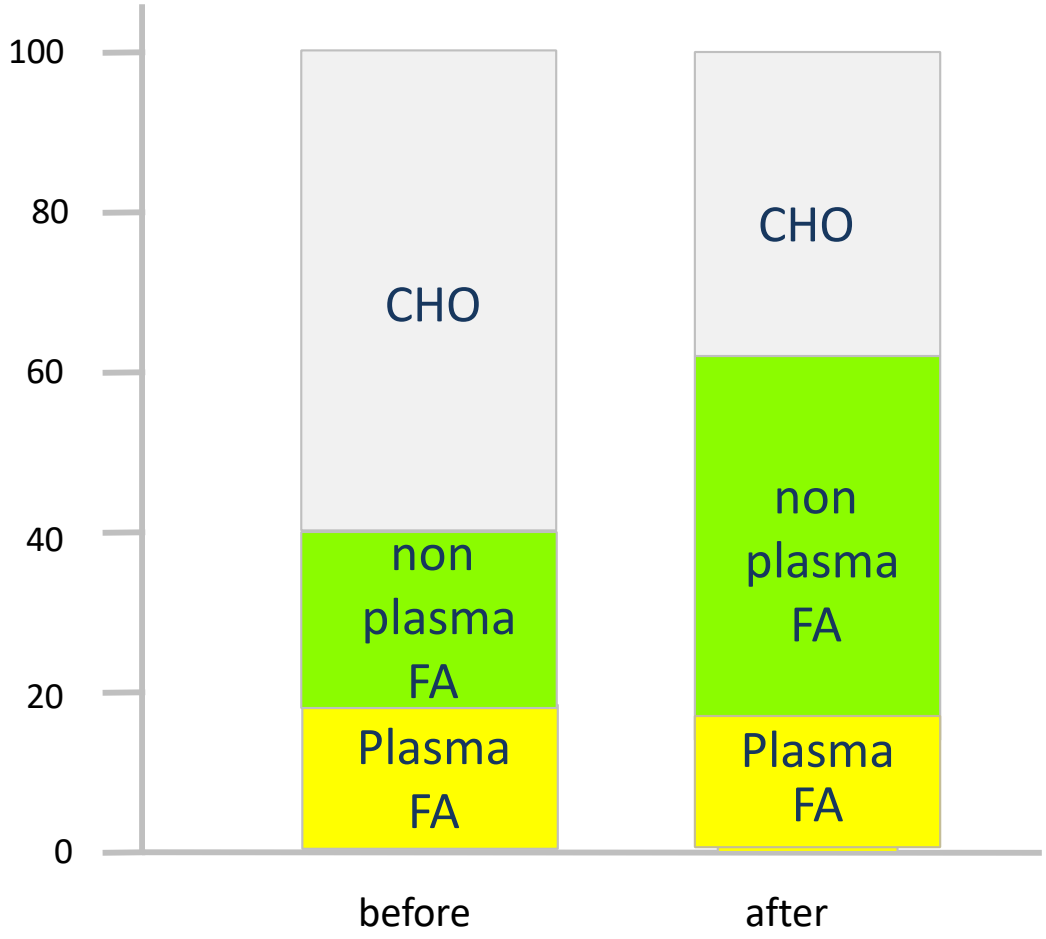
Joint classification of whole- and refined-grain intake on visceral adipose tissue (VAT) volume



McKeown N M et al. Am J Clin Nutr 2010;92:1165-1171

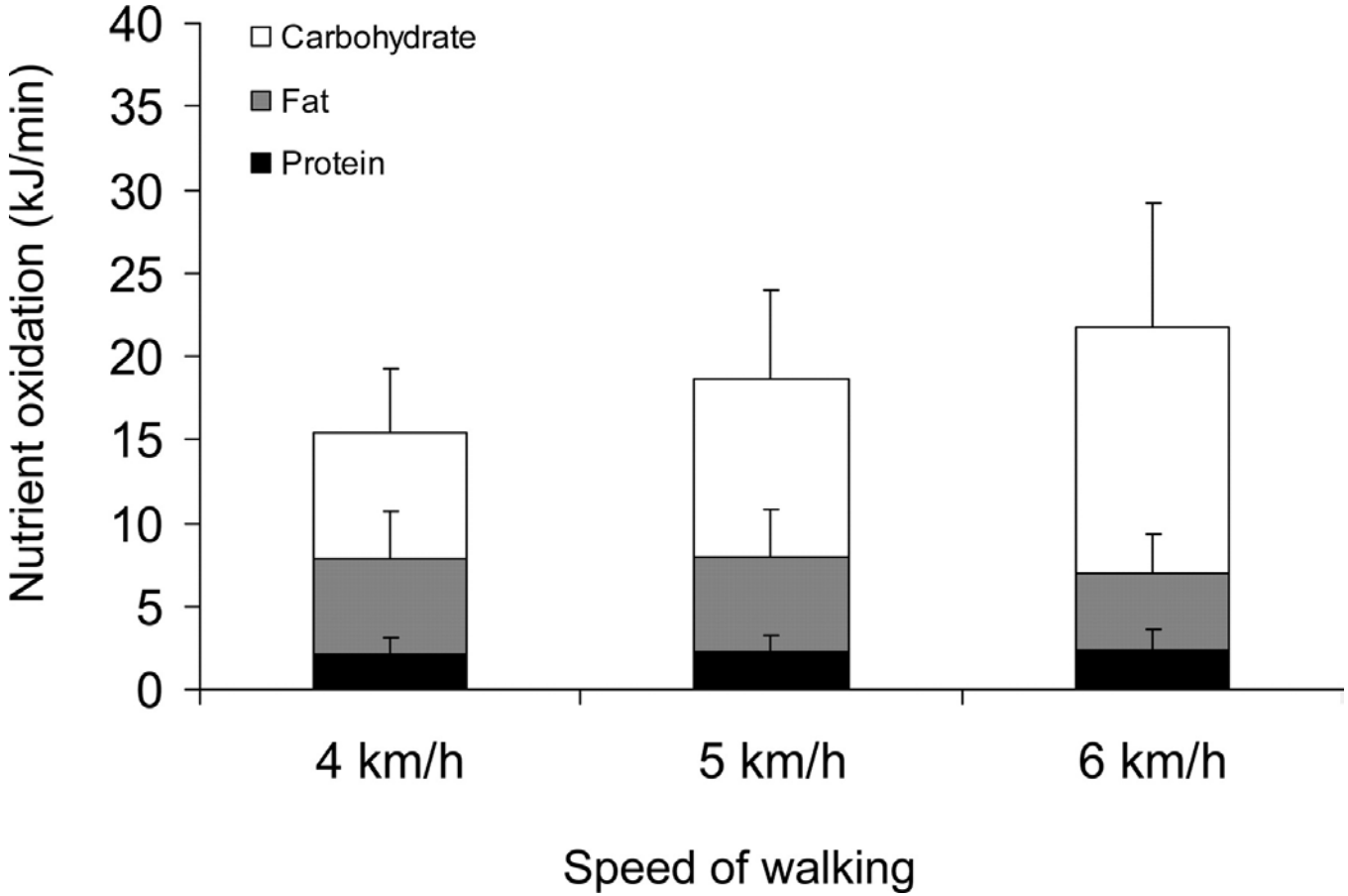

skeletal muscle
Glucose uptake & ox (Fat ox).
VAT
Ectopic fat
Ingested:
CHO
FAT
liver
insulin resistance
de novo lipogenesis
hypertriglyceridemia
FFA
insulin resistance

effect of endurance training on plasma free fatty acid turnover and oxidation during exercise



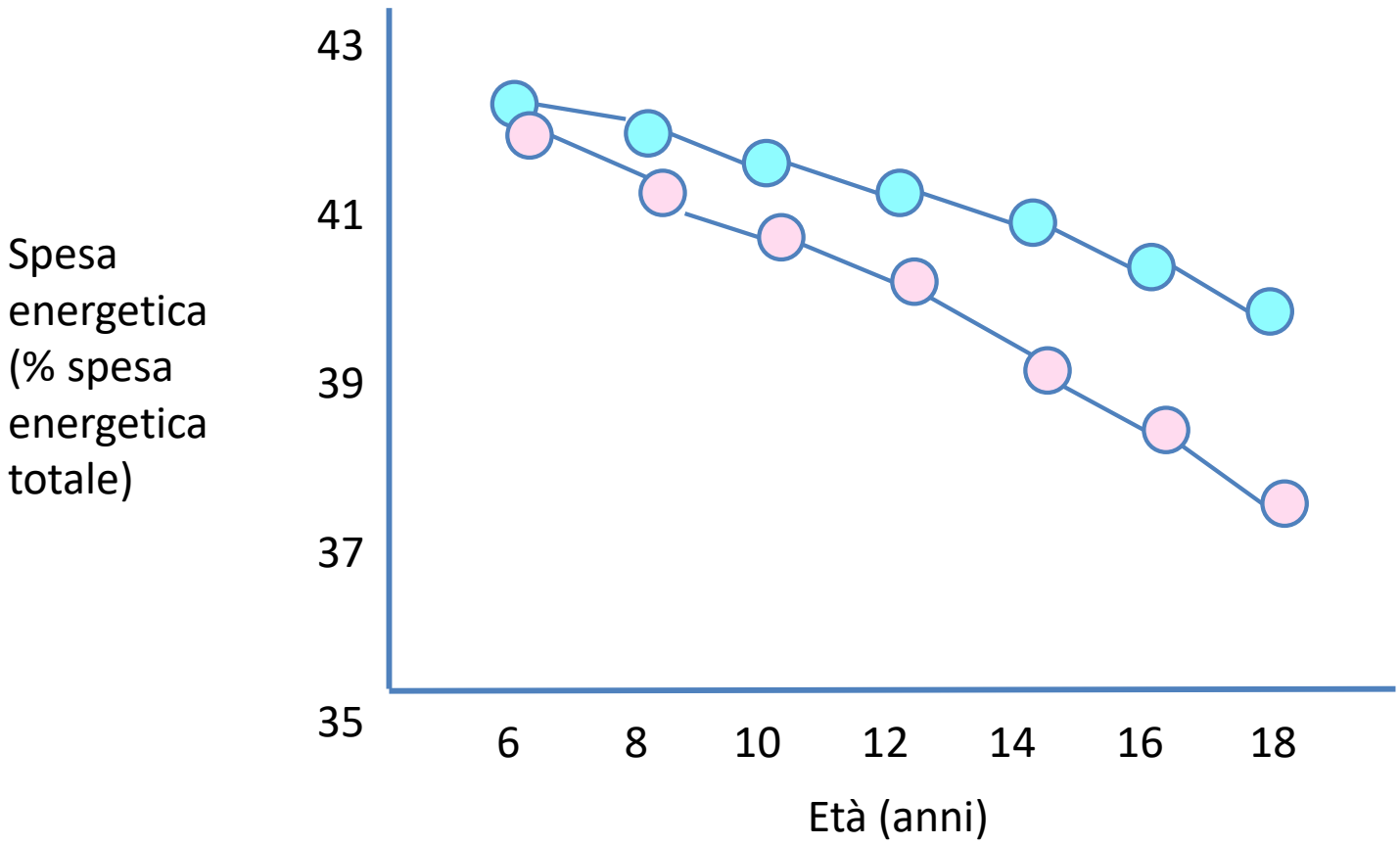
Martin WH III *et al*. Am J Physiol 1993; 265: E708-14

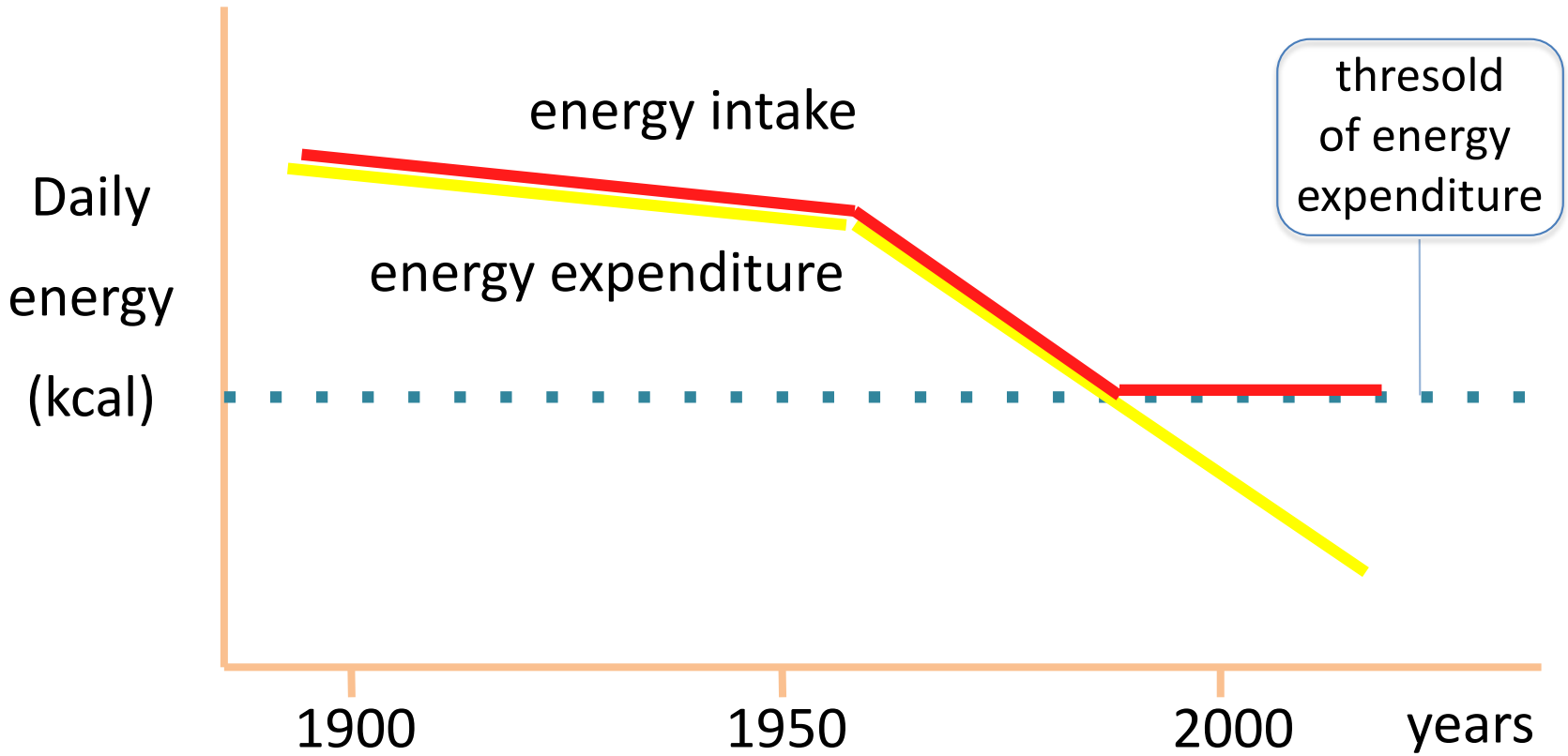
Nutrient oxidation measured during walking at speeds of 4, 5, and 6 km/h, respectively, in a group of obese prepubertal children



Maffeis, C. *et al.* J Clin Endocrinol Metab 2005;90:231-236

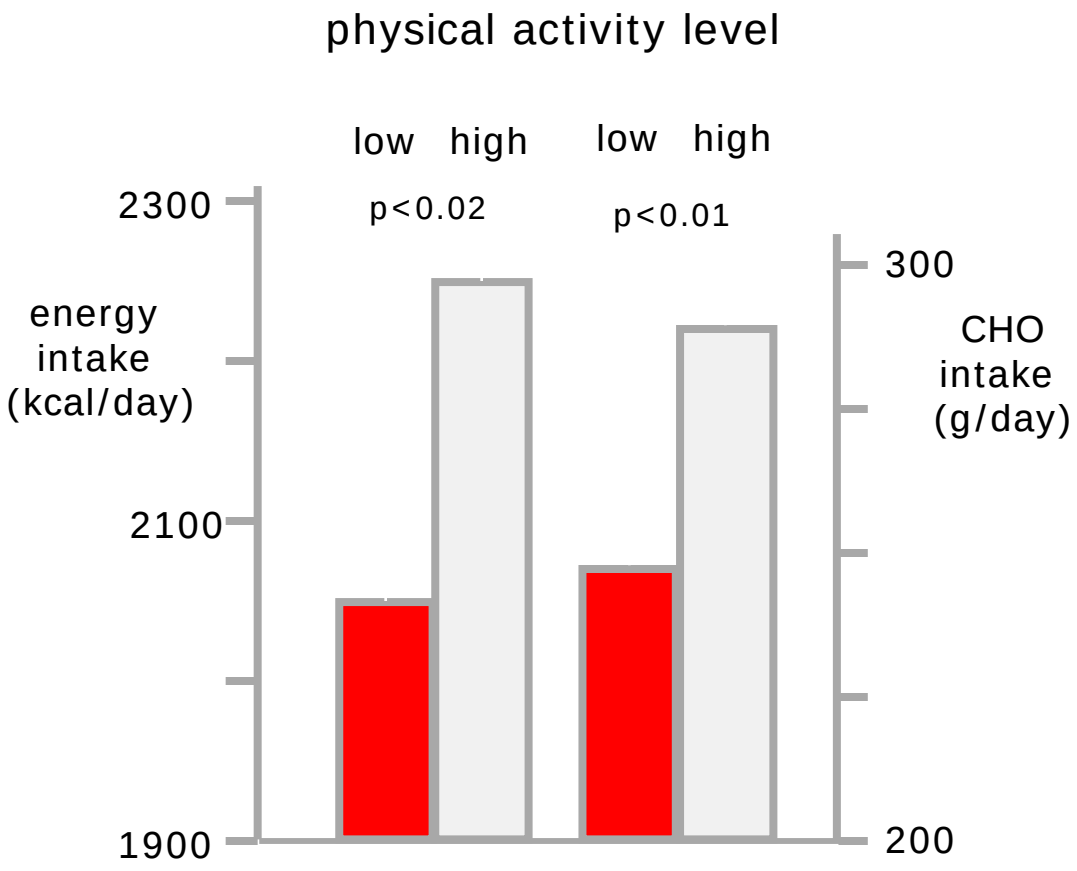
SPESA ENERGETICA PER L'ATTIVITA' FISICA

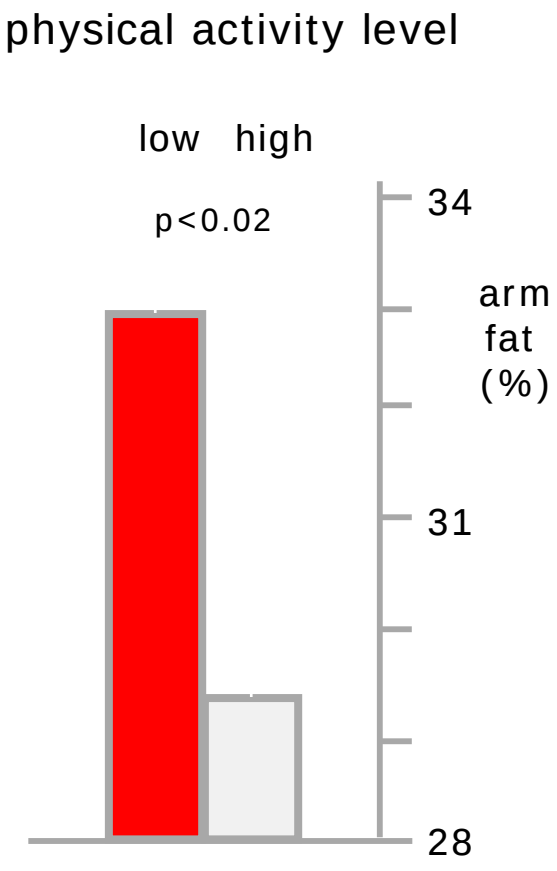




Hill & Wyatt J Appl Physiol , 2005

physical activity, dietary intake and adiposity in healty 10-year-old French children

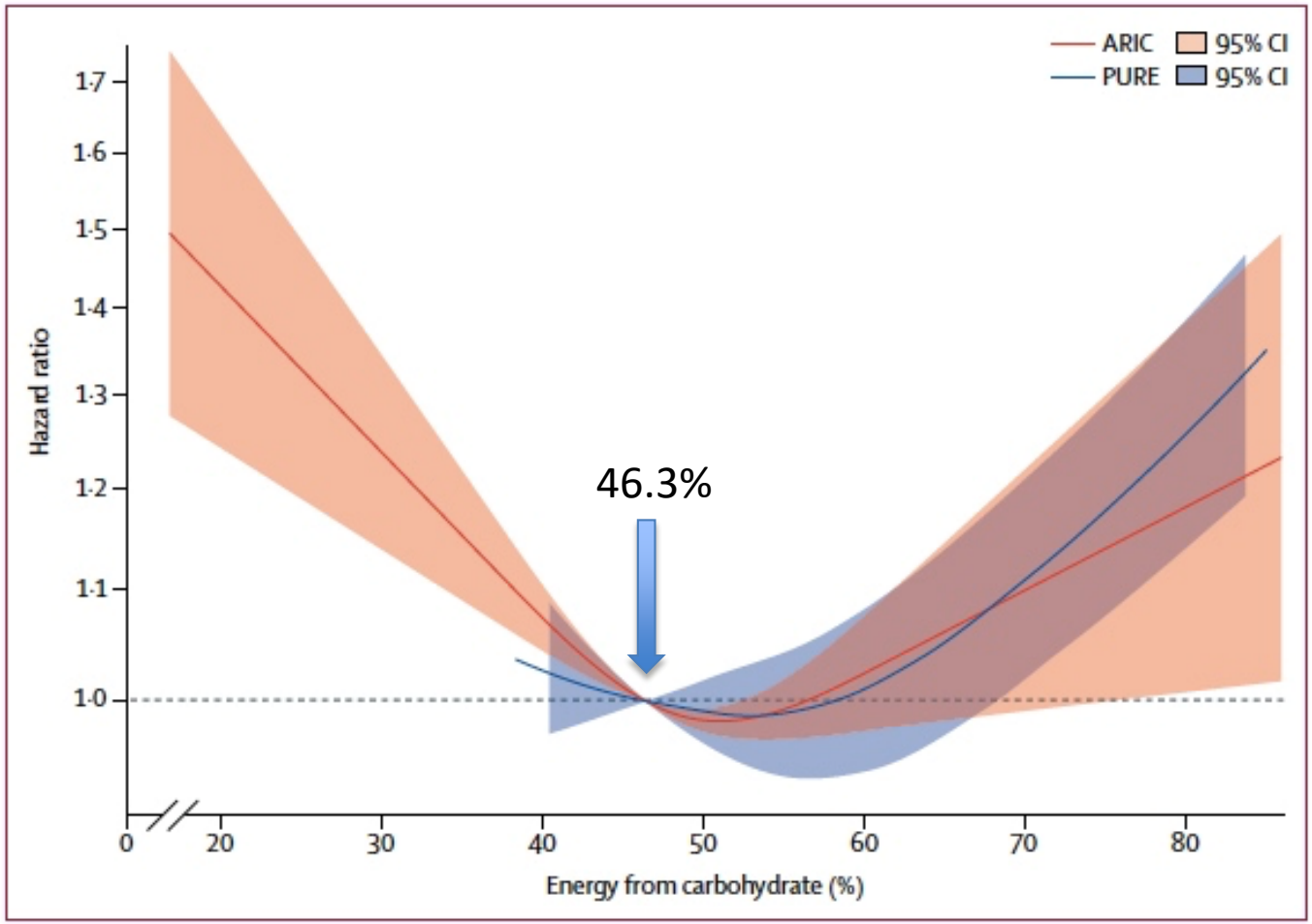




Dehaeger M, *et al*. Int J Obes 1997

Dietary carbohydrate intake and mortality: a prospective cohort study and meta-analysis

U-shaped association between percentage of energy from carbohydrate and all-cause mortality in the ARIC and PURE cohort studies



Seidelmann SB *et al.* Lancet Public Health 2018;3:e419-28

Points of consensus

Well-formulated low-carbohydrate, high-fat diets do not require high intakes of protein or animal products.

Reduced carbohydrate consumption can be achieved by substituting grains, starchy vegetables, and sugars with nonhydrogenated plant oils, nuts, seeds, avocado, and other high-fat plant foods.

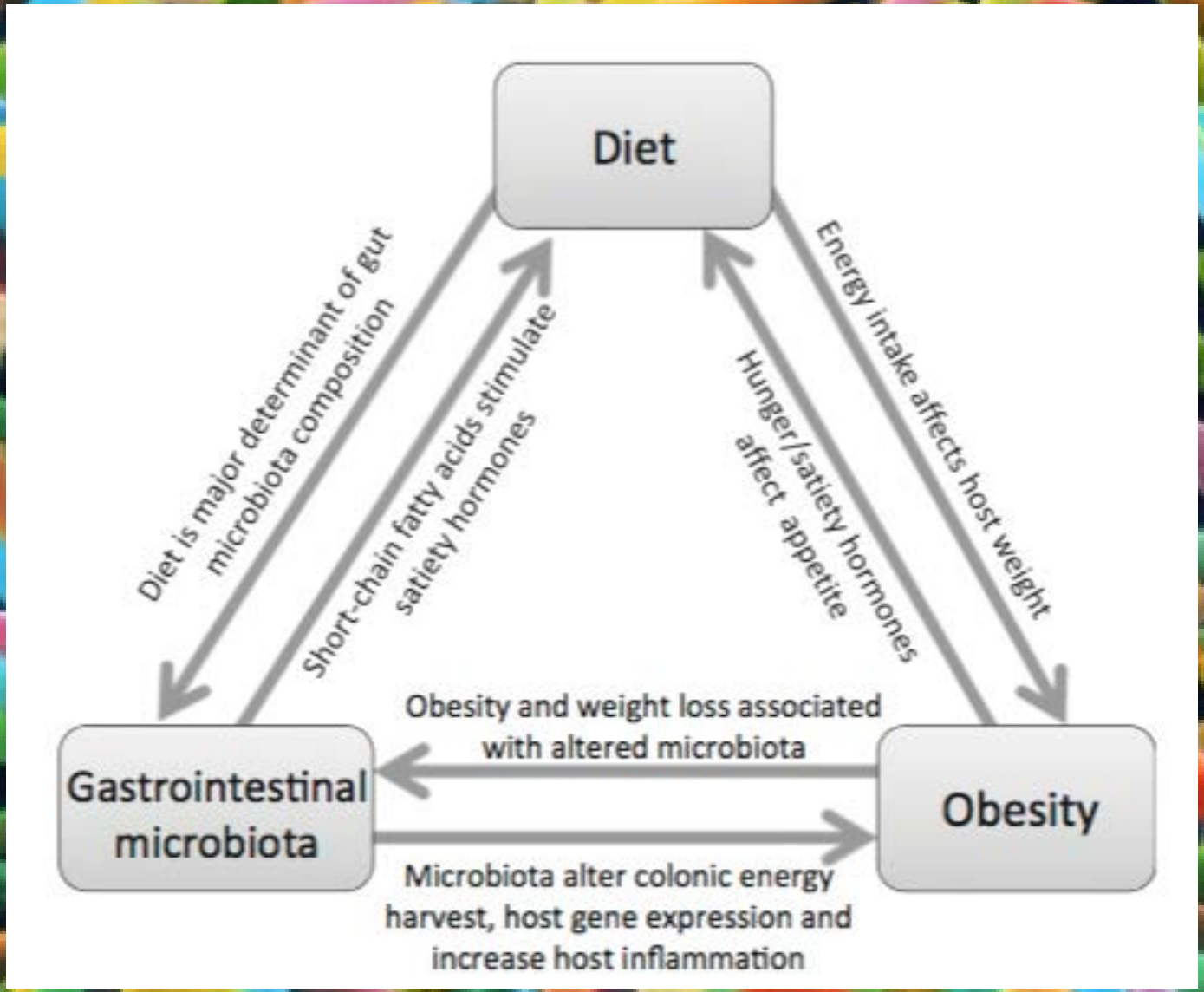
conclusioni

La dieta chetagenica trova indicazione in pediatra nel trattamento di alcune patologie neurologiche (epilessia).

Non vi è indicazione dell'uso della dieta chetogenica nel trattamento dell'obesità in pediatria se non in casi molto selezionati di obesità grave e complicata e necessita di attento follow-up specialistico pediatrico con esecuzione di esami ematochimici e strumentali prima e durante il trattamento oltre a garantire opportune integrazioni in acqua, minerali, vitamine.

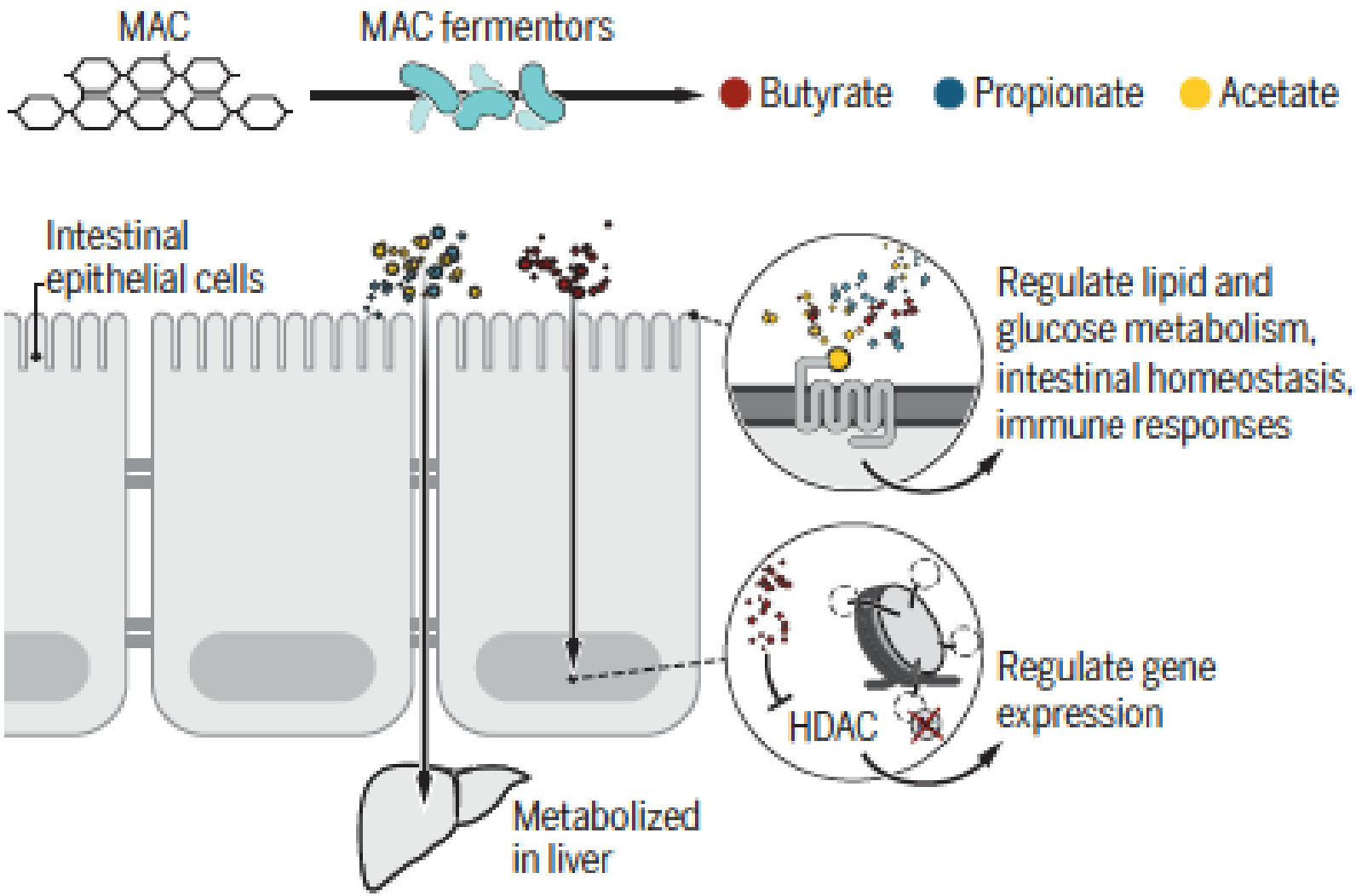
UOC di Pediatria ad Indirizzo Diabetologico e Malattie del Metabolismo
Azienda ospedaliera Universitaria Integrata Verona

Related mechanisms involved in the iteractions among dietary intake, the gastrointestinal microbiota, and obesity



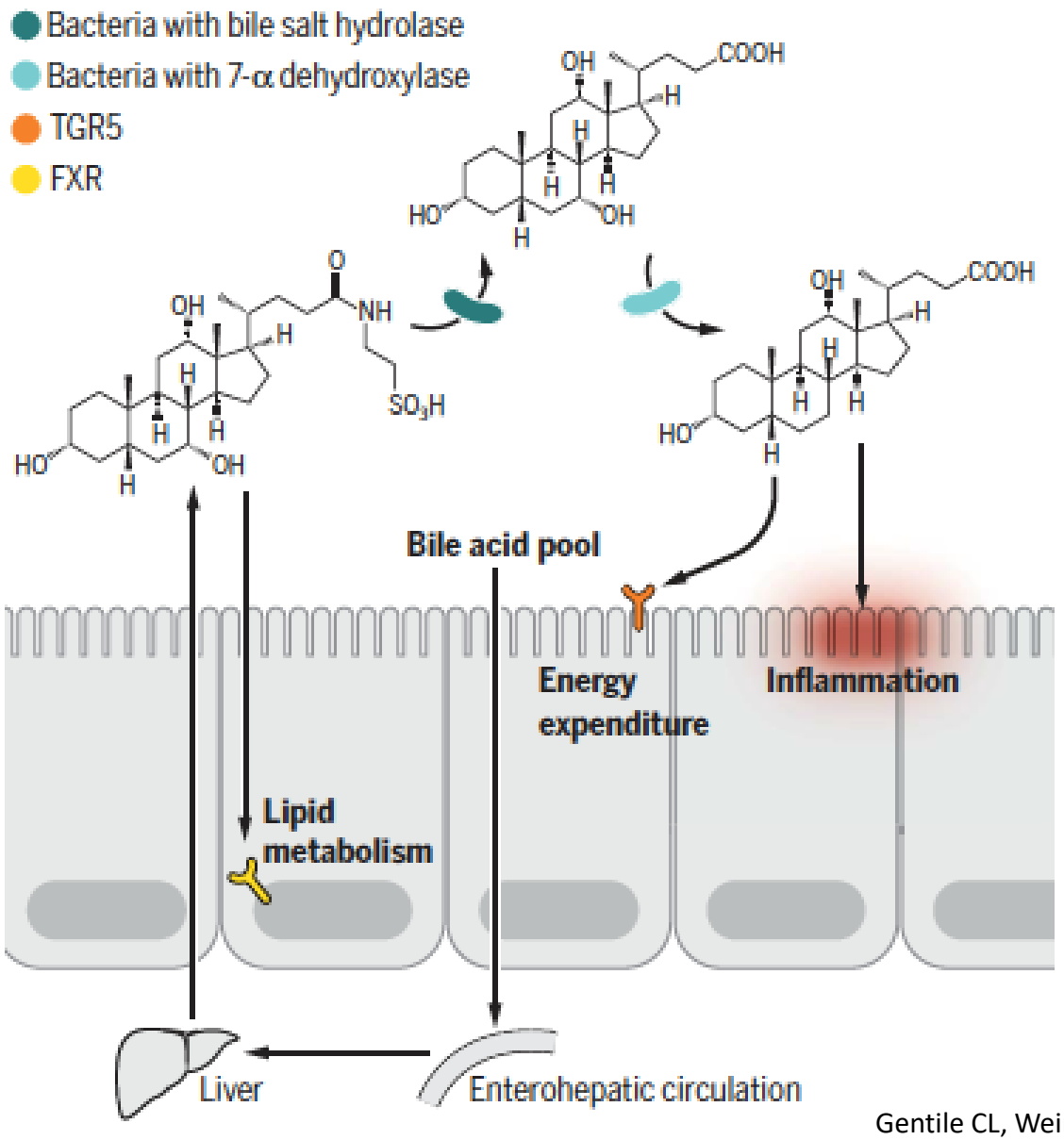
Graham C, *et al.* Nutr Rev 2015;73:376-85

Microbiota-accessible carbohydrate fermentors produce SCFAs that can have multiple interactions with host tissues.



Gentile CL, Weir TL. Science 2018;362:776-80

Gut bacteria play an important role in bile acid modification



Gentile CL, Weir TL. Science 2018;362:776-80

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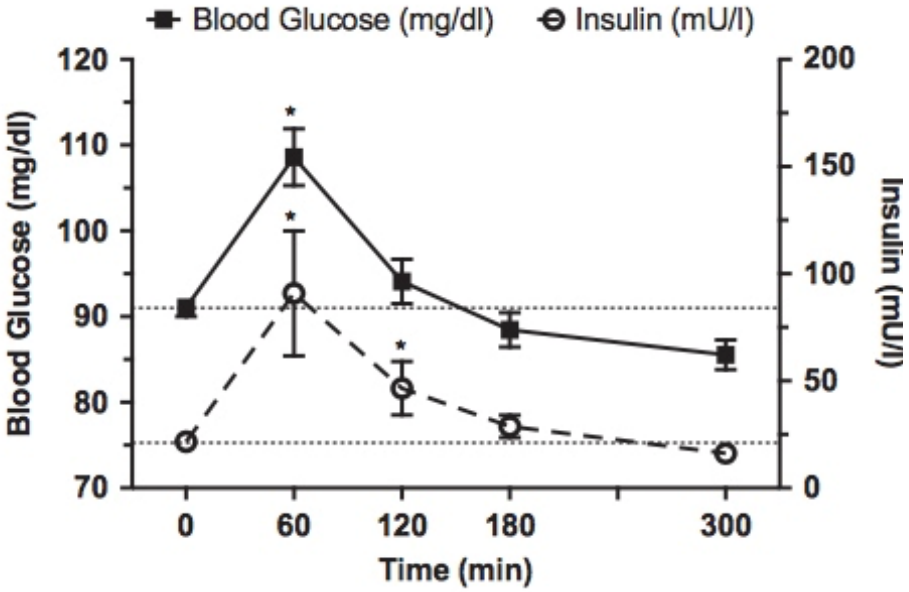
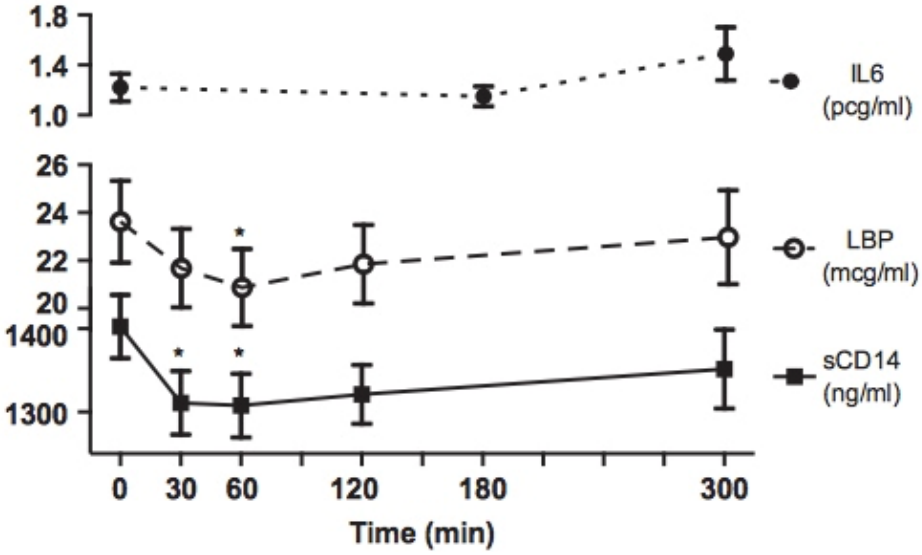
SHORT COMMUNICATION

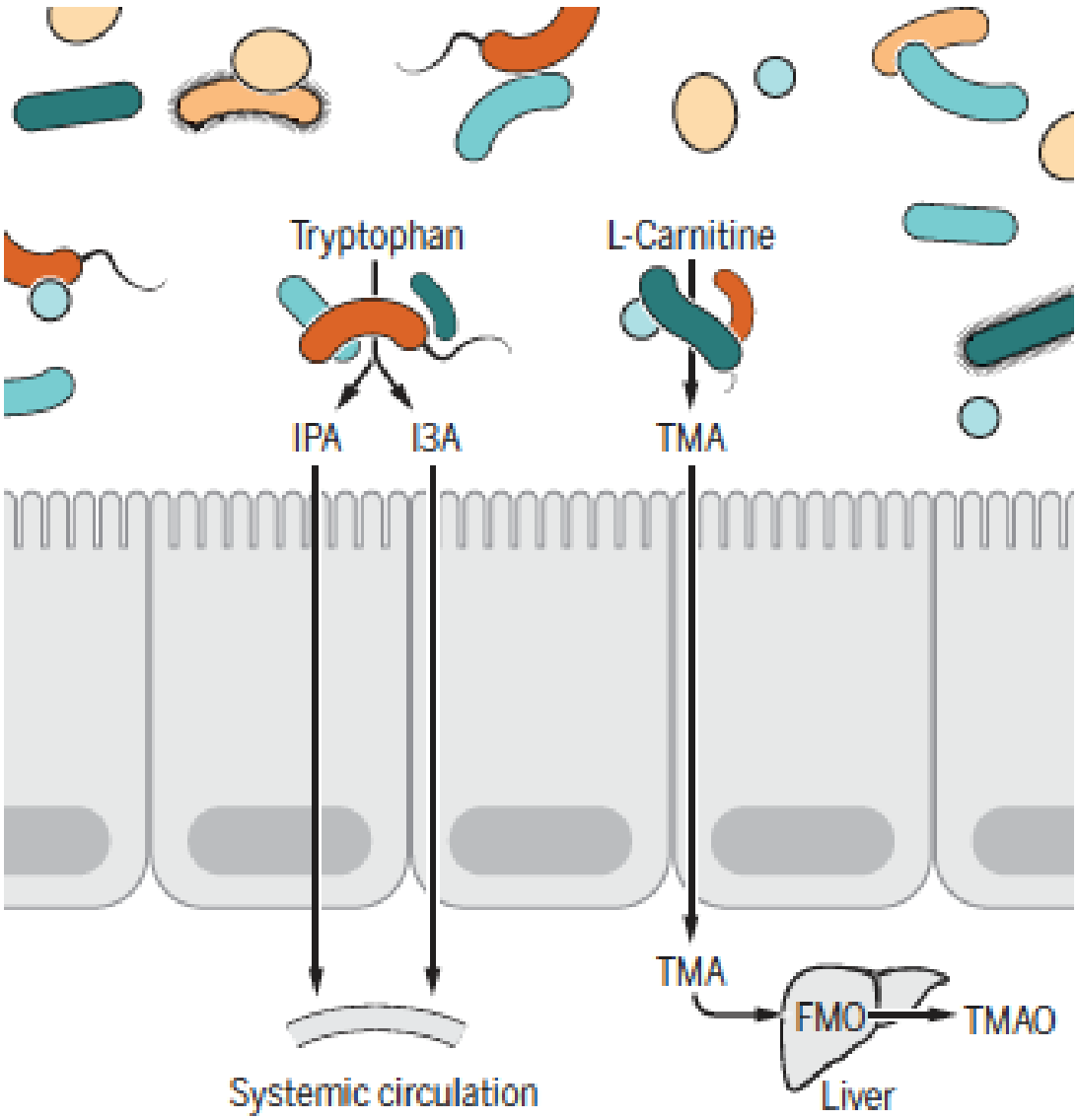
High-fat meal, systemic inflammation and glucose homeostasis in obese children and adolescents

A Morandi[1], E Fornari[1], F Opri[1], M Corradi[1], M Tommasi[1], R Bonadonna[2] and C Maffeis[1]





Interactions between amino acids and the gut microbiota



Gentile CL, Weir TL. Science 2018;362:776-80

Points of consensus

Biological factors appear to influence responses to diets of differing macronutrient composition. People with relatively normal insulin sensitivity and beta cell function may do well on diets with a wide range of carbohydrate-to-fat ratios; those with insulin resistance, hypersecretion of insulin, or glucose intolerance may benefit from a lower carbohydrate, higher-fat diet.

A ketogenic diet may confer particular metabolic benefits for some people with abnormal carbohydrate metabolism, a possibility that requires long-term study.