Impatto delle diete nel metabolismo.

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Desenzano, 23 maggio 2015

Il trattamento del sovrappeso e dell'obesità è rappresentato da modifiche nello stile di vita che comprendono interventi nutrizionali, comportamentali e l' attività fisica

Before

After

Una perdita di peso anche modesta (5-10%) porta ad una riduzione dei fattori di rischio e quindi alla prevenzione di diverse condizioni associate all'obesità quali DMT2, malattia cardiovascolare, ipertensione, dislipidemia, s. delle apnee notturne, steatosi epatica, osteoartrosi e depressione.

Intervento dietetico

Le linee guida del National Institute of Health per il trattamento dell'obesità raccomandono che:

- persone in sovrappeso o con obesità di 1° grado con 2 o più fattori di rischio devono ridurre il loro intake energetico di 500 kcal/die
- persone con obesità di 2° e 3° grado persons with class II and class III obesity devono portare la riduzione calorica a 500–1000 kcal/die.

Lo scopo è una perdita di peso di 0.5 kg/settimana.

Dieta Mediterranea. = ≥55% carboidrati, ≤30% lipidi e circa il 15% di proteine.

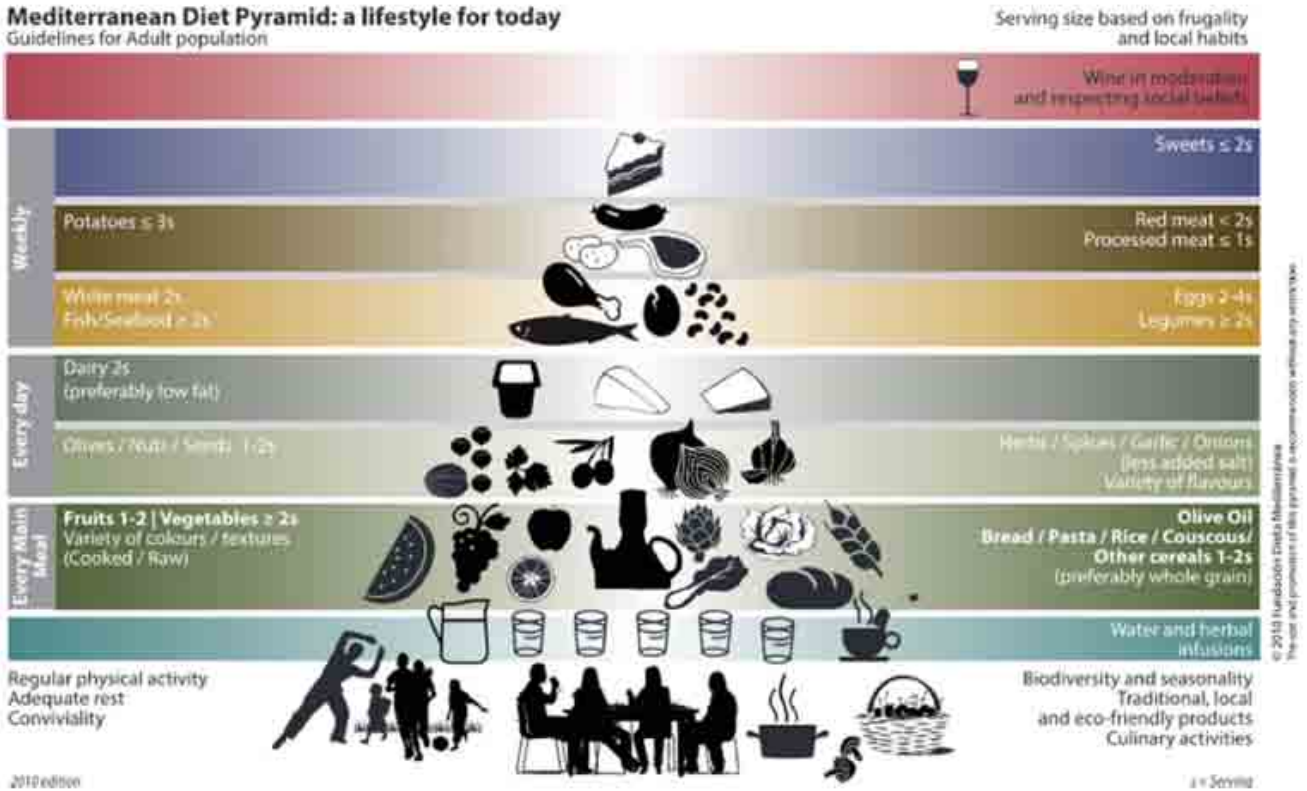
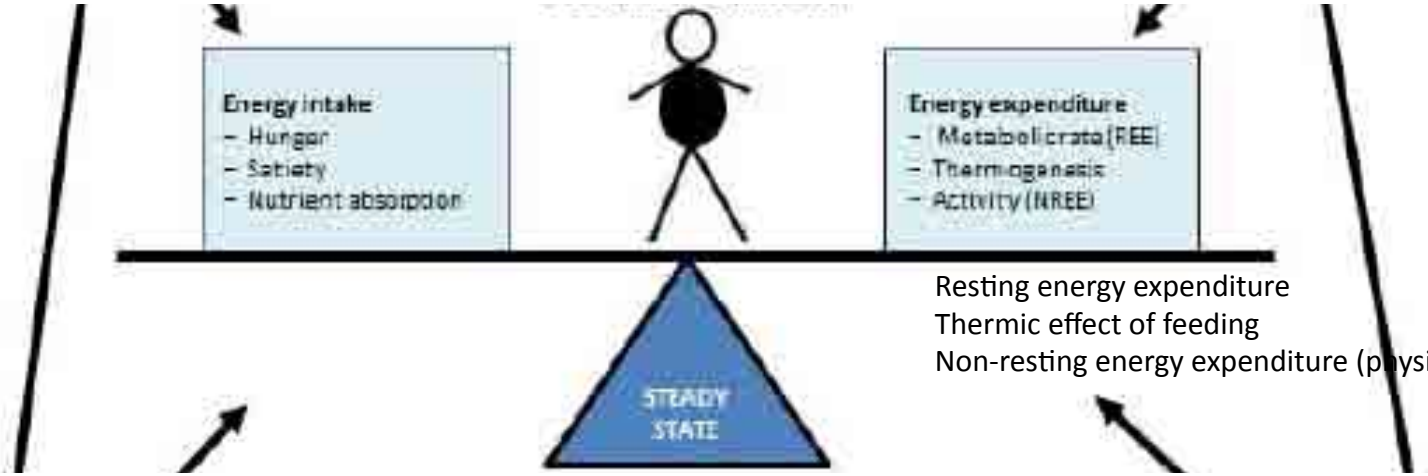


Fig. 1 Pyramid of the Mediterranean diet (with permission from the Mediterranean Diet Foundation, 2010)

This dietary pattern is a **balanced** diet characterized by a high intake of olive oil, fruits, vegetables, cereals (mainly whole grain cereals), nuts, and seeds; a moderate consumption of fish, seafood, poultry, and eggs; and a low consumption of dairies, red meat, processed meat, and sweets . Recent systematic reviews and meta-analyses from cohort studies ranked MD as the dietary pattern most likely to provide **protection against cardiovascular disease.** This effect may be exerted by **reducing blood pressure; improving glucose metabolism, lipid profile, and lipoprotein particle characteristics; and decreasing inflammation and oxidative stress.** It may also stem from a favorable interaction between diet and gene polymorphisms related to cardiovascular risk factors and events.

Curr Atheroscler Rep (2014) 16:446



Resting energy expenditure
Thermic effect of feeding
Non-resting energy expenditure (physical activity)

F L Greenway, International Journal of Obesity preview 21 April 2015

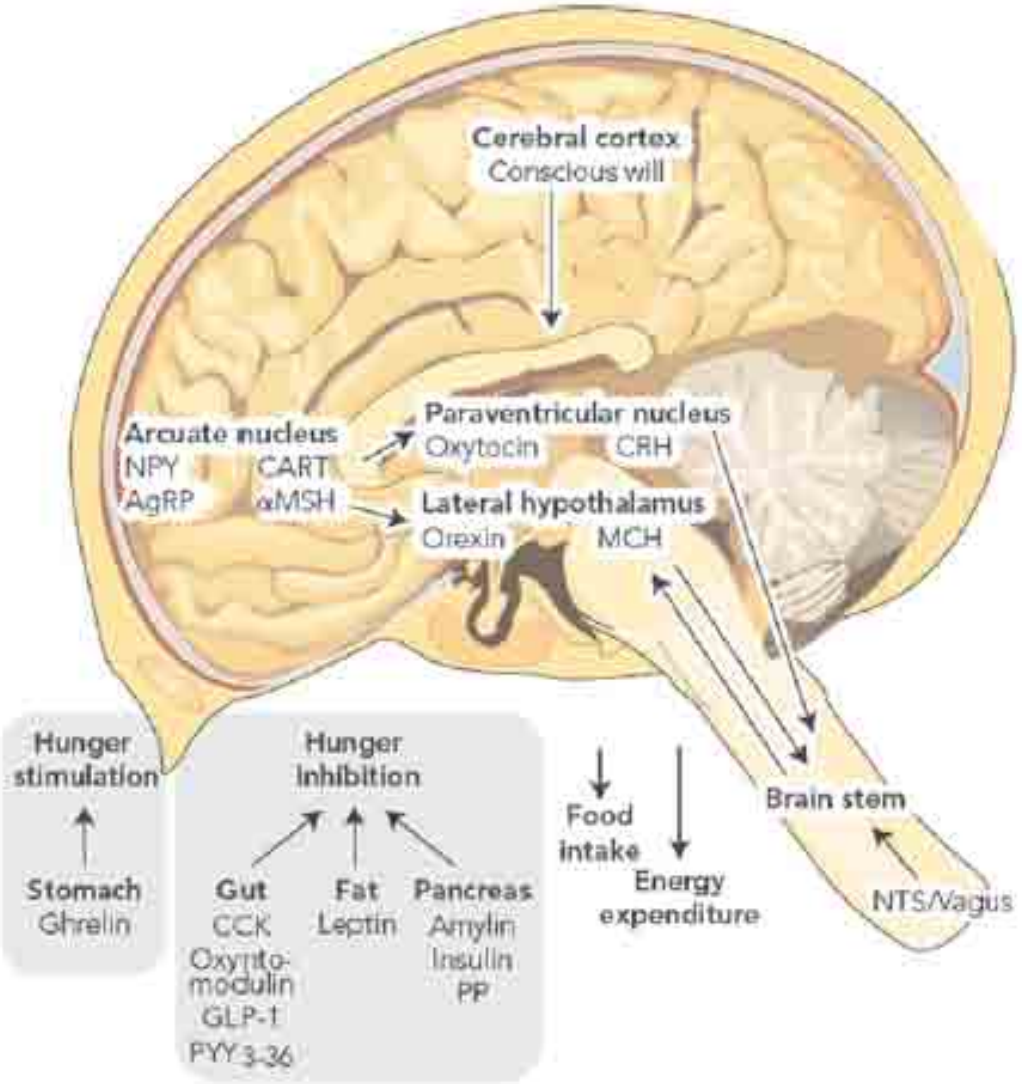


Figure 1 **Selected pathways involved in body weight regulation**

CART, cocaine- and amphetamine-regulated transcript; αMSH, α-melanocyte-stimulating hormone. This Figure was reproduced from Proietto J. Why is treating obesity so difficult? Justification for the role of bariatric surgery. Med. J. Aust. 2011; 195(3): 144–146. © Copyright 2011 *The Medical Journal of Australia* – reproduced with permission.

Clinical Science (2013) 124, 231–241

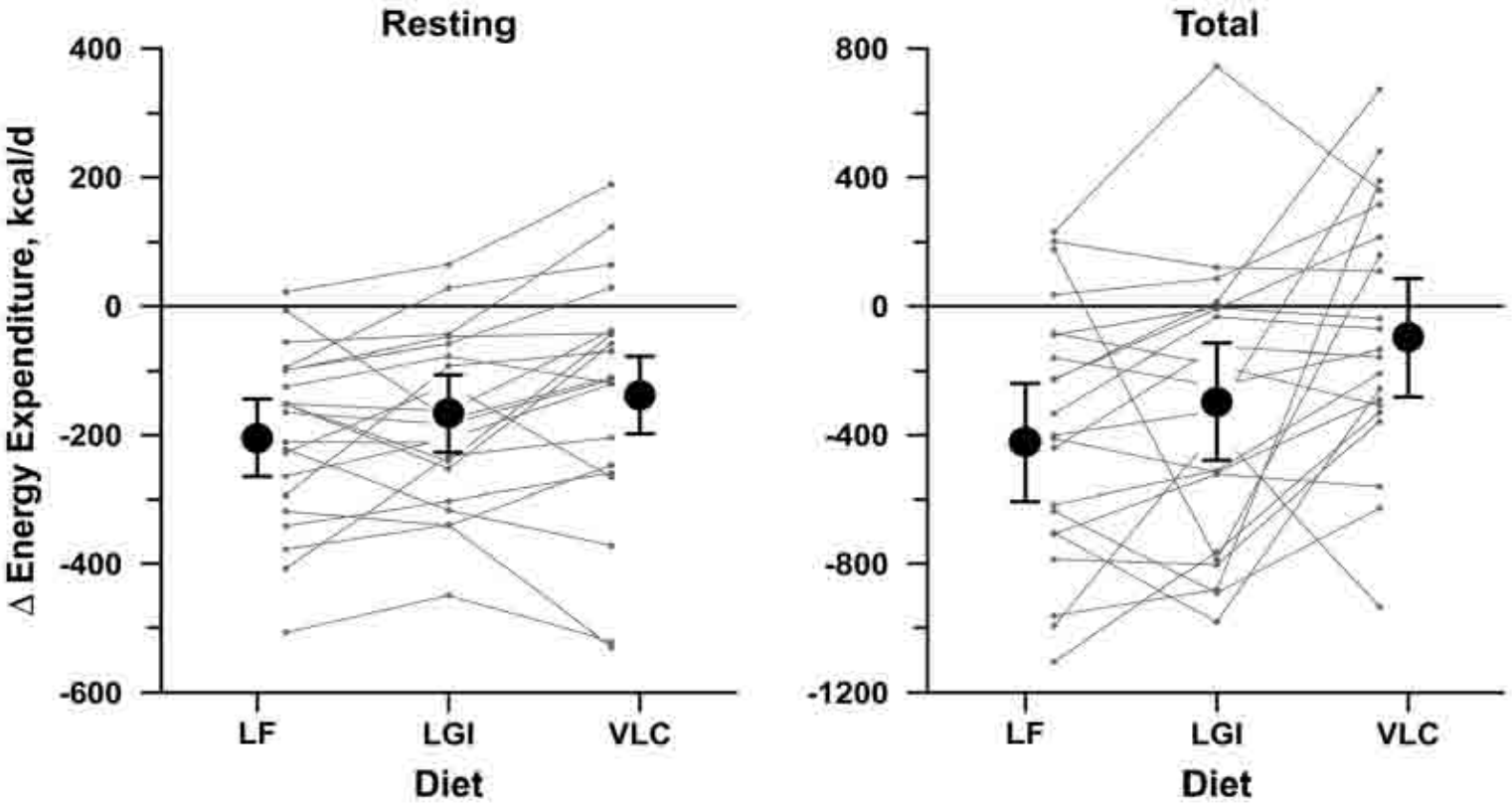


Figure 3. Changes in Energy Expenditure

Resting energy expenditure (left) and total energy expenditure (right) during three test diets for weight-loss maintenance: low-fat (LF), low-glycemic index (LGI), and very low carbohydrate (VLC). Each symbol with error bars indicates mean change from a common baseline period preceding weight loss, with 95% confidence interval, obtained from analysis of cross-over experiment and adjusted for sex, age, order of diets, baseline weight, and mean weight during the 4-wk diet period. Connected lines indicate individual outcomes for the 21 subjects. Both resting and total energy expenditure showed a significant linear trend in mean change from LF to LGI to VLC, $P < 0.01$.

JAMA. 2012 June 27; 307(24): 2627–2634.

L’ ossidazione lipidica aumenta durante una VLCD. Questo è evidente dalla riduzione del REE e dall’aumento delle concentrazioni di FFA e UCP3.

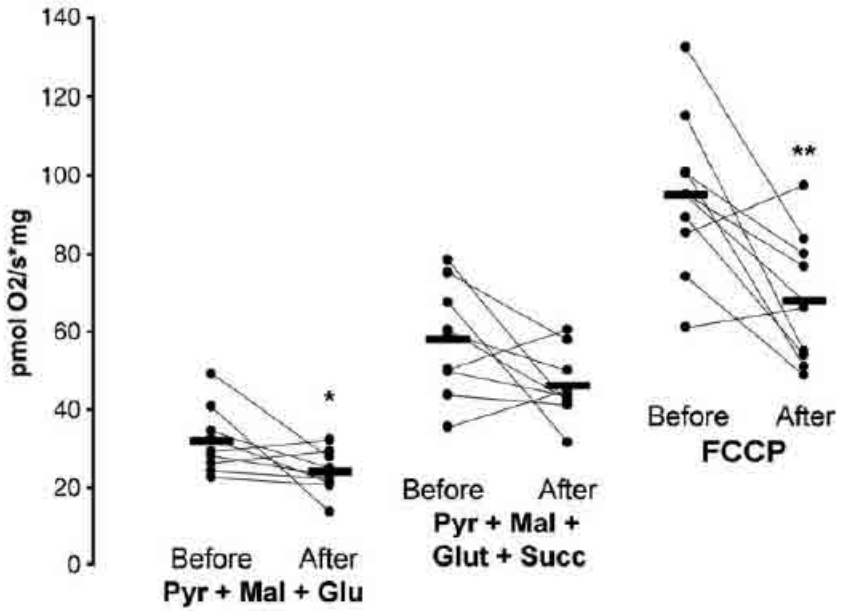
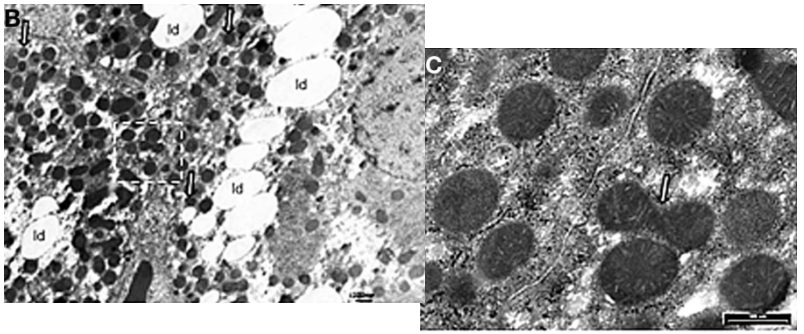


Fig. 4. Individual changes in mitochondrial respiration in response to weight loss. Oxygen consumption measured per milligram muscle. *P equal to .05. **P <.05. Mal + Glut: malate and glutamate, substrates for complex I. Mal + Glut + Succ: malate, glutamate, and succinate, substrates for complex I and II. FCCP: uncoupler, total electron transport capacity.



Fegato infiltrato di grasso => mitocondri in attività per degradare

Table 2
Effect of intervention; muscle biopsy analysis

	Before VLCD	After VLCD	% change	P value
IMTG (n = 8) (nmol/mg)	194 (57)	149 (40)	−23%	NS
Glycogen (nmol/mg)	89.6 (5.76)	92.2 (8.0)	+2.9%	NS
RCR	2.7 (0.6)	2.8 (0.3)	+3.7%	NS
UCP3 (n = 8), (%)	100 (35.5)	147 (45.2)	+47.2%	NS (.06)

Data are given as means (SE). RCR was measured using respirometry as state 3/state 2. Average baseline UCP3 was set at 100%.

Rasmus Rabøla - Metabolism Clinical and Experimental 58 (2009) 1145–1152

Enhanced fatty acid uptake in visceral adipose tissue is not reversed by weight loss in obese individuals with the metabolic syndrome

Marco Bucci Diabetologia (2015) 58:158–164

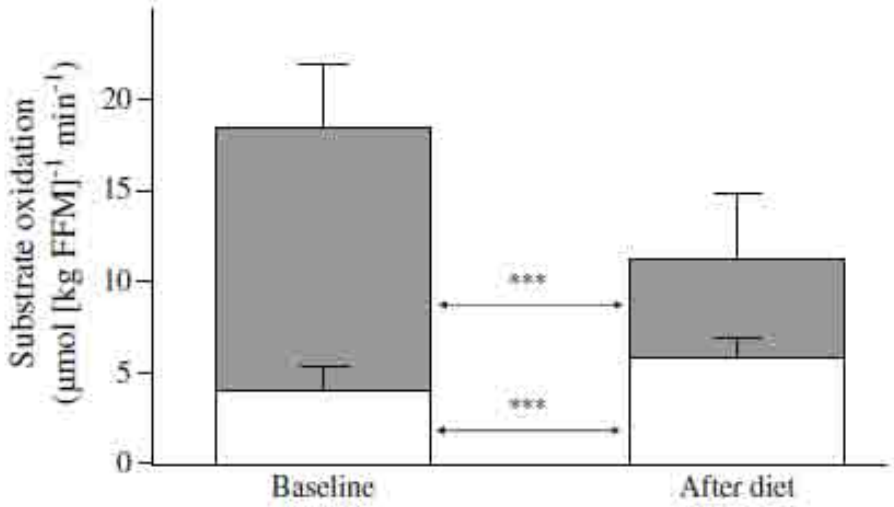
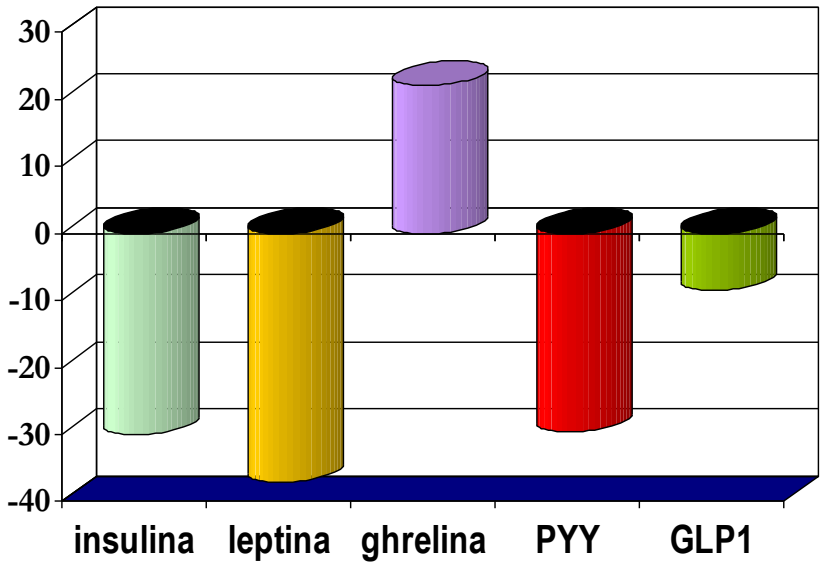


Fig. 3 Substrate oxidation in the obese group before (baseline) and after (after diet) treatment. Carbohydrate oxidation decreased (grey), while fat oxidation (white) increased, significantly. ***$p<0.001$

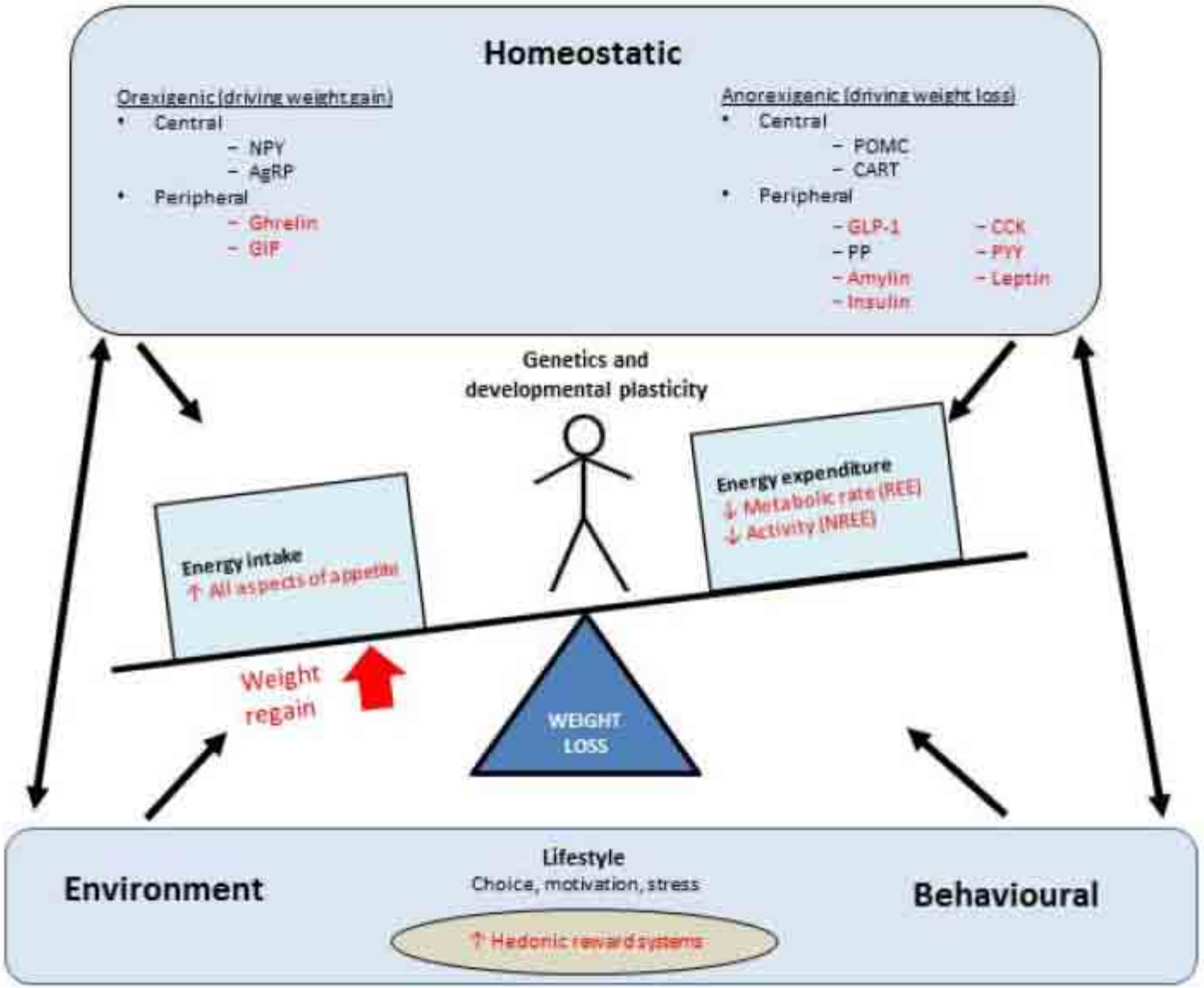
PESO



Leptin reduce food intake and increase energy expenditure

PYY, insulin, amylin inhibit food intake

Ghrelin stimulate hunger



F L Greenway, International Journal of Obesity preview 21 April 2015

The Effect of Very-Low-Calorie Diet on mRNA Expression of Inflammation-Related Genes in Subcutaneous Adipose Tissue and Peripheral Monocytes of Obese Patients with Type 2 Diabetes Mellitus

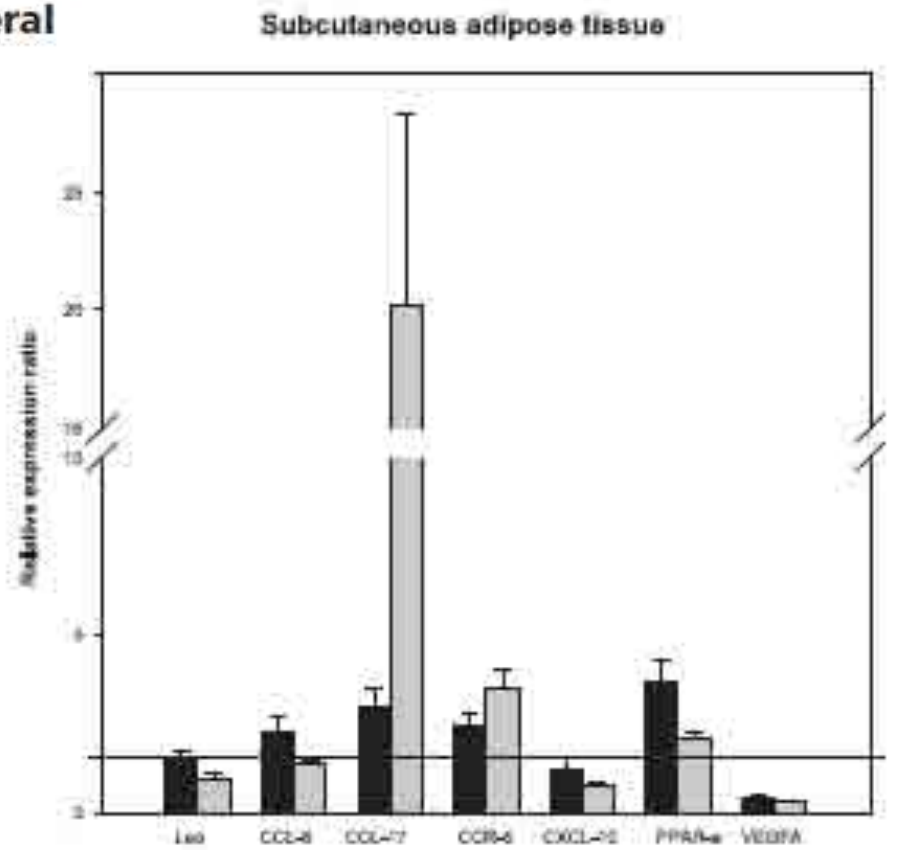


FIG. 1. mRNA expression changes in SCAT of T2DM after VLCD (*gray bars*) vs. baseline (*black bars*). Mean value of the relative gene expression of control group was taken as 1.0. Only genes with significant change ($P < 0.05$) after VLCD are depicted. Leo, leptin; CXCL-10, chemokine (C-X-C motif) ligand 10; VEGFA, vascular endothelial growth factor A.

M. Mraz, ***J Clin Endocrinol Metab*** **96:E606–E613, 2011)**

Tipi di dieta

Table 1 Comparison of different weight-loss diets[15–19]

Diet	Daily caloric content/ composition	Mean weight loss	Benefits	Disadvantages
Low calorie	800–1500 kcal 55–60% carbohydrate (high fiber, low GI) < 30% fat	~ 10% in 3–12 months	Reduction in blood glucose, TG, LDL, BP	Compliance difficult in long term
Low fat	1000–1500 kcal 20–25% fat	~ 5% in 2–12 months	Reduction in blood glucose, LDL, BP	Less palatable, feel hungry easily Increase TG
Low carbohydrate	1000–1500 kcal 60–150 g of carbohydrate < 60 g (very low carbohydrate)	~ 5% in 2–12 months	Faster initial weight loss than low-fat diets Reduced blood glucose, TG, LDL, BP	Ketosis when carbohydrate intake < 50 g/day
Very low-calorie diet	200–800 kcal 55–60% carbohydrate (high fiber, low GI) < 30% fat	> 10% in 2–8 weeks	Rapid weight loss	Electrolyte imbalance, hypotension, gallstones Needs medical supervision

BP, blood pressure; GI, glycemic index; LDL, serum low-density lipoprotein cholesterol; TG, serum triglyceride.

Fock KM Journal of Gastroenterology and Hepatology 2013; **28** (Suppl. 4): 59–63

Una dieta sotto le 200 kcal/die è digiuno.
Quando l' intake di carboidrati è inferiore a 50 g/die si avvia la ketosis a partire dalla glicogenolisi.

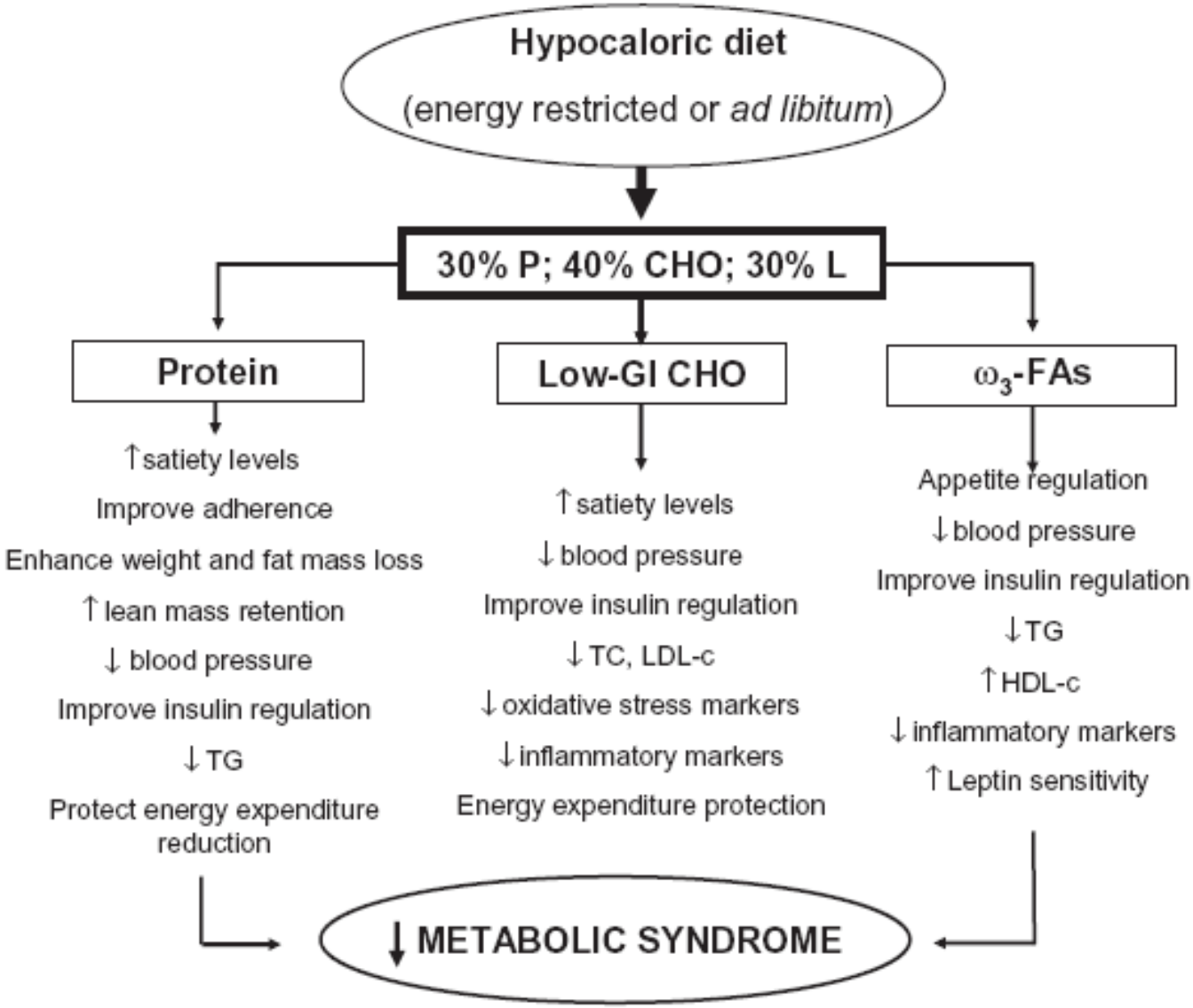
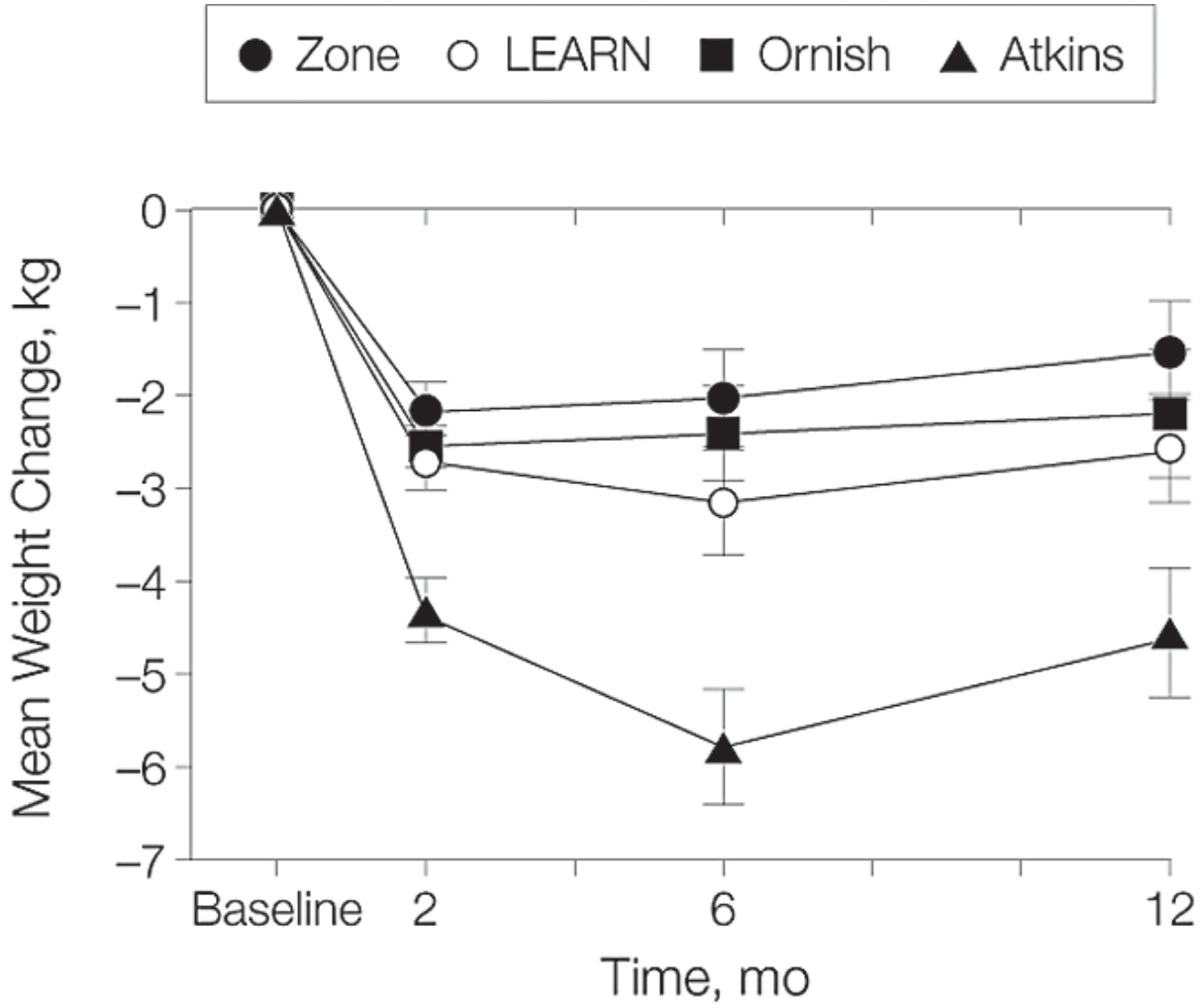


Figure 1 **Metabolic changes that could be achieved with an energy-restricted or *ad libitum* diet combining moderate protein content with low glycemic index carbohydrates and high omega-3 fatty acids intake.**

JAMA. 2007;297:969-977.



Atkins = VLCD, carbohydrate intake to 20 g/day, high-protein/high-fat diet
Zone = 40% from low glycaemic index carbohydrate, 30% from protein and 30% from fat
LEARN Program= VLF
Ornish = LF vegetarian diet containing 10% of calories from fat

Effect of reducing total fat intake on body weight: systematic review and meta-analysis of randomised controlled trials and cohort studies

Hooper L

BMJ *2012;345:e7666 doi: 10.1136/bmj.e7666*

This systematic review found that lowering the proportion of energy intake from total fat was associated with lower body weight (by 1.6 kg), body mass index, and waist circumference in adults

Each 1% decrease in energy from total fat resulted in a 0.19 kg reduction in body weight, compared with not altering total fat intake, in populations with 28-43% of energy from total fat, and in studies of six months to over eight years

Systematic review and meta-analysis of different dietary approaches to the management of type 2 diabetes[1–3]

Olubukola Ajala, Patrick English, and Jonathan Pinkney

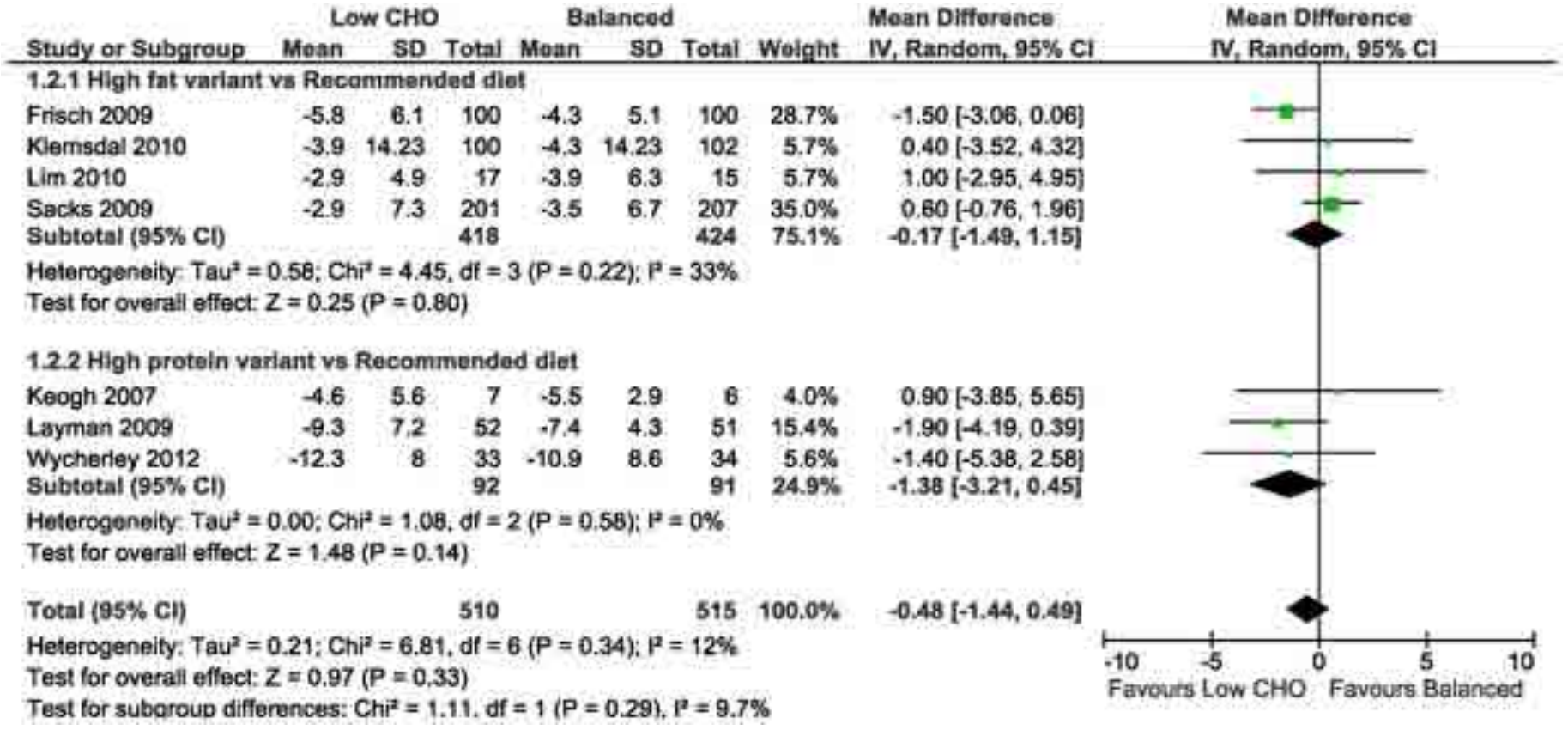
Am J Clin Nutr 2013;97:505–16

The reason for a carbohydrate restriction is to reduce serum insulin levels and force a change in substrate metabolism. Low-carbohydrate diets reduce the dietary contribution to serum glucose, which lowers insulin levels. Because insulin is an anabolic hormone and a potent stimulator of lipogenesis and inhibitor of lipolysis, lowering insulin levels allows utilization of stored body fat for energy.

Dietary carbohydrate restriction also leads to appetite suppression and reduced caloric intake. In many cases, lipolysis is maintained despite excess calories because glycerol from fat is needed as a gluconeogenic precursor. The exact carbohydrate level required to produce this metabolic shift is thought to be between 20 and 50 g per day in the initial phases of the diet

Conclusion: Low-carbohydrate, low-GI, Mediterranean, and high protein diets are effective in improving various markers of cardiovascular risk in people with diabetes and should be considered in the overall strategy of diabetes management.

Figure 4. Forest plot of low carbohydrate versus balanced diets in overweight and obese adults for weight loss (kg) at 1–2 years.



Naude CE, Schoonees A, Senekal M, Young T, Garner P, et al. (2014) Low Carbohydrate versus Isoenergetic Balanced Diets for Reducing Weight and Cardiovascular Risk: A Systematic Review and Meta-Analysis. PLoS ONE 9(7): e100652. doi:10.1371/journal.pone.0100652
http://127.0.0.1:8081/plosone/article?id=info:doi/10.1371/journal.pone.0100652

Effects of Low-Carbohydrate vs Low-Fat Diets on Weight Loss and Cardiovascular Risk Factors

Alain J. Nordmann

BW

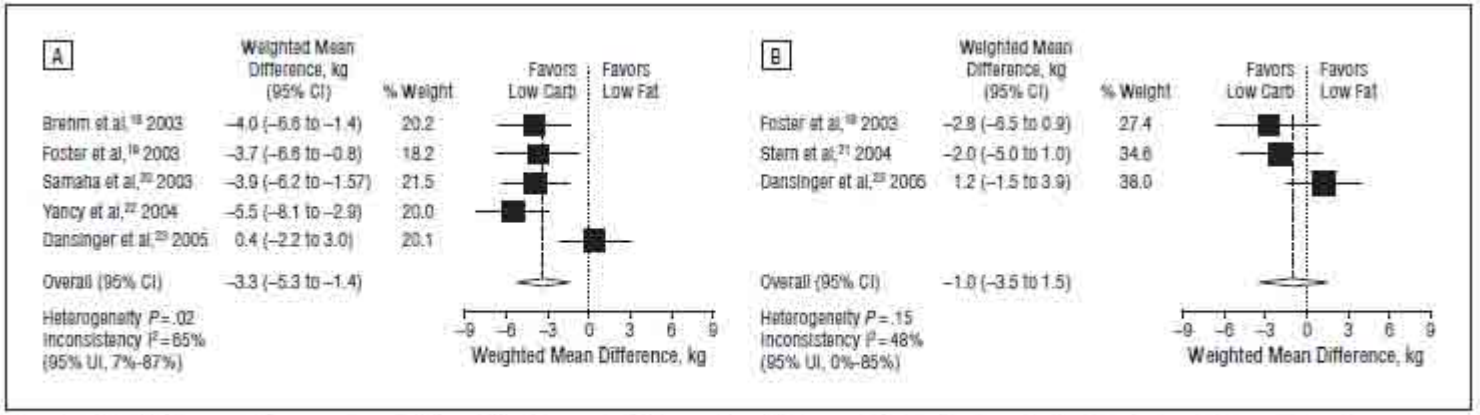


Figure 2. Weighted mean differences in weight loss after 6 (A) and 12 (B) months of follow-up. Carb indicates carbohydrates; CI, confidence interval; UI, uncertainty interval.

LDL

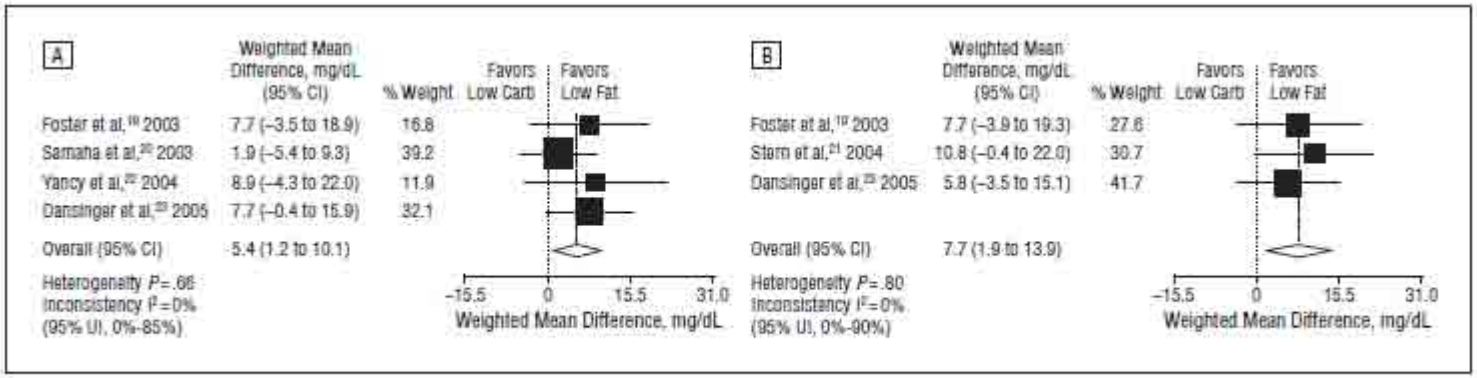


Figure 5. Weighted mean differences in low-density lipoprotein cholesterol level after 6 (A) and 12 (B) months of follow-up. Carb indicates carbohydrates; CI, confidence interval; UI, uncertainty interval. To convert cholesterol levels to millimoles per liter, multiply by 0.0259.

Arch Intern Med. 2006;166:285-293

Effects of Low-Carbohydrate Diets Versus Low-Fat Diets on Metabolic Risk Factors: A Meta-Analysis of Randomized Controlled Clinical Trials

Tian Hu

Am J Epidemiol. 2012;176(Suppl):S44–S54

The effects of low-carbohydrate diets (≤45% of energy from carbohydrates) versus low-fat diets (≤30% of energy from fat) on metabolic risk factors were compared in a meta-analysis of randomized controlled trials. Twenty-three trials from multiple countries with a total of 2,788 participants met the predetermined eligibility criteria (from January 1, 1966 to June 20, 2011) and were included in the analyses. Data abstraction was conducted in duplicate by independent investigators. Both low-carbohydrate and low-fat diets lowered weight and improved metabolic risk factors. Compared with participants on low-fat diets, persons on low-carbohydrate diets experienced a slightly but statistically significantly lower reduction in total cholesterol (2.7 mg/dL; 95% confidence interval: 0.8, 4.6), and low density lipoprotein cholesterol (3.7 mg/dL; 95% confidence interval: 1.0, 6.4), but a greater increase in high density lipoprotein cholesterol (3.3 mg/dL; 95% confidence interval: 1.9, 4.7) and a greater decrease in triglycerides (−14.0 mg/dL; 95% confidence interval: −19.4, −8.7). Reductions in body weight, waist circumference and other metabolic risk factors were not significantly different between the 2 diets. These findings suggest that low-carbohydrate diets are at least as effective as low-fat diets at reducing weight and improving metabolic risk factors. Low-carbohydrate diets could be recommended to obese persons with abnormal metabolic risk factors for the purpose of weight loss. Studies demonstrating long-term effects of low-carbohydrate diets on cardiovascular events were warranted.

Nelle principali linee guida nutrizionali per adulti è raccomandato un intake giornaliero (RDA) di 46 e 56 gr/die pari a 0.8 gr/kg body weight (BW) di proteine per donne e uomini rispettivamente. Una dieta viene considerata ada alto contenuto proteico se eccede gli 0.8 gr/kg BW o se le proteine sono il 15-16% del consumo energetico totale.

Table 1 Popular high-protein diets and their macronutrient composition

DIET	CHO	Fat	Protein	g/kg/d Protein*
USDA recommend	45-65%	20-35%	10-35%	0.8
Atkins [4]	6%	59%	35%	2.3
South Beach [5]	28%	33%	39%	2.6
Stillman [5]	3%	33%	64%	4.3
Zone [5]	36%	29%	34%	2.3
High Protein, normal CHO [6]	50%	30%	20%	1.3

*based on a 2000 kcal diet and a 75 kg person.

REVIEW Open Access

A high-protein diet for reducing body fat: mechanisms and possible caveats

Dominik H Pesta[1,3,4*] and Varman T Samuel[1,2]

Abstract

High protein diets are increasingly popularized in lay media as a promising strategy for weight loss by providing the twin benefits of improving satiety and decreasing fat mass. Some of the potential mechanisms that account for weight loss associated with high-protein diets involve increased secretion of satiety hormones (GIP, GLP-1), reduced orexigenic hormone secretion (ghrelin), the increased thermic effect of food and protein-induced alterations in gluconeogenesis to improve glucose homeostasis. There are, however, also possible caveats that have to be considered when choosing to consume a high-protein diet. A high intake of branched-chain amino acids in combination with a western diet might exacerbate the development of metabolic disease. A diet high in protein can also pose a significant acid load to the kidneys. Finally, when energy demand is low, excess protein can be converted to glucose (via gluconeogenesis) or ketone bodies and contribute to a positive energy balance, which is undesirable if weight loss is the goal. In this review, we will therefore explore the mechanisms whereby a high-protein diet may exert beneficial effects on whole body metabolism while we also want to present possible caveats associated with the consumption of a high-protein diet.

Keywords: High-protein diet, Weight loss, Satiety, Energy expenditure, Thermic effect of food

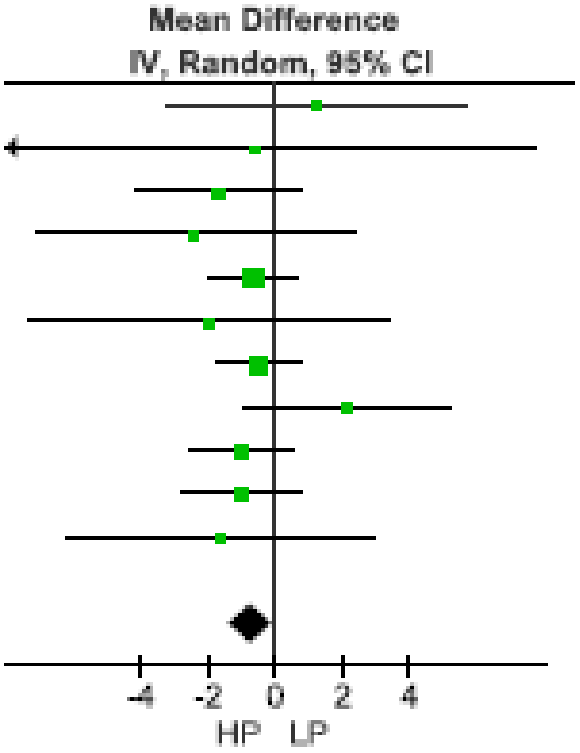
Nutrition & Metabolism 2014, 11:53

Long-term effects of low-fat diets either low or high in protein on cardiovascular and metabolic risk factors: a systematic review and meta-analysis

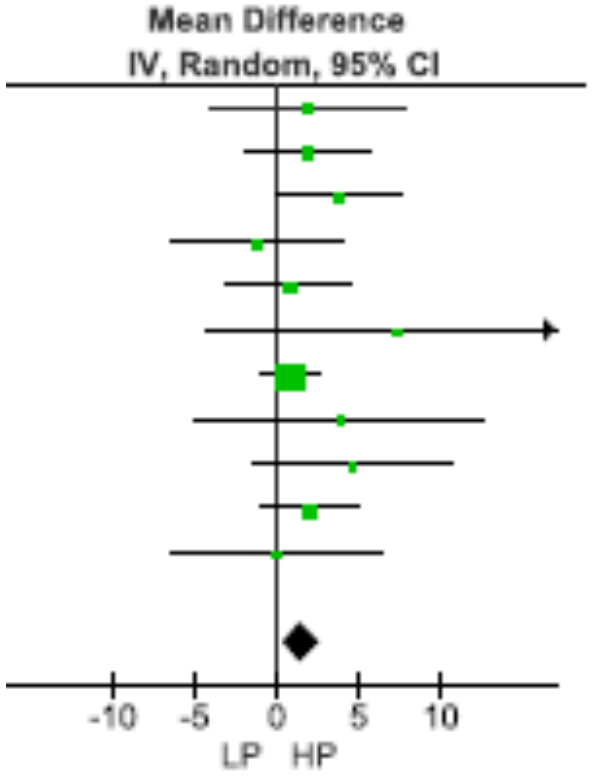
Schwingshackl L

2013, 12:48

NUTRITION JOURNAL



fasting insulin (µlU/ml)



HDL-cholesterol (mg/dl)

Sarcopenic Obesity – How Do We Treat It?

The ingestion of less than 25–30 grams of protein per meal is associated with suboptimal muscle protein synthesis in the elderly. Likewise, ingestion in excess of 30 grams of protein per meal has not been shown to further improve the anabolic response. Supplementation with leucine, the most potent branched-chain amino acid for stimulation of protein synthesis, has also been proposed for the prevention of sarcopenia

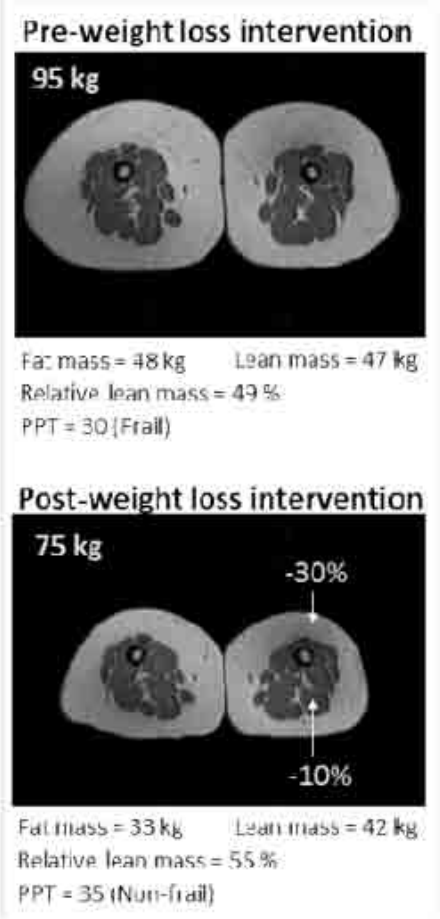


Figure 1. Changes in body composition after weight loss therapy in a frail obese older adult
Physical performance test (PPT) score 0–36 with higher scores indicating better performance (<32 indicates frailty)

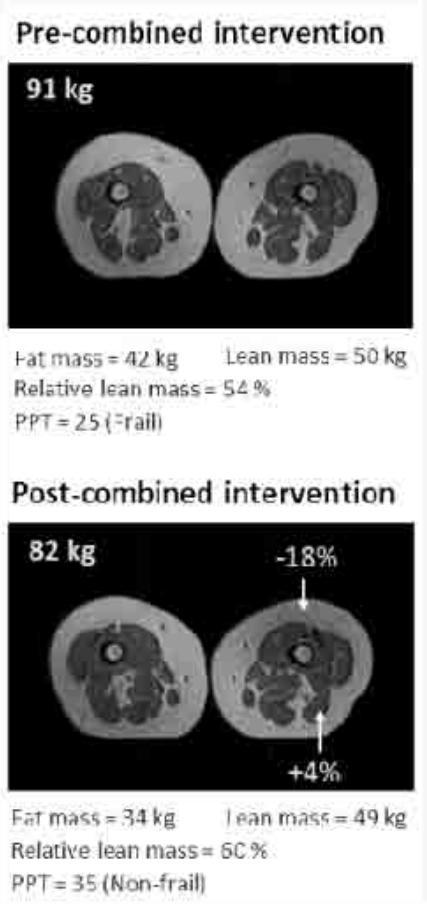


Figure 2. Changes in body composition after combined (exercise plus weight loss) intervention in a frail obese older adult
Physical performance test (PPT) score 0–36 with higher scores indicating better performance (<32 indicates frailty)

Curr Opin Endocrinol Diabetes Obes. 2013 October ; 20(5): 412–419.

Dopo alcuni gg di digiuno o intake di carboidrati <20gr/die, le riserve di glucosio diventano insufficienti per la produzione di oxaloacetate nella normal ossidazione lipidic nel ciclo di Krebs e per fornire glucosio al sistema nervoso centrale che non è in grado di utilizzare lipidi. Dopo 3–4 gg di digiuno o VLCD il SNC ha bisogno di fonti alternative che gli derivano da un aumento di produzione di acetyl-CoA che porta alla produzione di corpi ketonici (KB): acetoacetate (AcAc), β-hydroxybutyric acid (BHB) and acetone. Questo processo si definisce chetosi e si verifica nella matrice dei mitocondri epatici.
I meccanismi della dieta ketogenica alla base della perdita di peso sono stati ipotizzati quali::
(1) Riduzione dell'appetito dovuto all'effetto saziante delle proteine, per effetto del controllo ormonale centrale dell'appetito (minor aumento grelina) ma anche per un effetto diretto anoressizzante dei corpi chetonici;
(2) Riduzione della lipogenesi e aumento della lipolisi;
(3) Maggior efficienza metabolica per minor riduzione del quoziente respiratorio (REE?);
(4) Aumento del costo metabolico della glucogenesi (insulino-resistenza?).

Table 1. Blood levels during a normal diet, ketogenic diet and diabetic ketoacidosis [35].

Blood Levels	Normal Diet	Ketogenic Diet	Diabetic Ketoacidosis
Glucose (mg/dL)	80–120	65–80	>300
Insulin (μU/L)	6–23	6.6–9.4	≈0
KB conc (mmol/L)	0.1	7/8	>25
pH	7.4	7.4	<7.3

Int. J. Environ. Res. Public Health **2014**, *11*, 2092-2107

Attenzione a pazienti con funzionalità renale alterata per l'aumento dell'acidità delle urine (aumento escrezione di nitrogeno). Inoltre, nella fase di transizione dalla ketogenica ad una dieta normale il passaggio deve essere graduale e controllato. La durata della dieta ketogenica e del ritorno ad una dieta normale deve essere di un range minimo (per indurre una fisiologica ketosi) di 2–3 settimane ad un massimo (per un criteri di precauzione) di alcuni mesi (6–12 mesi).

Multiphase dietetic protocol with meal peplacements

80% of target weight loss			20% of target weight loss	Long-term maintenance of weight loss
Multidisciplinary team (dietary counselling / physical activity / psychological support)				
Stage 1 Active Stage			**Stage 2 Dietary re-education**	**Stage 3 Maintenance**
Phase 1	Phase 2	Phase 3	Gradual re-introduction of different foods	Balanced diet
VLCK diet[1] (600-800 kcal/day)			LC diet[2] (800-1500 kcal/day)	Maintenance diet (1500-2250 kcal/day)

Endocrine (2014) 47:793–805

Fig. 1 Scheme of the dietary intervention program for the VLCK diet. The duration of the different stages is dependent on the targets and the clinical decision of the physician in charge of the patient. VLCD, stage of a very low-calorie diet; LCD, stage of a low-calorie diet

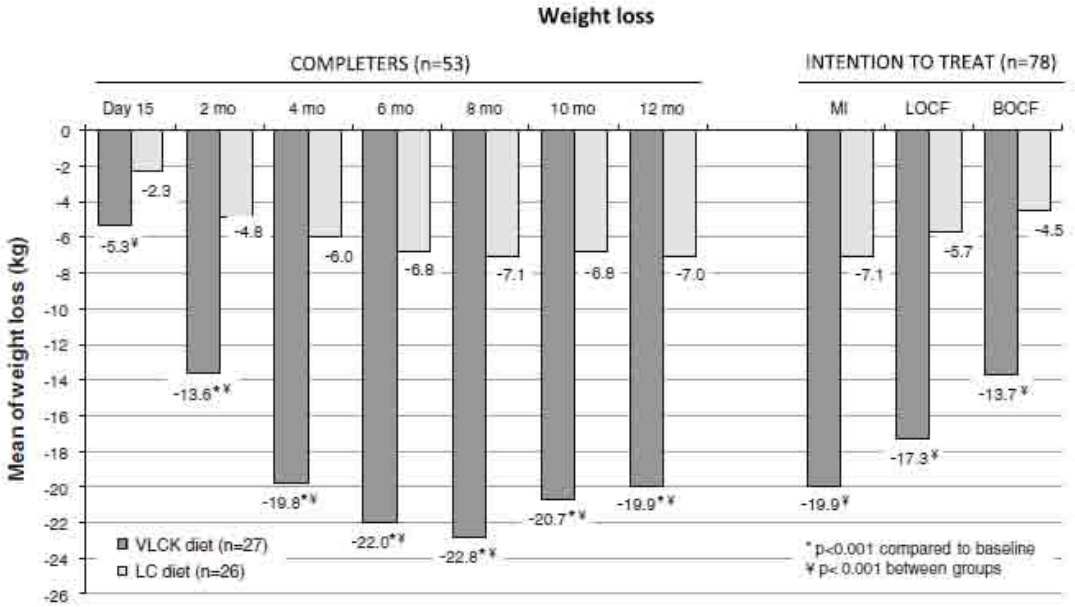


Fig. 2 Evolution of the weight loss after the initiation of treatment and during the 12-months follow-up. Data from the completers groups are presented and the data obtained through the intention-to-treat (*ITT*) analysis are also shown. last observation carried (*LOC*) forward; basal observation carried (*BOC*) forward; and multiple imputations (MI). *$p < 0.001$ compared with the value at baseline; ++$p < 0.001$ when compared between groups

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

Nutrition 31 (2015) 350–358

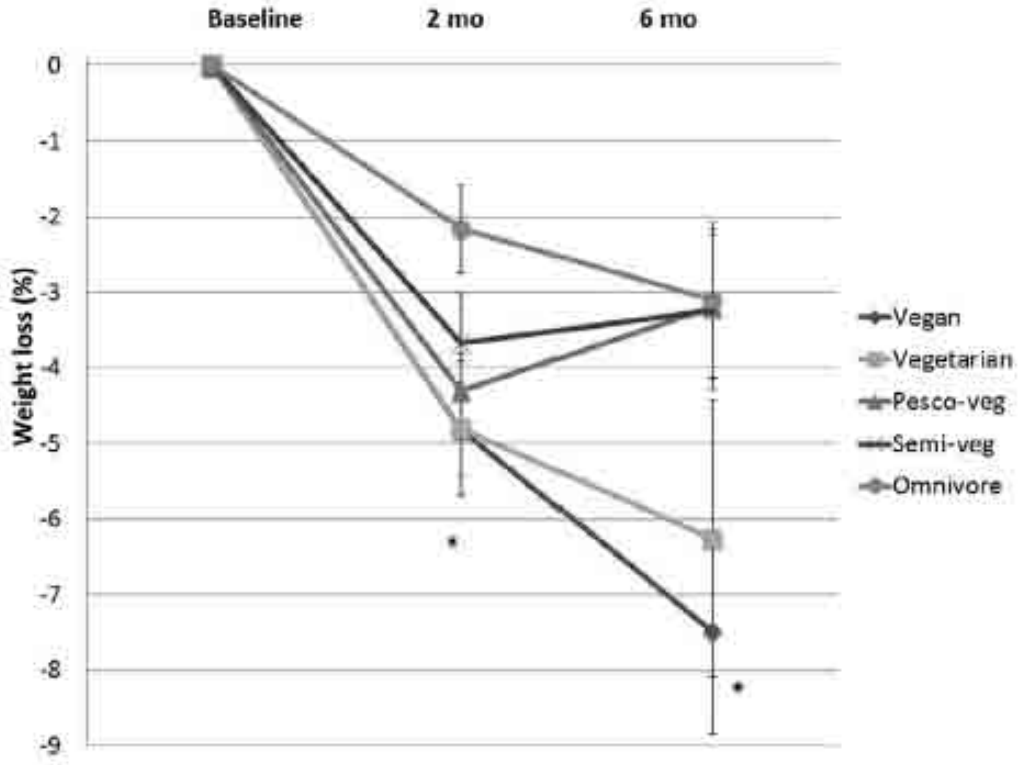


Fig. 2. Percent weight loss (±SE) during 6-mo New DIET's trial by diet group. New DIET, New Dietary Interventions to Enhance the Treatments. *P trend < 0.01.

Grazie !