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COGNITIVE HEALTH

Branched-chain amino acids and central fatigue

ABSTRACT
An account of the tryptophan (Trp)-5-hydroxytryptamine (5-HT)-central fatigue theory is provided and an explanation of how oral administration of BCAAs can decrease fatigue on the basis of this theory is given. The rate-limiting step in the synthesis of 5-HT is the transport of Trp across the blood-brain barrier. This transport is influenced by the fraction of Trp available for transport into the brain and the concentration of the other large neutral amino acids, including the BCAAs, which are transported via the same carrier system. During endurance exercise, there is an uptake of Trp by the brain, suggesting that this may increase the synthesis and release of 5-HT in the brain. Oral intake of BCAAs may reduce this uptake and also brain 5-HT synthesis and release, thereby delaying fatigue. Other hypotheses for the effect of BCAAs on central fatigue are included.

Source

Obesity phenotypes in midlife and cognition in early old age. The Whitehall II cohort study

ABSTRACT
OBJECTIVE:
To examine the association of body mass index (BMI) and metabolic status with cognitive function and decline.

METHODS:
A total of 6,401 adults (71.2% men), aged 39–63 years in 1991–1993, provided data on BMI (normal weight 18.5–24.9 kg/m², overweight 25–29.9 kg/m²; and obese ≥30 kg/m²) and metabolic status (abnormality defined as 2 or more of 1) triglycerides ≥1.69 mmol/L or lipid-lowering drugs, 2) systolic blood pressure ≥130 mm Hg, diastolic blood pressure ≥85 mm Hg, or antihypertensive drugs, 3) glucose ≥5.6 mmol/L or medications for diabetes, and 4) high-density lipoprotein cholesterol <1.04 mmol/L for men and <1.29 mmol/L for women). Four cognitive tests (memory, reasoning, semantic, and phonemic fluency) were administered in 1997–1999, 2002–2004, and 2007–2009, standardized to z scores, and averaged to yield a global score.

RESULTS:
Of the participants, 31.0% had metabolic abnormalities, 52.7% were normal weight, 38.2% were overweight, and 9.1% were obese. Among the obese, the global cognitive score at baseline (p = 0.82) and decline (p = 0.19) over 10 years was similar in the metabolically normal and abnormal groups. In the metabolically normal group, the 10-year decline in the global cognitive score was similar (p for trend = 0.38) in the normal weight (−0.40; 95% confidence interval [CI] −0.42 to −0.38), overweight (−0.42; 95% CI −0.45 to −0.39), and obese (−0.42; 95% CI −0.50 to −0.34) groups. However, in the metabolically abnormal group, the decline on the global score was faster among obese (−0.49; 95% CI −0.55 to −0.42) than among normal weight individuals (−0.42; 95% CI −0.50 to −0.34), (p = 0.03).

CONCLUSIONS:
In these analyses the fastest cognitive decline was observed in those with both obesity and metabolic abnormality.

Prospective studies suggest that overweight and obesity, particularly in midlife, are risk factors for dementia. Early studies relating adiposity to dementia provided conflicting results until it became evident that age modified this association. Higher body mass index (BMI) in elderly individuals is associated with lower dementia risk; possible explanations include weight loss during the preclinical phase of dementia (reverse causation) and selection biases because of competing risks of death related to high BMI. Recent evidence suggests that in younger populations, in whom dementia is rare, obesity is a risk factor for poor cognitive outcomes in cross-sectional and prospective analyses. It is hypothesized that obesity-related pathology that leads to cognitive decline takes many years to develop, and BMI in midlife rather than at older ages may reflect the long-term effect of obesity on cognition.

Although obesity is typically accompanied by unfavorable metabolic profiles, such as high glucose, adverse lipid levels, and elevated blood pressure, this is not always the case. Recent attempts to capture this heterogeneity include concepts such as metabolically healthy obesity (MHO), used to describe individuals with a BMI ≥30 kg/m² combined with an otherwise healthy metabolic profile. Although there is considerable evidence to show adverse effects of obesity on health, research suggests that the MHO phenotype is not associated with increased risk of cardiovascular disease. However, the evidence is far from conclusive, and little is known about the impact of MHO on cognitive function.

The objective of the present study was to examine the association between midlife obesity phenotypes, including MHO, and cognitive function in early old age. We also assess associations with cognitive decline, based on 3 assessments over 10 years. A standardized definition was used to categorize individuals based on their BMI and metabolic profile using data on dyslipidemia, hypertension, and hyperglycemia.

Source
HEART HEALTH

Dietary Fiber Intake and Mortality in the NIH-AARP Diet and Health Study

ABSTRACT

BACKGROUND:

Dietary fiber has been hypothesized to lower the risk of coronary heart disease, diabetes, and some cancers. However, little is known of the effect of dietary fiber intake on total death and cause-specific deaths.

METHODS:

We examined dietary fiber intake in relation to total mortality and death from specific causes in the NIH (National Institutes of Health)-AARP Diet and Health Study, a prospective cohort study. Diet was assessed using a food-frequency questionnaire at baseline. Cause of death was identified using the National Death Index Plus. Cox proportional hazard models were used to estimate relative risks and 2-sided 95% confidence intervals (CIs).

RESULTS:

During an average of 9 years of follow-up, we identified 20 126 deaths in men and 11 330 deaths in women. Dietary fiber intake was associated with a significantly lowered risk of total death in both men and women (multivariate relative risk comparing the highest with the lowest quintile, 0.78 [95% CI, 0.73-0.82; P for trend, <.001] in men and 0.78 [95% CI, 0.73-0.82; P for trend, <.001] in women). Dietary fiber intake also lowered the risk of death from cardiovascular, infectious, and respiratory diseases by 24% to 56% in men and by 34% to 59% in women. Inverse association between dietary fiber intake and cancer death was observed in men but not in women. Dietary fiber from grains, but not from other sources, was significantly inversely related to total and cause-specific death in both men and women.

CONCLUSIONS:

Dietary fiber may reduce the risk of death from cardiovascular, infectious, and respiratory diseases. Making fiber-rich food choices more often may provide significant health benefits.

Source


SPORTS NUTRITION

Branched-chain amino acids activate key enzymes in protein synthesis after physical exercise

ABSTRACT

BCAAs (leucine, isoleucine, and valine), particularly leucine, have anabolic effects on protein metabolism by increasing the rate of protein synthesis and decreasing the rate of protein degradation in resting human muscle. Also, during recovery from endurance exercise, BCAAs were found to have anabolic effects in human muscle. These effects are likely to be mediated through changes in signaling pathways controlling protein synthesis. This involves phosphorylation of the mammalian target of rapamycin (mTOR) and subsequent activation of 70-kD S6 protein kinase (p70 S6 kinase) and the eukaryotic initiation factor 4E-binding protein 1. Activation of p70 S6 kinase, and subsequent phosphorylation of the ribosomal protein S6, is associated with enhanced translation of specific mRNAs. When BCAAs were supplied to subjects during and after one session of quadriceps muscle resistance exercise, an increase in mTOR, p70 S6 kinase, and S6 phosphorylation was found in the recovery period after the exercise with no effect of BCAAs on Akt or glycogen synthase kinase 3 (GSK-3) phosphorylation. Exercise without BCAA intake led to a partial phosphorylation of p70 S6 kinase without activating the enzyme, a decrease in Akt phosphorylation, and no change in GSK-3. It has previously been shown that leucine infusion increases p70 S6 kinase phosphorylation in an Akt-independent manner in resting subjects; however, a relation between mTOR and p70 S6 kinase has not been reported previously. The results suggest that BCAAs activate mTOR and p70 S6 kinase in human muscle in the recovery period after exercise and that GSK-3 is not involved in the anabolic action of BCAAs on human muscle.

Source


Essential amino acids and muscle protein recovery from resistance exercise

ABSTRACT

This study tests the hypothesis that a dose of 6 g of orally administered essential amino acids (EAs) stimulates net muscle protein balance in healthy volunteers when consumed 1 and 2 h after resistance exercise. Subjects received a primed constant infusion of L-[2H(5)]phenylalanine and L-[1-13C]leucine. Samples from femoral artery and vein and biopsies from vastus lateralis were obtained. Arterial EAA concentrations increased severalfold after drinks. Net muscle protein balance (NB) increased proportionally more than arterial AA concentrations in response to drinks, and it returned rapidly to basal values when AA concentrations decreased. Area under the curve for net phenylalanine uptake above basal value was similar for the first hour after each drink (67 ± 17 vs. 77 ± 20 mg/leg, respectively). Because the NB response was double the response to two doses of a mixture of 3 g of EAA + 3 g of nonessential AA (NEAA) (14), we conclude that NEAA are not necessary for stimulation of NB and that there is a dose-dependent effect of EAA ingestion on muscle protein synthesis.

Source


International Society of Sports Nutrition position stand: nutrient timing
ABSTRACT

Position Statement: The position of the Society regarding nutrient timing and the intake of carbohydrates, proteins, and fats in reference to healthy, exercising individuals is summarized by the following eight points: 1) Maximal endogenous glycogen stores are best promoted by following a high-glycemic, high-carbohydrate (CHO) diet (600 - 1000 grams CHO or ~8 - 10 g CHO/kg/d), and ingestion of free amino acids and protein (PRO) alone or in combination with CHO before resistance exercise can maximally stimulate protein synthesis. 2) During exercise, CHO should be consumed at a rate of 30 - 60 grams of CHO/hour in a 6 - 8% CHO solution (8 - 16 fluid ounces) every 10 - 15 minutes. Adding PRO to create a CHO:PRO ratio of 3 - 4:1 may increase endurance performance and maximally promote glycogen re-synthesis during acute and subsequent bouts of endurance exercise. 3) Ingesting CHO alone or in combination with PRO during resistance exercise increases muscle glycogen, offsets muscle damage, and facilitates greater training adaptations after either acute or prolonged periods of supplementation with resistance training. 4) Post-exercise (within 30 minutes) consumption of CHO at high dosages (8 - 10 g CHO/kg/day) have shown to stimulate muscle glycogen re-synthesis, while adding PRO (0.2 g - 0.5 g PRO/kg/day) to CHO at a ratio of 3 - 4:1 (CHO:PRO) may further enhance glycogen re-synthesis. 5) Post-exercise ingestion (immediately to 3 h post) of amino acids, primarily essential amino acids, has been shown to stimulate robust increases in muscle protein synthesis, while the addition of CHO may stimulate even greater levels of protein synthesis. Additionally, pre-exercise consumption of a CHO + PRO supplement may result in peak levels of protein synthesis. 6) During consistent, prolonged resistance training, post-exercise consumption of varying doses of CHO + PRO supplements in varying dosages have been shown to stimulate improvements in strength and body composition when compared to control or placebo conditions. 7) The addition of creatine (Cr) (0.1 g Cr/kg/day) to a CHO + PRO supplement may facilitate even greater adaptations to resistance training. 8) Nutrient timing incorporates the use of methodical planning and eating of whole foods, nutrients extracted from food, and other sources. The timing of the energy intake and the ratio of certain ingested macronutrients are likely the attributes which allow for enhanced recovery and tissue repair following high-volume exercise, augmented muscle protein synthesis, and improved mood states when compared with unplanned or traditional strategies of nutrient intake.

Source

Hyperinsulinaemia, hyperaminoacidaemia and postexercise muscle anabolism: the search for the optimal recovery drink

ABSTRACT

Dietary supplements and other ergogenic aids are popular among athletes. Recent studies have shown that nutritional mixtures containing protein hydrolysates, added leucine, and high-glycaemic carbohydrates greatly augment insulin secretion compared with high-glycaemic carbohydrates only. When post-exercise hyperinsulinaemia is supported by hyperaminoacidaemia induced by protein hydrolysate and leucine ingestion, net protein deposition in muscle should occur. Thus, consumption of post-exercise recovery drinks containing these nutrients in conjunction with appropriate resistance training may lead to increased skeletal muscle hypertrophy and strength. However, the long-term effects on body composition and exercise performance remain to be determined.

Source

Effect of protein blend vs whey protein ingestion on muscle protein synthesis following resistance exercise

ABSTRACT

Resistance exercise followed by the ingestion of amino acids or protein causes an additive stimulation of muscle protein synthesis (MPS). Proteins such as whey are digested at a fast rate whereas soy and casein are digested at an intermediate and slow rate, respectively. To determine if ingestion of a protein blend (soy and dairy protein) extends the post-exercise MPS response compared to whey protein we conducted a double-blind, randomized clinical trial in 20 young adults before and after ingestion of ~20g of the protein blend or whey (N=10 per group) given 1h after a bout of high-intensity leg resistance exercise. We utilized stable isotopic methods to measure the mixed muscle protein fractional synthetic rate (FSR) and western blotting to examine mTORC1 signaling. Muscle biopsies (vastus lateralis) were collected at baseline and at two time points during post-exercise (Early: 1–3h & Late: 3–5h post-ex). We report differences between the two beverages as Protein A and B (data will be unblinded at the EB meeting). FSR increased by ~40–70% in both groups during Early and remained elevated into Late. Protein A and B also activated mTORC1 signaling to a similar extent following exercise, yet Protein B tended to be greater. We conclude, from these preliminary data that following resistance exercise, the ingestion of a protein blend enhances mTORC1 signaling and MPS similarly to that of whey protein.

Source
Ingestion of whey hydrolysate, casein or soy protein isolate: effects on mixed muscle protein synthesis at rest and following resistance exercise in young men

ABSTRACT
This study was designed to compare the acute response of mixed muscle protein synthesis (MPS) to rapidly (i.e., whey hydrolysate and soy) and slowly (i.e., micellar casein) digested proteins both at rest and after resistance exercise. Three groups of healthy young men (n = 6 per group) performed a bout of unilateral leg resistance exercise followed by the consumption of a drink containing an equivalent content of essential amino acids (10 g) as either whey hydrolysate, micellar casein, or soy protein isolate. Mixed MPS was determined by a primed constant infusion of l-[ring-(13)C(6)]phenylalanine. Ingestion of whey protein resulted in a larger increase in blood essential amino acid, branched-chain amino acid, and leucine concentrations than either casein or soy (P < 0.05). Mixed MPS at rest (determined in the nonexercised leg) was higher with ingestion of faster proteins (whey = 0.091 +/- 0.015, soy = 0.078 +/- 0.014, casein = 0.047 +/- 0.008%/h); MPS after consumption of whey was approximately 93% greater than casein (P < 0.01) and 18% greater than soy (P = 0.067). A similar result was observed after exercise (whey > soy > casein); MPS following whey consumption was approximately 122% greater than casein (P < 0.01) and 31% greater than soy (P < 0.05). MPS was also greater with soy consumption at rest (64%) and following resistance exercise (69%) compared with casein (both P < 0.01). We conclude that the feeding-induced simulation of MPS in young men is greater after whey hydrolysate or soy protein consumption than casein both at rest and after resistance exercise; moreover, despite both being fast proteins, whey hydrolysate stimulated MPS to a greater degree than soy after resistance exercise. These differences may be related to how quickly the proteins are digested (i.e., fast vs. slow) or possibly to small differences in leucine content of each protein.

Source

Acute response of net muscle protein balance reflects 24-h balance after exercise and amino acid ingestion

ABSTRACT
The purpose of this study was to determine if the acute anabolic muscle response to resistance exercise and essential amino acids (EAA) reflects the response over 24 h. Seven subjects participated in the following two 24-h studies: 1) resting (REST) and 2) rest plus resistance exercise (RES). Mixed MPS at rest (determined in the nonexercised leg) was significantly greater for EAA ingestion (ES) compared to resting (REST) (P < 0.05). MPS following ES consumption was approximately 122% greater than casein (P < 0.01) and 31% greater than soy (P < 0.05). MPS was also greater with soy consumption at rest (64%) and following resistance exercise (69%) compared with casein (both P < 0.01). We conclude that the feeding-induced simulation of MPS in young men is greater after whey hydrolysate or soy protein consumption than casein both at rest and after resistance exercise; moreover, despite both being fast proteins, whey hydrolysate stimulated MPS to a greater degree than soy after resistance exercise. These differences may be related to how quickly the proteins are digested (i.e., fast vs. slow) or possibly to small differences in leucine content of each protein.

Source

Regulation of muscle protein by amino acids

ABSTRACT
Amino acid availability is a potent regulator of muscle protein synthesis (MPS). We have performed a series of studies using stable isotope methodology and the arteriovenous balance approach to quantify many aspects of the response of MPS, breakdown, and the balance between synthesis and breakdown to changes in the availability of amino acids. A constant intake of amino acids stimulates MPS in a dose-dependent manner until concentrations are approximately doubled, after which further increases in concentration are ineffective. MPS rises more rapidly after bolus ingestion to a peak rate of MPS higher than during constant intake, but the response is transient. A reduction in amino acid availability below basal levels inhibits MPS. Ingestion of nonessential amino acids is not needed to stimulate MPS. When carbohydrate alone is ingested there is minimal effect on MPS, but there is an interactive effect with amino acid ingestion, meaning the response to amino acids plus glucose is more than the sum of their individual effects. Finally, acute anabolic responses in net MPS correspond quantitatively to differences in 24-h net muscle balances.

Source
Effects of dietary composition on energy expenditure during weight loss maintenance

ABSTRACT

CONTEXT:
Reduced energy expenditure following weight loss is thought to contribute to weight gain. However, the effect of dietary composition on energy expenditure during weight-loss maintenance has not been studied.

OBJECTIVE:
To examine the effects of 3 diets differing widely in macronutrient composition and glycemic load on energy expenditure following weight loss.

DESIGN, SETTING, AND PARTICIPANTS:
A controlled 3-way crossover design involving 21 overweight and obese young adults conducted at Children’s Hospital Boston and Brigham and Women’s Hospital, Boston, Massachusetts, between June 16, 2006, and June 21, 2010, with recruitment by newspaper advertisements and postings.

INTERVENTION:
After achieving 10% to 15% weight loss while consuming a run-in diet, participants consumed an isocaloric low-fat diet (60% of energy from carbohydrate, 20% from fat, 20% from protein; high glycemic load), low–glycemic index diet (40% from carbohydrate, 40% from fat, and 20% from protein; moderate glycemic load), and very low-carbohydrate diet (10% from carbohydrate, 60% from fat, and 30% from protein; low glycemic load) in random order, each for 4 weeks.

MAIN OUTCOME MEASURES:
Primary outcome was resting energy expenditure (REE), with secondary outcomes of total energy expenditure (TEE), hormone levels, and metabolic syndrome components.

RESULTS:
Compared with the pre–weight-loss baseline, the decrease in REE was greatest with the low-fat diet (mean [95% CI], −205 [−265 to −144] kcal/d), intermediate with the low–glycemic index diet (−166 [−227 to −106] kcal/d), and least with the very low–carbohydrate diet (−138 [−198 to −77] kcal/d; overallP = .03; P for trend by glycemic load = .009). The decrease in TEE showed a similar pattern (mean [95% CI], −423 [−606 to −239] kcal/d; −297 [−479 to −115] kcal/d; and −97 [−281 to 86] kcal/d, respectively; overallP = .003; P for trend by glycemic load < .001). Hormone levels and metabolic syndrome components also varied during weight maintenance by diet (leptin, P < .001; 24-hour urinary cortisol, P = .005; indexes of peripheral [P = .02] and hepatic [P = .03] insulin sensitivity; high-density lipoprotein [HDL] cholesterol,P < .001; non-HDL cholesterol, P < .001; triglycerides, P < .001; plasminogen activator inhibitor 1, P for trend = .04; and C-reactive protein, P for trend = .05), but no consistent favorable pattern emerged.

CONCLUSION:
Among overweight and obese young adults compared with pre–weight-loss energy expenditure, isocaloric feeding following 10% to 15% weight loss resulted in decreases in REE and TEE that were greatest with the low-fat diet, intermediate with the low–glycemic index diet, and least with the very low-carbohydrate diet.

TRIAL REGISTRATION:
clinicaltrials.gov Identifier: NCT00315354

Source

Interrelationship between physical activity and branched-chain amino acids

ABSTRACT

Some athletes can have quite high intakes of branched-chain amino acids (BCAAs) because of their high energy and protein intakes and also because they consume protein supplements, solutions of protein hydrolysates, and free amino acids. The requirement for protein may actually be higher in endurance athletes than in sedentary individuals because some amino
acids, including the BCAAs, are oxidized in increased amounts during exercise compared with rest, and they must therefore be replenished by the diet. In the late 1970s, BCAAs were suggested to be the third fuel for skeletal muscle after carbohydrate and fat. However, the majority of later studies, using various exercise and treatment designs and several forms of administration of BCAAs (infusion, oral, and with and without carbohydrates), have failed to find a performance-enhancing effect. No valid scientific evidence supports the commercial claims that orally ingested BCAAs have an anabolic effect during and after exercise in humans or that BCAA supplements may accelerate the repair of muscle damage after exercise. The recommended protein intakes for athletes (1.2 to 1.8 g . kg body mass(-1) . d(-1)) do not seem to be harmful. Acute intakes of BCAA supplements of about 10-30 g/d seem to be without ill effect. However, the suggested reasons for taking such supplements have not received much support from well-controlled scientific studies.


Could increased time spent in a thermal comfort zone contribute to population increases in obesity?

ABSTRACT Domestic winter indoor temperatures in the USA, UK and other developed countries appear to be following an upwards trend. This review examines evidence of a causal link between thermal exposures and increases in obesity prevalence, focusing on acute and longer-term biological effects of time spent in thermal comfort compared with mild cold. Reduced exposure to seasonal cold may have a dual effect on energy expenditure, both minimizing the need for physiological thermogenesis and reducing thermogenic capacity. Experimental studies show a graded association between acute mild cold and human energy expenditure over the range of temperatures relevant to indoor heating trends. Meanwhile, recent studies of the role of brown adipose tissue (BAT) in human thermogenesis suggest that increased time spent in conditions of thermal comfort can lead to a loss of BAT and reduced thermogenic capacity. Pathways linking cold exposure and adiposity have not been directly tested in humans. Research in naturalistic and experimental settings is needed to establish effects of changes in thermal exposures on weight, which may raise possibilities for novel public health strategies to address obesity. Source Johnson F et al. Could increased time spent in a thermal comfort zone contribute to population increases in obesity? Obesity Reviews 12:543-551, 2011.

Long-term weight loss maintenance in the United States

ABSTRACT CONTEXT: Although the rise in overweight and obesity in the United States is well documented, long-term weight loss maintenance (LTWLM) has been minimally explored.

OBJECTIVE: The aim of this study is to estimate the prevalence and correlates of LTWLM among US adults.

DESIGN, SETTING AND PARTICIPANTS: We examined weight data from 14,306 participants (age 20–84 years) in the 1999–2006 National Health and Nutrition Examination Survey (NHANES). We defined LTWLM as weight loss maintained for at least 1 year. We excluded individuals who were not overweight or obese at their maximum weight.

RESULTS: Among US adults who had ever been overweight or obese, 36.6, 17.3, 8.5 and 4.4% reported LTWLM of at least 5, 10, 15 and 20%, respectively. Among the 17.3% of individuals who reported an LTWLM of at least 10%, the average and median weight loss maintained was 19.1 kg (42.1 pounds) and 15.5 kg (34.1 pounds), respectively. LTWLM of at least 10% was higher among adults of ages 75–84 years (vs ages 20–34, adjusted odds ratio (OR): 1.5; 95% confidence interval (CI): 1.2, 1.8), among those who were non-Hispanic white (vs Hispanic, adjusted OR: 1.6; 95% CI: 1.3, 2.0) and among those who were female (vs male, adjusted OR: 1.2; 95% CI: 1.1, 1.3).

CONCLUSIONS: More than one out of every six US adults who has ever been overweight or obese has accomplished LTWLM of at least 10%. This rate is significantly higher than those reported in clinical trials and many other observational studies, suggesting that US adults may be more successful at sustaining weight loss than previously thought.


Effects of variations in protein and carbohydrate intake on body mass and composition during energy restriction: a metaregression

ABSTRACT BACKGROUND: It is unclear whether low-carbohydrate, high-protein, weight-loss diets benefit body mass and composition beyond energy restriction alone.

OBJECTIVE: The objective was to use meta-regression to determine the effects of variations in protein and carbohydrate intakes on body mass and composition during energy restriction.

DESIGN: English-language studies with a dietary intervention of ≥4200 kJ/d (1000 kcal/d), with a duration of ≥4 wk, and conducted in subjects aged ≥19 y were considered eligible for inclusion. A self-reported intake...
in conjunction with a biological marker of macronutrient intake was required as a minimum level of dietary control. A total of 87 studies comprising 165 intervention groups met the inclusion criteria.

**RESULTS:**
After control for energy intake, diets consisting of ≤35–41.4% energy from carbohydrate were associated with a 1.74 kg greater loss of body mass, a 0.69 kg greater loss of fat-free mass, a 1.29% greater loss in percentage body fat, and a 2.05 kg greater loss of fat mass than were diets with a higher percentage of energy from carbohydrate. In studies that were conducted for >12 wk, these differences increased to 6.56 kg, 1.74 kg, 3.55%, and 5.57 kg, respectively. Protein intakes of >1.05 g/kg were associated with 0.60 kg additional fat-free mass retention compared with diets with protein intakes ≤1.05 g/kg. In studies conducted for >12 wk, this difference increased to 1.21 kg. No significant effects of protein intake on loss of either body mass or fat mass were observed.

**CONCLUSION:**
Low-carbohydrate, high-protein diets favorably affect body mass and composition independent of energy intake, which in part supports the proposed metabolic advantage of these diets.

Source

**Recruitment of brown fat and conversion of white into brown adipocyte: Strategies to fight the metabolic complications of obesity?**

Source

**Neural responses to visual food stimuli after a normal vs. higher protein breakfast in breakfast skipping teens: A pilot fMRI study**

**ABSTRACT**
This functional magnetic resonance imaging (fMRI) pilot study identified whether breakfast consumption would alter the neural activity in brain regions associated with food motivation and reward in overweight “breakfast skipping” (BS) adolescent girls and examined whether increased protein at breakfast would lead to additional alterations. Ten girls (Age: 15 ± 1 years; BMI percentile 93 ± 1%; BS 5 ± 1×/week) completed 3 testing days. Following the BS day, the participants were provided with, in randomized order, normal protein (NP; 18 ± 1 g protein) or higher protein (HP; 50 ± 1 g protein) breakfast meals to consume at home for 6 days. On day 7 of each pattern, the participants came to the laboratory to consume their respective breakfast followed by appetite questionnaires and an fMRI brain scan to identify brain activation responses to viewing food vs. nonfood images prior to lunch. Breakfast consumption led to enduring (i.e., 3-h post breakfast) reductions in neural activation in the hippocampus, amygdala, cingulate, and parahippocampus vs. BS. HP led to enduring reductions in insula and middle prefrontal cortex activation vs. NP. Hippocampal, amygdala, cingulate, and insular activations were correlated with appetite and inversely correlated with satiety. In summary, the addition of breakfast led to alterations in brain activation in regions previously associated with food motivation and reward with additional alterations following the higher-protein breakfast. These data suggest that increased dietary protein at breakfast might be a beneficial strategy to reduce reward-driven eating behavior in overweight teen girls. Due to the small sample size, caution is warranted when interpreting these preliminary findings.

Source

A randomized trial of a hypocaloric high-protein diet, with and without exercise, on weight loss, fitness, and markers of the Metabolic Syndrome in overweight and obese women

**ABSTRACT**
The purpose of this study was to examine the effects of 3:1 and 1:1 carbohydrate to protein ratios, hypocaloric diets with and without exercise, and risk factors associated with the Metabolic Syndrome in overweight and obese Canadian women. Groups were designated as control diet (CON), control diet with exercise (CONEx),
high-protein (HP), or high-protein with exercise (HPEx). Free-living women from the Guelph community were studied in a university health and fitness facility. The participants were 44 of 60 overweight and obese women who had been randomized to the 4 weight-loss programs. Habitual diets of the subjects were energy restricted and were to contain either a 1:1 or 3:1 ratio of carbohydrate to protein energy. Subjects either exercised 3 times/week or maintained their normal level of activity for 12 weeks. The main outcome measures were weight loss, blood lipids, blood pressure, insulin, body composition, nitrogen balance, fitness, and resting energy expenditure. All groups lost weight over the 12 week period: -2.1 kg for the CON group, -4.0 kg in the CONEx group, -4.6 kg in the HP group, and -7.0 kg in the HPEx. All participants exhibited improved body composition, decreased blood pressure, and decreased waist and hip circumference. Actual diets consumed by the subjects contained ratios of carbohydrate to protein of 3.0:1, 2.7:1, 1.5:1, and 0.96:1 for the CON, CONEx, HP, and HPEx groups, respectively. Cardiovascular fitness improved in both exercise groups. There were no changes in resting energy expenditure. No adverse events were reported. Significant changes in blood lipids included decreased total cholesterol in the HP and CONEx groups, decreased low-density lipoprotein cholesterol in the HP group only, and decreased blood triglycerides in the HPEx group only. High-density lipoprotein cholesterol, fasting blood glucose, and fasting insulin levels were unaltered by diet or exercise. A high-protein diet was superior to a low-fat, high-carbohydrate diet either alone or when combined with an aerobic/resistance-training program in promoting weight loss and nitrogen balance, while similarly improving body composition and risk factors for the Metabolic Syndrome in overweight and obese Canadian women.

Source

Unexpected evidence for active brown adipose tissue in adult humans

ABSTRACT
The contention that brown adipose tissue is absent in adult man has meant that processes attributed to active brown adipose tissue in experimental animals (mainly rodents), i.e., classical nonshivering thermogenesis, adaptive adrenergic thermogenesis, diet-induced thermogenesis, and obesity, should be either absent or attributed to alternative (unknown) mechanisms in man. However, serendipitously, as a consequence of the use of fluoride-deoxyglucose positron emission tomography (FDG PET) to trace tumor metastasis, observations that may change that notion have recently been made. These tomography scans have visualized symmetrical areas of increased tracer uptake in the upper parts of the human body; these areas of uptake correspond to brown adipose tissue. We examine here the published observations from a viewpoint of human physiology. the human depots are somewhat differently located from those in rodents, the main depots being found in the supraclavicular and the neck regions with some additional paravertebral, mediastinal, para-aortic, and suprarenal localizations (but no interscapular). Brown adipose tissue activity in man is acutely cold induced and is stimulated via the sympathetic nervous system. The prevalence of active brown adipose tissue in normal adult man can be only indirectly estimated, but it would seem that the prevalence of active brown adipose tissue in the population may be at least in the range of some tens of percent. We conclude that a substantial fraction of adult humans possess active brown adipose tissue that thus has the potential to be of metabolic significance for normal human physiology as well as to become pharmacologically activated in efforts to combat obesity.

Source


ABSTRACT
CONTEXT: The prevalence of high body mass index (BMI) among children and adolescents in the United States appeared to plateau between 1999 and 2006.

OBJECTIVES: To provide the most recent estimates of high BMI among children and adolescents and high weight for recumbent length among infants and toddlers and to analyze trends in prevalence between 1999 and 2008.

DESIGN, SETTING, AND PARTICIPANTS: The National Health and Nutrition Examination Survey 2007-2008, a representative sample of the US population with measured heights and weights on 3281 children and adolescents (2 through 19 years of age) and 719 infants and toddlers (birth to 2 years of age).

MAIN OUTCOME MEASURES: Prevalence of high weight for recumbent length (> or = 95th percentile of the Centers for Disease Control and Prevention growth charts) among infants and toddlers. Prevalence of high BMI among children and adolescents defined at 3 levels: BMI for age at or above the 97th percentile, at or above the 95th percentile, and at or above the 85th percentile of the BMI-for-age growth charts. Analyses of trends by age, sex, and race/ethnicity from 1999-2000 to 2007-2008.

RESULTS: In 2007-2008, 9.5% of infants and toddlers (95% confidence interval [CI], 7.3%-11.7%) were at or above the 95th percentile of the weight-for-recumbent-length growth charts. Among children and adolescents aged 2

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Efficacy of calcium supplementation for management of overweight and obesity: A systematic review of randomized trials

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Numerous dietary supplements are marketed as slimming aids, but the efficacy of most has not been proven. One such slimming aid is calcium. Presented here are the results of a systematic review that aimed to evaluate the evidence for or against the efficacy of calcium supplements for body-weight reduction in overweight and obese individuals. Electronic searches were conducted to identify relevant randomized clinical trials of at least 6 months duration. No restrictions of age, gender, language, or time of publication were imposed. Two reviewers independently determined the eligibility of studies, assessed the reporting quality of the studies included, and extracted data. Twenty-four eligible trials were identified, and seven were included. Five of the randomized clinical trials included were not of good reporting quality. A meta-analysis revealed a small, significant reduction in body weight for calcium compared with placebo (mean difference, (-) 0.74 kg; 95% confidence interval, (-) 1.00-(-) 0.48). A small, significant reduction in body fat favoring calcium over placebo was also noted (mean difference, (-) 0.93 kg; 95% confidence interval, (-) 1.16-(-) 0.71). In conclusion, the evidence from randomized clinical trials suggests calcium supplementation generates small, statistically significant weight loss in overweight and obese individuals, but the clinical relevance of this finding is uncertain.

Source

Protein, weight management and satiety

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Obesity, with its comorbidities such as metabolic syndrome and cardiovascular diseases, is a major public health concern. To address this problem, it is imperative to identify treatment interventions that target a variety of short- and long-term mechanisms. Although any dietary or lifestyle change must be personalized, controlled energy intake in association with a moderately elevated protein intake may represent an effective and practical weight-loss strategy. Potential beneficial outcomes associated with protein ingestion include the following: 1) increased satiety—protein generally increases satiety to a greater extent than carbohydrate or fat and may facilitate a reduction in energy consumption under ad libitum dietary conditions; 2) increased thermogenesis—higher-protein diets are associated with increased thermogenesis, which also influences satiety and augments energy expenditure (in the longer term, increased thermogenesis contributes to the relatively low-energy efficiency of protein); and 3) maintenance or accretion of fat-free mass—in some individuals, a moderately higher protein diet may provide a stimulatory effect on muscle protein anabolism, favoring the retention of lean muscle mass while improving metabolic profile. Nevertheless, any potential benefits associated with a moderately elevated protein intake must be evaluated in the light of customary dietary practices and individual variability.

Source

Appetite regulation and weight control: the role of gut hormones

abstracT
The overwhelming increase in the prevalence of overweight and obesity in recent years represents one of the greatest threats to the health of the developed world. Among current treatments, however, gastrointestinal (GI) surgery remains the only approach capable of achieving significant weight loss results with long-term sustainability. As the obesity prevalence approaches epidemic proportions, the necessity to unravel the mechanisms regulating appetite control has garnered significant attention. It is well known that physical activity and food intake regulation are the two most important factors involved in body weight control. To regulate food intake, the brain must alter appetite. With this realization has come increased efforts to understand the intricate interplay between gut hormones and the central nervous system, and the role of these peptides in food intake regulation through appetite modulation. This review discusses the central mechanisms involved in body weight regulation and explores a suite of well characterized and intensely investigated anorexigenic and orexigenic gut hormones. Their appetite-regulating capabilities, post-GI surgery physiology and emerging potential as anti-obesity therapeutics are then reviewed.
The implication of brown adipose tissue for humans

ABSTRACT
We here discuss the role of brown adipose tissue on energy homeostasis and assess its potential as a target for body weight management. Because of their high number of mitochondria and the presence of uncoupling protein 1, brown fat adipocytes can be termed as energy inefficient for adenosine-5′-triphosphate (ATP) production but energy efficient for heat production. Thus, the energy inefficiency of ATP production, despite high energy substrate oxidation, allows brown adipose tissue to generate heat for body temperature regulation. Whether such thermogenic property also plays a role in body weight regulation is still debated. The recent (re)discovery of brown adipose tissue in human adults and a better understanding of brown adipose tissue development have encouraged the quest for new alternatives to treat obesity since obese individuals seem to have less brown adipose tissue mass/activity than do their lean counterparts. In this review, we discuss the physiological relevance of brown adipose tissue on thermogenesis and its potential usefulness on body weight control in humans.

Source

Calcium and vitamin D supplementation is associated with decreased abdominal visceral adipose tissue in overweight and obese adults

ABSTRACT
Women’s diets are of interest as they not only impact on wellbeing and risk of chronic disease in women themselves, but also influence pregnancy outcomes and infant health. UK dietary surveys show that, while some improvements have occurred, intakes of key micronutrients, particularly iron, vitamin D, calcium and folate remain below recommended levels. Women’s diets are also too high in saturated fat and salt, and low in fibre, oily fish and fruits and vegetables. Evidence suggests that certain chronic conditions are influenced by dietary components, e.g. inadequate calcium and vitamin D intakes reduce bone density, salt and saturated fat increase cardiovascular disease risk, excessive alcohol intakes increase cancer risk, low intakes of long chain n-3 fatty acids may adversely affect fetal development and mental health, while adequate folic acid reduces the risk of birth defects. Focused health initiatives are needed to improve diet quality in women, particularly school-aged girls, women planning a pregnancy, those living in areas of deprivation and elderly women. Vitamin and mineral supplements, and fortified foods may have a role to play alongside dietary improvements in helping women to achieve optimal diet quality.

Source

Increasing total fiber intake reduces risk of weight and fat gains in women

ABSTRACT
Research investigating fiber intake and changes in weight over time has not controlled for important covariates, especially physical activity. Moreover, studies have rarely examined the influence of fiber on changes in body fat, only weight. Hence, this study was conducted to determine whether changes in fiber intake (total, soluble, and insoluble) influence risk of gaining weight and body fat over time. Another objective was to examine the influence of age, energy intake, activity, season, and other potential confounders. A prospective cohort design was used and 252 women completed baseline and follow-up assessments 20 mo apart. Diet was measured using 7-d weighed food records. Fiber was expressed per 1000 kcal (4187 kJ). Body fat was assessed via the Bod Pod and physical activity was measured using accelerometers over 7 consecutive days. Across the 20 mo, almost 50% of the women gained weight and fat. For each 1 g increase in total fiber consumed, weight decreased by 0.25 kg (P = 0.0061) and fat decreased by 0.25 percentage point (P = 0.0052). Controlling for potential confounders did not affect the relationships, except changes in energy intake, which weakened the associations by 24-32%. Soluble and insoluble fibers were borderline predictors of changes in weight and fat. In conclusion, increasing dietary fiber significantly reduces the risk of gaining weight and fat in women, independent of several potential confounders, including physical activity, dietary fat intake, and others. Fiber’s influence seems to occur primarily through reducing energy intake over time.

Source

Using brown adipose tissue to treat obesity - the central issue

ABSTRACT
Current therapeutic strategies are proving inadequate to deal with growing obesity rates because of the inherent resistance of the human body to weight loss. The activation of human brown adipose tissue (BAT) represents an opportunity to increase energy expenditure and weight loss alongside improved lipid and glucose homeostasis. Research into the regulation of BAT has made increasing the thermogenic capacity of an individual to treat metabolic disease a plausible strategy, despite thermogenesis being under tight central nervous system control. Previous therapies targeted at the sympathetic nervous system have had deleterious effects because of a lack of organ specificity, but advances in our
understanding of central BAT regulatory systems might open up better strategies to specifically stimulate BAT in obese individuals to aid weight reduction.

Source

**Effects of energy-restricted high-protein, low fat compared with standard protein, low-fat diets: a meta-analysis of randomized controlled trials**

**ABSTRACT**

**BACKGROUND:**
It is currently unclear whether altering the carbohydrate-protein ratio of low-fat, energy-restricted diets augments weight loss and cardiometabolic risk markers.

**OBJECTIVE:**
The objective was to conduct a systematic review and meta-analysis of studies that compared energy-restricted, isocaloric, high-protein, low-fat (HP) diets with standard-protein, low-fat (SP) diets on weight loss, body composition, resting energy expenditure (REE), satiety and appetite, and cardiometabolic risk factors.

**DESIGN:**
Systematic searches were conducted by using MEDLINE, EMBASE, PubMed, and the Cochrane Central Register of Controlled Trials to identify weight-loss trials that compared isocalorically prescribed diets matched for fat intake but that differed in protein and carbohydrate intakes in participants aged $18$ y. Twenty-four trials that included 1063 individuals satisfied the inclusion criteria.

**RESULTS:**
Mean (GSD) diet duration was 12.1 ± 9.3 wk. Compared with an SP diet, an HP diet produced more favorable changes in weighted mean differences for reductions in body weight (20.79 kg; 95% CI: 21.50, 20.08 kg), fat mass (FM; 20.87 kg; 95% CI: 21.26, 20.48 kg), and triglycerides (20.23 mmol/L; 95% CI: 20.33, 20.12 mmol/L) and mitigation of reductions in fat-free mass (FFM; 0.43 kg; 95% CI: 0.09, 0.78 kg) and REE (595.5 kJ/d; 95% CI: 67.0, 1124.1 kJ/d). Changes in fasting plasma glucose, fasting insulin, blood pressure, and total, LDL, and HDL cholesterol were similar across dietary treatments ($P \geq 0.20$). Greater satiety with HP was reported in 3 of 5 studies.

**CONCLUSION:**
Compared with an energy-restricted SP diet, an isocalorically prescribed HP diet provides modest benefits for reductions in body weight, FM, and triglycerides and for mitigating reductions in FFM and REE.

Source

**Recent progress in the study of brown adipose tissue**

**ABSTRACT**
Brown adipose tissue in mammals plays a critical role in maintaining energy balance by thermogenesis, which means dissipating energy in the form of heat. It is held that in mammals, long-term surplus food intake results in energy storage in the form of triglyceride and may eventually lead to obesity. Stimulating energy-dissipating function of brown adipose tissue in human body may counteract fat accumulation. In order to utilize brown adipose tissue as a therapeutic target, the mechanisms underlying brown adipocyte differentiation and function should be better elucidated. Here we review the molecular mechanisms involved in brown adipose tissue development and thermogenesis, and share our thoughts on current challenges and possible future therapeutic approaches.

Source