

Parallel Session RTD Line 5 / Consumer Responses to Food Products

Lecture 6: Role of different proteins in energy homeostasis and body-weight regulation

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Abstract

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The role of relatively high-protein diets in energy homeostasis and body-weight regulation, encompasses effects on the high-protein diet related targets satiety, energy expenditure, and body composition.

With respect to satiety and energy intake, effects of casein-, soy-, whey with or without glycomacropeptide (GMP)-, alpha-lactalbumin-, or gelatin with or without added tryptophan (TRP) - protein breakfasts in two concentrations (25 and 10 percentage of energy) at a pre-determined sensitive time-point for lunch are compared. The proteins alpha-lactalbumin, gelatin, and gelatin+TRP appear to be 30-50% more satiating than the proteins casein, soy, whey, and whey-GMP and show a related 17-24% reduction of subsequent energy intake.

Subsequently, effects of casein (complete protein) and gelatin (incomplete protein) are compared, in single protein diets with either 25% or 10% of energy (En%) from protein with respect to energy expenditure, substrate balances and appetite profile over 24 hrs during a 36-h respiration chamber stay. The greater hunger suppression of the incomplete protein diet is confirmed; elevated energy expenditure at higher dosages do not differ; the complete protein diet shows higher protein anabolism, while in the incomplete protein diet gluconeogenesis may play a role.

Third, gluconeogenesis (GNG) is hypothesized to increase on a high protein diet, especially in the absence of carbohydrates. This process may be responsible for the increased energy expenditure at such a diet. After one and a half day in a randomized, crossover design with respect to consumption of a high protein carbohydrate free diet vs a normal protein diet in a respiration chamber, in energy-balance, endogenous glucose production (EGP) and fractional GNG are measured using infusion of [6,6-2H₂]glucose and ingestion of 2H₂O. Since the increase in resting metabolic rate on the high-protein diet appears to be a function of the increase in GNG, it is concluded that a major part of increased energy expenditure at a high-protein, carbohydrate-free diet is explained by increased gluconeogenesis.

With respect to body-composition effects, a high-versus normal protein diet consumed over 3 months in energy-balance, without changes in physical activity, appears to increase stimulated fat-oxidation, and increase fat-free mass at the cost of fat mass, independent of small, non-significant changes in body-mass or fitness. This indicates that a high-protein diet induced fat free mass sparing effect is also present in energy-balance.

Finally, effects on body-weight regulation of higher protein vs high protein diets are compared, using alpha-lactalbumin-, or gelatin-protein vs milk-protein in the additional part of the higher protein diets.

Effects on body weight development, body composition and metabolic parameters during weight loss and subsequent weight maintenance, while subjects kept their subject-specifically determined absolute high or higher protein-intake throughout, will be highlighted.