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High-Fat Diets Rich in Polyunsaturated Fatty Acids Counteract Catch-Up Fat during Nutritional Rehabilitation after Caloric Restriction

Raffaella Crescenzo*, Rosa Cancelliere, Arianna Mazzoli, Cristina Gatto, Francesca Bianco, Antonia Giacco, Abdul G. Dulloo, Giovanna Liverini and Susanna Iossa

University of Naples, Italy

Catch-up growth, a risk for later obesity and type-2 diabetes, is characterized by a higher rate of fat relative to lean tissue deposition. Using a rat model of refeeding after semistarvation, such catch-up fat has been shown to be primarily driven by suppressed thermogenesis and to be exacerbated by high-fat diets rich in saturated and monounsaturated fats. High-fat diets rich in polyunsaturated fatty acids (PUFA) seem to limit the excess fat deposition and improve glucose homeostasis; these anti-obesity effects being explained partly by a higher lean tissue deposition and partly by enhanced metabolic efficiency. To investigate whether changes in liver mitochondrial energetics and adipose tissue metabolism could underlie the enhanced energetic efficiency, that drives catch-up fat during refeeding after caloric restriction, rats were subjected to caloric restriction (50% of spontaneous intake) for 14 days and then re-fed for 2 weeks isocaloric amounts of low fat or high-fat diets, the latter differing only in PUFA content. We evaluated whole-body metabolism, hepatic lipogenic capacity and mitochondrial energetics, as well as modulation of de novo lipogenesis by the different fatty acids in white and brown adipose tissue, together with body composition, energy balance, glycemic profile, oxidative stress and markers of inflammation. High-fat high-PUFA diet was able to improve protein deposition and maintain glucose homeostasis, limiting lipid storage in adipose tissue and oxidative stress and inflammation in the liver. The suppression of thermogenesis is counteracted by PUFA also via increased thermogenesis, resulting from increased hepatic mitochondrial proton leak and decreased mitochondrial efficiency.

Biography:

Dr. Raffaella Crescenzo, born in Naples in 1970, graduated in 1997 in Biological Sciences at University of Naples "Federico II", Italy, obtained a PhD degree in Physiology, a postdoc position at University of Fribourg, Switzerland, and other two postdoc at University of Naples. She is now researcher of Physiology, in the Department of Biology of University of Naples. Her research is centered on study of whole-body energy balance and adaptive changes in tissue metabolism (liver, skeletal muscle, adipose tissue, gut, brain) in different conditions: high-fat and high-fructose feeding, food restriction, refeeding, ageing. The results produced 43 papers and 30 congress abstracts.