The role of anorexigenic and orexigenic neuropeptides and peripheral signals on quartiles of weight loss in obese adolescents

Lila Missae Oyama a,b, Claudia Maria Oller do Nascimento a,d, June Carnier a, Aline de Piano a, Lian Tock a, Priscila de Lima Sanches a, Fabíola Alvise Corrêa Gomes a, Sergio Tufik c, Marco Túlio de Mello a,c, Ana R. Dâmaso a,b,*

a Post Graduate Program of Nutrition, Federal University of São Paulo–Unifesp, Brazil
b Department of Biosciences, Federal University of São Paulo–Unifesp, Brazil
c Department of Psychobiology, Federal University of São Paulo–Unifesp, Brazil
d Department of Physiology, Federal University of São Paulo–Unifesp, Brazil

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Abstract

Obesity is characterized as an inflammatory state associated with a modification in the pattern of adipokine secretion. The present study aimed to assess the role of anorexigenic and orexigenic neuropeptides and peripheral signals in obese adolescents submitted to 1 year of weight loss interdisciplinary therapy and grouped according to quartiles of weight loss. A total of 111 post-puberty adolescents, with a BMI >95th percentile, were included. Glycemia and lipid profiles were analyzed. Insulin resistance was estimated by HOMA-IR. Cytokine concentrations were measured by ELISA. The results are presented according to quartiles of weight loss: 1st (<2.5 kg) = low; 2nd (2.5–8 kg) = low to moderate; 3rd (8–14 kg) = moderate; and 4th (>14 kg) = massive. The most important finding was that the NPY concentration increased significantly only in the first phase of weight loss. Moreover, α-MSH variation was an independent factor in explaining the NPY changes during the intervention, confirming the role of the α-MSH concentration in the peripheral control of energy balance in obese adolescents. Indeed, BMI reduction was correlated with increased α-MSH (p < 0.05). Massive weight loss promoted a significant increase in α-MSH concentration, and hyperleptinemia was reduced after intervention. All together, our findings, which contribute to our understanding of how orexigenic and anorexigenic systems are regulated by weight loss, will provide insight into the pathogenesis and treatment of obesity and other metabolic diseases, especially in obese adolescents.

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1. Introduction

Obesity is characterized as an inflammatory state associated with a modification in the pattern of adipokine secretion (Marra and Bertolani, 2009). The relevance of adipose tissue, particularly the expansion of visceral fat, is due to its important role in inflammation and its contribution to the pathogenesis of obesity-related disorders (Dyck, 2009).

The control of appetite and energy balance is a key biological process, and unraveling the complex system of peripheral and central signals involved represents a continuing challenge in physiology. Much recent progress has been made in identifying the central neuroendocrine pathways involved in the control of energy intake and expenditure (Trayhurn and Bing, 2006; Velloso, 2006).

In the central nervous system, the arcuate nucleus of the hypothalamus is crucial for feeding control and contains two interconnected groups of “first-order” neurons producing neuropeptide Y (NPY) and Agouti-related protein (AgRP), both important in orexigenic pathways, and pro-opiomelanocortin (POMC) and the cocaine- and amphetamine-regulated transcript peptide (CART), which are important in anorexigenic pathways. These hypothalamic circuits also affect secretion- and metabolism-regulating hormones. In turn, hormones from fat stores and other tissues, as well as other peripheral circulating signals, can regulate the response of NPY/AgRP (Trayhurn and Bing, 2006; Palou et al., 2009).