

New insights into the regulation of energy expenditure in skeletal muscle

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Body weight is determined not only by energy intake, but also by the rate at which energy is expended. Skeletal muscle is an important site of energy expenditure. Our recent work has demonstrated that skeletal muscle exhibits an increase in heat production after meal feeding. Molecular studies indicate that this increase in heat production is caused by enhanced adaptive thermogenesis in muscle. Thus, skeletal muscle displays physiological properties similar to brown adipose tissue and can expend energy *via* thermogenic processes. These changes in heat production are associated with changes in cellular metabolism or function and not due to changes in blood flow, since manipulated excursions in one parameter do not correlate with changes in the other. Central administration of leptin markedly enhances thermogenesis in muscle and fat tissues of the sheep. In this case, the primary drivers appear to be uncoupling proteins 2/3 and not uncoupling protein 1. In addition to the central control of thermogenesis, we have shown that direct infusion of alpha-melanocyte stimulating hormone (α MSH) into the femoral artery increases post-prandial thermogenesis. This work provides new insight into how the body expends energy, and is fundamental to our understanding of weight regulation. Furthermore, our studies clearly indicate a strong potential for skeletal muscle thermogenesis as a novel target in the development of anti-obesity drugs.