INTERNATIONAL MEDICAL PRESS

6th International Workshop on Adverse Drug Reactions and Lipodystrophy in HIV

25–28 October 2004 - Washington, DC, USA

NEUROENDOCRINE REGULATION OF ADIPOSE TISSUE

Antiviral Therapy **2004; 9(6):L1 (abstract no. P1)**

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Neuroendocrine research has altered the traditional perspective of white adipose tissue (WAT) as a passive store of triglycerides. In addition to fatty acids, WAT produces many hormones and can, therefore, be designated as a traditional endocrine gland. It has an important role in the conversion of androgens to oestrogens and in glucocorticoid metabolism. It also produces more recently identified hormones such as leptin, resistin and adiponectin. Many of these hormones have both central and peripheral effects upon intracerebroventricular administration. Leptin acts in the hypothalamic arcuate nucleus on POMC and NPY expressing neurons that project to the paraventricular nucleus. These neuropeptidergic pathways are involved in the neuroendocrine and behavioural response to starvation. Therefore, WAT actively participates in the integrative physiology of energy metabolism and eating behaviour. Conversely, WAT is controlled by humoral factors, para- and intracrine factors and by neural regulation. Sympathetic nerve fibres innervate WAT and stimulate lipolysis leading to the release of glycerol and free fatty acids. Earlier pharmacological studies have shown effects on glycerol output in human WAT through nicotinic and muscarinic receptors. Later studies in rats have clearly shown a functional parasympathetic innervation of WAT. Selective parasympathectomy induces insulin resistance with respect to glucose and fatty acid uptake in the denervated fat depot and has selective effects on local hormone synthesis. Thus, the CNS is involved in the regulation of WAT hormone production and hormone sensitivity. The parasympathetic brain stem nuclei display a distinct somatotopy: separate sets of autonomic neurons in the dorsal motor nucleus of the vagus innervate either the visceral or the subcutaneous fat compartment. Recent experiments show that this somatotopy extends to the hypothalamus. We therefore propose that the central nervous system (CNS) plays a major role in the hitherto unexplained regulation of body fat distribution. The developments in this research area are likely to increase our insights in the pathogenesis of metabolic

disorders such as type 2 diabetes mellitus and lipodystrophy syndromes. Specifically, the adipose tissue redistribution seen in HIV lipodystrophy may be mediated via the central nervous system.

2004-10-25
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