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## **Overfeeding, autonomic regulation and metabolic consequences.**

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### **Abstract**

The autonomic nervous system plays an important role in the regulation of body processes in health and disease. Overfeeding and obesity (a disproportional increase of the fat mass of the body) are often accompanied by alterations in both sympathetic and parasympathetic autonomic functions. The overfeeding-induced changes in autonomic outflow occur with typical symptoms such as adiposity and hyperinsulinemia. There might be a causal relationship between autonomic disturbances and the consequences of overfeeding and obesity. Therefore studies were designed to investigate autonomic functioning in experimentally and genetically hyperphagic rats. Special emphasis was given to the processes that are involved in the regulation of peripheral energy substrate homeostasis. The data revealed that overfeeding is accompanied by increased parasympathetic outflow. Typical indices of vagal activity (such as the cephalic insulin release during food ingestion) were increased in all our rat models for hyperphagia. Overfeeding was also accompanied by increased sympathetic tone, reflected by enhanced baseline plasma norepinephrine (NE) levels in both VMH-lesioned animals and rats rendered obese by hyperalimantation. Plasma levels of NE during exercise were, however, reduced in these two groups of animals. This diminished increase in the exercise-induced NE outflow could be normalized by prior food deprivation. It was concluded from these experiments that overfeeding is associated with increased parasympathetic and sympathetic tone. In models for hyperphagia that display a continuously elevated nutrient intake such as the VMH-lesioned and the overfed rat, this increased sympathetic tone was accompanied by a diminished NE response to exercise. This attenuated outflow of NE was directly related to the size of the fat reserves, indicating that the feedback mechanism from the periphery to the central nervous system is altered in the overfed state.

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