

TITLE*: OREXINS AND OREXIN-RECEPTORS EXPRESSION IN THE NEOCORTEX OF THE RAT: DEVELOPMENTAL STUDY

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ABSTRACT SUMMARY:

This study was undertaken in order to demonstrate the development of two hypothalamic neurotransmitters – Orexin-A and -B and their receptors (OR1 and OR2) in the brain of one-week old rats and adult animals. Our result clearly demonstrate that the brain of one week old rats already has orexinergic system, which is of crucial importance for the control of man processes, including attention, learning and memory.

INTRODUCTION*:

Orexin-A and -B are hypothalamic neuropeptides identified as endogenous ligands for G-protein-coupled receptors (OR1 and OR2) (Gautvik et al., 1996). Orexinergic neurons project their axons to various brain regions, including the cortex and other structures involved in learning and memory processes (Lin et al., 1999; Peyron et al., 2000). Data about development of the orexin system in the brain are contradictory and insufficient (Yamamoto et al., 2000); therefore in the present study we investigated the developmental distribution of orexin-A and -B neurons and fibers, as well as their receptors, in the brain of one-week old and adult rats.

EXPERIMENTAL METHODS:**

Experiments were performed on one week old and adult (12 weeks) Wistar rats. The immunohistochemical staining procedure was performed according to the ABC (avidin-biotin-horseradish peroxidase) method (Hsu et al., 1981). Free-floating fixed in 4% paraformaldehyde brain sections were incubation in primary antibodies against Orexin-A, -B, OR1 and OR2, followed by incubation in biotinylated secondary antibodies, ABC complex, and visualisation of the reaction with SG chromogen.

RESULT AND DISCUSSION*:

We demonstrated that a large subset of cells in the lateral hypothalamus and the perifornical and paraventricular areas were orexin-A and orexin-B positive, not only in adult rats but also in one-week old animals. Orexinergic neurons in one-week old rats were smaller in size and their arborizations were not well developed. In addition,

orexin-A and -B expressing neuronal varicosities were found in the cortex of young and adult animals. The vast majority of the cortical neurons expressed OR1 and OR2 receptors.

CONCLUSION*:

These results suggest that (i) the hypothalamic neurons of one-week old rats already show orexin-A and -B immunoreactivity; (ii) cortical neurons are directly innervated by orexinergic projections from the hypothalamus; and (iii) the function of the cortical neurons, expressing OR1 and OR2 may be directly modulated by orexin-A and -B.

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