

Role of osmosensitive neurons in the lateral preoptic area for the central mechanisms of thirst.

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Summary

Osmosensitive neurons in the hypothalamus are assumed to have a cardinal role in the central control of body water and salt homeostasis. The lateral preoptic area (LPO) of the hypothalamus is one of candidates of drinking centers. In the present study, we recorded activities of osmosensitive LPO neurons during drinking behavior. Non-osmosensitive LPO neurons were also recorded for comparison.

Adult male rats of Wistar strain were trained to drink water, 9% sucrose solution, and 0.93% NaCl solution under partial restraint with a head holder. During drinking behavior, activities of 105 LPO neurons were extracellularly recorded with a multibarrel pipette. Of these, neurons responded (excited or inhibited) to distilled water were most frequent (40%). On the other hand, neurons responded to sucrose and NaCl solutions were 23% and 24%, respectively. Five neurons responded specifically to distilled water. In contrast, 1 neuron responded specifically to sucrose and 2 neurons responded specifically to NaCl, although the difference was not statistically significant. Artificial cerebrospinal fluid solutions with different osmolalities with physiological range were ejected from the multibarrel micropipette to immediate vicinity of recorded neurons. Of 29 neurons tested, 3 were excited by hypertonic solutions or inhibited by hypotonic solutions. They were designated as a hypertonic cell. Two neurons were excited by hypotonic solutions and inhibited by hypertonic solutions, and designated as a hypotonic cell. Other 24 neurons were non-osmosensitive cells. One hypertonic cell specifically excited during distilled water intake, and one hypotonic cell specifically inhibited during intake of NaCl solution. These data support the idea that the LPO is involved in the central mechanisms of thirst.