

Activity of osmosensitive neurons in the lateral preoptic
area during the intake of salt solution

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Summary

Osmosensitive neurons in the hypothalamus are considered to have a cardinal role in the central control of body water and salt homeostasis. In the present study, we recorded activities of osmosensitive neurons in the lateral preoptic area (LPO) of the hypothalamus during drinking water, 0.93% NaCl, and 9% sucrose solution. Non-osmosensitive LPO neurons were also recorded for comparison.

Adult male rats of Wistar strain were trained to drink under partial restraint with a head holder. During drinking behavior, activities of 204 LPO neurons were extracellularly recorded with a multibarrel pipette. Of these, neurons responded (excited or inhibited) to water were most frequent (41%). On the other hand, neurons responded to sucrose and NaCl solutions were 23% and 30%, respectively. Eleven neurons specifically responded to water. In contrast, 1 neuron was sucrose specific and 3 neurons were NaCl specific. Artificial cerebrospinal fluids with various physiological osmolality were ejected from the multibarrel micropipette to immediate vicinity of recorded neurons. Of 66 neurons tested, 4 were excited by hypertonic solutions or inhibited by hypotonic solutions. They were designated as hypertonic cells. Eleven neurons were excited by hypotonic solutions and inhibited by hypertonic solutions, and designated as hypotonic cells. Other 51 neurons were non-osmosensitive cells. One hypotonic cell specifically inhibited during intake of NaCl solution. However, water specific neurons were more frequent (n=3) than the NaCl specific neurons among osmosensitive neurons. These data suggest that the LPO is involved in the central mechanisms of thirst, but not those of sodium appetite.