FOS EXPRESSION INDUCED BY LOCAL WARMING OR COOLING OF THE PREOPTIC AREA IN RATS

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The preoptic area plays an important role as a thermosensitive site for body temperature regulation: local warming or cooling there produces variety of thermoregulatory effector responses. To elucidate the functional projection from the preoptic area, we analyzed Fos expression during thermal stimulation of the preoptic area. Male specific pathogen-free crj-Wistar rat (300-350 g; Charles River Japan, Osaka Japan) was anesthetized with sodium pentobarbital (1 ml/kg, i.p.). A water-perfused thermode was clonically implanted into the brain so that its tip was positioned just rostral to the preoptic area (0.0 mm to bregma, 1.0 mm from midline and 8.8 mm below the skullface). Brain temperature was measured with a thin thermocouple glued to the thermode tip and body temperature with a thermocouple implanted in the peritoneal cavity. Throughout the recovery and experimental periods the rat was put in a box (30 cm in diameter, 30cm height), the floor of which rotated the same angle in the opposite direction to the rat's rotation, so that thermode tubes and lead wires were not twisted. In this box, a rat can move freely during brain thermal stimulation. During 140 min experiment room temperature was set at 26°C. The brain temperature was maintained at 37.5°C except the period from 60th to 90th min, when the brain was warmed to 42°C or cooled to 33°C. As soon as the brain warming or cooling started, body temperature decreased or increased, respectively. This indicates that the thermode was appropriately located at thermosensitive region in the preoptic area. At the 140th min rats were deeply anesthetized with sodium pentobarbital (2.5 ml/kg, i.p.) and perfused transcardially. Fos expression of the rat brain was analyzed with immunohistchemical method. The local warming of the preoptic area induced intensive elevation of Fos immunoreactivity around the thermode. On the contrary, the local cooling of the preoptic area did not produce any specific Fos expression in the preoptic area itself. These results suggest that the number of cold-sensitive neuron in the preoptic area is far smaller than warm-sensitive neurons. Outside the preoptic area, the local warming of the preoptic area produced intense elevation of Fos immunoreactivity in the supraoptic nucleus and the rostral part of the periaqueductal grey matter. The local cooling of the preoptic area produced Fos immunoreactivity in the anterior hypothalamus and the caudal part of the periaqueductal grey matter. These areas would receive information concerning local brain temperature of the preoptic area, and involve in some ways in thermoregulation.

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