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MEETING ABSTRACT

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Role of the central kappa opioid system in modulation of salt appetite through central and basolateral amygdala

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Background: It has been documented that endogenous opioid peptides, dynorphins, are important for maintaining hydro-mineral balances, by modulating thirst and salt appetite through central kappa opioid receptors. We have previously shown that an osmotic stimulus, such as dehydration, up-regulates the expression of the transcriptional factor Giot1, which in turn increases the expression of mRNA encoding the dynorphin precursor preprodynorphin in the hypothalamic paraventricular and supraoptic nucleus. These hypothalamic nuclei are directly projecting to the amygdala. Therefore, the aim of the present study was to investigate the role of kappa opioid receptors, located in the central amygdala and the basolateral amygdala, in the regulation of thirst and salt appetite.

Methods: Experiments were performed in 12-weeks-old male Wistar rats. Rats were bilaterally cannulated in the central amygdala or the basolateral amygdala for infusion of the selective kappa opioid receptor antagonist norbinaltorphimine (nor-BNI, 20 nmol) or saline (2 µl). Rats were randomized into two experimental groups and subjected to a salt loading protocol and a water deprivation–partial repletion protocol (WD-PR). In the salt loading protocol rats pretreated with nor-BNI were offered hypertonic saline solution for 7 days. In the water deprivation–partial repletion protocol rats were dehydrated for 36 hours and then partially rehydrated for 2 hours. This was followed by 2-hours-long salt appetite test.

Results: In salt-loaded rats, nor-BNI infused into the basolateral amygdala significantly decreased consumption of hypertonic saline solution, while infusion of nor-BNI into the central amygdala decreased the consumption of hypertonic saline in the WD-PR protocol.

Discussion: Under physiological conditions basolateral and central amygdala increase salt intake. After bilateral lesions of the basolateral amygdala sodium intake is inhibited. However, bilateral lesions of the central amygdala reduce spontaneous sodium intake, while water intake is unchanged. Our results show that central kappa opioid receptors in the amygdala nuclei, basolateral and central, modulate salt appetite and water intake in different manners in response to different osmotic stimuli, dehydration and salt loading. It follows that the central kappa opioid system triggers different mechanisms in different parts of the amygdala tuning salt and water intake, behavior associated with maintenance of hydro-mineral balance.

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