Physiological roles of TRPV4 as osmoreceptors in the central nervous system and its underlying mechanisms

Hiromi Tsushima[1)], Mayumi Mori[1)] and Akihiko Moriyama[2)]
[1)] Nagoya City University Graduate School of Medical Sciences;
[2)] Nagoya City University Graduate School of Natural Sciences

Summary

Intracerebroventricular (i.c.v.) injections of 4α-phorbol 13, 14-didecanoate (PDD), a TRPV4 agonist, decreased water intake under the basal condition during the light and dark phases in rats. Also an increased water intake accompanied with food intake after 16-h food deprivation was inhibited by PDD. However, PDD did not change an increased water intake after intragastric administration of hypertonic NaCl solution or 16-h water deprivation. Locomotor activity of the PDD-injected groups slightly decreased, compared with that of the vehicle-injected group. Sucrose intake, food intake or body temperature was not different between the PDD- and vehicle-injected groups. Plasma osomolality significantly increased after the 16-h water deprivation and NaCl-gastric administration, although the plasma osmolality after food deprivation did not change, compared the basal level during the light and dark phase. The antidipsogenic effects of PDD were blocked by pretreatment with ruthenium red or gadolinium. In addition, genistein (a tyrosine kinase inhibitor) and chelerythrine (a protein kinase C inhibitor) inhibited the effects. These findings suggest that TRPV4 is involved in the regulatory mechanisms of the physiological changes in body fluid osmolality mediated through water intake, and activation of tyrosine kinase and protein kinase C contribute to the regulation.