Role of large intestine in regulation of salt balance

Yuichi Suzuki
Lab. of Physiol., Sch. of Food and Nutr. Sci., Univ. of Shizuoka, Shizuoka

Summary

There is an amiloride-sensitive, electrogenic Na absorption in the distal colon, which is activated by a mineralocorticoid, aldosterone. The purpose of this study was to examine the role of cAMP in regulation of the electrogenic Na absorption in the colon. To this end, we measured short-circuit current (Isc) in hyperaldosteronic guinea pig distal colon mounted in Ussing chamber. In the presence of bumetanide in the serosal solution to inhibit electrogenic K and Cl secretion, 8Br-cAMP (0.3 mM) added to the serosal side caused a biphasic Isc responses: Isc decreased initially and reached bottom (60-79% of the baseline level) 20-40 min after the addition, and then increased gradually to the level above the baseline. A similar biphasic response was observed when forskolin (1mM) , an activator of adenylyl cylclase, or isoproterenol (1mM), a beta-adrenergic agonist, was added to the serosal side. All of these biphasic Isc responses were virtually abolished when tissue was treated with mucosal amiloride, indicating that they are mostly reflecting the change in the amiloride-sensitive, electrogenic Na absorption. The biphasic changes in electrogenic Na absorption induced by 8Br-cAMP were both mostly abolished by a nonspecific protein kinase inhibitor K252a. Okadaic acid, a protein phosphatase inhibitor, enhanced the initial inhibitory effect, but abolished the late stimulatory effect of 8Br-cAMP on the electrogenic Na absorption. Conclusion: cAMP initially inhibits and then stimulates the electrogenic Na absorption through the activation of protein kinases. Protein phosphatase may also play a role in regulation of Na absorption by cAMP.