Effects of amiloride and bumetanide on hyperpolarization after movement across the distal colon epithelium

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Abstract:
The aim of the paper was to define which transepithelial ion transport pathways were activated during stimulation by movement across the colonic epithelium. The experiments were performed with Ussing method on 241 specimens of isolated distal colon wall from 51 rabbits. The tissue was stimulated by a flux from peristaltic pump which caused transient hyperpolarization of the isolated tissue. In the control, the transepithelial potential difference (PD) and its changes during stimulation (dPD) were –3.16 ± 1.81 mV and –2.16 ± 0.99 mV, respectively. Preincubation of the tissue in the presence of amiloride diminished the PD and dPD by about 50% and 64%, respectively, and in the presence of bumetanide, both PD and dPD were lower by about 30%. The separate application either of inhibitors only to the stimulation fluid usually diminished the hyperpolarization. The combined inhibition of adrenergic (benextramine and timolol) and cholinergic (atropine and hexamethonium) transmission did not influence the hyperpolarization. It is summarized that hyperpolarization depends on electrogenic sodium currents in the presence of bumetanide or electrogenic chloride currents in the presence of amiloride. After simultaneous application of both inhibitors, small but significant hyperpolarization reaction occurred which was caused by yet unidentified ionic currents. Participation of the sodium and/or chloride ions in physiologically (without inhibitors) evoked hyperpolarization is variable and the two mutually excluding situations, when only one ion transport is responsible for the whole reaction, are extremes of the range of possibilities. Usually, both these ion currents participate in the hyperpolarization reaction.

Key words:
amiloride, bumetanide, colon wall, ion transport pathways, transepithelial potential difference, Ussing method