

ELECTROLYTE TRANSPORT AND CARBONIC ANHYDRASE ACTIVITY IN THE COLON OF AN HERBIVOROUS RODENT - THE VOLE

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Mechanisms of ion transport in the vertebrate colon, exhibits interspecies differences and distinguishes segmental heterogeneity along its longitudinal axis. The enzyme carbonic anhydrase (CA) is known to be involved in regional control of intestinal transport of electrolytes and short chain fatty acid (SCFA). In the present study, segmental difference in sodium and chloride transport mechanisms and CA activity in the intestine of the vole (*Microtus socialis*) were studied. Short circuit techniques were employed to measure potential difference (PD), short circuit current (Isc), tissue conductivity (G) and unidirectional Na⁺ and Cl⁻ fluxes across the proximal and distal segments of the colon. The electrometric method was used to measure CA activity in samples of homogenized tissues and blood. CA activity was determined as the time required for a saturated CO₂ solution to lower the pH of a 0.012 M Tris HCl buffer from 8.3 to 6.3 at 4 °C. In the proximal and distal colon, net Na⁺ flux was not significantly different from that of Cl⁻, and the combined fluxes were higher than the measured Isc. Amiloride (1 mM) resulted in a decrease in net Na⁺ and Cl⁻ fluxes, whereas no effect on the electrical parameters was recorded. Amiloride added at a low concentration (0.1 mM, known to inhibit Na⁺ channels) had no effect on any of the tissue parameters. Employing Cl⁻ or Na⁺ free solutions, significantly reduced net Na⁺ and Cl⁻ fluxes as well as tissue PD. When HCO₃⁻ free solutions were used Na⁺ and Cl⁻ fluxes, Isc PD and G were significantly reduced in the proximal colon but not in its distal part. The results suggest that parallel exchangers for Na⁺/H⁺ and Cl⁻/HCO₃⁻ underlay the colonic electroneutral transport mechanism for Na⁺ and Cl⁻. In addition, a Na-Cl cotransporter is present in the proximal colon only. The activity of CA along the intestine was determined in samples of homogenized tissues. CA activity was the highest in the proximal colon amounting to 44.4 ± 3 EU/mg significantly lower values of 19.7 ± 2.2 and 33.3 ± 3.2 were recorded in the distal colon and in the cecum respectively. CA amounted to only 3.3 ± 0.6 and 2.9 ± 1.3 EU/mg in the Jejunum and Ileum respectively. In the colon of the vole, carbonic anhydrase, plays an important role in supplying H⁺ and bicarbonate ions for the various transport systems.