1. The CAH activity of the small and large intestine and its relationships to HCO$_3^-$ and Cl$^-$ transport were studied. The CAH activity of the mucosa was studied by histochemical and biochemical techniques, and HCO$_3^-$, Cl$^-$ and water transport were studied using an in vitro intestinal sac preparation or an in vivo ligated loop preparation. The effects of the CAH inhibitor acetazolamide (Diamox) on CAH activity and on ion and water transport were also studied.

2. Similar results were obtained for CAH activity from both histochemical and biochemical studies. The proximal colon had the highest total CAH activity and next in order were the lower ileum, the duodenum and finally the jejunum. The percentage inhibition with Diamox was greatest with the lowest initial CAH activity.

3. In in vivo experiments HCO$_3^-$ was actively secreted into the lumen of all intestinal segments, except the colon where it appeared to move passively. Chloride was absorbed from all segments. As the luminal [HCO$_3^-$] and [Cl$^-$] were reciprocally related, it is probable that a HCO$_3^-$ - Cl$^-$ exchange took place, except in the colon.

4. In the in vivo experiments fluid was secreted into the duodenum and proximal colon and absorbed from the jejunum and ileum. Inhibition of CAH activity by Diamox reduced the net fluid movement, whether
absorption or secretion, and it also reduced the change in luminal \( [\text{HCO}_3^-] \) and \( [\text{Cl}^-] \) at a given initial \( [\text{HCO}_3^-] \). Again the proximal colon was the exception because Diamox caused this tissue to secrete \( \text{HCO}_3^- \) so that the luminal \( [\text{HCO}_3^-] \) was greater than the plasma level. Diamox also increased the luminal \( [\text{Cl}^-] \) at a given initial \( [\text{HCO}_3^-] \).

5. No clear cut correlations could be found between the sites or amounts of CAH activity in gut mucosa and the transport of \( \text{HCO}_3^- \) and \( \text{Cl}^- \). Apparently CAH was involved in water and ion transport as seen in the Diamox experiments, particularly in the colon where the drug seemed to unmask a \( \text{HCO}_3^- \) transport system.
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