

# Acid Base Online Tutorial



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## GI Hydrogen Loss and Reduction in ECV

GI Hydrogen Loss  
and Reduction in  
ECV

Contraction Alkalosis  
and Hypokalemia

Posthypercapnia and  
Mineralocorticoid  
Excess

Diagnosis and  
Treatment of  
Metabolic Alkalosis

Loss of hydrogen ions leading to metabolic ~~acidosis~~ <sup>alkalosis</sup> most commonly occurs via the GI tract in the form of **vomiting** or **nasogastric suction**. Gastric juice contains a high concentration of HCL and lesser concentration of KCL. Each meq of H<sup>+</sup> ion secreted generates 1 meq of HCO<sub>3</sub><sup>-</sup> which is then absorbed in the plasma. Under normal conditions the increase in the plasma HCO<sub>3</sub><sup>-</sup> concentration is only transient, since the entry of acid into the duodenum stimulates an equal amount of HCO<sub>3</sub><sup>-</sup> secretion from the pancreas. However there is no stimulus to HCO<sub>3</sub><sup>-</sup> secretion if gastric juice is removed during vomiting and NG suction. The net result is an increase in the plasma [HCO<sub>3</sub><sup>-</sup>] and metabolic alkalosis.

Under normal conditions, the excess HCO<sub>3</sub><sup>-</sup> generated would be excreted in the urine by the kidney and thus alkalosis would not be maintained. However vomiting or nasogastric suction also results in a decrease in the extracellular fluid compartment and the effective circulating volume (ECV). The reduction in the ECV leads to decreased GFR (less bicarb filtered), and also serves as a stimulus to increase angiotensin and aldosterone production leading to an increase in Na and HCO<sub>3</sub><sup>-</sup> reabsorption by the proximal tubules. An increase in Na reabsorption leads to increased HCO<sub>3</sub><sup>-</sup> reabsorption because of the increase in hydrogen secretion as Na is exchanged for H<sup>+</sup> across the Na-H<sup>+</sup> transporter in the proximal tubule. The secreted hydrogen ions combine with filtered HCO<sub>3</sub><sup>-</sup> leading to reabsorption as previously described. **Aldosterone primarily acts distally to increase H<sup>+</sup> and K secretion resulting in increased acid and potassium excretion.** The net result is a hypokalemic metabolic alkalosis. The almost complete reabsorption of HCO<sub>3</sub><sup>-</sup> in the setting of reduced ECV, leads to the **paradoxical finding of an acidic urine** despite the presence of extracellular alkalosis.

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