Acid Base Online Tutorial

University of Connecticut

Daily Acid Load

The daily acid load is constituted by one's diet, and is comprised primarily of foods containing acid, and the production of acid as a result of metabolism. The intake of alkali containing foods and the production of alkali as a result of metabolism offsets the daily acid load but the net effect is daily addition of acid to the body that must be **buffered** and **excreted** to maintain acid base balance.

There are 2 types of acids that can potentially contribute to the daily acid load**; carbonic** or **volatile acid** (**H_2CO_3**) and **noncarbonic** or **nonvolatile acids**.

Carbonic acids

Metabolism of fats and carbohydrates result in the production of 15-20 mol of CO_2 per day. Before elimination by the lungs, most of the CO_2 is taken up by red blood cells, reacting with H_2O to form carbonic acid as shown below:

$$\mathbf{CO_2 + H_2O \leftrightarrow H_2CO_3(CA) \leftrightarrow H+ \ + HCO_3^-}$$

where (CA) is the very important enzyme **carbonic anhydrase**.

Intracellularly, carbonic acid dissociates to form hydrogen and bicarbonate ions. The latter is pumped out of the cell into plasma. At the alveoli, bicarbonate ions re-enter the RBC and the above equation is driven to the left, re-producing CO_2 which is then eliminated by the lung.

Under normal circumstances, CO_2 produced via metabolism is primarily eliminated via alveoli ventilation. Any increases in CO_2 production is matched by an increase in alveolar ventilation leading to a stable PCO_2 level.

Nonvolatile Acids	Volatile Acids (H_2CO_3)
Metabolism of amino acids, producing HCL and H_2SO_4	**Metabolism of fats and carbohydrates producing CO_2**

Intake of acid containing foods- sulphates, phosphates	
Daily loss of alkali in feces (minimal unless diarrhea)	

Noncarbonic acids

Noncarbonic acids on the other hand are primarily derived from the metabolism of proteins and dietary intake of foods containing sulphates (H_2SO_4) and phosphates ($H_2PO_4^-$) and are primarily responsible for the daily acid load that requires excretion by the kidneys.

A normal diet results in the generation of 50 -100 meq of H+ per day. Most of this comes from the metabolism of sulphur containing amino acids such as cysteine and methionine which yield sulphuric acid and from metabolism of lysine, arginine and histidine which yield hydrochloric acid.

Ingestion of alkali containing foods (e.g. citrate), and metabolism of amino acids such as aspartate and glutamate that lead to alkali production offset the daily acid load but the net effect is daily acid addition.

Click next to continue.

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