**Acid / Alkaline Buffering Systems**

*The body’s pH Buffer systems correct both excess acidity and alkalinity, but here the focus is on acid-buffering systems, since over-acidity in the body is the “problem of the day”*

**Overview of Body’s Acid- Buffering Systems**

- The body’s first step to counter acidosis - is to try and buffer excess acid with alkaline mineral bicarbonates in the blood and lungs.

- If sufficient alkalizing minerals are unavailable - the body begins to sweep the extra acids into the tissues, especially muscles and joints. This is known as lactic acid ‘buildup’ and is experienced as pain.

- If all else fails - the body will precipitate acids out of solution in the form of solid crystals and salts, realized as gallstones, kidney stones, uric acid crystals, plaque, and cholesterol crystals.

**Technical Details of Body’s Acid Buffering Systems**

- An acid buffer is made up of a buffering pair:

  (a) A weak acid (capable of donating a H+ and thus lowering pH);

  (b) The acid’s conjugate base (Capable of accepting H+, and thus raising pH)

- An acid-buffering system is likened to a sponge which soaks up H+ ions - When an acid is added to a solution, the pH change can be minimized by the adequate presence of buffers, and to have this effect, *acid buffers have to be a weak acid themselves.*

- For example, carbonic acid (H2CO3) is an acid buffer: Since carbon dioxide and water are the principal end products from carbohydrate, protein and fat breakdown, carbon dioxide (CO₂) is the most abundant acid-forming substance produced by the body. CO₂ + water (H₂O) in the blood forms *carbonic acid (H₂CO₃)* a weak acid which
ionizes to give H⁺ (hydrogen ion) and HCO₃⁻ (bicarbonate ion). The \textit{H⁺ in strong acids are completely dissociated}, but the \textit{H⁺ in weak acids are only partially dissociated} and are efficient at preventing pH changes.

\textbf{3 main acid / alkaline buffer systems}

- In functional equilibrium with each other, there are three main buffer systems contributing to the regulation of the acid-base balance:
  
  \begin{enumerate}
  \item \textbf{Chemical Buffer Systems} - in blood, lymph, and intra/extracellular fluids;
  \item \textbf{Respiratory Compensation} (Gaseous exchange in the lungs) – breathing out CO₂ deals with much of our acid excess.
  \item \textbf{Renal Mechanisms} (Excretory functions of the kidneys) - the kidneys serve primarily to excrete protons created during the breakdown of different acids. This excretory system is needed because the typical diet tends to present more H⁺ ions (protons) than alkalizing substances that might neutralize them.
  \end{enumerate}