

Acid-Base Chemistry and Medicine

Normal human blood pH is 7.4 and has a narrow range of about +/- 0.2 units. If blood pH goes too low (more acidic) or too high (more basic or alkaline), it can cause severe problems and even death (might recover if pH gets down to 6.9 and it is treated promptly but unlikely to live if as low as 6.8).

Various diseases or situations can cause blood pH to be
too acidic (called **acidosis**)
or too basic or alkaline (called **alkalosis**)

These causes can be
associated with chemical interactions in your body (**metabolic**)
or related to lung and breathing problems (**respiratory**)

Examples of 4 possible combinations of above are:

1) **Metabolic Acidosis**

Diabetes - if uncontrolled and there is too little insulin, then free fatty acid molecules are released into the blood and broken down for energy. Three molecules are produced as by products of this metabolism – acetone and two carboxylic acids and these can cause the blood to be too acidic.

Renal Failure - kidneys do not clear out chemicals and amounts of acids build up.

2) **Metabolic Alkalosis**

Severe Vomiting - cause loss of stomach acid and as the body replaces this acid and fluid levels decrease, the blood becomes too basic

3) **Respiratory Acidosis**

COPD (chronic obstructive pulmonary disease) - lungs damaged from, for example years of smoking, cannot exhale CO₂ effectively so CO₂ levels increase in blood and the increase in CO₂ causes equilibrium below to shift to the right (remember Le Chatelier's Principle) and so the blood becomes too acidic



Drug Overdose - can lead to extremely shallow breathing where CO₂ is not exhaled well and as in the COPD example, the blood becomes too acidic

4) **Respiratory Alkalosis**

Breathing too rapidly due to severe pain or panic can cause too much CO₂ to be exhaled and as it is removed the equilibrium below shifts to the left and blood becomes too alkaline



If you want to know much more about acid-base chemistry and medicine as might be important in medical school then go to site below:

<http://www.acid-base.com/index.php>