



## **1. Summary - How to Minimise Excess Acid and Carbon Dioxide Concentrations**

Carbon dioxide is a well known greenhouse gas. It exists in the normal atmosphere at a very low concentration (0.03 percent). Biologically, it is a destructive and toxic gas that is produced in high concentrations inside the body cells of humans and other animals as a consequence of the metabolism of food. Average humans produce in their cells a total of half to one kilogram of carbon dioxide per day. This carbon dioxide is carried to the lungs via the blood and is breathed out into the atmosphere.

The carbon dioxide produced in body cells is destructive and toxic to cells because carbon dioxide is a partially-charged polar molecule that reacts with water to form acids (strictly, protons). Body cells are seventy-five percent water and the body is sixty percent water overall. The destruction and toxicity caused by carbon dioxide occur in body cells before the body can either control carbon dioxide physiologically by intracellular and extracellular chemical buffers or eliminate carbon dioxide physically by exhalation from the lungs.

The acids formed from carbon dioxide contribute to fatigue and they are considered also to be involved directly with the causes of ageing and senescence. That is, carbon dioxide and the acids it forms are considered to be involved directly in the ageing process. In nature, animals that have evolved processes that quickly and efficiently eliminate carbon dioxide and acids from their bodies live extraordinarily long and energetic lives. Some of these animals show negligible signs of senescence and die from accident, starvation or predation rather than from old age. They may be potentially immortal.



The damaging effects of excess carbon dioxide and acid in the body can be minimised by an integration of several approaches. Four of these approaches are described below:

i. Decrease carbon dioxide production in body cells. That is, diminish the intake of high-calorie foods that are readily absorbed into the body and are readily metabolised to carbon dioxide and acids such as refined carbohydrates, fats and alcohol. Increase the consumption of high-fibre foods that are not readily absorbed into the body and hence are not readily metabolised. In other words, follow nutritionists' advice and eat nutritious, high-fibre foods. Avoid chronic stress. Stress increases the metabolism of some tissues and the destruction of peripheral fat and muscle. This increases the production of carbon dioxide and acids in the body.

ii. Increase the elimination of carbon dioxide from the body. This can be achieved in a number of appropriate ways. In particular, an increase in carbon dioxide elimination occurs as a consequence of regular exercise. The resultant increases in blood vessel diameters and in tissue capillary numbers that occur with regular exercise help to remove carbon dioxide from the tissues. Exercise also increases ventilation in the lungs which increases the elimination of carbon dioxide from the body. Avoid excess travel in aircraft. Aircraft travel increases carbon dioxide concentrations in tissues by a diminution of the Haldane effect. The Haldane effect is the displacement of carbon dioxide from haemoglobin in red blood cells by oxygen concentrations. The Haldane effect is diminished in an aircraft cabin which is pressurised only to the equivalent height of two to three thousand metres and contains recycled air. Avoid the breathing of recycled air in modern office buildings. Recycled air is low relatively in oxygen concentration and high relatively in carbon dioxide concentration. Recycled air diminishes the carbon dioxide concentration gradient between the lungs and the atmosphere.

iii. Drink adequate amounts of water. Water intake hydrates body cells and dilutes intracellular and extracellular carbon dioxide and acid concentrations. Preferably, water should be consumed that contains appropriate 'hard' mineral complexes of bicarbonate (such as magnesium bicarbonate).

iv. Neutralise excess carbon dioxide and acid concentrations in body cells. This is achieved by the consumption of water that contains appropriate mineral complexes of magnesium bicarbonate. With the consumption of water that contains magnesium bicarbonate, the bicarbonate is able to enter body cells to neutralise carbon dioxide and acid concentrations before any intracellular destruction occurs. When strenuous physical activities are undertaken, such as competitive sport, magnesium bicarbonate protects the natural organic and inorganic phosphate buffers inside muscle cells. This minimises fatigue caused by acidity. Energy and performance are enhanced.