



8. Appendix

It is known that mitochondrial dysfunction in body cells is correlated often to cell pathology, to cell death and to a decrease in life span per se. Magnesium bicarbonate has direct beneficial effects on the maintenance of the optimum thermodynamic and kinetic processes in mitochondria in body cells: magnesium bicarbonate keeps mitochondria functional. This gives an explanation for the increase in cell energy, the increase in cell life and the increase in life span that occurs with the appropriate consumption of magnesium bicarbonate.

The mitochondrial respiratory chain (electron transfer or transport chain) in human cells functions optimally at a redox potential difference of about 1.16 volts between the NAD^+/NADH couple and the $\text{O}_2/2\text{H}_2\text{O}$ couple: where NAD^+/NADH is nicotinamide adenine dinucleotide oxidised and reduced. This 1.16 volt redox potential difference is affected detrimentally by any increase in carbon dioxide concentrations, any increase in proton concentrations, any alteration in the NAD^+/NADH concentration ratio, and any alterations in the concentration of oxygen or the atmospheric partial pressure of oxygen.

Magnesium bicarbonate maintains an optimum redox potential difference in mitochondria by preventing the excess production of protons from carbon dioxide concentrations. Similarly, magnesium bicarbonate maintains an optimum electrochemical concentration gradient across the inner mitochondrial membrane. In other words, by neutralising the potentially damaging effects of carbon dioxide, magnesium bicarbonate optimises the transduction of energy from electrons to ATP concentrations: including optimising the expulsion (pumping) of protons by the respiratory chain from the mitochondrial matrix. Magnesium bicarbonate helps to maintain the appropriate displacement from equilibrium of the essential substrates involved in all the energy production processes in mitochondria. Mitochondrial function is maintained. Cell energy is maintained. Cell life is maintained.

Life span (life expectation) is increased.

In addition, magnesium bicarbonate optimises the conditions in mitochondria for the secondary transport of substrates, products and cations. In particular, magnesium bicarbonate optimises the conditions for electroneutral hydroxide antiport across the inner membrane. This optimises the availability to the mitochondrial matrix of pyruvate and phosphate and assists the mitochondria in its protecting of the cell from excess (pathological) calcium ion concentrations.