Abstract of a Lecture given at the **3rd World-Congress on „Cellular and Molecular Biology“,** 8-13 Oct 2000, Jena, Germany. An interdisciplinary conference...
Congress Vol .46/2000. Editor:R.Wegmann,Paris

ELECTROPHYSIOLOGY AND THERMODYNAMICS OF MITOCHONDRIA

Reinhold KIEHL

Laboratory and Research for Molecular Medicine/Biology (RKI),
Saliterweg 1, 93437 Furth im Wald/FRG, faxnumber: 0049-9973-801057

The research performed during the last 20 years lead inevitably to the formulation of the mitochondrial F_0F_1-complex as coupled K^+/H_2O-pump (similar to the nAChR) with H^+/P_i^--inducible ATPsynthase as well as to the respiratory chain substrate driven K^+/H^+-antiport system. These systems are linked together in anticyclic energy driven K^+/H_2O, H^+/P_i^--movements and oscillations (swelling plus contraction of the mitochondrial matrix space by osmotically active K^+-ions), controlled by O_2 and the free Mg^{2+} - and Ca^{2+}-concentrations in the cytosol of the cells. The system is responsible for the thermoregulation of our body. - The cyclic hydrolysis/synthesis of ATP and the concomitantly cyclic release/binding of Mg^{2+} in the "steady state flow system" releases heat (q) and the temperature (ΔT) is permanently raised. The released heat is constantly distributed throughout the entire body by the oscillating mitochondria, as well as the pumping heart, and is used up by the normal body functions. Disturbances of this system are normally compensated for by lower/higher respiration rates. The essentially by iron and is state of oxidation dependent H^+/e^- displacements, current (i), lead to high local voltages (ΔV) over the membrane with corresponding magnetic fields (H). The entire system is dependent on oxidized and reduced glutathione.