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Effects of Li⁺ on isolated rat heart mitochondria

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Swelling, state 4, state 3, and 2,4-dinitrophenol (DNP)-stimulated respiration as well as the membrane potential (Ψ_{mito}) of Li⁺-loaded rat heart mitochondria (LiRHM) were studied. The Li⁺ loading of rat heart mitochondria (RHM) resulted both in increase of passive permeability of the inner mitochondrial membrane (IMM) to H⁺ or K⁺ ions and in decrease of activity of the mitochondrial Na⁺/H⁺ exchanger. In comparison to RHM, energized LiRHM weaker pumped out protons from the matrix and demonstrated more potent uptake of K⁺ from an incubation medium. State 3 and 2,4-dinitrophenol (DNP)-stimulated respiration as well as the membrane potential ($\Delta\Psi_{\text{mito}}$) of LiRHM in KCl or LiCl media were the same that the parameters found in experiments with RHM. It is supposed that negligible influence of Li⁺ on the respiration can be possible resulted in that Li⁺ unlike Na⁺ does not decrease activity of mitochondrial respiratory enzymes. It is discussed that diminution of contractile parameters of heart preparations after replacement in Ringer solution of NaCl by LiCl can be related to influence of LiCl on trigger extension in cardiac muscle but not to effects of LiCl on energy supply of excitation-contraction processes in a heart.