THE MITOCHONDRIAL MEMBRANES – COMPOSITION, FUNCTIONS. NEW DATA.

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Introduction. The outer and the inner membranes of mitochondria are of great importance for existence and functioning of the organelles. The membranes differ as to the composition, structure and functions very much. So the outer mitochondrial membrane (OMM) is easily permeable to ions and molecules with molecular weights less than 10 kDa, but not to most proteins. The OMM is 6-7 nm in thickness, has no protrusions and invaginations. The inner mitochondrial membrane (IMM) is 6-8 nm thick, impermeable to ions and vast amount of molecules without special mechanisms, it has many convolutions (cristae) directed into the matrix. Such convolutions enlarge the IMM surface to a great extent.

Aim. For better understanding of the functions of both membranes we should have a closer look at their specific chemical composition. Almost all cholesterol is present in the OMM, stiffening the membrane. The IMM contains practically no cholesterol and has a high fluidity. In contrast, such phospholipid as cardiolipin is located only in the IMM, mostly (70-75%) in the matrix layer of the membrane. On the whole, quantity of phospholipids per unit of protein in the OMM is greater (2 or 3 times) than it is in the IMM, which may be easily explained by the difference in protein content – 50-60% in the OMM versus 70-75% in the IMM.

Discussion. The OMM is very rich in the special integral protein – porin, which β-sheets are arranged in channels to pass ions and molecules. Thus, the OMM is a barrier for large molecules only, and it possesses relatively little enzymatic activity. For instance, acyl-CoA-synthetase, phospholipase A_2, monoamine oxidase and kynurenine hydroxylase were found out on the OMM. In general, the main function of the OMM is to separate the mitochondrion from the cytoplasm. The IMM is much more complicated as to structure and functions. So phospholipids in the IMM are rich in unsaturated fatty acids facilitating its fluidity at physiological temperatures. Most proteins of the IMM are transporters, components of the 4 mitochondrial respiratory chain complexes or subunits of the ATP synthase, which resembles “tiny mushroom” on shape. The proteins of the IMM are to fulfill mainly transport and catalytic functions in the membrane.

Conclusion. A big difference between the mitochondrial membranes is obvious. If the OMM primarily delimits the mitochondrion, and large molecules do not pass it through, the IMM is freely permeable to small, uncharged molecules only. The transport and the oxidative phosphorylation are the main functions of the IMM.