

## **TOM-TIM RECEPTOR SYSTEM SUPPLIES THE MITOCHONDRIA WITH IMPORTED PROTEINS**

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Most structural and functional mitochondrial proteins are encoded by the nuclear DNA and are synthesized outside the organelles. Such pre-proteins should be first of all recognized by the corresponding membrane receptors, and then be transported into the organelle. Both mitochondrial membranes contain translocase complexes – the TOM complex (outer membrane), and the TIM complex (inner membrane). These complexes usually interact with each other to supply the mitochondrion with incoming pre-proteins, but can also act independently. The TOM-TIM-complexes at the same time exhibit receptor functions.

It has been shown that the TOM complex is represented in the outer mitochondrial membrane more largely than the TIM complex in the inner membrane. The first complex is thought to have up to 9 protein subunits: from Tom72 to Tom5 (figure means molecular weight). The second complex may contain up to 11 subunits: from Tim54 to Tim8. The TOM complex components are located in the membrane not far from one another. Some special structural elements – domains – play a key part in the interaction of subunits. For example, Tom37 and Tom20 contain one tetratricopeptide repeat (TPR-motif), whereas Tom70 and Tom72 include seven TPR-motives each. Literature data point out that the TOM complex contains various quantity of the main subunits in different species: e.g. 0-1.5 Tom70, 4-8 Tom40, 3-6 Tom22. This complex realizes its receptor function through such units acting together in certain combinations. So, the 120-kDa sub-complex from the yeast was identified as a Tom70-Tom37-receptor. Due to electron microscope it has been ascertained that the TOM complex subunits may form triplets of circular structures with a diameter of about 138 angstroms, as well as doublet or singlet circular structures.

As usual, during the translocation a protein-precursor sews together both mitochondrial membranes. For further import of this precursor protein a formation of so-called translocational contact site – site of import – occurs.

Before the pre-protein is inserted into the inner mitochondrial membrane it is bound to a complex of low molecular weight subunits Tim9-Tim10 that possesses a chaperone-like function and the homologous Tim8-Tim13 complex also maintains the process of precursor translocation. Then the pre-protein is delivered to the insertion machinery represented by the TIM22 complex, which functions as a carrier translocase, and its analogue – the TIM23 complex.

Thus, the TOM and TIM complexes of the mitochondrial membranes fulfil three important biological functions regarding to imported precursor proteins. They recognize pre-proteins, translocate them via membranes, and insert these proteins into the structure of mitochondrion.