Researchers discover a new basic principle of the mitochondria architecture

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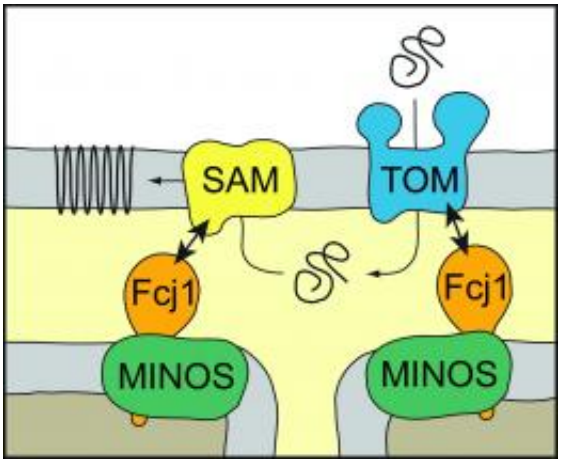

The protein complex MINOS plays a key role in the formation of the two membrane systems of mitochondria. MINOS is necessary for the architecture of the inner membrane and helps TOM and SAM embed proteins in the outer membrane by forming membrane bridges. Credit: Ralf Zerbes

A team of scientists at the University of Freiburg led by Dr. Martin van der Laan has achieved groundbreaking new insights into the structure of mitochondria. Mitochondria are the microscopic power plants of the cell that harness the energy stored in food, thus enabling central life functions. This conversion of energy takes place in delicately formed cavities of the biological membranes inside mitochondria. Defects in these fine membrane structures can lead to severe diseases of the muscles and the central nervous system. A sophisticated molecular

machine of the inner membrane that the Freiburg team already discovered in 2011 is not only responsible for forming the characteristic structures within mitochondria but evidently also plays an important role in assembling the outer membrane enclosing these organelles, as the scientists now report in the renowned journal *Molecular Biology of the Cell*.

The protein machine studied by the scientists is essential for maintaining the typical architecture inside the mitochondria and have thus received the name "Mitochondrial Inner Membrane Organizing System" (MINOS). In their latest study, the Freiburg researchers and their colleagues in Graz, Austria, Warsaw, Poland, and Groningen, Netherlands, demonstrate that the role of MINOS in creating the mitochondrial architecture is clearly more extensive than previously assumed. In a joint research effort between the Collaborative Research Center 746 and the Cluster of Excellence Centre for Biological Signalling Studies (BIOSS), Dr. Maria Bohnert, Lena-Sophie Wenz and Ralf Zerbes found out how MINOS connects the distinct membrane systems of the mitochondria with each other.

The membrane complexes SAM and TOM play a key role in this process. They use tunnel-shaped structures to transport proteins into the mitochondrion and then embed them in the outer membrane. In their latest study, the Freiburg scientists demonstrate that the MINOS component Fcj1 of the Mitofilin protein family participates directly in this process, which is essential for the survival of the cells. The inactivation of Fcj1 inhibits the integration of proteins into the mitochondrial outer membrane. These findings show how molecular switches affecting the connectivity of mitochondrial membranes control the assembly and function of the cellular power plants. These newly gained insights improve our understanding of the basic principles of the architecture of mitochondria. In the future they could help scientists to understand and influence mechanisms of diseases that involve changes in

the fine structure of mitochondria.

More information: Bohnert M, Wenz LS, Zerbes RM, Horvath SE, Stroud DA, von der Malsburg K, Müller JM, Oeljeklaus S, Perschil I, Warscheid B, Chacinska A, Veenhuis M, van der Klei IJ, Daum G, Wiedemann N, Becker T, Pfanner N, van der Laan M: "Role of MINOS in protein biogenesis of the mitochondrial outer membrane", in: Molecular Biology of the Cell, published online August 23, 2012. www.molbiolcell.org/content/ea … 8/20/mbc.E12-04-0295

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