About mitochondrial importWhile the mitochondrial genome encodes a handful of proteins, most of the hundreds of proteins that reside in the mitochondrion are encoded by nuclear genes, translated in the cytoplasm, and imported into mitochondria via a series of complex molecular machines. Many of the proteins imported into mitochondria are involved in respiration, which is not an essential process: S. cerevisiae is able to carry out either fermentative growth on carbon sources such as glucose, or respiratory growth on nonfermentable carbon sources such as glycerol and ethanol. However, since maintenance of the mitochondrial compartment is essential to life, mutations that completely disrupt mitochondrial import are lethal.About the Inner Membrane ProteaseMost proteins undergo proteolytic processing upon import into mitochondria, and multiple proteases cleave different subsets of these proteins. The Inner Membrane Protease, IMP, processes some proteins that are translocated from the mitochondrial matrix into the intermembrane space. IMP consists of three subunits: Imp1p, Imp2p, and Som1p. Both Imp1p and Imp2p are catalytic subunits and share 25% identity, though each protein has distinct substrate specificities. Among the substrates of Imp1p are the precursors to NADH-cytochrome b5 reductase, cytochrome b2, FAD-dependent glycerol-3-phosphate dehydrogenase, and the mitochondrially encoded subunit II of cytochrome c oxidase, while the only known substrate of Imp2p is cytochrome c1. In addition to its catalytic activity, Imp2p is also required for the stable expression of Imp1p. Som1p is a noncatalytic subunit that has been proposed to have a role in substrate recognition and correct functioning of Imp1p; it is required for processing of Cox2p and Mcr1p, and the som1 mutation reduces processing of Cyb2p.