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 TIM22 complex The TIM22 complex of the mitochondrial inner membrane mediates the insertion of large hydrophobic proteins, typically transporterswith multiple transmembrane segments, into the inner membrane. These proteins travel through the outer membrane via the translocase of the outer mitochondrial membranecomplex. Their transit across the intermembrane space to the TIM22 complex in the inner membrane is mediated by complexes of small soluble protein chaperones: Tim8p with Tim13p, and Tim9p with Tim10p. The membrane-embedded core of the TIM22 complex consists of Tim54p, Tim22p, Tim18p, and Sdh3p; additionally, the small Tim proteins Tim9p, Tim10p, and Tim12p are associated with the complex on the intermembrane space side.About TIM22 Tim22p is the only essential component of the membrane-embedded core of the TIM22 complex. The protein has sequence similarity to Tim17p and Tim23p. It has four transmembrane helices that form a hydrophilic, voltage-activated channel through the inner membrane. Purified Tim22p is capable of inserting substrate proteins into the inner membrane even in the absence of the other components of the core TIM22 complex, Tim54p and Tim18p, although with a greatly reduced efficiency. Thus, Tim22p appears to be the central component of the complex, capable of recognizing the internal targeting signals of the precursor proteins, forming a translocation channel, and inserting the precursors into the inner membrane.