The peroxisomal protein import machinery

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Peroxisomes are small organelles found in every eukaryotic cell, which are involved in various cellular processes. All proteins in the peroxisomal matrix are nuclear encoded and post-translationally imported into the organelle. The peroxisomal protein import machinery differs fundamentally from other known translocons (ER or mitochondria) as it allows the passage of folded and even oligomerized proteins. Current data show that soluble import receptors comprise a cycle starting with the recognition of cargo proteins in the cytosol. Subsequently, the receptor-cargo complex docks to the peroxisomal membrane followed by the translocation of the cargo across the membrane. Finally, the receptor is exported back to the cytosol in an ubiquitin- and ATP-dependent manner. These steps are facilitated by a proteinaceous machinery at the peroxisomal membrane, called the peroxisomal importomer. The mechanistic principles of protein translocation across the peroxisomal membrane remained unknown. During the cycle, the import receptor Pex5p changes its topology from a soluble cytosolic form to an integral membrane-bound form. According to the transient pore model (1), the membrane-bound receptor forms the core component of the peroxisomal import pore. Recently, it was demonstrated that Pex5p together with its docking partner Pex14p forms a gated ion-conducting channel which can be opened to a diameter of about 9 nm by the cytosolic receptor-cargo complex (2). This newly identified pore shows striking dynamics, as expected for an import machinery translocating proteins of variable sizes. Here the different steps of the peroxisomal matrix protein import will be discussed with the main focus on the peroxisomal protein import pore.

References
