

Ancient mitochondrial protein secretion.

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The bacterial origin of mitochondria has been evidenced by a number of shared features with current bacteria, including some of the protein transport components. However, most of the original bacterial protein transport pathways have been lost from the mitochondria and replaced by the protein import apparatus. To some detail, mitochondria of *Discoba* represent an evolutionary intermediate stage as they carry the largest mitochondrial genomes encoding bacterial SecY and TAT translocases. By a multi-phylome approach we have analyzed eukaryotic proteomes for nuclear encoded genes, which are exclusive to *Discoba*. We show that their nuclei encode for about forty genes not found in other eukaryotic lineages. These include eight components of bacterial type II secretion system (T2SS). We show that mitochondria of *Discoba* express minimalist T2SS, which includes the pore forming secretin in the outer mitochondrial membrane and pseudopilin in the intermembrane space. Using the bacterial and yeast two hybrid assays, we are currently looking for the putative substrate of the ancient mitochondrial protein secretion pathway.