ABSTRACT

This thesis is focused on the phylogeny, diversity, and cell structure of obligately anaerobic Heterolobosea (Excavata: Discoba). Using culture-based approach, we have discovered their hidden species diversity and described 11 new species. Our phylogenetic analyses showed that obligately anaerobic heterolobosean evolved at least twice independently (Creneidae and Psalteriomonadidae). Psalteriomonadidae is a major anaerobic lineage of Heterolobosea as it includes 16 species and 5 genera. Most psalteriomonadids have acristate mitochondria, although *Pseudoharpagon pertyi* probably possesses remnants of mitochondrial cristae. Creneidae are represented just by a single species, *Creneis carolina*, which displays unique cell structure and life cycle. Architecture of its flagellar apparatus is not readily comparable with any other eukaryotes and at least some cytoskeletal elements have undergone unprecedented evolutionary positional changes. Anaerobic heterolobosean are just rarely detected by environmental, culture-independent approaches. Thus, it is impossible to estimate their real species diversity. Nevertheless, our current data on anaerobic jakobids, another lineage of Discoba, indicates that the culture-based approach is relatively powerful to discover species diversity of anaerobic excavates. *In silico* analysis of anaerobic energy metabolism indicates that some genes have been acquired by horizontal gene transfer independently in anaerobic heterolobosens (ACS), while some have been inherited from the common ancestor of the subphylum Tetramitia (PPDK, Ppi-PFK, [FeFe]-hydrogenase and its maturases).