Abstract

Parasitic protists with modified mitochondria represent important and exciting group of organisms, not only from the view of eukaryotic cell evolution but also because these parasites are causative agents of serious and widespread diseases. The study and understanding of their biology is thus necessary for the development of new antiparasitic drugs. These organisms reside in host body cavities with low concentrations of oxygen and while they lack typical mitochondria, they possess mitochondrion-related organelles which still integrate many physiologically important processes.

Trichomonas vaginalis is an anaerobic flagellate inhabiting mucosal surface of vagina. Instead of canonical mitochondria, *T. vaginalis* possesses organelles termed hydrogenosomes. These organelles harbor pathways of ATP-generating metabolism via substrate-level phosphorylation, dependent on enzymes prone to oxidative damage, such as pyruvate:ferredoxin oxidoreductase and Fe-Fe hydrogenase. Because the environment of trichomonads is not fully anaerobic, the parasite had to develop complex strategies to cope with both oxygen and reactive oxygen species (ROS) generated by host immune system cells.

Recent data from *T. vaginalis* proteomic and genomic analyses revealed the presence of bacterial-type proteins potentially participating in antioxidant defense. In this thesis, we characterized three hydrogenosomal proteins involved in oxygen and ROS detoxification. Flavodiiron protein (TvFDP), iron-sulfur flavoprotein (TvIsf3) and TvOsmC (a member of OsmC/Ohr protein family) represent proteins rarely encountered in eukaryotes, that were probably acquired by *T. vaginalis* predecessor trough lateral gene transfer from a prokaryotic donor. TvFDP, the terminal hydrogenosomal oxidase, catalyzes reduction of oxygen to water. TvIsf3, in addition to its oxygen-reducing activity, is able to detoxify the nitro-antibiotics metronidazole and chloramphenicol. TvOsmC is a thiol-dependent peroxidase homologues of which were believed to be restricted to prokaryotes. Unexpectedly, in addition to *T. vaginalis* we identified members of OsmC/Ohr proteins in a number of eukaryotic species.

We also describe new and unexpected physiological function of H and L protein homologues of incomplete glycine decarboxylase complex (GDC) in hydrogenosomes. The proteins serve as electron donors for peroxidase activity of TvOsmC and together constitute the defense system against both hydrogen peroxide and organic hydroperoxides in hydrogenosomes of *T. vaginalis*.