

ABSTRACT

Mitochondria of opisthokonts undergo permanent fusion and fission throughout the cell cycle. Keeping these two processes in balance is vital for various aspects of mitochondrial and cellular homeostasis. Both mitochondrial fusion and division mechanisms are controlled by highly conserved dynamin-related GTPases that are present in all kingdoms of life. The aspects of mitochondrial dynamics outside the opisthokonts is, however, almost completely unexplored phenomenon.

In our work, we introduced a tool for live imaging of the reduced forms of mitochondria into model organisms *Giardia intestinalis* and *Trichomonas vaginalis*, anaerobic protist parasites from the Excavata supergroup of Eukaryotes. Using this technique, we investigated the dynamics of the mitosomes, the simplest forms of mitochondria, of *G. intestinalis*. The division of mitosomes is restricted to *Giardia* mitosis and is absolutely synchronized with the process. The synchrony of the nuclear and the mitosomal division persists also during the encystation of the parasite. Surprisingly, the sole dynamin-related protein of the parasite seems not to be involved in mitosomal division. However, throughout the cell cycle mitosomes associate with the endoplasmic reticulum, although none of the known ER tethering complexes are present. Instead, the mitosome-ER interface is occupied by lipid metabolism enzyme long chain acyl-CoA synthetase 4.

Additionally, we investigated mitosomal content using in vivo enzymatic tagging method, thereby discovering another component of mitosomal protein import machinery, GiTim44, together with several other mitosomal proteins.