

Abstract

SNARE proteins play essential role in most membrane fusions taking place in eukaryotic cell. They are responsible for all fusions that occur across endocytic and secretory pathways. Apart from these processes stand mitochondria and plastids. Fusion of these organelles is directed by specific protein machineries. In this work we review up-to-date information on SNARE mediated membrane fusion and fusion of outer and inner mitochondrial membranes with an emphasis on situation in flagellated protozoan parasite *Giardia intestinalis*. It was suggested that one of typical SNARE protein in *Giardia* (*GiSec20*) is localised to its highly reduced mitochondria called mitosomes. This protein is also essential for surviving of *Giardia* trophozoites.

In this work we show that mitosomal localization of *Gisec20* is caused by episomal expression however the protein is localised to endoplasmic reticulum under physiological conditions. Using GFP tag we were able to characterize its targeting signal which showed to be localised in transmembrane domain of *GiSec20*. This signal targets the protein to mitosomes of *G. intestinalis* and *S. cerevisiae*, respectively. Mitosomal localization was prevented by adding 3'UTR to gene sequence and its episomal expression. This suggests existence of targeting mechanism based on information contained in mRNA of *GiSec20*. Moreover, overexpression causes massive aggregation or fusion of mitosomes or endoplasmic reticulum depending on the localisation of *GiSec20*. This phenotype is also accompanied by a reduced cell growth. These results show importance of maintaining expression level of *GiSec20* and suggest brand new view of possible protein targeting in *G. intestinalis*.

Keywords: SNARE proteins, membrane fusion, mitochondria, mitosomes, *Giardia intestinalis*, Sec20, protein targeting