

*Giardia intestinalis* is an anaerobic parasite, that colonizes the small intestine of humans and other vertebrate hosts. This cosmopolitan parasite, which causes diarrhoea, is transmitted by contaminated water or food via a resistant stage, the cyst. The encystation process involves a number of events that lead to a complete reconstruction of the cell into the form of infectious cyst. The aim of this work was to visualize these modifications *in vivo* by means of enzymatic labelling of proteins. For the purposes of this work, enzymatic tags Y-FAST and HaloTag were chosen, as they enable visualizing live cells under anaerobic conditions. Chimeric protein constructs were created to visualize the dynamics of the encystation vesicles, the structures of endoplasmic reticulum, the adhesive disc and mitosis. Using the developed constructs, we successfully followed the dynamics of the encystation vesicles and the adhesive disc *in vivo*. Finally, this work has provided novel molecular tools, which will be used to follow the overall redesign of the parasite cell during encystation.