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Endosymbiosis in trypanosomatid protozoa: an eternal love affair

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Some trypanosomatids harbor a symbiotic bacterium, which maintains a close association with the host, constituting an excellent model to study organelle origin and cellular evolution. Molecular data show that all endosymbiont containing trypanosomatids are grouped together in a single phylogenetic branch. Endosymbionts of different species are similar, being classified in the beta division of Proteobacteria, thus suggesting that a single evolutionary event gave rise to the symbiosis in the Trypanosomatidae family. The bacterium is enclosed by two unit membranes and presents a reduced peptidoglycan layer, which is essential for cell division and morphological maintenance. Regarding the protein composition, the number of intramembrane particles in the endosymbiont envelope is similar to that described for Gram-negative bacteria. Lipid analyses of purified endosymbionts show absence of sterols and indicate phosphatidylcholine as a major component of the envelope, as described in other intracellular bacteria. The endosymbiont promotes ultrastructural and physico-chemical alterations in the trypanosomatid and its presence influences the protozoan interaction with the insect host and mammalian cells. Symbiont-containing trypanosomatids are able to infect and to replicate inside fibroblasts and macrophages, whose microbicidal activity was deactivated by HIV-1 infection. The symbiosis in trypanosomatids is characterized by intensive metabolic exchanges; the bacterium contains enzymes and metabolic precursors that complete essential biosynthetic pathways of the protozoan. Conversely, the symbiont is capable of obtaining part of the required energetic molecules from the host glycosomes. Taken together, data suggest that the endosymbiont in trypanosomatids represents an intermediate evolutionary step between bacteria and eukaryotic cell organelles..