Intracellular symbiosis of Chlorella in *Paramecium bursaria* with possible involvement of mitochondrial dynamics

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Paramecium bursaria is a protozoan ciliate which keeps many *Chlorella* cells in the cytoplasm. Ultrastructure and interaction of symbiotic *Chlorella* cells and organelles in *P. bursaria* were investigated using an electron microscopic approach with 3-D reconstruction from serial sections and electron tomography with freeze-substitution technique. Symbiotic *Chlorella* cells, which are enclosed by a membrane (perialgal vacuole membrane; PVM), were not in direct contact with the host cell cortex, but they are associated with trichocysts, mitochondria, and small vesicles around the ciliary basal bodies. As trichocysts and small vesicles were directly attached to the inner surface of the cell cortex, all of these organelles constituted a sub-cortical stationary network together with the symbiotic *Chlorella* cells. TEM observations have shown that mitochondria are always in close contact with the outer surface of PVM, providing structural scaffold for symbiotic *Chlorella* to be anchored at the sub-cortical region in the host's cytoplasm. Moreover, the outer membrane of mitochondria was occasionally found to be fused with PVM, and also with various other membranous organelles including trichocysts and food vacuoles. These results imply that mitochondria in this ciliate species may be performing a unique function in addition to act as a cell's supply of ATP.