

Studies on the Role of Endosymbiotic *Chlorella* for Photoaccumulation  
in *Paramecium bursaria*

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SUMMARY

*Paramecium bursaria* cells contain several hundred endosymbiotic *Chlorella* in perialgal vacuoles. The *Chlorella*-containing *P. bursaria* stock, BND-1G, is photosensitive and accumulates in areas of appropriate light intensity (photoaccumulation), while a *Chlorella*-free *P. bursaria* stock, BND-1W, which had been artificially obtained from BND-1G by prolonged culture in darkness, does not show photoaccumulation, although the cells are photosensitive. In the current study, photoaccumulation rates were compared in two batches of cells having different numbers of endosymbiotic *Chlorella*. A higher photoaccumulation rate was observed in the batch with more *Chlorella*. The resting membrane potentials of BND-1G and BND-1W were measured using microelectrodes, and compared. The measured resting potential of BND-1W was approximately 5–8 mV negative to that of BND-1G. The resting membrane potential of the *Chlorella*-free BND-1W could be elevated to almost the level of BND-1G by the addition of maltose to the external medium, and photoaccumulation also occurred. Elevation of the resting potential and photoaccumulation were also induced in BND-1W by the addition of either the membrane-permeable cyclic nucleotide analog, 8-bromo-adenosine 3',5'-cyclic monophosphate, or the cyclic nucleotide phosphodiesterase inhibitor, theophylline. Based on these data, we discuss the role of endosymbiotic *Chlorella* in photoaccumulation of *P. bursaria*.