

Observation of digestive vacuoles in *Paramecium bursaria* ingesting different sized microspheres

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SUMMARY

Ciliate *Paramecium bursaria* cells include about 700 symbiotic *Chlorella* spp. in their cytoplasm. Each alga is enclosed in a perialgal vacuole (PV) membrane, which provides protection from host's lysosomal fusion and an ability to localize beneath the host cell cortex. To establish endosymbiosis with alga-free *P. bursaria* cells, symbiotic alga must bud off and separate from digestive vacuole (DV) membrane into the cytoplasm after acidosomal and lysosomal fusion to the DVs. This budding was induced not only by intact algae but also by boiled or fixed algae. Both intact and boiled yeasts also budded from the DVs. However, this budding was not induced when food bacteria or India ink was ingested into the DVs. These results raise the possibility that *P. bursaria* can recognize the diameter of the DV content, and content with a similar size as algae can bud from the DVs into the cytoplasm. To examine the possibility, we mixed microspheres of various diameters with alga-free cells, and observed them with a light microscope. Budding from the DVs with 0.2 μm diameter microspheres was not observed. With 0.8 μm diameter microspheres, fragmentation of the DVs into small vacuoles was observed. With microspheres of which the diameter was greater than 3.0 μm , individual budding from the DVs was observed. These observations demonstrate that the budding pattern from a *P. bursaria* DV is dependent on the diameter of the content of the DVs.