

Synthetic Symbiosis between *Tetrahymena thermophila* and *Escherichia coli*

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SUMMARY

To help understand how an intracellular symbiosis evolves from independently living organisms, we have tried to construct a symbiosis between a ciliate, *Tetrahymena thermophila*, and a bacterium, *Escherichia coli*, under laboratory conditions. These two species do not form a symbiosis in nature because of the difference in their habitats. We hoped to construct a symbiosis (obligate mutualism) between them via reciprocal nutrient (amino acids) exchange. We utilized the phagocytosis behavior of *T. thermophila* to take up *E. coli* into *Tetrahymena* cells, and we used amino acid auxotrophic strains of *E. coli*. First, we searched for candidate amino acids by co-culturing in a minimal medium lacking single amino acids essential for *Tetrahymena*. Second, we conducted selection cycles for 10 months in which co-culturing and sorting for *Tetrahymena* cells having more *E. coli* were repeated weekly. As a result, we obtained *Tetrahymena* populations that contained live *E. coli* cells. Moreover, both species proliferated well indicating that they mutually co-existed. However, there were many free-living *E. coli* cells in the co-culture, so we could not confirm the establishment of an intracellular symbiosis. In future studies, we will try to further select for *Tetrahymena* with established intracellular symbionts.