Cell proliferation of *Paramecium tetraurelia* under simulated microgravity.

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Paramecium is known to proliferate faster under microgravity in space, and slower under hypergravity. Experiments using axenic culture medium have demonstrated that the hypergravity affected directly on the proliferation of *Paramecium* itself (Kato *et al*., 2003). In order to assess the mechanisms underlying the physiological effects of gravity on cell proliferation, *Paramecium tetraurelia* was grown under simulated microgravity performed by clinorotation and the time course of the proliferation was investigated in detail on the basis of the logistic analysis. *P. tetraurelia* was cultivated in a closed chamber in which cells were confined without air babbles, reducing the shear stresses and turbulence under the rotation. The chamber is made of quartz and silicone rubber film; the former is for the optically-flat walls for the measurement of cell density by means of a non-invasive laser optical-slice method, and the latter for gas exchange. Because the closed chamber has an inner dimension of $3\times3\times60$ mm, *Paramecium* does not accumulate at the top of the chamber despite its negative gravitactic behavior. We measured the cell density at regular time intervals without breaking the configuration of the chamber, and analyzed the proliferation parameters by fitting the data to a logistic equation. Clinorotation had the effects of reducing the proliferation of *P. tetraurelia*. It reduced both the saturation cell density and the maximum proliferation rate, although it had little effect on the specific proliferation rate, the proportional factor in the logistic equation.