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Bacterium Swimming Motion Close to a Wall

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The mechanism of some characteristics about swimming motion of the marine bacterium, Vibrio alginolyticus, close to a boundary was investigated. The motion of the microorganism that possesses single polar-flagellum propelling the cell body was dealt with as an outer flow problem from a bio-fluid dynamics viewpoint. Numerical analyses based on the boundary element method in addition to the resistive force theory were applied to elucidate the effects of the boundary on the swimming motion. The boundary reduces the swimming speed when a bacterium moves along it. Forward swimming is stable in pitching motion and backward swimming is unstable. The swimming speed varies depending on the attitude of the bacterium. When the flagellum is closer to the boundary, the trajectory of the bacterium draws a curve. These results qualitatively agree with the observed motions and have potential to explain the mechanism of the phenomena.

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