Flagellum Causes Euglenoid Movements by Detecting Contact Stimuli in Euglena

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Euglena, a phytomastigophora, moves either with its flagellum beating vigorously or with its body surface crooking and twisting. The latter movement, known as euglenoid movement, is frequently observed when the organism receives contact stimuli. I hypothesized that the flagellum detects contact stimuli and causes euglenoid movement. Using newly-developed quantitative stimuli-exposing device, euglenoid movements were first examined in a population of Euglena exposed to various frequencies of contact stimuli. It was found that euglenoid movements were increased according to an increment in contact frequencies. When Euglenas were treated with ethanol, their flagella were soon completely removed. These ethanol-treated, deflagellated organisms failed to show any euglenoid movements. The flagellum was later reconstructed and euglenoid movements were gradually observed again. Euglenas were then treated with nickel sulfate to prevent their flagellum movements. Nickel-treated organisms invariably failed to move their flagella and thus exhibited no euglenoid movements. Exposure to magnesium chloride solution promoted recoveries of flagellum movements in these nickel-treated organisms. Euglenoid movements in these magnesium-exposed, nickel-treated organisms started again earlier than those in the nickel-treated organisms. The results clearly exhibited that euglenoid movements were caused by contact stimuli detected at the flagellum in Euglena. The present experiments incite new interests in the role of flagellum in the detection of external stimuli in Euglena.

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