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The Effect of Electric Field Magnitude and Frequency on *Caenorhabditis* Elegans HAN-SHENG CHUANG, DAVID RAIZEN, NOOREEN DABBISH, ANNESAI LAMB, HAIM BAU, University of Pennsylvania — Low magnitude, DC electric fields have been used to guide the motion of the wild-type nematode (worm) Caenorhabditis elegans. Low intensity AC fields (<100 Hz) can even be utilized to localize the worm. However, the worm appears oblivious to the electric field as the frequency is higher than several hundreds of Hz. In contrast, in the presence of nonuniform, moderate AC fields (∼15–50 kV/m) at higher frequencies (>10 kHz), the worm is restrained by the field's maximum. This is the first demonstration of dielectrophoretic trapping of an animal. With certain electrode arrangements, only the worm's tail is immobilized, and the worm's swimming motion does not appear to be affected by the trapping force. Similar trapping conditions with transitional frequencies (∼10–100 kHz) can cause paralysis. The worm is (irreversibly) paralyzed with lower frequencies (e.g. 45 kV/m, 2 kHz) or electrified with higher electric field intensities (e.g. 10 Hz, 70 kV/m). We report on the results of a parametric study that delineates the effect of the electric field on the worm as a function of the worm's stage and the electric field intensity and frequency. Worm-dielectrophoresis can be used, among other things, to sort worms by size, to temporarily immobilize worms to enable their characterization and study, and to use worms to induce fluid motion and mixing.

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