Title

Radiation Evoked Action Potentials from Single Plant Cells (Nitella) and the Influence of Radiation on Cyclosis

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"Radiation evoked action potentials from single plant cells (Nitella) and the influence of radiation on cyclosis." C. T. Gaffey and G. P. Welch, Donner Laboratory, Lawrence Radiation Laboratory, University of California, Berkeley, California 94720.

Action potentials from single algal cells (Nitella gracilis) can be generated by electrical, mechanical, chemical, and thermal stimuli. Radiation with 60-MeV α-particles, restricted to about 20% of the length of mature algal cells, evoked repeated action potentials per cell. The duration of radiation pulses varied from 0.1 to 4.0 sec; the dose rates employed ranged from 0.05 to 2.0 x 10^6 rads/sec. A pulse of radiation was presented to a cell about once every two minutes. The electric threshold for excitation was determined one minute before and one minute after each radiation pulse. It was found that the dose of radiation required to trigger excitation depended upon the dose rate and the accumulated radiation previously absorbed by each cell. The radiation threshold for excitation steadily increased as a function of the accumulated dose, whereas the electric threshold remained relatively unchanged until large doses of radiation were absorbed. Action potentials, attenuated in amplitude, could be evoked by radiation and electric current even after the absorption of 26 million rads of 60-MeV α-particles. Approximately 28 million rads of this fractioned radiation suppressed excitation irreversibly. Thus, if a 500 krad pulse of radiation evoked excitation, this dose was only about 2% of the dose to inhibit bioelectric activity.

Protoplasmic streaming of Nitella cells was viewed by closed-circuit T.V. before, during, and after radiation. Cessation of cyclosis was found to be a function of the absorbed dose of radiation administered to cells.

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