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Electric Pulse Manipulation of Cancer Cell Population Dynamics

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While electric pulses (EPs) can control cell population in vitro [1], the ability to specifically predict the types of cells (dividing or resting) targeted and optimize the EP parameters remain critical challenges for potential cancer treatment applications. Mathematical models of cancer cell population dynamics based on coupled differential equations can predict the transition of cells between the proliferating, quiescent, and dead states to predict the progression of cell population over time [2,3]. In this study, we experimentally assess the impact of pulse duration, field intensity, and number of pulses on cell population dynamics and then fit the model parameters governing transition between proliferating, quiescent, and dead states [3] to the measured cell population to assess the cell types targeted by EPs. The potential implications of EPs on cell death, cancer treatment, and regenerative medicine will be discussed.

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[2] G. I. Solyanik, N. M. Berezetskaya, R. I. Bulkiewicz, and G. I. Kulik, "Different growth patterns of a cancer cell population as a function of its starting growth characteristics: analysis by mathematical modelling,"Cell Prolif., vol. 28, pp. 263-278, 1995.

[3] A. L. Garner, Y. Y. Lau, D. W. Jordan, M. D. Uhler, and R. M. Gilgenbach, "Implications of a simple mathematical model to cancer cell population dynamics,"Cell Prolif., vol. 39, pp. 15-28, 2006.

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