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**Quantification of Electroporation-Mediated Propidium Iodide Delivery into 3T3 Cells** MOHAMED M. SADIK, JIANBO LI, JERRY W. SHAN, DAVID I. SHREIBER, HAO LIN, Rutgers University — Electroporation is an effective means to deliver exogenous molecules into the cellular cytoplasm, while simultaneously maintaining cell viability and functionality. In this technique, an applied electric field transiently permeabilizes the cellular membrane to enable molecular exchange. The main objective of the current work is to identify the transport mechanisms involved during electroporation, and to quantify the amount of molecules delivered into the cellular cytoplasm. An optical diagnostic system is developed to examine the transport of Propidium Iodide (PI) into 3T3 mouse fibroblast cells. Upon entering the permeabilized cell, PI binds to DNA/RNA within the cytoplasm to emit fluorescence, which is measured to track the dynamic accumulation of the dye within the cell. The results show that the total fluorescence intensity increases with a decreasing buffer electrical conductivity. The data are compared with numerical simulations, which reveals good agreement. The experimental observations and numerical analysis demonstrate that: 1) Electrophoresis plays a dominant role in mediating the transport. 2) An electrokinetic mechanism, field-amplified sample stacking, controls the achievable delivery efficiency. The study in this work is an important step toward the quantification as well as the eventual improvement of this useful technique.

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