

Abstract Submitted  
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**The effect of extracellular conductivity on electroporation-mediated molecular delivery**<sup>1</sup> MIAO YU, MOHAMED SADIK, JIANBO LI, HAO LIN, Mechanical and Aerospace Engineering, Rutgers University — Electroporation is a non-viral technique to introduce foreign molecules into a biological cell with electric fields. In this work, the effect of extracellular conductivity on electroporation-mediated molecular delivery efficiency is numerically investigated, and the results are compared in details with experimental data. The model couples the Smoluchowski equation and the Nernst-Planck equations to solve for the evolution of membrane permeabilization and ion transport simultaneously. The uptake of Propidium Iodide (PI) into single 3T3 fibroblast cells is simulated. The results quantitatively predict the experimental observations, and that the total delivery is reciprocally correlated with the extracellular conductivity. This correlation is mediated primarily by electrophoretic transport induced by a gradient in the electric field. A compact formula is also developed to estimate ion delivery based on the pulsing parameters. This work offers a mechanistic interpretation to experimental observations. In synergy with experimental efforts, the quantification of molecular delivery via electroporation has been achieved.

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