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An engineer's perspective on irreversible electroporation for tissue ablation

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Electroporation is the phenomenon in which cell membrane permeability to ions and macromolecules is increased after exposing the cell to high electric field short pulses. Both, reversible and irreversible, electroporation have important applications in biotechnology and in medicine. For instance, reversible electroporation is now a routine technique in microbiology labs for in vitro gene transfection.

During the last decade and half, reversible electroporation has been applied experimentally and clinically in living tissues for in vivo gene therapy (electrogenetherapy) and for enhancing the penetration of anti-cancer drugs into undesirable cells (electrochemotherapy). More recently, irreversible electroporation has been proposed and demonstrated as a minimally invasive tissue ablation method suitable for tumor treatment.

Tissue electroporation for clinical applications offers different engineering challenges. In this talk I will address some developments on electroporation in which I have participated. In particular, I will discuss about the use of Finite Element Method tools for forecasting electric field distribution. Moreover I will deal with measurements of changes in electrical passive properties due to electroporation and how those changes need to be considered in electroporation models and how it is possible to make use of those changes in order to create images of the electroporated volumes.

More in: <https://sites.google.com/site/antoniivorra/>