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Corona Ion Generating Method & Apparatus for Manipulation of Molecules & Biological Cells

Researchers at the University of South Florida have developed an improved method of delivering molecules to cells using ions generated from corona discharge.

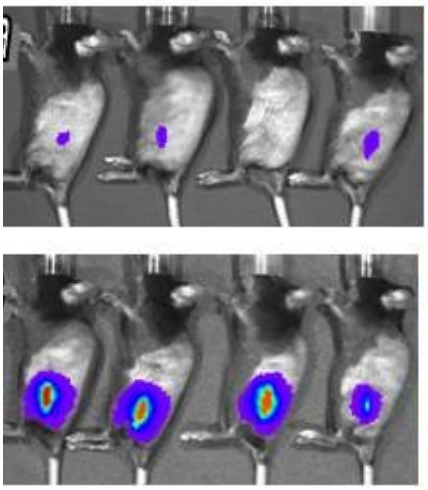
Electroporation is a technique used to deliver therapeutic molecules to target cells, such as tumors. It uses an electric field applied with electrodes that either contact or penetrate the target tissue. This causes the membrane of the target cells to breakdown, which enables therapeutic molecules to enter the cell that would otherwise be blocked by the membrane. Electroporation typically causes discomfort, unwanted muscle stimulation, and some damage to healthy tissue. Other issues with this treatment include invasiveness, as well as the expense of single use electrodes used to apply the electric field.

Our researchers have invented a device that overcomes these limitations of electroporation. This device uses corona charges, which are ions generated in the air around exposed electrical conductors. Cells are manipulated with charges transmitted through air, so no contact between the device and cells is required, making it noninvasive. Additionally, the device may apply charge from a range of distances and for varying times, which means it can be tuned for a number of applications. This device was successfully used to deliver plasmid DNA encoding luciferase (a light producing protein) into normal mouse skin as a proof-of-concept. This novel invention will provide researchers with an improved tool to explore novel drug delivery systems. It may also be developed into a platform to deliver therapeutics for a wide range of diseases.

ADVANTAGES:

- **Enhanced delivery of therapeutics**
- **Does not require contact with cells**
- **Avoids muscle contraction**
- **Minimizes pain and tissue damage**

Noninvasive Technique for Delivery of Therapeutic Molecules to Cells



Visualization of Delivery of DNA to Mouse Skin Top: DNA Alone Bottom: DNA Delivery Enhanced with Corona Charge

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