COMPACT SHOCK WAVE GENERATING DEVICE FOR DRUG DELIVERY

Genetic Engineering and Biotechnology News reported that "the burgeoning markets that surround biopharmaceuticals, RNA interference screening, and stem cell research are limited by the lack of a silver bullet for successful gene transfer. Because stable transfection is hard to achieve in primary cell lines, this application continues to be an important untapped niche in the transfection market."

Inventors developed a microdevice creating shock waves from the reaction of nanoenergetic materials of fuel and oxidizer in nanoscale. The shock waves then permeabilize target cells allowing delivery of genetic material into the cells. The characteristics of the shock wave that can be controlled include pulse intensity, and pulse duration. The tunability of the shock waves allows the device to be adapted for use in a wide range of applications. DNA and nanoparticle delivery have been demonstrated.

As compared to existing cell transfection products, this device achieves a significantly greater transfection success rate, significantly greater cell survival rate, and should cost less than most, if not all other methods. The invention was compared with commercially available chemical-based transfections (SiPort NeoFx, SiPort Amine, Lipofectamine 2000, Lipofectamine LTX, Transit LT1), and electroporation. The prototype of the invention produced transfection and survivability rates in excess of 99% while none of the existing transfection methods resulted in a rate greater than 10%, and the survivability of those transfected cells ranged from 0% to 80%.

This device has the potential to revolutionize cell transfection, as the shock waves are particularly good at making the cell membranes porous, while at the same time the shock waves are gentle and do not cause catastrophic damage during the transfection, so cells survive.

POTENTIAL AREAS OF APPLICATIONS:

- Cell Transfection
- Shockwave drug delivery for killing cancer cells
- Precision drug delivery of imaging particles
- Fragmentation of kidney stones
- Destruction of plaques

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