

Intermittent Direct Current Electric Field-A Novel Scheme To Electrically Guide Cell Migration

Tech ID: 23563 / UC Case 2011-440-0

ABSTRACT

A method and device for selectively migrating cells using electrical fields.

FULL DESCRIPTION

Electric stimulation has been heralded as a novel and powerful mechanism to guide cell migration in wound healing and potentially in regenerative medicine. Translation of this technology to clinical use, however has met very limited success. One of the major problems is that continuous applied electric direct currents (DC) to tissues generate heat, changes in pH, and harmful electrode products. Electrical stimulation is further complicated because human tissue is highly conductive, allowing for large current flow which significantly increase the detrimental effects to stimulated tissue. As a result, there are no commercially available devices for direct current brain stimulation at this time to regulate behaviors of neural stem cells and other types of cells in the brain.

In search of providing a system and method for safe and effective direct current brain stimulation, researchers at the University of California Davis developed a novel method and device for the application of electric currents to cells with minimal energy delivery, while still maintaining obvious guidance effect in directing cell migration via an intermittent direct current electrical field (EF). Applied EFs guide human neural stem cells (hNSCs) migration to the cathode. The electrotaxis is voltage and time dependent.

This method and device provides a new effective stimulation paradigm to guide cell migration while significantly minimizing possible side effects of continuous application of EFs resulting in 50% energy saved and reduction in heat production. Intermittent EF application offers a critical step in translating application of DC EF in guiding cell therapies from *in vitro* to *in vivo*.

APPLICATIONS

- ▶ This method offers a critical step in translating application of DC EF in guiding cell therapies (regenerative medicine and wound healing) from *in vitro* to *in vivo*.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,044,611	06/02/2015	2011-440

FEATURES/BENEFITS

- ▶ EF stimulation strategy: intermittent DC EF application, which minimizes energy delivery and side effects while maintaining almost the same guidance effect comparing with traditional continuous EF stimulation.
- ▶ Novel concepts and methods for setting stimulation duration (EF-on) and interval (EF-off) for certain cells.
- ▶ Findings of the migration characteristics in a continuous/ intermittent 200 mV/mm EF of human neural stem cells.
- ▶ Minimized energy delivery and heat production
- ▶ Minimized side effects, including changes in pH and ion concentration, harmful electrode production

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OTHER INFORMATION

CATEGORIZED AS

- ▶ **Biotechnology**
 - ▶ Genomics
 - ▶ Health
- ▶ **Medical**
 - ▶ Devices
 - ▶ Research Tools
 - ▶ Therapeutics

RELATED CASES

2011-440-0

► Importantly, the invention makes the translation of the technology, EF guiding cells migration, to clinical use possible and practical.

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