



Office of Technology Management

Facilitated and Enhanced Stem Cell Differentiation and Proliferation by Non-Invasive Electrical Stimulation

Technology Reference

CY010

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Field

Tissue Engineering

Bio Implants

Key Words

Stem Cell differentiation, proliferation, implants

Electrical stimuli for stem cell differentiation

License Status

Seeking Licensing and Development Partner

Patent Status

Provisional patent application filed

Overview

Stem cells have the unique property of self-renewal without differentiation until and unless appropriate biological and physical signals are provided. Because regulation of stem cell differentiation offers exciting possibilities for numerous biomedical and clinical applications, there are now concentrated research efforts to control and manipulate stem cell differentiation. Although combinations of biological and pharmacological reagents have been used to induce stem cell differentiation, application of physical stimuli including non-invasive electrical stimulation, could offer a new biotechnology to regulate stem cell proliferation and differentiation.

Electrical stimulation for cell differentiation has already been known previously. However, the optimization of the electrical signal used in above described technology, conditions and parameters in which the electrical stimuli are applied, the rapid results it produces, and its lack of restriction on tissue-specific stem cell differentiation give the invention its uniqueness and may result in maximal beneficial effect.

Technical Summary

The UIC researchers have found a way to control intended stem cell differentiation and proliferation without causing cellular and molecular damages using non-invasive electrical stimulation of various parameters. Optimal engineering of enhanced and facilitated mammal stem cell differentiation provides the capability to produce and manufacture tissue-specific artificial replacements, as well as to stimulate in vivo stem cell implants to accelerate tissue regeneration and rehabilitation.

Quantitative and qualitative measures of stem cell differentiation experiments performed resulted in a beneficial technique that can possibly yield numerous scientific and economic advantages.

Benefits

- Accelerated rate of stem cell proliferation and differentiation which will potentially lead to the repair and regeneration of damaged or lost tissue
- Minimized number of undifferentiated stem cells, thereby significant reduction of potential tumor development
- Presented substantial cost benefits for a non-invasive treatment technique.

Areas of Application

- Tissue regeneration and rehabilitation
- Tumor prevention
- Stem cell-based biosensors for various tissue-specific biodefense devices
- In vivo implants
- Control of plastic development of stem cells
- 3D stem cell-derived organ equivalents for drug testing

Stage of Development

- In-vitro study completed on rat and human mesenchymal stem cells.