(SD2018-372): A Protocol To Induce Human Spinal Cord Neural Stem Cells (US Pat No. 11,773,369)

Tech ID: 33500 / UC Case 2018-372-0

BACKGROUND

Worldwide, over 2.5 million people live with spinal cord injury, with over 100,000 new cases occurring annually. Spinal cord injury often causes motor dysfunction below the level of the injury. For example, thoracic and lumbar spinal cord injury can cause paraplegia and cervical spinal cord injury can cause quadriplegia. Such injury is permanent and often severe and there is no effective treatment. Various neurologic diseases also involve damaged or dysfunctional spinal cord neurons. Neural stem cell grafts have potential for treating such conditions. However, it has not been possible to obtain sufficient numbers of appropriately patterned neural stem cells, having a spinal cord positional identity, for implanted cells to survive and functionally engraft.

TECHNOLOGY DESCRIPTION

Researchers from UC San Diego patented methods of inducing and maintaining spinal cord neural stem cells (NSC) and spinal cord neural progenitor cells, staring with human pluripotent stem cells. In some embodiments the hPSC are human embryonic stem cells (hESC). In some embodiments the hPSC are induced pluripotent stem cells (iPSC).

APPLICATIONS

ADVANTAGES

The ability to create a diversity of spinal cord neuronal types could facilitate disease modeling and drug screening for several spinal cord disorders.

The hESC-derived NSCs could further constitute the optimal cell type for clinical translation for spinal cord ‘replacement’ strategies in SCI or other disorders.

STATE OF DEVELOPMENT

UC San Diego is seeking companies interested in commercializing US patent rights through a license.

INTELLECTUAL PROPERTY INFO

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OTHER INFORMATION

KEYWORDS
Neural stem cells, neuroscience

CATEGORIZED AS
- Materials & Chemicals
  - Biological
- Medical
  - Rehabilitation
  - Research Tools
  - Stem Cell

RELATED CASES
2018-372-0

US Pat No. 11,773,369


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(12) **United States Patent**
Kumamaru et al.

(10) **Patent No.: US 11,773,369 B2**
(45) **Date of Patent: Oct. 3, 2023**

(54) **GENERATION OF HUMAN SPINAL CORD NEURAL STEM CELLS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 970 days.

(21) Appl. No.: **16/530,777**

(22) Filed: **Aug. 2, 2019**

(65) **Prior Publication Data**

US 2020/0087623 A1 Mar. 19, 2020

Related U.S. Application Data

(60) Provisional application No. 62/714,590, filed on Aug. 3, 2018.

(51) **Int. Cl.**
C12N 5/0797 (2010.01)

(52) **U.S. Cl.**
CPC ***C12N 5/0623*** (2013.01); *C12N 2501/115* (2013.01); *C12N 2501/119* (2013.01); *C12N 2501/999* (2013.01); *C12N 2506/02* (2013.01); *C12N 2506/45* (2013.01)

(58) **Field of Classification Search**
CPC C12N 5/0623

(56) **References Cited**

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(57) **ABSTRACT**

Spinal cord neural stem cells (NSCs) have great potential to reconstitute damaged spinal neural circuitry. In some embodiments, derivation of spinal cord NSCs from human pluripotent stem cells (hPSCs) is described. These spinal cord NSCs can differentiate into a diverse population of spinal cord neurons comprising multiple positions in the dorso-ventral axis, and can be maintained for prolonged time periods. After grafting into injured spinal cords, grafts may be rich with excitatory neurons, extend large numbers of axons over long distances, innervate their target structures, and enable robust corticospinal regeneration. In some embodiments, hPSC-derived spinal cord NSCs enable a broad range of biomedical applications for in vitro disease modeling, and can provide a clinically-translatable cell source for spinal cord "replacement" strategies in several spinal cord disorders.

8 Claims, 44 Drawing Sheets

RELATED MATERIALS

▶ Kumamaru H, Kadoya K, Adler AF, Takashima Y, Graham L, Coppola G, Tuszynski MH. Generation and post-injury integration of human spinal cord neural stem cells. Nat Methods. 2018 Sep;15(9):723-731. doi: 10.1038/s41592-018-0074-3. Epub 2018 Aug 6. - 08/06/2018

PATENT STATUS

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