A Therapeutically Relevant Culture System for Human Neural Stem-Cells and Oligodendrocytes

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SUMMARY

UCLA researchers have developed a novel culture system that accelerates the propagation of neural stem cells (NSC) and their specification into oligodendrocytes (OL). The system is capable of modulating the maturational stages of OL, allowing them to reach a full myelinating state. The system also accommodates specification of human embryonic stem cells (ES) and induced pluripotent stem cells (hiPS) into OL. Thus, the invention has a great potential to accelerate stem cell research and therapies for myelin disorders and nervous system injury.

BACKGROUND

The production, culture, and harvest of stem cells are essential components of cell-replacement therapies that hold great promise in treating a variety of human diseases. Current methods of propagating and fate specifying stem cells are hampered by slow cell growth and poor efficiency. The vast majority of stem cells often do not reach the desired cell type. Therefore, there is a need to develop more efficient culture and induction methods for stem cells. Such improvements hold a particularly great potential for advancing research and treatment of neurodegenerative disorders or neurological trauma, both of which lack effective therapies.

INNOVATION

Neural stem cell propagation and fate specification. The novel culture system - developed by Dr. Araceli Espinosa-Jeffrey and colleagues in the Semel Institute for Neuroscience and Human Behavior - improves NSC propagation and specification into oligodendrocytes. The system relies on a series of chemically defined media, specifically designed and carefully characterized for each developmental stage in the OL lineage. Generation of OL precursors from this system could be used for cell-replacement therapies, which are not limited to therapeutic myelin regeneration after brain or spinal cord trauma or for treatment of genetic myelin disorders. The induced OL or OL precursors would also be valuable to biomedical research.

ES and hips cell fate specification. The research team has modified the novel culture system to also allow the specification of ES and hiPS cells into the OL cell fate. The versatility of the system to induce these cell types to oligodendrocytes expands its utility as a research tool and improves compatibility for patient cell transplantation applications.

ADVANTAGES

- The invention utilizes proprietary, serum-free, animal free nutrient media formula to first to propagate NSCs. A second distinct media formula is used to induce cell lineage specification of neural stem cells into oligodendrocytes.
- High efficiency of cell induction from neural stem cell to oligodendrocyte fate: from NSCs, most cells become OL. The system also allows specification of hips and ES cells in a shorter period of time than previously reported in the literature.
- The culture system can be used in formation, propagation, and maintenance of NSCs in adherent cultures, i.e. in two-D cultures, or as neurospheres or oligospheres, i.e. three-dimensional cultures.

STATE OF DEVELOPMENT

Researchers have described, tested, and validated these novel culture systems on human pluripotent and neural stem cells.

PATENT STATUS

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OTHER INFORMATION

KEYWORDS

Stem cells, regenerative medicine, culture systems, neural stem cells

CATEGORIZED AS

- **Medical**
  - Stem Cell

RELATED CASES

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Country	Type	Number	Dated	Case
United States Of America	Published Application	20120052577	03/01/2012	2011-068

RELATED MATERIALS

▶ Espinosa-Jeffrey A, Wakeman DR, Kim SU, Snyder EY, de Vellis J. Culture system for rodent and human oligodendrocyte specification, lineage progression, and maturation. Curr Protoc Stem Cell Biol. 2009 Sep; Chapter 2: Unit 2D.4. PMID: 19725014.

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