Protocol for generation of thymic epithelial progenitor cells from human embryonic stem cells in vitro

Tech ID: 23163 / UC Case 2013-057-0

INVENTION NOVELTY

Investigators at UCSF have developed a novel robust protocol for programing human embryonic stem cells (hESCs) into thymic epithelial progenitors (TEPs) in vitro.

VALUE PROPOSITION

The thymus deteriorates with age and is susceptible to damage from irradiation and chemotherapy, which can lead to reduced immune function and increased susceptibility to infection. Generation of the thymus from pluripotent stem cells is a promising strategy for promoting immune tolerance in the context of stem cell-based therapies. While new sources of thymic epithelial cells (TECs) to restore thymic function are sorely needed in the clinic, efforts to produce functional TECs from human pluripotent stem cells have been unsuccessful thus far.

This novel invention provides the following advantages:

- First demonstration of functional human TEPs generation in vitro
- Enables thymus to generate new functional T cells
- Potential to promote immune tolerance without long-term use of immunosuppressant drugs
- Potential to make a major impact on effectiveness of stem cell-based therapies

TECHNOLOGY DESCRIPTION

A cornerstone of regenerative medicine is the study and use of reprogrammable (pluripotent) stem cells for the purpose of tissue repair and organ transplantation. A major challenge arises when the immune system recognizes transplanted tissue as foreign, which can cause the body to reject the new tissue or organ.

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OTHER INFORMATION

CATEGORIZED AS

- Medical
  - Stem Cell
  - Therapeutics

RELATED CASES

2013-057-0

The thymus is a key organ of the immune system and is responsible for the development of T-cells and establishment of the body's immune tolerance. A major component of the thymus is the thymic stroma, which is largely composed of thymic epithelial cells that are essential for the function of the thymus. Thymic epithelial progenitors are cells that give rise to TECs.

Investigators at UCSF have developed a new approach for generating TEPs in vitro. When the researchers transplanted TEPs generated from this method into thymus-deficient mice, the progenitors matured into functional TECs capable of supporting the development of new and functional murine T cells. Experiments testing hESC-derived TEPs for their ability to promote the maturation of human T cells are ongoing.

APPLICATION

- Thymus regeneration therapies
- Modulation of immune response to tolerate stem cell-based therapies (e.g. for treatment of type I diabetes)
- Reconstitution of T cells lost during HIV infection
- Research tool to model human immune diseases

STAGE OF DEVELOPMENT

Preclinical

PATENT STATUS

Country	Type	Number	Dated	Case
Canada	Issued Patent	2902857	11/29/2022	2013-057
United States Of America	Issued Patent	9,850,465	12/26/2017	2013-057

Additional Patent Pending

DATA AVAILABILITY

Under a CDA

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