The Torch
Vol. 4 (6)

An induced pluripotent stem cell-derived technology for cancer treatment

Shwetha Chandrasekaran

The use of human-induced pluripotent stem cells (iPSCs) for blood cell transfusion and research into the ontogeny of haematopoiesis is becoming widespread. Nowadays, iPSCs can be generated from antigen-specific T cells from patients even if they are small in number. The T cell-derived iPSCs (T-iPSCs) possess alterations in their genomic DNA that alter the T cell receptor (TCR) gene. This along with the study of T cell development proves to be useful in the development of antigen-specific T cells.

The TCR gene is an essential component for developing T cells that allow them to recognise antigens that are bound to the major histocompatibility complex (MHC) molecules. Cancers and viral infections are among the conditions that T cell immunotherapy may be effective in treating. With the availability of antigen-specific T cells tailored against certain diseases and for specific patients, T cell immunotherapy may become a popular option for treating a wide range of diseases. As a result of in vitro processing, T-iPSCs can be sequentially sorted to yield haematopoietic stem or progenitor cells (HSCs) (self-renewing cells that differentiate into distinct tissue types), T lineage cells (cells that originate from HSCs in the bone marrow but complete their development in the thymus) and mature CD8 (cluster of differentiation) single-positive T cells.

The CD8-positive T cells are an essential component of the adaptive immunity that expresses MHC class I-restricted T cell receptors. The cytotoxic T cells eliminate cancerous or virally infected cells; whereas, the CD8-positive T cells suppress a range of immune responses. The cells derived from these in vitro-produced CD8-positive T cells exhibit antigen-specific cytotoxicity and conduct general functions associated with the T cells. As a result, this novel protocol can allow the generation of antigen-specific T cells as well as the study of normal human lymphopoiesis. This approach may help identify and eliminate barriers to T cell immunotherapy, such as immune tolerance and cell exhaustion. It is possible to reprogramme and redifferentiate iPSCs into juvenile cells by transferring the juvenile status to their descendants. Such a process eliminates the exhaustion of T cells, thus making this process a practical approach towards cancer therapy.

Keywords: Stem cells, Human-induced pluripotent stem cells, Immunotherapy, Pluripotency, Rejuvenation, T cells

Citation:
Shwetha Chandrasekaran. An induced pluripotent stem cell-derived technology for cancer treatment. The Torch. 2023. 4(6). Available from: https://www.styvalley.com/pub/magazines/torch/read/an-induced-pluripotent-stem-cell-derived-technology-for-cancer-treatment.