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CRISPR-Cas9 based gene editing technologies in induced pluripotent stem cells

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Melek Yüce,Melek Yuce, Gulcin Delal Nozhatzadeh

Özet

Recent advances in the field of induced Pluripotent Stem Cells (iPSC) have a crucial role in therapeutic research iPSCs are cells reprogrammed from somatic cells using different transcription factors. The unique features of iPSCs such as self-renewal and differentiation into various cell lines makes it a more advantageous candidate in stem cell technologies. By replacing the use of embryonic stem cells (ESCs), iPSCs usage overcome various ethical issues related to the use of embryos in research and clinics. Besides iPSC technology is a promising field for disease modelling and gene therapy as human-derived pluripotent stem cells are the ideal source of cells for autologous cell replacement. Furthermore for patients with single gene disease, it is vital to genetically correct the disease-causing mutation before cellular differentiation and transplantation. Hence, the emergence of the CRISPR-Cas9 system has a very revolutionary and significant role in the genome editing field. Compared to other gene editing technologies, it is relatively easy to implement and at a lower cost, it is possible to repair and modify the genetic composition. Therefore CRISPR-Cas9 is a promising tool by leading repair of patient-specific iPSCs and serving possible future autologous cellular treatments. In this review, the current approaches and gene editing technologies in iPSCs will be summarized.

Anahtar Kelimeler

Gene editing, CRISPR/Cas9, Stem Cell, Induced Pluripotent Stem Cells

Abstract

Recent advances in the field of induced Pluripotent Stem Cells (iPSC) have a crucial role in therapeutic research iPSCs are cells reprogrammed from somatic cells using different transcription factors. The unique features of iPSCs such as self-renewal and differentiation into various cell lines makes it a more advantageous candidate in stem cell technologies. By replacing the use of embryonic stem cells (ESCs), iPSCs usage overcome various ethical issues related to the use of embryos in research and clinics. Besides iPSC technology is a promising field for disease modelling and gene therapy as human-derived pluripotent stem cells are the ideal source of cells for autologous cell replacement. Furthermore for patients with single gene disease, it is vital to genetically correct the disease-causing mutation before cellular differentiation and transplantation. Hence, the emergence of the CRISPR-Cas9 system has a very revolutionary and significant role in the genome editing field. Compared to other gene editing technologies, it is relatively easy to implement and at a lower cost, it is possible to repair and modify the genetic composition. Therefore CRISPR-Cas9 is a promising tool by leading repair of patient-specific iPSCs and serving possible future autologous cellular treatments. In this review, the current approaches and gene editing technologies in iPSCs will be summarized.

Keywords

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