The Torch
Vol. 2 (38)

Retroviral vectors in haematopoietic stem cell transplantation

Sruthi SV

Haematopoietic stem cell transplantation (HSCT) is a clinical treatment used for millions of patients with life-threatening diseases. Haematopoietic stem cell gene transfer using retroviral vectors containing the therapeutic gene has been actively studied for several acquired human and congenital diseases. The most commonly used viral vehicles are the retroviral, namely gamma-retroviral and lentiviral vectors owing to their ability to integrate their genome into that of the host cell, thereby enabling permanent genetic alteration of the host cell and a stable long-term expression of the therapeutic gene. The retroviral vector contains proviral sequences that accommodate the transgene and allow proper integration into the target cells. There is little effort required for their cloning and production, which are added advantages in utilising them. Therefore, retroviral vectors mediated gene transfer, as well as the design of lentiviral vectors with increased safety properties are being carried out considering the mutagenesis cases in patients. In addition, to enhance the expression of the transgene in the host cell, the vector contains cellular gene promoters such as the cytomegalovirus (CMV) promoter. Gamma-retroviral vectors are commonly constructed from the Moloney-murine leukaemia virus (MoMLV) genome. As host immune response is exhibited during gene transplant, low immunogenicity is fundamental for successful gene therapy. Therefore, the efficient transfer of the therapeutic gene of interest into HSCs, followed by the long-term and stable expression of the transgene at therapeutic levels is necessary for successful haematopoietic stem cell transplantation. While the successful gene therapy cases using retroviral gene transfer are encouraging, some hindrances, such as low efficiency of gene transfer and gene silencing in the retroviral vector system have to be circumvented. The anticipated success has been established by the therapeutic potential of haematopoietic stem cell gene transfer but the subsequent development of leukaemia in patients has re-emphasised the risks related to gene therapy. However, these new-generation retroviral vectors have helped treat various patients with complex diseases and promote success stories of gene therapy.

Keywords: Haematopoietic stem cell transplantation, Retroviral vectors, Lentiviral vectors, Gene therapy, Transgenes

Citation:
Sruthi SV. Retroviral vectors in haematopoietic stem cell transplantation. The Torch. 2021. 2(38). Available from: https://www.styvalley.com/pub/magazines/torch/read/retroviral-vectors-in-haematopoietic-stem-cell-transplantation.