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Induction of HIV-1 Resistance: The New Approaches Based on Gene Modification and Stem Cell Engineering

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Abstract : Introduction: Current anti-retroviral drugs have some restrictions for treatment of HIV-1 infection. The efficacy of retroviral drugs is not same in different infected patients and the virus rebound from latent reservoirs after stopping them. Recently, the engineering of stem cells and gene therapy provide new approaches to eliminate some drug problems by induction of resistance to HIV-1. Literature review: Up to now, AIDS-restriction genes (ARGs) were suitable candidate for gene and cell therapies, such as cc-chemokine receptor-5 (CCR5). In this manner, CCR5 provide effective cure in Berlin and Boston patients by inducing of HIV-1 resistance with allogeneic stem cell transplantation. It is showed that Zinc Finger Nuclease (ZFN) could induce HIV-1 resistance in stem cells of infected patients by homologous recombination or non-end joining mechanism and eliminate virus loading after returning the modified cells. Then, gene modification by HIV restriction factors, as TRIM5, introduced another gene candidate for HIV by interfering in infection process. These gene modifications/editing provided by stem cell futures that improve treatment in refractory disease such as HIV-1. Conclusion: Although stem cell transplantation has some complications, but in compare to retro-viral drugs demonstrated effective cure by elimination of virus loading. On the other hand, gene therapy is cost-effective for an infected patient than retroviral drugs payment in a person life-long. The results of umbilical cord blood stem cell transplantation showed that gene and cell therapy will be applied easier than previous treatment of AIDS with high efficacy.

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