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CCR5 as an Ideal Candidate for Immune Gene Therapy and Modification for the Induced Resistance to HIV-1 Infection

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Abstract : Introduction: Cc-chemokine receptor-5 (CCR5) is known as a main co-receptor in human immunodeficiency virus type-1 (HIV-1) infection. Many studies showed 32bp deletion (Δ32) in CCR5 gene, provide natural resistance to HIV-1 infection in homozygous individuals. Inducing the resistance mechanism by CCR5 in HIV-1 infected patients eliminated many problems of highly-active-anti retroviral therapy (HAART) drugs like as low safety, side-effects and virus rebounding from latent reservoirs. New treatments solved some restrictions that are based on gene modification and cell therapy. Literature review: The stories of the “Berlin and Boston patients” showed autologous hematopoietic stem cells transplantation (HSCT) could provide effective cure of HIV-1 infected patients. Furthermore, gene modification by zinc finger nuclease (ZFN) demonstrated another successful result again. Despite the other studies for gene therapy by Δ32 genotype, there is another mutation -CCR5 Δ32/m303- that provides HIV-1 resistant. It is a heterozygote genotype for Δ32 and T→A point mutation at nucleotide 303. These results approved the key role of CCR5 gene. Conclusion: Recent studies showed immune gene therapy and cell therapy could provide effective cure for refractory disease like as HIV. Eradication of HIV-1 from immune system was not observed by HAART, because of reloading virus genome from latent reservoirs after stopping them. It is showed that CCR5 could induce natural resistant to HIV-1 infection by the new approaches based on stem cell transplantation and gene modifying.

Keywords : CCR5, HIV-1, stem cell, immune gene therapy, gene modification
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