B Cells Genetic Engineering With a Gene for HIV Antibodies Production, by an Innovative Method Based on the Class-Switch Recombination Process and by CRISPR/Cas9

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The HIV virus caused millions of deaths in the last decades. Today's treatment for HIV infection has substantial shortcomings. Genetic engineering of B cells by inserting a gene encoding antibodies that can detect and neutralize HIV, has the potential to create an effective and specific treatment for the virus. In the current study, a new method for genetic engineering of B cells was examined, and the effect of gene insertion for the production antibodies against HIV was characterized. B cells previously extracted from mousses' spleen were separated into three groups. The first group was engineered by CRISPR/Cas9. Another group was engineered by a new method based on the Class-Switch recombination (CSR) process which naturally occurs in B cells, in which there is no need for artificial cutting of the genome. The last group, the control group, remained untreated. The results showed that B cells can be successfully engineered by both methods and that CRISPR/Cas9 does that with higher effectiveness but is more harmful to the cells causing higher death rates. Furthermore, unlike CRISPR, CSR-based engineering succeeded in engineering the cells without affecting their differentiation into plasma and memory cells. It seems that though engineering B-cells with CRISPR resulted in higher success rates, engineering B-cells using CSR caused less damage to the cells. These results are essential for the development of genetically engineering-based treatment for HIV that could solve substantial shortcomings of the current treatment and could also be used for the neutralization of other pathogens in the future.

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