CRISPR Based Gene Editing Confers Resistance to Human Immunodeficiency Virus (HIV)

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Current HIV therapies lead to drug resistance and fail to address the latent viral reservoir which reactivates and inevitably leads to AIDS and mortality. Commonly infectious HIV targets T-cells via the cluster of differentiation glycoprotein (CD4) receptor and a highly conserved chemokine co-receptor, CCR5. This project aims to create resistance to HIV by generating lentiviral particles that will use CRISPR (clustered regularly interspaced short palindromic repeats) to specifically edit the CCR5 gene in T-cells, rendering them resistant to HIV. First, novel CRISPR lentiviral particles were created to effectively and specifically deliver the gene editing complex into T-cells. These lentiviral particles were then transduced into T-cells and resultant genomic DNA was isolated. Subsequently, gene editing efficiency was determined by subjecting genomic DNA isolated from these modified T-cells to T7 Endonuclease Assays. Results indicated that approximately 90% of the cells had undergone gene editing at the CCR5 gene. Further, flow cytometric analysis showed T-cells had lost cell surface CCR5 expression. Therefore, they will be resistant to HIV infection. In future, resistance will be confirmed by measuring the reduced susceptibility to HIV infection in the CCR5 gene-edited cells. Such HIV resistance will also be tested in vivo. In summation, CRISPR based gene editing confers resistance to HIV. This project presents a potential single round gene therapy that confers resistance to HIV as opposed to current lifelong HIV therapies that are associated with comorbidities.

Awards Won:

Third Award of $1,000