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 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