Heller

TBIOMD 410

Tran, Jason

Abstract – Final Draft

CRISPR-Cas9 Gene Editing Potential in Cancer Therapeutics

Jason Tran and Marc Nahmani

Abstract

The American Cancer Society (ACS) predicts that 1.9 million new cancer diagnoses and 600,000 cancer mortalities will occur in 2023. In addition, cancer therapies such as chemotherapy are unable specifically target cancer stem cells resulting in harmful side effects to the patient. While targeted cancer therapy does exist, it is not an available treatment for all cancer types. CRISPR-Cas9 is a genome editing tool comprised of the Cas9 enzyme and a guide RNA sequence (gRNA). The gRNA allows for sequence specific binding and is attached to the Cas9 enzyme, which is responsible for cutting targeted sequences, allowing for removal of unwanted sequences and/or replacement with a desired sequence. This literature review was conducted to explore the potential effectiveness and drawbacks of CRISPR in cancer therapies. This review analyzed research in the efficacy of current cancer treatments to identify an area of treatment that could benefit from CRISPR. Our findings suggest the use of CRISPR-Cas9 for cancer therapy appears to be possible by direct injection to a tumor with cationic lipids. If gRNA is equipped with specifications for an individual, the sequence of interest can be corrected or removed, inhibiting proliferation of the tumor. Moreover, the sequence targeting capability of CRISPR could allow for removal of oncogenes and repair tumor suppressor genes and could be used in tandem with other therapeutics increasing treatment efficacy overall. Further research is required to identify unforeseen side effects such as rate of 'off-target' effects from CRISPR as well as the efficacy of this method.