CRISPR Cas9 as a Gene Editing Tool

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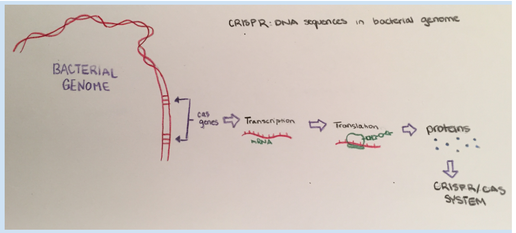
How to apply the CRISPR-cas 9 gene editing system to design a tool to cure a single mutated gene disorder such as neurofibromatosis type II (NF2)?

INTRODUCTION

A novel gene editing system, CRISPR-cas9 gives scientists the opportunity to cure disorders that are caused by single mutated genes. While we may not have had the ability to test the tool, we studied an incurable disease, neurofibromatosis type II – caused by the NF2 gene – in order to gain a more developed understanding of how CRISPR could be applied.

BACKGROUND AND SIGNIFICANCE

What is CRISPR - cas9?



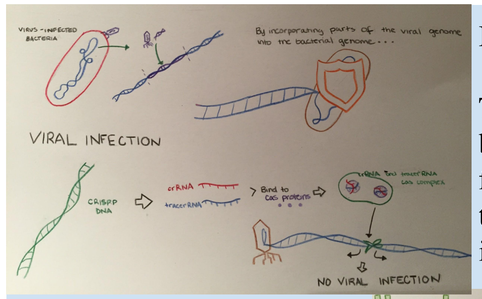
CRISPR - cas9 is a **gene editing system** that is used to develop an **efficient and reliable** way to make changes to the genome of living cells, by adding, editing, or deleting amino acids. It is based off a CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) associated-9 nuclease (which is where the cas 9 comes from), coming from a bacterium (Reis NP).

What is NF2 and why is it a problem?

NF2 is a disease that is correlated with bilateral vestibular schwannomas (acoustic neuromas), that is often caused by an **alteration** in the NF2 gene which is responsible for tumor suppression (Cancer.net). **One in every 40,000 people** have NF2 and 50% of patients that have it have no family history of the disease; scientists still have trouble distinguishing whether or not a patient has the disease (Cancer.net).

NF2 studies usually focus on meningioma, the most frequent tumor occurring in the skull; most are slow growing and benign (Hansson, et al.). Most of these studies confirm the frequency of mutations relating to NF2 (Hansson, et al.) in different subgroups such as menopausal women (Tabernero, et al.) Other studies includes relating neurofibromatosis therapeutics to oncogenic kinases such as PAK1 (Maruta), and experimenting with tumor suppressors by using alternative splicing and deletion to research their correlation to chromosomal instability (Yang, et al.).

HOW DOES CRISPR WORK?

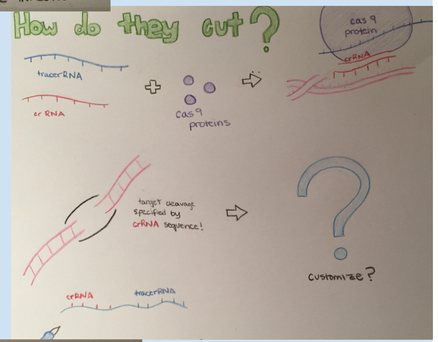


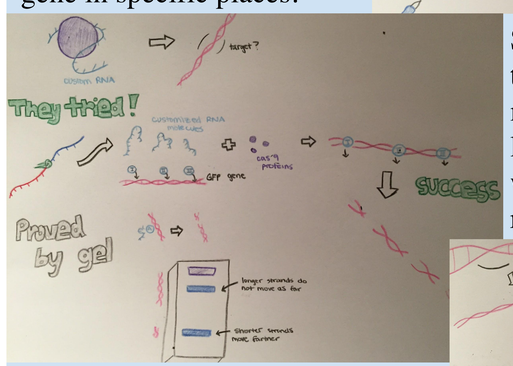
Bacterial Immune System

The crRNA and tracrRNA bind to the cas proteins forming a complex that then cuts the DNA of the infecting virus.

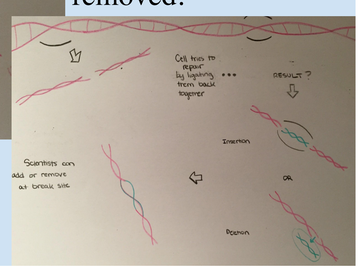
Scientists try to apply the system

They bind the tracrRNA and crRNA to a cas protein and then use the customized molecule to cut the gene in specific places.





Scientists can apply this to gene editing by manipulating the location of the cut and what is deleted or removed.



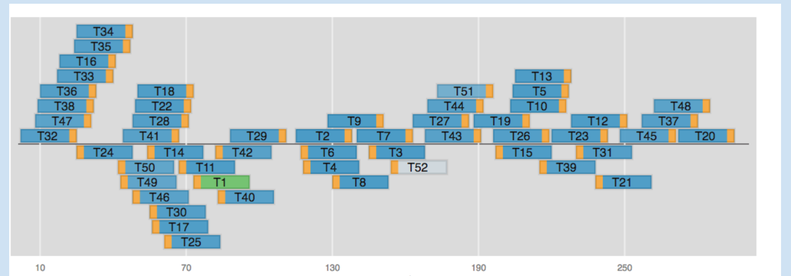
RESEARCH METHODOLOGIES

The idea of the study is to understand how CRISPR-cas9 is applied to edit mutated genes such as with NF2.

DATA ANALYSIS AND RESULTS

Original Protein Sequence (shortened):
magaiasrmsfsslkrkqpktft**y**rivtmdaemefncemkwkgkdlfdlvcrtlglret wffglqytikdtvawlkmdkkvldhdvskee pvtfhflakf

Mutated Protein Sequence (shortened):
magaiasrmsfsslkrkqpktft**a**rivtmdaemefncemkwkgkdlfdlvcrtlglret wffglqytikdtvawlkmdkkvldhdvskee pvtfhflakf



ACKNOWLEDGEMENTS / REFERENCES

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2. Mentor - Dr. Mai Nguyen