**Crispr**

**Intro to CRISPR-Cas9**

Using a paper model and the online model through Biointeractive, we were able to explore the process of CRISPR-Cas9.

1. **What does CRISPR-Cas9 mean?**

CRISPR-Cas9 is gene-editing technology which allows scientists to make changes to an organism's DNA. CRISPR stands for Clustered Regularly Interspaces Short Palindromic Repeats.

Cas9 is an enzyme which is used to cut nucleic acids. It is also used to help bacteria defend against viruses.

1. **Structure of CRISPR-Cas9**

Clustered, regularly interspaced, Short palindromic repeats.

1. **How CRISPR-Cas9 targets a specific gene**

The Cas9 is introduced into the cell where it attaches to the DNA. It binds once the correct nucleotide sequence is connected.

1. **How CRISPR-Cas9 binds to the target area of the specific gene**

Once the CRISPR-Cas9 is binded to the nucleotide, the Cas9 unwinds the DNA double helix with the assist of helicase. Once it matches 20 nucleotides in a row, the DNA will bind to the RNA via complementary base pairing.

1. **How CRISPR-Cas9 cleaves DNA**

After the DNA and RNA have paired, the complex initiates a change in shape and begins activating its nuclease activity. This would result in cleavage of both DNA strand and RNA nucleotide.

1. **How CRISPR-Cas9 can repair DNA to “knock out” a gene**

By altering the DNA sequence of a gene, CRISPR-Cas9 can “knock” it out or switch it off. The cell’s built-in repair mechanisms kick in when the Cas9 protein snips the DNA at the right spot in the gene. These repairs can occasionally fail, which leads to mutations that prohibit the gene from functioning properly.

1. **How CRISPR-Cas9 can repair a mutation in DNA**

a DNA mutation can be fixed using CRISPR-Cas9. Researchers or scientists can direct the repair procedure by introducing a repaired DNA sequence together with the Cas9 protein and guide RNA. The gene’s normal function will be restored when the cell incorporates the proper sequence, replacing the mutant one.

1. **How CRISPR-Cas9 could be used to our benefit**

CRISPR-Cas9 can be used to our benefit in a variety of fields, including medicine, agriculture, science, and biotechnology. In medicine, it has the potential to revolutionize the treatment of genetic diseases through precise gene corrections/repairing mutations, while in agriculture, it can increase crop growth, resilience, and food security. The technology also allows for personalized medical treatments for people which allows for more precise treatments which can accommodate a wider variety of conditions and patients . To ensure responsible use, it is essential to approach its application with thorough ethical considerations and strict safety procedures.

**Analyzing the models I used to learn:**

1. **In what ways did the model accurately reflect the process?**

Paper models can correctly represent a variety of processes clearly. My group mates and I were able to accurately reflect the general idea of how the process of CRISPR-Cas9 works with our paper model model. It allowed us to grasp a basic concept of the enzyme, and the various components of the process such as guide RNA, the Cas9 protein, and DNA editing. This activity also made it easier for us to understand the crucial steps in this process. However, the paper model may not have accurately captured all the specific characteristics and components of CRISPR-Cas9. It was difficult to accurately represent every feature through the paper model because of how complicated the actual process is. Although it did a good job of explaining the fundamentals, it might not have gone into great detail about the specifics of how CRISPR-Cas9 works at the molecular level.

1. **Models are commonly used to communicate scientific concepts to nonscientific audiences. Do you think this is an effective way to educate students and/or the public about science? Why or why not?**

Models serve as efficient instruments for explaining scientific ideas and promoting learning. They effectively engage learners by simplifying complex ideas and offering visual clarity. Models improve understanding and provide concrete form to complex concepts by bridging the gap between scientific language and common understanding. Students can be actively engaged in interactive activities with models, which can stimulate curiosity and create enduring learning opportunities. I support the use of case studies, critical thinking exercises, and models with practical applications to provide a thorough scientific education. This method stimulates different parts of the brain, resulting in knowledge retention and greater understanding. In order to keep models accurate and relevant, regular updates are required. In conclusion, I think that models are crucial for public and student education. Models make complex scientific ideas understandable and relatable to a wider audience, allowing for effective comprehension, appreciation, and application of scientific ideas.

#### **Work Cited**

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