Gene Splicing: Human Growth Hormone and Recombinant DNA

Today's scientists can insert genes of one organism into the DNA of another organism. This technique, gene splicing, is used in research on human DNA to produce large quantities of human growth hormone, a protein. In gene splicing, a plasmid, a small piece of circular DNA in a bacterial cell, is opened with a restriction enzyme. Restriction enzymes cut strands of DNA at particular base sequences. Once the plasmid is open, the human gene that codes for the production of human growth hormone is inserted. The plasmid with its new gene is described as recombinant DNA. The recombinant plasmid is inserted into a bacterium. As the bacterium grows and divides, it and its descendants produce human growth hormone. This activity will simulate that process.

**Materials**

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| White Legal sized paper | Scissors | Clear Tape | Piece of red construction paper | Ruler |

**Activity**

1. Use scissors to cut a one-inch-wide strip of paper from the longer side of the legal-sized paper. Shape the strip into a circular loop and secure it with tape. This represents a bacterial plasmid.
2. Use scissors to cut a one-inch-wide strip from the short end of the red construction paper. This represents the gene coding for human growth hormone.
3. To simulate gene splicing, use the scissors to cut open the plasmid. The scissors represent the restriction enzyme opening the plasmid.
4. Tape the red paper into the place where the plasmid was opened, reforming the loop. The tape represents the enzyme*ligase* that affixes the new gene into the plasmid. This new plasmid with recombinant DNA is ready to be reinserted into a bacterium so it can make growth hormone.

**Follow-Up Questions**

1. Describe the process of gene splicing.
2. What are the functions of a restriction enzyme and ligase?

**Answers**

1. Gene splicing is the process of putting the desired gene in the plasmid to produce recombinant DNA.
2. Restriction enzymes cut open the plasmid at specific sites on the plasmid so the new gene can be inserted. The ligase is responsible for affixing the new gene into the opened plasmid at that specific location.

**Extension**

Expand this activity by researching how the restriction enzyme knows where to cut the plasmid. Also, find out the gene code for growth hormone and write it on the red construction paper.