Virtual Learning

Medical Interventions
Bacterial Transformation

May 5, 2020

Medical Interventions
Lesson: May 5, 2020

Objective/Learning Target:

Explain how plasmids, rings of DNA containing genes of interest, can be inserted into bacteria cells by outlining the process of bacterial transformation. (4.1.2)

Let's Get Started:

1. Review the structures of bacteria that you learned about last semester. What are plasmids?
2. Review how DNA can be manipulated by going through this tutorial.
3. Last semester you learned how vaccines can be created through DNA recombinant technology. How might plasmids be useful for creating insulin?

Let's Get Started: Answers

1. Review the structures of bacteria that you learned about last semester. What are plasmids?
   a. Small rings of DNA separate from the bacterial chromosome that often carry resistance genes
2. Review how DNA can be manipulated by going through this tutorial.
3. Last semester you learned how vaccines can be created through DNA recombinant technology. How might plasmids be useful for creating insulin?
   a. A gene for making insulin could be inserted into a plasmid and then back into a bacteria for it to make the hormone

Lesson Activity

It is difficult to visualize insulin being produced in a lab, so we will focus on the common lab experiment of inserting a jellyfish gene that causes them to glow (green fluorescent protein or GFP) into an E. coli bacterial cell. Go through the animation on DNA transformation and apply this information to explain how a bacteria can glow using this procedure. Make sure you include the following terms:

- Jellyfish gene
- plasmid
- E. coli bacteria
- ultraviolet light
- chemical transformation
- plasmid
- green fluorescent protein (GFP)
- heat shock
- ampicillin

Lesson Activity - Answer

It is difficult to visualize insulin being produced in a lab, so we will focus on the common lab experiment of inserting a jellyfish gene that causes them to glow (green fluorescent protein or GFP) into an E. coli bacterial cell. Go through the animation on DNA transformation and apply this information to explain how a bacteria can glow using this procedure. Make sure you include the following terms:

- Check your answer by watching this video explanation.

Practice

Answer the following questions based on your answer to the lesson activity:

1. What is transformation? What does exogenous DNA mean?
2. What is competency for a cell? How is it achieved?
3. What evidence is there that transformation was successful?
4. What is the source of the fluorescence?
5. What would be needed if you were wanting the bacteria to produce insulin instead of GFP?

Practice - Answers

Answer the following questions based on your answer to the lesson activity:

1. Transformation is the insertion of a foreign plasmid into a bacteria cell which results in newly acquired genetic trait(s) for that cell. Exogenous means foreign or found outside.
2. Competency for a cell is a process by which bacteria is manipulated to undergo transformation. It is a change in physiologic state of the cell. Changes occur in the structure and permeability of the cell membrane (small holes are created) that makes the cells able to take up the plasmid DNA. This process is achieved via controlled growth conditions, sudden temperature change, and the use of certain chemicals.
3. The bacterial colonies will fluoresce underneath a UV light
4. The green fluorescent protein encoded by the plasmid
5. A gene that codes for the insulin protein

Additional Practice/Resources

1. Check your understanding by reviewing with these flashcards.
2. Check out this website for extra practice on the lab procedure with additional information and worksheets.
3. There is another technique that can be used to induce transformation in bacteria; learn about electroporation by reading this article.
4. In the next lesson we will learn how the insulin can be isolated and purified after being produced by bacteria. Think about how this could be achieved.