Bacterial Transformation

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BIO 1120 – Section 03

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Questions to consider: Bacterial transformation

1. Only one DNA molecule in 10,000 can successfully transform a bacterium in the most favorable conditions we can create in the laboratory, how important a phenomenon is transformation of bacteria in nature?

Answer :

Even though transformation has a low success rate in the lab, it plays a major role in nature. Bacteria have ways to pick up DNA from their surroundings, also even rare transformation events can have a huge impact over time. Such situations allow bacteria to adapt by gaining traits, for example, antibiotic resistance or new metabolic abilities. While slow, this process drives evolution, helps bacteria survive environmental changes accordingly, and contributes to the spread of useful genes in the evolution of microbial communities.

1. Predict the growth of the bacteria on the 4 plates that you prepared. Explain the reasons for your predictions.

Answer :

We worked with four different agar plates in this lab experiment. what I expect based on how each plate was set up:

* **Plate 1:**   
  No plasmid was added, so these bacteria don’t have the gene to resist ampicillin. As a result, I don’t expect any bacterial growth.
* **Plate 2:**   
  Since no antibiotic is present, and the bacteria were not transformed, they should grow normally without any resistance needed.
* **Plate 3:**   
  These bacteria received the plasmid, but since there’s no antibiotic to challenge them, I expect healthy growth.
* **Plate 4:**    
  Growth should occur here only if the transformation worked. The plasmid carries the gene for antibiotic resistance, so any colonies here likely took up the plasmid successfully.

1. Describe the role of CaCl2 in bacterial transformation.

Answer :

Calcium chloride helps prepare the bacterial cells to accept foreign DNA which is done by neutralizing the negative charges on the bacterial membrane and DNA, making it easier for the plasmid to enter. It also helps make the membrane more permeable during the heat shock step. Without CaCl₂, the transformation would be much less efficient.

1. On the agar plate(s) without antibiotics, how would you explain a result where you obtain no growth.

Answer :

If there’s no growth on a plate that doesn’t contain antibiotics, it suggests something went wrong in the process. Possible reasons include the bacteria being accidentally killed during preparation, improper handling (such as forgetting to plate the cells), or poor incubation conditions. It’s also possible the nutrients in the agar were bad or the plasmid degraded, preventing growth.

1. What results would you expect to obtain for this experiment if you omitted the heat shock step? Explain your answer.

Answer :

Skipping the heat shock would likely lead to little or no transformation. The rapid temperature change during heat shock causes temporary openings in the cell membrane, allowing the plasmid DNA to enter. Without this step, most bacteria wouldn’t take up the plasmid, and we wouldn’t see growth on antibiotic plates, since the cells wouldn’t gain resistance. So, transformation would mostly fail.