

Pre-Lab, Skills, and Standards Alignments

GENE THERAPY

Gene therapy is a gene modification technique that can be used to treat or prevent genetic disease. In this lab, a mutant strain of *E. coli* is engineered with a missing gene so it can survive in a Petri dish with a selective food source. After overnight growth, a color change indicates the bacteria have been transformed, and the “therapy” was a success.

Lab Length: 1 hour or 2 hours

Suggested Pre-Lab Teaching

- DNA Structure
- Bacterial cell components, including plasmids
- Central Dogma (genes to proteins)

Lab Skills

- Measure small volumes of liquid using micropipettes.
- Use sterile technique while working with bacteria.
- Culture bacteria in Petri dishes.
- Follow a multi-step procedure to conduct a controlled experiment.

Conceptual Knowledge/Skills

- Explain the steps of bacterial transformation.
- Predict experimental and control results.
- Construct an explanation of how the results show the host bacteria were genetically modified.
- Describe an example of how gene therapy could be used in humans.

New York State Science Learning Standards/NGSS

Science and Engineering Practices	Disciplinary Core Ideas	Cross Cutting Concepts
<p><u>Planning and Carrying Out Investigations</u> Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation.</p> <p><u>Analyzing and Interpreting Data</u> Analyze and interpret data to provide evidence for phenomena.</p>	<p><u>LS1.B Growth and Development of Organisms</u> Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (MS-LS3-2)</p> <p><u>LS3.B: Variation of Traits</u> In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1) (NYSED) Mutations may result in changes to the structure and function of proteins. (MS-LS3-1) •(NYSED) Advances in biotechnology have allowed organisms to be modified genetically. (HS-LS3-2)</p>	<p><u>Interdependence of Science, Engineering, and Technology</u> Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems.</p> <p><u>Cause and Effect</u> Cause and effect relationships may be used to predict phenomena in natural or designed systems.</p>