

Positions, Beliefs, and Values

Abstract

Students review statements about gene therapy and determine how strongly they agree or disagree with each one. Students also write out the personal belief that leads them to their position for each statement.

Learning Objectives

- Students will state their own opinion about who should have access to gene therapies, how gene therapies should be used, and to what extent the government should regulate gene therapies.
- Students will examine and state the personal beliefs that shape their opinions about the various aspects of gene therapy.
- Students will determine the values that underlie their personal beliefs about gene therapy.

Estimated time

- Class time 20 minutes
- Prep time 15 minutes

Materials

- Student Handouts

Background Information

The basic idea behind gene therapy is to add a normally functioning copy of a gene to cells of the affected tissue. This is often done using an engineered virus as a vector. Gene therapy will only work if the normal gene is delivered to a large number of correct cells -several million in fact. Once the gene reaches its destination, it must be activated (“turned on”) to produce the protein encoded by the gene. Due to this complexity, gene therapy poses one of the greatest technical challenges in modern medicine.

Below is a list of issues surrounding gene therapy that are pertinent to this activity and/or may add to classroom discussion.

- Germline gene therapy
Germline gene therapy aims to permanently add the desired gene to the reproductive cells that ultimately produce egg or sperm cells. This would ensure that offspring inherit the desired gene. In some cases, this could happen unintentionally and have a negative effect.
- Activating an immune response
Using viral vectors in gene therapy puts the patient at risk for an immune response. Serious illness or death can result.

- Disrupting important genes in target cells

Incorporation into the genome is crucial to the success of gene therapy. However, there is a risk that the gene will incorporate itself into an inappropriate place in the genome, disrupting the function of another gene.

For more information and examples of the challenges above see: [Gene Therapy: Molecular Bandage? - Challenges in Gene Therapy](#).

- Government regulation

Currently, gene therapy research trials are subject to approval by regulatory agencies such as the FDA. The FDA also must approve any gene therapy product sold currently and in the future. See the FDA's website for more information.

- The cost of gene therapy

The high cost of financing gene therapy research or treatment has given rise to a host of financial questions such as: Who will pay for the expensive gene therapy trials? Will health insurance cover gene therapy treatments? Will only those able to pay have priority in receiving treatment?

- Gene therapy and enhancement

Some worry that once gene therapy techniques have been established to treat disease, those same techniques could be used to change other traits. Many are discussing the ethical implications of using gene therapy techniques for genetic enhancement.

Instructions

1. Begin class by reviewing basic information about gene therapy such as:
 - the general idea behind gene therapy
 - how gene therapies are delivered (in general)
 - the risks associated with gene therapy
 - the difference between somatic cell and germline gene therapies
 - the aspects of gene therapy that are potentially time-consuming and costly
2. Distribute the student handouts and instruct students to:
 - Check the box beneath each statement on page 1 that most closely corresponds to how much they agree or disagree with it.
 - Write the personal belief that leads to the ranking they chose.
 - Look at the Values and Descriptors handout (pages 2-3). Choose the value or values on which their belief is based and list it for each statement.
3. When the students are finished, poll the class to determine their answers for each statement. Discuss the statements for which there were a variety of rankings or a strong similarity in ranking among the class.

Adaptations

Designate an area of the room to form a linear “agreement gradient” (for example, the east wall represents “strongly agree” and the west wall represents “strongly disagree”) along which students can stand. Read each statement aloud and ask students to stand along the imaginary “agreement gradient” indicating their ranking for each statement (for example, a neutral student would stand in the middle of the linear gradient, whereas a student who strongly agrees with the statement will stand at the east wall). Discuss students’ distributions where appropriate. This activity can be done before, after, or in place of the Positions, Beliefs and Values worksheet.

Misconceptions

- It is commonly thought that gene therapies, and many other techniques in genetics for that matter, are easy to do and enjoy a high success rate. Although these techniques may make sense theoretically, they are still very difficult to carry out in the laboratory. There are many factors that affect the success of gene therapies, some of which can be controlled and others that can not.
- Students may have the misconception that changes made to the somatic cell genome are incorporated throughout the body and can be passed on to offspring. One of the biggest challenges of gene therapy is delivering the desired gene to an adequate number of the right kind of cells in the body to make a difference. Also, only changes made to the germline (sex) cells can be passed to offspring.

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