
DNA Microarray Activity: An Ethical Dilemma?

Participant Guide

Description and Estimated Time to Complete

This activity provides you the opportunity to evaluate your own ethical decisions in various situations and to discuss with others the ethical dilemma surrounding some of the applications of DNA microarrays.

After completing this activity you should be able to describe and justify your personal opinions about the use of DNA microarray in certain applications and better understand the opinions of others in answering the question “Are DNA microarrays an ethical dilemma?”

Estimated Time to Complete

Allow at least 60 minutes to complete.

Introduction

What are ethics? You can think of ethics as being the study of why some specific actions may be right or wrong, praiseworthy or blameworthy. Being ethical is not just following the law or the rules that dictate society, but using your personal beliefs in forming your decisions.

*"Ethics refers to well based standards of right and wrong that prescribe what humans ought to do, usually in terms of rights, obligations, benefits to society, fairness, or specific virtues."*¹

However, one can always find arguments for and against the existence of the concepts of 'right' or 'wrong.' This is why ethics sometimes differs from one person to another, from one society to another, from one situation to another.

Think of a personal experience where you disagreed with someone. *Was the disagreement due to differences in your personal beliefs or values? How did you feel about having your beliefs challenged?*

What is ethical? Ethical issues are complex. They vary with each situation. Ethical issues can arise any time we consider an action as being morally right or wrong. Such actions can occur when humans, animals, living things or historical artifacts are being manipulated for the benefit of others. Some examples could be unfair employment practices, testing chemical side effects on animals, or tearing down a historical landmark to build a parking lot. In other words, would it be morally wrong for people to achieve personal gains without regard to others, such as selling a product that could hurt the buyer or a product that you know they don't need and can't afford? Ethical issues can be something as simple as where to park. For example, what choice would you make in the following situation?

An ethical dilemma: On your way home from school or work, you stop off at the local grocery to get a couple of items. The parking lot is pretty full, but a handicap spot is open near the door. You have to make the choice of parking in the handicap spot (since you only have 2 items to get) or park in the next closest spot about 30 to 40 feet away. What choice would you make?

Why do we need to discuss ethics? It is clear that many areas of life contain questions concerning right and wrong. How people answer these questions is dependent on their personal ethics which are not always the same as yours. One's ethics are unique. How many other people would make the same choice as you did in the previous situation?

People base ethical decisions on their personal values and principles. These values and principles are developed through individual life experiences and beliefs. Ethical principles are general statements of how people should or should not act in most situations. Principles are often the reasons behind our actions. Ethical principles need to be addressed in all areas including science and technological developments.

In this lesson you will examine the ethical challenges of new technology, specifically the DNA microarray in reference to human health and safety.

Activity Objectives

Activity Objectives

- State how you would respond to a situation in which one might find unethical.
- Justify your personal opinion on the ethics of using DNA microarray for certain applications.

Resources

Computer with high-speed Internet access.

Documentation

This activity has two parts. Your documentation should include all of the questions asked in each part of the activity and your answer to each of these questions. In Part II, your documentation should include a summary of your group's analysis of the situation and the group's discussion. Your summary should also include the opinions that were expressed on the ethics of the situation and the personal ethics of group members in forming their opinions and final decision on what should or should not be done in this situation.

Activity – Part 1: What is ethical?

PROCEDURE – Part I:

1. Analyze each of the following scenarios.

For each scenario answer the questions:

- a. What is the ethical situation presented (if there is one)?
- b. What is "right" or "wrong"?
- c. What do you believe is the cause of the problem (if there is a problem)?
- d. What are some ideas for possible solutions to the problem?
- e. Which of these solutions do you feel is the best? Why?
- f. Who would benefit from your decision?
- g. Who would lose due to your decision?

Scenario 1:

In a parking lot, you open your car door too forcefully and leave a big scratch as well as a dent on the car next to yours. What would you do?

Scenario 2:

You witness a hit and run along with 5 of your friends. There are several other people in the area that have also witnessed the hit and run. Your friends start walking away from the scene, heading toward your original destination. What would you do?

Activity – Part II: DNA Microarrays – An Ethical Dilemma?

There have been many questions raised on the ethics of DNA microarrays for certain applications and possible uses or abuses. Two questions we all need to ask are

- “Do these applications hurt society more than help it?
- Are these applications ethically "right" or "wrong"?

Every time the human race makes a new discovery or introduces new technology, the question "Is it ethical?" is asked. Reaching a unanimous decision is impossible because people's ethics differ; however, there are some common rights and wrongs on which people can reach consensus.

In this part of the activity you will research a specific application of DNA microarrays and then have a discussion with other participants on the ethics of using DNA microarrays for that application. Before beginning your discussion make sure that you understand the DNA microarray application and the ethical concerns surrounding it. Let's review some of the rules that should be applied when discussing controversial issues.

Rules to Apply

- Identify the ethical question or situation.
- Determine if the information given is reliable.
- Ask: "Is there something that is not been said?"
- If you feel like something is missing, then research the situation, learn more about it and get a better understanding of it.
- Determine who is responsible for what.
- Identify who may or may not be affected.
- Based on your analysis and facts, determine what should be done and by whom.
- Be able to justify your final decision as to what should be done.

PROCEDURE – Part II

1. Read through the following three scenarios that present “questionable” applications of DNA microarrays. With your group, decide which scenario you would like to discuss. If you are unfamiliar with the application or you need more information, your group may decide to do some additional research before discussing it so that you can better support your opinions. Since these articles are several years ago, after your discussion, research to see if these applications were implemented or not.

Scenario 1:

Swabbing Students: Should Universities Be Allowed to Facilitate Educational DNA Testing?.
Shawneequa L. Callier. Am J Bioeth. 2012 April; 12(4):32-40. PMC. NCBI.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3390747/>

Summary: “Recognizing the profound need for greater patient and provider familiarity with personalized genomic medicine, many university instructors are including personalized genotyping as part of their curricula. During seminars and lectures students run polymerase chain reactions on their own DNA or evaluate their experiences using direct-to-consumer genetic testing services subsidized by the university. By testing for genes that may influence behavioral or health-related traits, however, such as alcohol tolerance and cancer susceptibility, certain universities have stirred debate on the ethical concerns raised by educational genotyping. Considering the potential for psychosocial harm and medically relevant outcomes, how far should university-facilitated DNA testing be permitted to go?”

Scenario 2:

The Pros and Cons of Prenatal Genetic Testing. Holly Brewer. Health Guidance for Better Health. March 18, 2011.

<http://www.healthguidance.org/entry/15177/1/the-pros-and-cons-of-prenatal-genetic-testing.html>

Summary: “Prenatal genetic testing has been a source of controversy for many parents to be. There are certainly pros and cons to the process, many of which come down to personal beliefs and medical preparedness that can be difficult to look at when you’re expecting. Overall, the genetic testing is there to offer you certain choices in response to the probability of having a healthy or unhealthy child in your future.”

Scenario 3:

USDA's National Institute of Food and Agriculture Invests in Research on the Implications of Gene Editing Technologies. USDA. National Institute of Food and Agriculture. May 11, 2018. Media Contact: Kelly Sprute.

<https://nifa.usda.gov/announcement/nifa-invests-research-implications-gene-editing-technologies>

Summary: "Recent advances in gene editing technologies promise opportunities for meeting challenges that come with a rapidly growing global population," said NIFA Acting Director Tom Shanower. "However, these advances also raise important questions about their acceptability and potential unintended impacts, so NIFA created the Social Implications of Emerging Technologies program in 2017 to fund research on stakeholder and public engagement with gene drive and other gene editing techniques for agricultural use."

2. As a group, discuss the ethical dilemma that may or may not be associated with one of these scenarios. Use the following rules as a guide for your discussion.
 - Identify the ethical question or situation.
 - Determine if the information given is reliable.
 - Ask: "Is there something that is not been said?"
 - If you feel like something is missing, then research the situation, learn more about it and get a better understanding of it.
 - Determine who is responsible for what.
 - Identify who may or may not be affected.
 - Based on your analysis and facts, determine what should be done and by whom.
 - Be able to justify your final decision as to what should be done.
3. Document your group's analysis of the situation and summarize your discussion. Your summary should include the opinions that were expressed, the ethics of the situation and the personal ethics of group members in forming their opinions and final decision on what should or should not be done in this situation.

Summary

In this activity you learned a methodical and objective way to analyze potentially ethical situations. Using this method, you should have been able to evaluate your own ethics in certain situations and to be able to discuss difficult issues in a non-threatening and productive manner.

References

- ¹ What is Ethics? Developed by Manuel Velasquez, Claire Andre, Thomas Shanks, S.J., and Michael J. Meyer Markkula Center for Applied Ethics, Santa Clara University.
<http://www.scu.edu/ethics/practicing/decision/whatisethics.html>
- ² The Ethics of NanoTechnology – NanoTechnology Now, February 7, 2007:
<http://www.nanotech-now.com/ethics-of-nanotechnology.htm>
- ³ Responsible Nanotechnology: Looking Beyond the Good News, Vicki Colvin, *Director of the Center for Biological and Environmental Nanotechnology*, Rice University: Nov 2002.
NanoEthics Bank. <https://ethics.iit.edu/NanoEthicsBank/node/955>

Support for this work was provided by the National Science Foundation's Advanced Technological Education (ATE) Program through Grants. For more learning modules related to microtechnology, visit the SCME website (<http://scme-support.org/>)