

Investigation & Experimentation

S E R I E S

ANIMAL RESEARCH IF NOT, THEN WHEN?

GOAL OF ACTIVITY:

The goal of this activity/exercise is to have students understand the advantages and disadvantages of the various types of models used to assist researchers in studying and solving medical conditions. In addition, students will understand why certain animals are used to help researchers uncover the mysteries of disease and what safeguards are in place to ensure proper ethical treatment of animals occurs during the research process.

DESIRED OUTCOMES:

Students will be able to:

- 1) Describe the advantages and disadvantages of the different types of models used in scientific research
- 2) Understand the importance of outlining procedures for scientific research
- 3) Know some of the careers involved in and with animal research
- 4) Know the three R's of animal research and understand why alternatives should always be sought when considering animal-based research
- 5) Understand the importance of an IACUC and IRB
- 6) Know the steps of the scientific method
- 7) Write a concise position statement

PREREQUISITES:

Prior to conducting this exercise, students should have successfully completed California State Board of Education academic content standards in cell biology, genetics, and physiology.

PROCEDURE:

1. Introduce the goal of the activity to the students and briefly discuss the importance of investigation and experimentation.
2. Ask students what they have heard about animal research and have them provide you with their initial position on the topic.
3. Review the *Societal Statement* by having one student read it aloud.
4. Review the *Key Terms* with students.
5. To get students to understand the benefits and weigh the issues, we must start where they are most familiar – with themselves and their surroundings. Therefore, ask the students to give the first name of a person who is afflicted with an illness or disease that is impacting that person's quality of life.
6. Write the name of the disease or illness next to that person's name.
7. Ask for volunteers to share their answer to the following: Why is it important to remove/eliminate the disease/illness that they listed and how soon would they (the students) like the disease/illness cured or eliminated?
8. Request that each student conduct some basic research on the disease/illness that they listed. (CSBR has disease sheets available that provide basic information about numerous diseases and illnesses).
9. After the students have completed their basic research, ask them to think about the general steps/scientific processes/research involved in developing a cure for their listed disease.
10. Select a few students to provide answers to the following questions about their listed disease/illness.
 - a. How many people are affected by the disease/illness?
 - b. Is the disease/illness fatal?
 - c. What broad areas of science, engineering, and technology (i.e., biology, chemistry, etc.) are involved in developing a cure for this disease/illness?
 - d. Within the areas listed in question c, what type of expertise or skill sets are needed? (You may wish to provide the students with CSBR's *Careers in Biomedical Research* brochure to assist in answering this question).
11. Ask the students to provide a basic outline of the general steps they would use to develop a cure. Having the students work in small groups will facilitate brainstorming. You may need to help get the process started by listing the first step – identify the disease. Depending upon the level of your students, you may wish to ask, what data and methods would they use to identify the disease?

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12. Ask the students, how would we know a disease exists? Who would provide the information to the scientists/researchers?
13. After identifying the disease, how would we know how the disease starts or forms? Would we investigate cells or animals at this stage? Why or why not?
14. After learning and observing how the disease forms, what would we do next?
15. In the process of testing potential cures for the disease or illness, are you ready to provide the cure to the person on your list yet? Why or why not? If why not, what additional testing do you believe you will need?
16. When would you consider it safe to use new drugs/cures/procedures on the person listed on your paper?
17. How would you find out about your new drug's affect on other areas of the body, if testing was restricted to just the cellular level or computer models?
18. What types of animals, if any, would you use as part of your testing/research? Why?
19. Ask the students, if they had an illness for which there was no cure that was not prevalent in a large number of people, but over time would result in death, would they conduct animal research using animals with a shorter life span in an attempt to quickly determine how the disease attacks the body? Why or why not?
20. Ask the students, would they take a newly developed medicine without knowing the potential effects on their body? How would you determine what the effects of the new drug are if you do not use humans as “volunteers”?
21. Ask the students whether their position regarding animal research has changed. If so, why? If not, why not?
22. Ask the students whether they believe that animal research should be used to combat new strains of known diseases, including a pandemic or to combat against the potential for biological warfare? Why or why not?

SOCIETAL STATEMENT:

Although virtually every major advancement in medical treatment and the discovery of cures for illnesses and diseases have been expedited through the use of animal research, a large number of people do not approve of the use of animals to assist in solving the mysteries of illnesses and diseases. Despite the use of many other types of modeling in medicinal research, animal research remains the most effective ethical model to discover and determine the safety and effectiveness of treatments to many of the diseases and ailments that afflict millions of people around the world, and to assist in the discovery of treatments for new and emerging infectious diseases.

KEY TERMS:

- Clinical trials
- Animal model
- Transgenic animals
- Three R's of animal research
- Dependant variables
- IACUC
- IRB
- Computer models
- Scientific method
- Independent variables

FOLLOW-UP ASSIGNMENTS:

1. Have students define the key terms and describe their importance in animal research.
2. Have students search for information on animal research and have them write concisely why animal research is important. Students should consider using the Research Questions as a starting point. All references should be properly cited in their paper.
3. Use CSBR's Speaker's Bureau to have a scientist moderate the exercise and to provide additional insight on matters involving animal research. Speakers can be procured through the CSBR website.
4. Assign students to write a brief position paper addressing the following:
 - a. Their position
 - b. Supporting statements for their position (this will be acquired through researching information on the subject)

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STUDENT DISCUSSION QUESTIONS

1. Why is it important to remove/eliminate diseases/illnesses?
2. What are the general steps/scientific processes/research involved in developing a cure for a disease?
3. Select an illness or disease and answer the following questions concerning that disease.
 - a. How many people are affected by the disease/illness?
 - b. Is the disease/illness fatal?
 - c. What broad areas of science, engineering, and technology (i.e., biology, chemistry, etc.) are involved in developing a cure for this disease/illness?
 - d. Within the areas listed in question c, what type of expertise or skill sets are needed?
4. What data and methods would you use to identify a disease?
5. How would you know that a disease exists? Who would provide the information to the scientists/researchers?
6. After identifying the disease, how would you know how the disease starts or forms? Would we investigate cells or animals at this stage? Why or why not?
7. After learning and observing how the disease forms, what would we do next?
8. In the process of testing potential cures for the disease or illness, when would you be ready to provide the cure to the general public? Under what conditions would you believe additional testing would be necessary to ensure the safety of the public?
9. How would you find out about your new drug's effect on other areas of the body, if testing was restricted to just the cellular level or computer models?
10. What types of animals, if any, would you use as part of your testing/research? Why?
11. If your friend had an illness for which there was no cure that was not prevalent in a large number of people, but over time would result in death, would you conduct animal research using animals with a shorter life span in an attempt to quickly determine how the disease attacks the body? Why or why not?
12. Would you take a newly developed medicine without knowing the potential effects on your body? How would you determine what the effects of the new drug are if you do not use humans as "volunteers"?
13. Do you believe that animal research should be used to combat new strains of known diseases, including a pandemic or to combat against the potential for biological warfare? Why or why not?

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RESEARCH QUESTIONS

These questions are designed to provide students with a starting point for initiating research, discussion, or debate issues.

1. What are the drawbacks to using computer models as a substitute for animal research?
2. What are the three R's of animal based research?
3. What are the primary advantages of animal research? The disadvantages?
4. What is the purpose of an Institutional Review Board (IRB)?
5. What is the purpose of an IACUC and what does the acronym stand for?
6. If you were going to ensure research using animals is conducted humanely and ethically, who (what occupations/job titles) might make up your committee?
7. Which animals are used most often in animal research? Why?
8. What is basic research and why is it important?
9. How do animals (including farm animals and pets) benefit from animal research?
10. What federal laws protect research animals?
11. Is it legal to give a new drug to a person if it hasn't been tested on animals?