

Cloning

When is Enough Actually Enough?



Goal of Activity:

The goal of this activity/exercise is to ensure students understand the larger picture of cloning and research protocols that may use cloning, including controversial forms, approaches, and intents, so they are able to comprehend the potential issues, concerns, importance, liabilities, and benefits.

Desired Outcomes:

Students will be able to:

1. Understand why cloning can be useful in biomedical research
2. Understand the benefits and controversies of cloning
3. Understand the agricultural and economic benefits and potential liabilities of cloning plants and developing treatments using therapeutic cloning
4. Understand the necessity for biomedical research, and the limits necessary in medical care

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 cloning and have them discuss/list the sources of their information.
3. Review the Societal Statement by having one student read it aloud.
4. Review the Key Terms with students.
5. In order to get the students to make informed decisions based upon facts, ask them if they are concerned about controlling the attributes of off-spring, plant growth and reproduction, and effective disease treatment. Record where students stand on these issues and note whether the students believe if the stated problem is a top priority to alleviate or solve in their opinion.
6. Find out what the students know about genetically modified organisms. Ask them whether they are pro or con on the topic. Record the students' positions.
7. Assign each student the task of finding two articles on Google about cloning in health care. (The California Society for Biomedical

Research and the National Institutes of Health are two sources for articles). This is also a good opportunity to discuss the importance of obtaining information on the internet from reliable sources.

8. Divide the class into sections and assign one or two key terms to each group to define and report back to the class.
9. After researching definitions, have the students read the definitions assigned to them out loud.
10. Have the students read each of the student questions aloud and allow students to respond to the each question. Allow the students to express the pros and cons of their argument.
11. Ask whether any students have changed their minds regarding their opinion concerning the use of cloning in general and specifically in biomedical research. If they have changed their opinion, ask the students what made them switch their position.

Societal Statement:

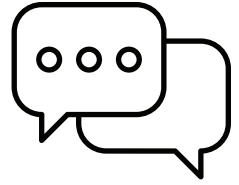
Researchers routinely use cloning techniques to make copies of genes that they wish to study. The procedure consists of inserting a gene from one organism, often referred to as "foreign DNA," into the genetic material of a carrier called a vector. Examples of vectors include bacteria, yeast cells, viruses or plasmids, which are small DNA circles carried by bacteria. After the gene is inserted, the vector is placed in laboratory conditions that prompt it to multiply, resulting in the gene being copied many times over.

Key Terms:

- Genome
- Genetic Recombination
- Somatic Cell
- Therapeutic Cloning
- Stem Cell
- Embryo
- in vitro
- Disease models
- Genetic Defect
- Genome

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1. Would you eat food from a cloned animal? Why or why not?
2. What animals in the United States food supply should or should not be cloned? Why or why not?
3. What would happen if a nation that is not an ally of the U.S. introduced cloned food into their food supply?
4. If there were too many cloned animals in the food supply, what might happen to food prices?
5. Could the size of farms be affected by cloned animals? How so? Would farmers be able to produce more food on the same amount of acreage?
6. Should cloned food be given to third world countries that can not produce enough food to feed their own population? Why or why not?
7. Should endangered species be cloned? Why or why not?
8. Would you like to see cloned animals in zoos? Why or why not?
9. Could cloned animals reduce the operational costs of zoos?
10. Could cloning become a national security issue?
11. Should cloned animals be used for animal research or product testing? Why or why not?
12. Should food from cloned animal sources be labeled as such? Why or why not if there is no biological difference between cloned and non-cloned animals?
13. What factors do you think currently restrict the use of cloned animals?