

## actionbioscience.org lesson

To accompany the peer-reviewed article by Lauren Pecorino, Ph.D.:

“Animal Cloning: Old MacDonald’s Farm Is Not What It Used to Be” (September 2000)

<http://www.actionbioscience.org/biotech/pecorino.html>

---

### Cloning Animals and Plants: Any Difference? (August 2004)

Lesson by Lorelei Crerar, biology teacher

Educator’s section: p. 1-2
Student handout 1: p. 3-4
Student handout 2: p. 5-6
Student handout 3: p. 7

#### Grades & Levels:

- **Handout 1:** middle school–high school (general)
- **Handout 2:** high school (general)
- **Handout 3:** high school (advanced/AP)–undergraduate (year 1)

#### Time Recommendations:

- **Handout 1:** one class period for most activities, some may take one week for research
- **Handouts 2 and 3:** five weeks or more for plant growth plus time for presentations

#### NSES (USA) Content Standards, 9–12:

- NSES 2.1. and 2.2. Science as Inquiry: Abilities... and Understanding...
- NSES 4.1. Life Science: The cell
- NSES 6.1. and 6.2. Science and Technology: Abilities... and Understanding...
- NSES 7.6. Science in Personal & Social Perspectives: Science and technology in...challenges
- NSES 8.3. History and Nature of Science: Historical perspective

Note: View the NSES content standards on this site to choose other curricular applications for additional activities at:

<http://www.actionbioscience.org/educators/correlationcharts.html>

#### NSES (USA) Content Standards, 5–8:

- NSES 2. Science as Inquiry
- NSES 4. Life Science
- NSES 6. Science and Technology
- NSES 7. Science in Personal & Social Perspectives

**Learning Objectives:** When the students have completed this lesson, they will

- understand the value of scientific inquiry
- have a better understanding of how plants and animals are cloned
- be able to present an informed, yet personal, view on cloning animals and plants

#### Key Words Include:

chromosome, clone, differentiated (differentiation), DNA, egg, fertilized egg, germ cell, mitochondrial DNA, nuclear transfer, roots, sex cells

---

#### Preparation

- **Article Discussion:** See introduction for instructions and suggested questions, page 2.
- **Handouts 3 and 4:** Review handouts for materials and procedures required for experiments.
- See “useful links for educators” at the end of Pecorino’s article for links to assessment resources that may help you create assessment strategies for activities in this lesson.

# Cloning Animals and Plants: Any Difference?

## For Educators: Article Discussion

About the article by L. Pecorino: “Animal Cloning: Old MacDonald’s Farm Is Not What It Used to Be”  
<http://www.actionbioscience.org/biotech/pecorino.html>

**Preparation:** Ask students to read the online article by Lauren Pecorino, or print and distribute copies of the article. The questions (below) can be used in a number of ways. They can be copied and handed out to the students for them to answer on their own. This would make a great lesson plan for a substitute, especially if the students can do some research using the Internet on the topic of cloning.

The “**Personal Viewpoint**” activity below is designed to be a “read, group, share” lesson (similar to “think, pair, share”). So before the students read, divide them into groups of three or four based on their views of cloning as per the categories suggested in the activity. Placing them in this type of group will get similar interests together and allow for better discussions. When everyone is finished reading, have the groups explain their platform and state either a contrasting point of view from the article or a view that matches their own. Personal viewpoint questions may require students to research pros and cons of cloning. See suggested links in “learn more links” and “useful links for student research” at the end of Pecorino’s article.

### Article Content Questions:

1. How long have farmers been “cloning” animals?
2. How successful is the procedure of selecting and propagating the best of the herd?
3. How successful is cloning?
4. What two things make Dolly the sheep unique compared with animals that were cloned before her?
5. What is the importance of the fertilized egg for the rest of the body?
6. What is a differentiated cell?
7. What is involved in the process of nuclear transfer?
8. Who was the first scientist to clone an animal from an adult body cell?
9. Where do the chromosomes in the fertilized egg come from?
10. What five things can be seen as benefits derived from cloning?

### Article Extension Questions:

1. Are heart cells and liver cells exactly the same? Why or why not?
2. What happens to cause cells to become different types of cells in the body?
3. How do scientists know that DNA does not become irreversibly specialized and differentiated?
4. For each of Ms. Pecorino’s last five points, find and describe two benefits from that point.

### Personal Viewpoint

Place yourself into one of the following categories and find two or three other people who share your view. Think carefully before choosing. Your teacher may reorganize groups to balance group sizes.

- Animal cloning is a good thing.
- Animal cloning a bad thing.
- I know very little about animal and/or plant cloning.
- I know a lot about animal and/or plant cloning.
- Cloning is OK for plants and animals but not for humans.

Share your views and answer questions on the article you read. It would be very helpful to you to write down your current views on cloning and a little of what you know, even if you are not sure it is correct.

# Cloning Animals and Plants: Any Difference?

## Student Handout 1

### 1. Famous Animal Clones

Create one of the following presentations:

- Storyboard for a short TV documentary (See “Useful links for student research” at the end of the article page for links to storyboarding information.)
- Feature article for your local newspaper
- Poster presentation for a science exhibit

Choose one of the animals below for your presentation. Make sure you describe why the animal of your choice is important in the history of animal cloning.

- Dolly, the sheep
- Megan and Morag, the sheep
- Copycat, the cat
- Annie, the cow
- Xena, the pig
- Tetra, the monkey
- Cumulina, the mouse
- Promotea, the horse
- Idaho Gem, the mule

### 2. Same or Different Worksheet

Using all of the resources available to you, examine the similarities and differences between animal and plant cloning. You will work on this for one week. Be sure to visit the library as well as using the Internet. Remember when using the Internet that you need to use reliable sources. Use a separate sheet of paper if you need more room for your notes.

Similarities	Differences



# Cloning Animals and Plants: Any Difference?

## Student Handout 2 *cont'd...*

### Conclusion:

1. Define “clone.” \_\_\_\_\_

2. This plant was clearly not produced with the same procedure as the sheep Dolly. Why is it considered a clone?

---

---

---

---

---

3. How long did it take for your plant to grow roots? \_\_\_\_\_

4. Is there any other type of plant that can be cloned in this manner? Think of the vegetables you know about.

---

---

---

---

5. Look at the “What lies ahead” section of the article by Dr. Pecorino. Describe how this procedure for cloning can be applied to her list of the benefits of cloning.

---

---

---

---

6. Describe your views on cloning different organisms.

---

---

---

7. This lab has added to your knowledge of cloning, and your views may have changed as a result of what you have learned. Explain how your views about cloning have changed since reading the article and taking part in the activities.

---

---

---

---

---

# Cloning Animals and Plants: Any Difference?

## Student Handout 3

### Objectives:

1. Design an experiment to clone a plant using the tissue culture propagation method.
2. Conduct the experiment and arrive at conclusions based on observations.
3. Compare, through literature research, how cloning animals differs from cloning plants.

### Introduction:

A **clone** is an exact genetic copy of an organism. It must have exactly the same DNA. A clone is not the same age as the original organism. See “Useful links for student research” at the end of Dr. Pecorino’s article for Internet sources that provide information on the term and technology. These links are also a good starting point for information to help you through the experiment and the extension activities.

### Procedure

#### 1. Design an experiment:

- a) Design a tissue culture propagation procedure to clone a plant.
- b) Make a list of materials needed to conduct the experiment, e.g., the kind of plant(s), soil, etc.
- c) Design a data table to measure progress. For example, consider the growth of roots that appear on your clone. In this case, a simple spreadsheet would have several rows for different trials, a column for the number of roots, a column for the length of the roots, and a column for the health of the plant.
- d) Discuss your design with your teacher before continuing to step #2.

#### 2. Experimentation:

Clone your plant based on your design and write your observations in the spreadsheet you created.

#### 3. Conclusion:

Include the following information in your written conclusion:

- Was the cloning method you used sexual or asexual reproduction? Explain completely.
- Describe your data and observations.
- What were the advantages or disadvantages of using tissue culture propagation for the plant that you selected?

#### 4. Extension

Research one of the following topics and add a discussion of it to your written report on the experiment:

- Explain the advantages and disadvantages, if any, of cloning plants.
- Explain the difference between cloning a plant using your experimental method and vegetative propagation.
- Explain the differences between cloning a plant and cloning an animal that were highlighted in Dr. Pecorino’s article. You may need to research animal cloning techniques to fully explain the difference.