

# **Biotechnology: Applications in Agriculture**

**Curriculum Guide:** *Biotechnology: Applications in Agriculture*

**Unit:** I. Introduction to Biotechnology

**Unit Objective:**

Students will demonstrate an understanding of the foundations of biotechnology by developing a pamphlet or poster and oral presentation describing the history, the use, and the benefits or detriments of a specific genetically manipulated food product.

**Show-Me Standards:** 3.4, SC8

**References:**

*Biotechnology: Applications in Agriculture*. University of Missouri-Columbia, Instructional Materials Laboratory, 1998.

Biotechnology in Food and Agriculture. Food and Agriculture Organization of the United Nations. Accessed August 8, 2003, from <http://www.fao.org/BIOTECH/act.asp>.

Food Biotech Info. Accessed August 8, 2003, from <http://www.foodbiotechinfo.com/index.html>.

*Food Science and Technology*. University of Missouri-Columbia, Instructional Materials Laboratory, 1994.

Genetically Engineered Foods. Mc Vitamins. Accessed March 16, 2004, from [http://www.mcvitamins.com/genetically\\_engineered\\_foods.htm](http://www.mcvitamins.com/genetically_engineered_foods.htm).

Lambrecht, B. *Dinner at the New Gene Café: How Genetic Engineering Is Changing What We Eat, How We Live, and the Global Politics of Food*, 1<sup>st</sup> ed., New York: Thomas Dunne Books, 2001.

Rader, C. M. *A Report on Genetically Engineered Crops*. Accessed March 16, 2004, from [http://members.tripod.com/c\\_rader0/gemod.htm](http://members.tripod.com/c_rader0/gemod.htm).

*Science in Your Shopping Cart*. U.S. Department of Agriculture. Accessed October 9, 2003, from <http://www.ars.usda.gov/is/np/shopcartintro.html>.

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Winston, M. L. *Travels in the Genetically Modified Zone*. Cambridge, MA: Harvard University Press, 2002.

Students may use additional outside sources to complete this activity.

### **Instructional Strategies/Activities:**

- Students will engage in study questions in lesson 1.
- Students will complete AS 1.1, What Is...? Facts about Biotechnology.
- Additional activities that relate to the unit objective can be found under the heading "Other Activities" in the following location: p. I-5 (1, 2).

### **Performance-Based Assessment:**

Students will work in groups of three to develop a pamphlet or poster designed to describe the history, the use, and the benefits or detriments of a specific genetically manipulated food product. Each team will complete its project with a brief oral presentation to the class regarding its findings.

Assessment will be based on the accuracy, organization, and clarity of the information cited in the pamphlet or poster. Additional consideration will be given to the quality of both the material produced and the oral presentation. Assessment also will take into account grammar, spelling, punctuation, and capitalization.

### Unit I—Introduction to Biotechnology Instructor Guide

The instructor should assign the performance-based assessment activity at the beginning of the unit. Students will work toward completing the activity as they progress through the unit lessons. The assessment activity will be due at the completion of the unit.

1. Students will work in teams of three to focus their efforts on the production of a pamphlet or poster on a genetically manipulated food product.
2. Team members will work as a unit to identify and research an example of a genetically manipulated food product.
3. Students may use material in the unit and additional outside material to complete their presentations. Students may not use the source material word for word and must provide a complete bibliography of their sources along with their presentation.
4. Below is a suggested list of genetically manipulated food products you may want to provide for students to consider. Students may also select another genetically manipulated food product, provided the selection is approved by the instructor.
  - Milk and other dairy products from cows that are injected with rBGH, a genetically engineered growth hormone
  - Soybean, tomato, corn, and canola plants that withstand herbicide application
  - Corn, tomatoes, and potatoes with built-in pesticides
  - Potatoes, tomatoes, cantaloupe, squash, cucumber, corn, canola, soybeans, and grapes manipulated to resist plant viruses
  - Peppers and tomatoes engineered to resist plant fungi
  - Tomatoes, peas, peppers, and tropical fruits manipulated to extend shelf life and improve processing quality
  - Corn, sunflowers, and soybeans engineered to contain altered levels of nutrients
  - Canola and peanuts with altered lipid profiles
  - Coffee beans with altered caffeine content
  - Potatoes that absorb less oil when fried
  - Corn and peas engineered for a prolonged shelf life
  - Various enzymes (proteins that speed up biological processes) used to make various products (e.g., beer, wine, fruit juice, sugar, oil, and baked goods)
  - Genetically engineered rennet for making cheese

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5. After completing the research, the team will use its findings to develop, outline, and write material for a pamphlet or poster.
  - a. Information in the pamphlet or poster will serve as the focus for a brief oral presentation on the food product selected for research.
  - b. The presentation should be thorough, but concise, and range between 5 and 10 minutes, including time for questions and answers.
  
6. Information in the oral presentation and in the pamphlet or poster should address the following:
  - The product's history and its use
  - How the food product has been genetically manipulated
  - Why the food product has been genetically manipulated
  - The implications (pro and con) for the commercial food production industry of the product's genetic manipulation
  - The benefits or detriments of the genetically manipulated product for the consumer
  
7. Assessment will evaluate the team's effort (both on the presentation and pamphlet/poster).
  - a. Factors to be evaluated will be accuracy, organization, clarity, and quality.
  - b. Spelling, grammar, punctuation, and capitalization will be factors in the assessment.

### Unit I—Introduction to Biotechnology Student Handout

1. You will work in teams of three students to focus your efforts on the production of a pamphlet or poster on a genetically manipulated food product.
2. As team members, you will work as a unit to identify and research an example of a genetically manipulated food product.
3. You may use material in the unit and additional outside material to complete your presentation. You may not use the source material word for word and must provide a complete bibliography of your sources along with your presentation.
4. After completing the research, your team will use its findings to develop, outline, and write material for a pamphlet or poster.
  - a. Information in the pamphlet or poster will serve as the focus for a brief oral presentation on the food product selected for research.
  - b. The presentation should be thorough, but concise, and range between 5 and 10 minutes, including time for questions and answers.
5. Information in your team's oral presentation and in the pamphlet or poster should address the following:
  - The product's history and its use
  - How the food product has been genetically manipulated
  - Why the food product has been genetically manipulated
  - The implications (pro and con) for the commercial food production industry of the product's genetic manipulation
  - The benefits or detriments of the genetically manipulated product for the consumer
6. Assessment will evaluate your team's effort (both on the presentation and pamphlet/poster).
  - a. Factors to be evaluated will be accuracy, organization, clarity, and quality.
  - b. Spelling, grammar, punctuation, and capitalization will be factors in the assessment.



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### Unit I—Introduction to Biotechnology

#### Scoring Guide

Team Topic/Members \_\_\_\_\_

Assessment Area	Criteria	0 Points	1 Point	2 Points	3 Points	4 Points	Weight	Total
Oral Presentation	<input type="checkbox"/> Accuracy <input type="checkbox"/> Organization <input type="checkbox"/> Clarity <input type="checkbox"/> Quality	0 criteria met	1 criterion met	2 criteria met	3 criteria met	All 4 criteria met	X 7.5	
Pamphlet or Poster	<input type="checkbox"/> Accuracy <input type="checkbox"/> Organization <input type="checkbox"/> Clarity <input type="checkbox"/> Quality	0 criteria met	1 criterion met	2 criteria met	3 criteria met	All 4 criteria met	X 15	
Technical Considerations	<input type="checkbox"/> Spelling <input type="checkbox"/> Grammar <input type="checkbox"/> Punctuation <input type="checkbox"/> Capitalization	0 criteria met	1 criterion met	2 criteria met	3 criteria met	All 4 criteria met	X 2.5	
<b>TOTAL</b>								

Final Assessment Total \_\_\_\_\_/100 pts.

Comments:

