

Name: _____

Section: _____

Activity 1: Read “Manipulating DNA” and answer the question below.**Manipulating DNA**

Genes change every day by natural mutation and recombination, creating new biological variations. Humans have been exploiting this for centuries—shuffling genes in systematic ways and using crossing and artificial selection—to create many combinations. Just about everything we eat is derived from livestock, crops, and micro-organisms bred specifically to provide food. Humans have also redistributed genes geographically: the soybean is native to Asia but is now grown throughout the Americas, and the potato, native to the American continent, is grown throughout the temperate world. DNA has never been “static,” neither naturally nor at the hand of people.

Genetic modification is an extension of this. However, unlike conventional breeding, in which new assortments of genes are created more or less at random, it allows specific genes to be identified, isolated, copied, and introduced into other organisms in much more direct and controlled ways. The most obvious difference from conventional breeding is that genetic modification allows us to transfer genes between species. For example, the gene for bovine chymosin has been transferred to industrial micro-organisms—*Kluyveromyces lactis* (a yeast), *Aspergillus niger var awamori* (a fungus), and *Escherichia coli* K12 (a bacterium). These microbes are grown in fermenters to produce chymosin (rennet) on a commercial scale; this rennet, which replaces the conventional form obtained from slaughtered animals, is now widely used in cheese production.

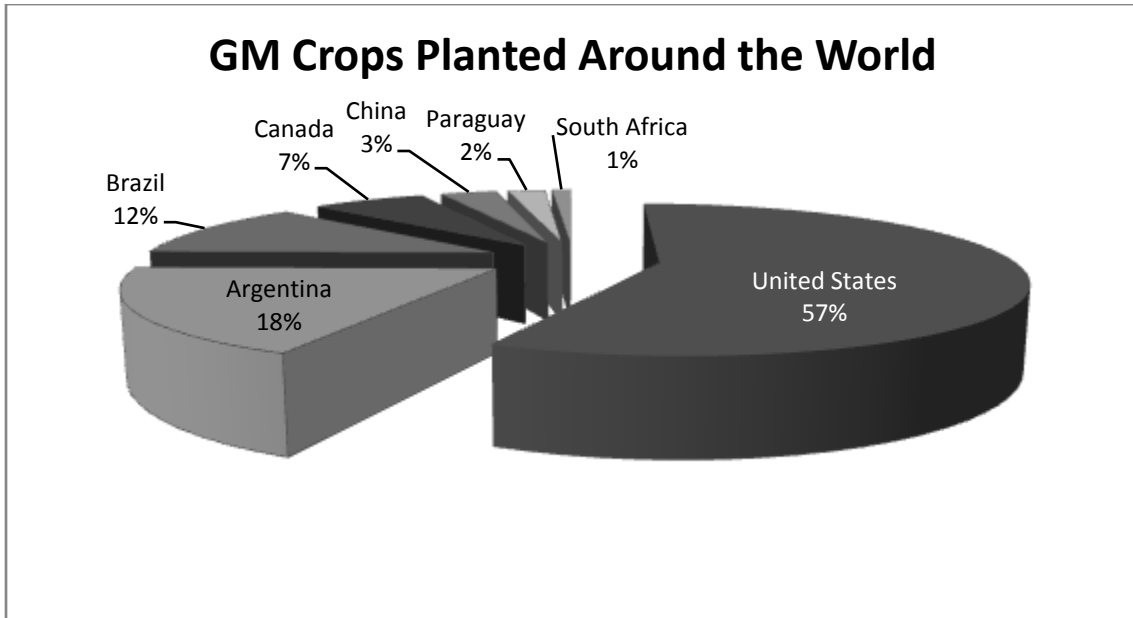
Excerpted from: Jones, Leighton. (1999). Genetically Modified Foods. *British Medical Journal*. February 27; 318(7183): 581–584.

Use your own words to write a definition of **genetically modified food**:

Activity 2: Watch the clip from *Food, Inc.* (Chapter 8: From Seed to Supermarket). Then **discuss** the following questions:

1. What is “Round-up Ready Soybean”? What are the benefits of this genetically modified seed?
2. What is the consequence for farmers who do not want to use Round-up Ready Soybeans?
3. What is your opinion about genetically modified foods?

Activity 3: Use the provided data to write at least three sentences explaining the information that is presented in the graph.



Activity 4: Read the article "Genetically Modified Foods and Organisms" carefully and answer the questions using full sentences.

Genetically Modified Foods and Organisms: What are Genetically Modified (GM) Foods?

Although "biotechnology" and "genetic modification" commonly are used interchangeably, GM is a special set of technologies that alter the genetic makeup of organisms such as animals, plants, or bacteria. Biotechnology, a more general term, refers to using organisms or their components, such as enzymes, to make products that include wine, cheese, beer, and yogurt.

Combining genes from different organisms is known as recombinant DNA technology, and the resulting organism is said to be "genetically modified," "genetically engineered," or "transgenic."

GM products (current or those in development) include medicines and vaccines, foods and food ingredients, feeds, and fibers.

Locating genes for important traits—such as those conferring insect resistance or desired nutrients—is one of the most limiting steps in the process. However, genome sequencing and discovery programs for hundreds of organisms are generating detailed maps along with data-analyzing technologies to understand and use them.

In 2006, 252 million acres of transgenic crops were planted in 22 countries by 10.3 million farmers. The majority of these crops were herbicide- and insect-resistant soybeans, corn, cotton, canola, and alfalfa. Other crops grown commercially or field-tested are a sweet potato resistant to a virus that could decimate most of the African harvest, rice with increased iron and vitamins that may alleviate chronic malnutrition in Asian countries, and a variety of plants able to survive weather extremes.

On the horizon are bananas that produce human vaccines against infectious diseases such as hepatitis B; fish that mature more quickly; cows that are resistant to bovine spongiform encephalopathy (mad cow disease); fruit and nut trees that yield years earlier, and plants that produce new plastics with unique properties.

In 2006, countries that grew 97% of the global transgenic crops were the United States (53%), Argentina (17%), Brazil (11%), Canada (6%), India (4%), China (3%), Paraguay (2%) and South Africa (1%). Although growth is expected to plateau in industrialized nations, it is increasing in developing countries. The next decade will see exponential progress in GM product development as researchers gain increasing and unprecedented access to genomic resources that are applicable to organisms beyond the scope of individual projects.

Technologies for genetically modifying foods offer dramatic promise for meeting some of the 21st Century's greatest challenges. Like all new technologies, they also pose some risks, both known and unknown. Controversies surrounding GM foods and crops commonly focus on human and environmental safety, labeling and consumer choice, intellectual property rights, ethics, food security, poverty reduction, and environmental conservation.

Retrieved from: http://www.ornl.gov/sci/techresources/Human_Genome/elsi/gmfood.shtml

1. What is the difference between biotechnology and genetic modifications?
2. What can be done to understand and use genes for GM products?
3. What characteristics make GM products stronger or better than natural products?

4. How can genetically modified foods help poor countries around the world?

Activity 5: Parts of Speech. Identify the word type of the following words in context (noun, verb, adjective or adverb) using the reading *Genetically Modified Foods and Organisms*. Then guess their meaning (in English or Spanish)

1. **commonly**- Word Type: ____ Guess: _____
2. **enzymes**- Word Type: ____ Guess: _____
3. **organisms**- Word Type: ____ Guess: _____
4. **detailed**- Word Type: ____ Guess: _____
5. **planted**- Word Type: ____ Guess: _____
6. **alleviate**- Word Type: ____ Guess: _____
7. **infectious**- Word Type: ____ Guess: _____
8. **genetically**- Word Type: ____ Guess: _____

Activity 6: Chose one of the two topics provided and a paragraph about it. Remember to write a topic sentence and supporting details in your paragraph.

1. Think about fast food consumption including problems that come from eating these foods. What can be done in the future to improve this situation?
2. Puerto Rico does not produce as much food as it could based on the resources that it has. What could Puerto Rican individuals and the government do in the future to increase food production in Puerto Rico?