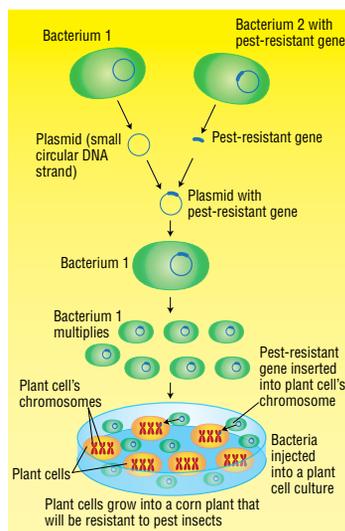


## Labels and Logos: “Genetically Modified” and “Certified Organic”

### “Genetically Modified”

Labels and logos bombard us in ads and tag our fruit. What do they stand for, and how will they affect us? “Genetically Modified,” or GM, for short, is one of the most controversial results of modern biochemistry. The genetic makeup of an organism is modified, in most cases by one gene. For years, farmers have used selective breeding, keeping the seeds from the healthiest corn plants for their next crop. Through repetition, a resistant strain can be developed. Today, this process is done quickly and precisely in the lab using biotechnology. GM technology appeared in the 1980s when a bacterium was modified to carry the human insulin gene. Thus, high-quality insulin was produced cheaply for diabetic patients.

How genetically modified corn is produced. *Note: Although a corn plant cell contains 10 chromosomes, only three are shown here (to simplify the drawing).*



### “Certified Organic”

In chemistry, “organic” refers to hydrocarbons and their derivatives, the molecules involved in the chemistry of life.

When applied to food production, “organic” means “naturally grown with no artificial additives.” To be “certified organic,” a farmer submits a plan to keep his or her land free of manufactured pesticides and fertilizers, growth hormones, and genetically modified organisms (GMOs) for three years and agrees to periodic on-site inspections.



### Benefits and concerns of GM foods

Foods are genetically modified to enhance their taste and quality, increase their nutritional value, and become more resistant to insects and disease. This process conserves natural resources by requiring less water and energy. Between 60% and 70% of processed foods on U.S. shelves contain GM ingredients.

In developing countries, vitamin A-enriched “golden rice” reduces childhood blindness. In the United States, preventing apple-browning is a GM technology undergoing certification



An Arctic Apple (left) is a variety of apple that has been genetically engineered to inhibit browning.

by the U.S. Department of Agriculture. Will anticancer fruits and fat-reducing foods be options soon? A major concern is the potential long-term effects of GM foods on human health, which are not well known (see table below).



(left to right) White rice and two types of golden rice

### Assessing the risks

Last May, an Oregon farmer reported herbicide-resistant wheat growing in his field. Lab tests linked the plants to GM seeds. As a result, Japan and South Korea suspended some U.S. wheat exports, and the European Union is testing U.S. wheat. Who decides what is safe and ensures that potentially dangerous products are identified? Three U.S. government agencies are involved in this process (see table below).

While GM foods have the potential to solve many of the world’s problems, testing, regulation, and international policy present challenges.



How should society proceed with this powerful new biotechnology to ensure its potential benefits while minimizing risks? Contrasting points of view are discussed at: <http://www.csa.com/discovery-guides/gmfood/overview.php>.



BENEFITS OF GM FOODS	CONCERNS
Resistance to disease, insect attack, and weeds	Uncertain effects of genetic changes
Increased crop yield at reduced cost	Cross-contamination of crops
Enhanced taste and nutritional value	Drug-resistant genes
Fewer pesticides in the environment	Allergic reaction to foods
Solutions to world hunger and malnourishment	Pest resistance to toxins

U.S. Department/Agency	Certification
U.S. Department of Agriculture	“Organic Food” label
U.S. Food and Drug Administration	“Safe for People”
U.S. Environmental Protection Agency	“Safe for the Environment”