

# TEST YOUR KNOWLEDGE OF GMOs

Get ready to answer your customers' queries on Genetically Modified Organisms



## QUESTIONS:

### 1. What does GMO mean?

- a. Genetically Modified Organism
- b. Grow More Organic
- c. God Move Over
- d. Get Monsanto Outta-here

### 2. Check the crops that are currently Genetically Modified and commercialized:

- |                                     |  |
|-------------------------------------|--|
| <input type="checkbox"/> Alfalfa    | <input type="checkbox"/> Hawaiian papaya         |
| <input type="checkbox"/> Apples     | <input type="checkbox"/> Lemons                  |
| <input type="checkbox"/> Bananas    | <input type="checkbox"/> Lettuce                 |
| <input type="checkbox"/> Broccoli   | <input type="checkbox"/> Nuts                    |
| <input type="checkbox"/> Cane Sugar | <input type="checkbox"/> Olives                  |
| <input type="checkbox"/> Canola     | <input type="checkbox"/> Soy                     |
| <input type="checkbox"/> Carrots    | <input type="checkbox"/> Tobacco                 |
| <input type="checkbox"/> Corn       | <input type="checkbox"/> Tomatoes                |
| <input type="checkbox"/> Cucumbers  | <input type="checkbox"/> Yellow crookneck squash |
| <input type="checkbox"/> Eggplant   | <input type="checkbox"/> Zucchini                |

### 3. How can shoppers avoid products or ingredients derived from GM crops?

- a. Buy organic.
- b. Buy products labeled Non-GMO or listed in a Non-GMO Shopping Guide.
- c. Avoid foods with "at risk" ingredients from GM food crops.
- d. All of the above.

### 4. What is a gene?

- a. Short sequence of DNA inside the nucleus of a cell.
- b. The leg of one type of pant that is normally blue in color, made of denim.

### 5. How is genetic engineering done?

- a. Genes from one species are split and then placed in a sterile, antibiotic resistant environment to combine traits.
- b. There are several rather crude, imprecise ways via which scientist attempt to combine genes of one species with another such as a gene gun, electric shocks, fine needles, or the use of a virus or bacteria to "infect" cells.
- c. Two scientists put on their safety goggles and lab coats and slosh around in a tub of genes in rubber boots to combine traits of several species together (very much like making wine).
- d. Genes are placed onto a microscopic bull's-eye. Genetic Engineers put on their cowboys hats, draw their gene guns, and the first to actually get a desired trait to arise from years of shoddy gene shooting gets 5 billion dollars for future research.

### 6. Haven't growers been grafting trees and hybridizing seeds for years? Isn't this the same thing as genetic modification?

- a. Yes, hybridization and genetic modification both involve the breeding of two similar plants or animals together.
- b. No, Genetic Modification crosses natural boundaries between species.

## QUESTIONS (CONTINUED):

### 7. GMO crops currently on the market have been developed to address the following issues:

- Varieties of plants have been developed to resist drought.
- GMO crops have successfully increased vitamins in foods such as nutrient enhanced rice
- GMO crops have been shown to increase yield, curbing world hunger
- None of the above.

### 8. There have been no documented cases of animal or health problems due to the consumption of GMOs.

- True
- False

### 9. Have GMOs been proven to be safe for consumption?

- Yes, GMOs are more nutritional than old fashioned "natural" food.
- Some GMOs have been proven safe by the FDA.
- The USDA requires rigorous safety testing of all GMOs.
- No. There have been no in-depth, long-term studies and in reality, the FDA has absolutely no safety testing requirements.

### 10. Name 3 possible potential health risks associated with genetically modified foods.

- Allergies and toxins
- New diseases
- Nutritional problems
- All of the above

## ANSWERS:

1. **Answer A.** Genetically Modified Organism.

2. **Currently commercialized GM crops in the U.S. include soy (91%), cotton (87%), canola (80%), corn (73%), Hawaiian papaya (more than 50%, but only Hawaiian varieties), zucchini and yellow squash (small amount), and tobacco (Quest® brand). GM sugar beets were planted in the spring of 2008 and unless stopped, this sugar will be mixed with cane sugar after harvest in the fall of 2008.**

GM alfalfa for animal feed was planted and briefly commercialized, until sales were stopped by a federal judge. GM alfalfa is no longer for sale but some is growing in the US. It is very unlikely to be used for alfalfa sprouts.

Popcorn is not yet genetically modified nor is white, blue, or red corn. A small percentage of fresh corn on the cob is genetically engineered. The yellow corn used for corn chips and corn derivatives is mostly GMO.

GM tomatoes and potatoes were taken off the market years ago.

Other sources of GMOs include: dairy products from cows injected with rbGH; GM food additives, enzymes, flavorings, and processing agents, including the sweetener aspartame (NutraSweet®) and rennet used to make hard cheeses; meat, eggs, and dairy products from animals that have eaten GM feed; and honey and bee pollen that may have GM sources of pollen.

3. **Answer D: All of the above.** Meats, dairy products, farmed fish, and eggs are usually from animals fed GM feed. To avoid these buy "Organic," "Wild Caught," or meat or dairy from "100% Grass-Fed" animals. Avoid honey and bee pollen that may have been gathered from GM plants.

Avoid dairy products from cows injected with GM bovine growth hormone (called rbGH or rbST). See [www.responsibletechnology.org](http://www.responsibletechnology.org) for brands.

There are many additives, enzymes, flavorings, and processing agents used in foods that are produced by GM bacteria, yeast, or fungi. To avoid them, either buy organic or stick to non-processed foods.

Avoid the GMO derivative labeled as the sweetener aspartame. It is also referred to as NutraSweet® and Equal® and is found in over 6,000 products, including soft drinks, gum, candy, desserts, mixes, yogurt, tabletop sweeteners, and some pharmaceuticals such as vitamins and sugar-free cough drops. *Go to [www.responsibletechnology.org](http://www.responsibletechnology.org) for more tips or consult a [Non-GMO Shopping Guide](#).*

**4. Answer A:** Every plant and animal is made of cells, each of which has a center called a nucleus. Inside every nucleus there are strings of DNA, half of which are normally inherited from the mother and half from the father. Short sequences of DNA are called genes. These genes operate in complex networks that are finely regulated to enable the processes of living organisms to happen in the right place and at the right time. Genetic Engineering typically involves modifying DNA in a very crude and unpredictable way.

**5. Answer B:** Because living organisms have natural barriers to protect themselves against the introduction of DNA from a different species, genetic engineers have to find ways to force the DNA from one organism into another. These methods include:

- Coating DNA onto tiny metal pellets, and firing it with a special gene gun.
- Using viruses or bacteria to “infect” animal or plant cells with the new DNA.
- Using electric shocks to create holes in the membrane covering sperm, and then forcing the new DNA into the sperm through these holes.
- Injecting the new DNA into fertilized eggs with a very fine needle.

The top two methods are typically used to engineer plants.

**6. Answer B: Genetic engineering or modification crosses natural species barriers and is completely different from traditional breeding of any kind and carries unique risks.**

Here’s the scoop: Natural barriers between species almost never allow organisms of different types to cross and spread or procreate. Genetic Engineering allows scientists to cross those natural species barriers, inserting the DNA from one organism into that of a completely different organism. Often these new GM organisms have the ability to spread freely: to procreate, mutate, cross pollinate, etc. Here are some colorful examples of true GMO experiments:

- Spider genes were inserted into goat DNA, in hopes that the goat milk would contain spider web protein for use in bulletproof vests. (Spider web protein is actually stronger than steel.)
- Cow genes turned pigskins into cowhides.
- Jellyfish genes lit up pigs’ noses in the dark.
- Artic fish genes gave tomatoes and strawberries tolerance to frost.
- Potatoes glowed in the dark when they needed watering.
- Human genes were inserted into corn to produce spermicide.

**7. Answer D:** Though Biotech companies would like us to believe that they have introduced GM crops that address complex agricultural issues such as drought tolerance, adapting plants for climate change, developing nutrient enhanced varieties of grain, etc. there have been NO commercialized crops with these traits. More than 99% of GMOs on the market are engineered not to die when sprayed with herbicide, or they’re designed to produce their own pesticide, or both. The average GM crops has reduced yield while herbicide tolerant plants actually INCREASE herbicide application worldwide.

**8. Answers B:** False. There have been several cases of animal and human health problems associated with the consumption of GMOs.

Various feeding studies in animals have resulted in potentially pre-cancerous cell growth, damaged immune systems, smaller brains, livers, and testicles, partial atrophy or increased density of the liver, odd shaped cell nuclei, false pregnancies, higher death rates and other unexplained anomalies.

The biotech industry says that millions have been eating GM foods without ill effect. This is misleading. No one monitors human health impacts of GM foods. If the foods were creating health problems in the US population, it might take years or decades before we identified the cause.

One epidemic was rare, serious, and fast acting, and therefore more easily discovered. Called EMS, it was traced to a GM brand of the food supplement L-tryptophan. In the 1980s, the contaminated brand killed about 100 Americans and caused sickness or disability in about 5-10,000 others.

**9. Answer D:** Many consumers in the US mistakenly believe that the FDA approves GM foods through rigorous, in-depth, long-term studies. **In reality, the FDA has absolutely no safety testing requirements.**

Since no one is monitoring the human health impacts of GM foods, it might take years to discover most reactions, if they are discovered at all. Refer to the "Frequently Asked Questions" document for specific examples.

**10. Answer D.** There are a number of dangers that broadly fall into the categories of **potential toxins, allergens, carcinogens, new diseases, antibiotic resistant diseases, and nutritional problems.** Frankly NO ONE knows what the exact health dangers of GMOs are due to insufficient safety testing and the fact that there have been no human clinical trials and no post-marketing surveillance.

We recommend *Genetic Roulette*, Jeffrey Smith's book about the health risks of GMOs.

**Here are some examples of information that supports a possible link between GM soy and allergic reactions**

- Soy allergies skyrocketed by 50% in the UK, soon after GM soy was introduced.
- A human subject showed a skin prick allergic-type reaction to GM soy, but not to natural soy.
- The level of one known soy allergen is as much as 7-times higher in cooked GM soy compared to non-GM soy.
- GM soy also contains an unexpected allergen-type protein not found in natural soy.
- GM soy has higher levels of herbicide, which might inspire a reaction.
- GM soy fed to mice inhibits production of digestive enzymes, which might ultimately increase the allergenicity of proteins that are broken down more slowly.

The Roundup Ready gene inserted into soy produced a protein with properties of a known allergen. The only human feeding study on GMOs found that the gene had transferred into human intestinal bacteria and continued to function. It continued to produce that potentially allergenic protein inside people's digestive tract, long after they had stopped eating the GM soy.

(\*references available on [www.responsibletechnology.org](http://www.responsibletechnology.org) or in Genetic Roulette.)

**Congratulations and thanks for taking the time to educate yourself about GMOs.**

How did you score? Consider re-taking the quiz until you get all the answers right. It's likely that you will have to answer many of these questions for curious customers.