

Genetically Modified Organism

Concept: Genetically Modified Organism

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Description Located in the nucleus of every living cell is DNA or deoxyribonucleic acid, the molecule that is the hereditary template for creating, repairing, and ending life, whether human, plant, or animal. DNA exists in a chain-like structure or double helix. Genes are certain sections in the DNA chain that determine the synthesis of proteins, which govern all the life processes. The term gene derives from the Greek word *genos*, for birth or origin. Genes can be seen as sources of information or genetic codes. The code uses sets of three nucleotide bases (codons) to make the amino acids that, in turn, constitute proteins. Proteins, in turn, are substances controlled by genes that make up virtually all of the body's ingredients. By adding or subtracting a protein, one can switch genes on and off.

For example, within a given plant, there might be a gene that, when "switched on," makes that plant resistant to colder temperatures. In another similar plant, this gene might be "switched off," rendering that plant less resistant to cold. For millennia, farmers have sought to transfer genetic information from one plant to another. They try to produce a version of a plant that is resistant to cold by using grafting or other cross-breeding techniques to transfer genetic codes from a cold resistant plant to one that is less resistant to cold. Such techniques are a way to "turn on" the cold resistant gene. Historically, these techniques were limited to plants of the same species or very similar species.

Beginning in the 1970s, scientists developed a capability for genetic engineering. They created a technology that permitted them to transfer particular genes or parts of DNA directly from one organism to another in the laboratory. Such technologies permit the direct transfer of genetic codes across organisms. Because all living organisms have DNA and genes that take the same chemical form, this technology permits the transfer of genetic information, in principle, from any one living organism to any other living organism. So, for example, scientists have been able to transfer genetic codes from a fish to a plant. In these respects, this technology is potentially globalizing. It permits the transfer of genetic information not only from one kind of apple to another apple as in traditional cross-breeding, but from a papaya plant grown in the tropics to an apple tree grown in temperate climates. Neither species type nor physical location are limits on the transfer of genetic information.

Almost immediately after the development of genetic engineering technology, scientists began to explore how this technique might be used in agriculture. The initial focus was to turn on genes in widely grown plants

like soybeans, cotton, canola and corn that would make them resistant to certain herbicides or to insects that often attacked the plant. Governments in Canada and the United States gave approval for the commercialization of such plants in the early 1990s. Since soybeans, canola, and corn are highly traded food commodities, genetically modified crops entered the international trading system shortly afterward. Genetically modified organisms or GMOs like soybeans, corn, or canola are often used in some processed foods. Genetically modified (GM) foods then are foods where some of their components come from GMOs. Since processed foods are also highly traded, GM products have also entered the trading system.

GMOs and GM foods have become a source of concern to many activists concerned with globalization. These activists have raised questions such as: Are GMOs and GM foods safe for humans and animals to eat? Will the dispersion of GM seeds into the wild reduce biological diversity? Will developing countries lose some of their unique genetic resources if some of their plants become used in genetic engineering, leading to the patenting of genetic processes? Of course, such questions relate to the autonomy of these countries as well since the technology is principally in the hands of a relatively small number of transnational corporations from developed countries. Autonomy also comes into play as some jurisdictions like the European Union have sought to restrict the trade in GMOs and GM foods. Such restrictions have been challenged by the United States, Canada, and Australia at the dispute settlement process of the World Trade Organization.