



Genetic Engineering

DID YOU KNOW?

More than 60 percent of the foods that Americans purchase from the supermarket today contain genetically modified (GM) crops.



some GM groceries

WHAT IS GENETIC ENGINEERING?

Genetic engineering involves moving genes from one organism into another. Scientists pinpoint a desirable trait in one organism, isolate the gene responsible for the trait, remove it, and then transfer it to another organism.



Scientists added a gene to soybeans to make them resistant to weed killer. When we spray our soybean fields with the weed killer, the weeds die, but the GM soybeans survive.

HOW DOES GENETIC ENGINEERING WORK?

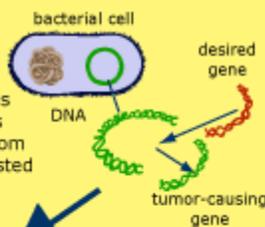
Scientists use various methods to add genes to an organism's DNA. One method to transfer genes uses a soil bacterium.

The soil bacterium *Agrobacterium tumefaciens* has a ring of DNA that naturally inserts itself into the DNA of plant cells and causes tumors.



tumor

1 The tumor-causing gene is cut out of the bacterium's DNA. The desired gene from the donor organism is pasted into the DNA in its place.



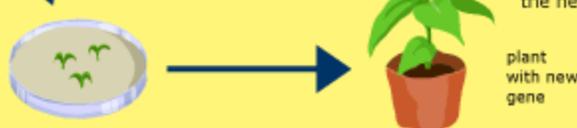
2 The DNA is put back into a bacterial cell. The cell is put in a nutrient broth, where it multiplies. Each new bacterial cell has the new gene.



3 A piece of leaf is placed in the nutrient broth. The DNA with the new gene enters some of the plant cells.



4 Leaf cells with the new gene are put in a special growth medium where they grow into complete plants. Every cell in the new plant contains the new gene.



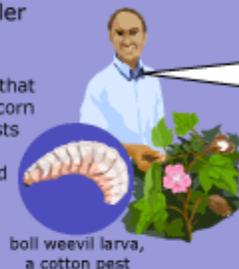
5 When the plants mature, they make seeds that carry the new gene.

plant with new gene

WHY IS GENETIC ENGINEERING BEING DONE?

* To make crops resistant to insects and weed killer

A gene from a soil bacterium called Bt produces a protein that is toxic to pests of corn and cotton. Scientists added this gene to the DNA of corn and cotton, so the plants contain the insecticide.



boll weevil larva, a cotton pest

* To make foods that are larger, more nutritious, tastier, or that resist rot

A daffodil has a gene for making vitamin A. Scientists can add this daffodil gene to a rice plant. In this way, rice plants can produce more vitamin A. People need vitamin A for healthy eyes, skin, bones and teeth.



* To develop crops that could survive where they normally would not

Scientists can take a gene from the *E. coli* bacterium, and add it to rice. This GM rice is able to withstand drought, salt water and cold temperatures.



WHAT PEOPLE ARE SAYING ABOUT GENETIC ENGINEERING.



GM crops are owned by the companies that develop them. Farmers can't save seeds of GM crops to plant the following year. I don't like that idea.



Nearly all US farmers buy their seed each year anyway, but this might be a concern for farmers in some poorer countries.



I'm more concerned that GM crops might harm the environment and reduce biodiversity.



Pests damage crops. So we need ways to manage them but not harm the environment. Perhaps GM crops can do both, but we do need to examine them carefully, and compare them to alternative technologies.

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