Genetic Engineering Pros and Cons

Definition and Examples

Genetic engineering is where a scientist physically changes or modifies the DNA of an organism. This is done to plants, animals, and even humans. The DNA in plants can be changed so they need less water or will grow taller or faster. It can also cause the plant to make more fruit, which gives us more food. Genetic engineering can make it so bugs don't like to eat the plant. This means farmers can use fewer pesticides to kill the bugs that eat the plants. Pesticides are chemicals that can make many people sick.

Genetic engineering in animals is used to grow human organs in the animals that can then be transferred to humans and the human body won't reject the organ. This allows the human to live longer. Animals can be cloned to make more of them and feed more people. Extinct or endangered species can also be cloned so we don't lose the variety of animals that we have on Earth.

Genetic engineering in humans can be used to regrow organs to save lives. Genetic engineering can also replace damaged or bad genes to cure some diseases in humans. Finally, genetic engineering scientists can create medicines that will cure people of sickness.

Pro of Genetic Engineering

There are many good things that can be created from genetic engineering. Genetically modified crops can make more food for starving people. Plants can also be changed to have more vitamins and nutrients in them to be healthier for humans to eat. Plants can also be changed so that they contain medicines. Children can then eat these plants and take their medicine at the same time.

Animals have been genetically modified to grow faster and resist diseases. Some cows have been genetically modified to make human milk for babies whose mothers can't make milk on their own. Genetic engineering is being used to end the spread of different diseases in humans, including unborn children. It can also help increase the life span of humans.

Cons of Genetic Engineering

Genetic engineering has many negative issues with it as well. Genetically modified plants and animals may cause mutations in the genes that could increase food allergies. It can also cause foods to be less nutritious, or make people sick.

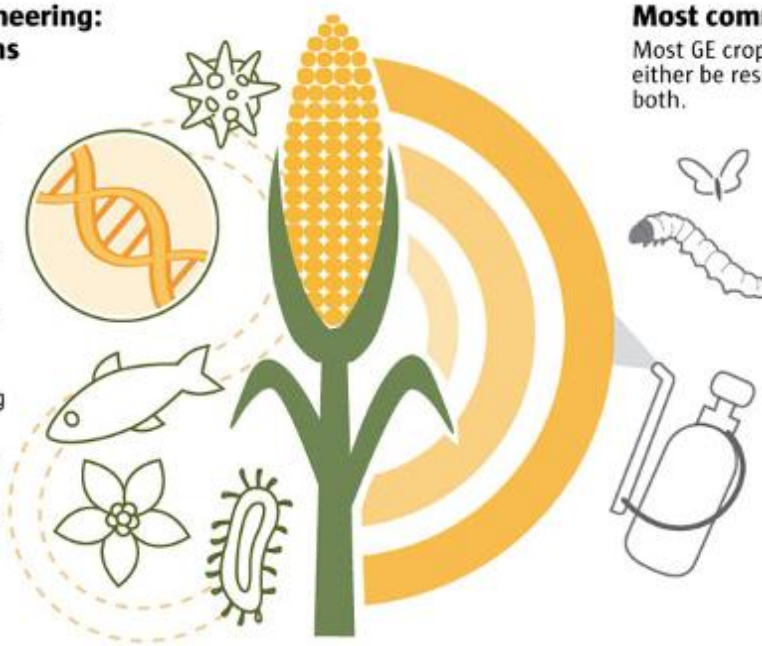
Genetic modifications in humans may not be safe now or for the human race in the future. It may fix one disease or mutation and cause other diseases or mutations that could make the person sicker or even kill them. There could be long term affects to the human race that we won't know about for many generations since these harmful mutations are passed down from one generation to the next.

The process of gene therapy is very expensive and would only be easily afforded by rich people. This would give the rich people an advantage over people who cannot afford to pay for the genetic modifications. This could create two different classes of humans; those that are genetically modified and those that aren't.

Finally, many people have ethical issues with genetic engineering. They feel that humans should not be changing what God has created.

Genetic engineering: What it means

All breeding leads to genetic changes, but genetic engineering is the targeted manipulation of a plant's or animal's DNA to modify specific traits. It can involve tweaking a species' own genes or adding genes from another species.



Most common GE traits

Most GE crops on the market were designed to either be resistant to herbicides, insect pests or both.

PEST RESISTANCE

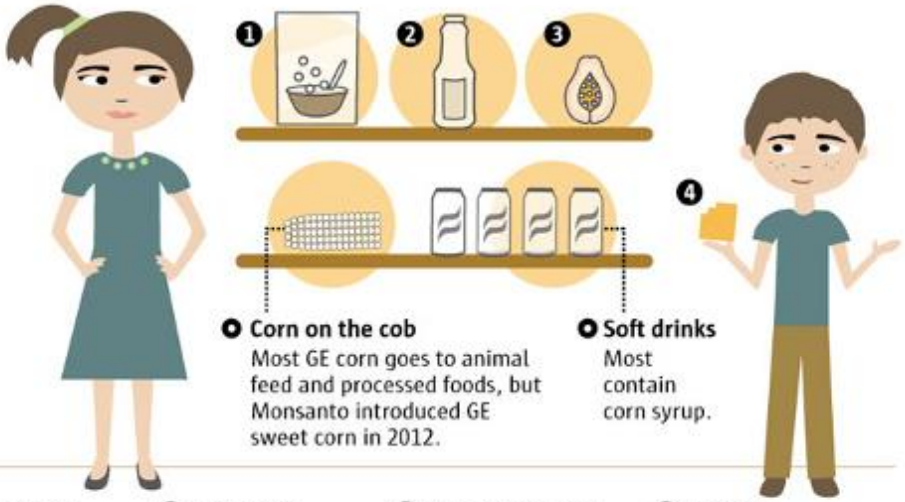
A gene from the microbe Bacillus thuringiensis (Bt) is inserted in cotton, corn and other crops, allowing the plants to produce an insecticide that kills caterpillar pests. Bt in spray form is widely used in organic farming.

HERBICIDE RESISTANCE

Corn, soy, canola, cotton and other crops have been genetically engineered with a bacterial gene to be immune to the weed-killer glyphosate, sold as Roundup. When farmers spray their fields with Roundup, the weeds are killed but the crops survive.

Where are the genetically engineered ingredients?

Most processed foods in the United States contain some GE ingredients, from high-fructose corn syrup to soy protein, corn starch, soy flour, lecithin, beet sugar, canola oil and cottonseed oil. Products labeled "organic" cannot contain any deliberately added GE ingredients.



Corn on the cob
Most GE corn goes to animal feed and processed foods, but Monsanto introduced GE sweet corn in 2012.

Soft drinks
Most contain corn syrup.

1 Cereals
Many contain corn, soy and GE sweeteners.

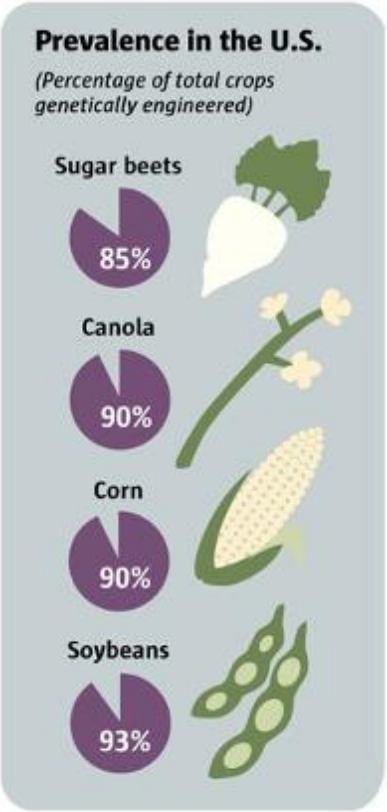
2 Canola oil
85% of U.S. canola is engineered for herbicide resistance.

3 Hawaiian papaya
Most are engineered to resist a virus that decimated the crop in the 1990s.

4 Cheese
Most cheese in the U.S. is produced using enzymes from GE bacteria or yeast.

Prevalence in the U.S.

(Percentage of total crops genetically engineered)

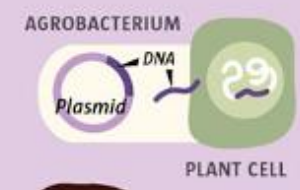


http://healthresearchfunding.org/pros-cons-genetic-engineering/

Genetic engineering versus plant breeding

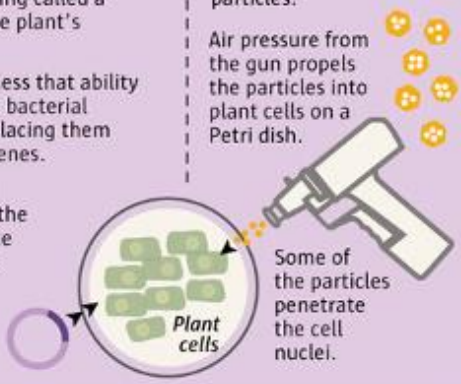
GENETIC ENGINEERING: HOW PLANTS ARE ALTERED

Genetic engineering is a way to speed up and control the plant-breeding process by altering or inserting specific genes in a food crop. The new genes can come from the same species or other species and are inserted in one of two ways:



Transfer methods

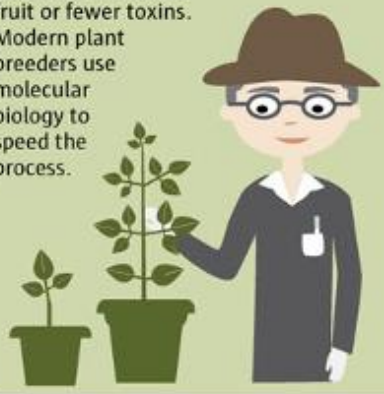
Agrobacterium	Gene gun
Agrobacterium tumefaciens, a soil-dwelling bacterium, infects plants by injecting its own DNA – in the form of a ring called a plasmid – into the plant's chromosomes.	Thousands of gene copies are attached to microscopic gold particles.
Researchers harness that ability by extracting the bacterial plasmids and replacing them with beneficial genes.	Air pressure from the gun propels the particles into plant cells on a Petri dish.
When combined with plant cells, the bacteria insert the altered plasmids into the plant chromosomes.	Some of the particles penetrate the cell nuclei.



PLANT BREEDING: CONVENTIONAL METHODS

Humans have been modifying plant genes for 10,000 years to develop foods that are tasty and productive. Today's commercial crops bear little resemblance to their wild ancestors.

Most changes came through the slow process of conventional breeding: Growers rely on nature to produce mutants with desirable qualities, like bigger fruit or fewer toxins. Modern plant breeders use molecular biology to speed the process.



Modern techniques

Simple selection

The oldest method, by which most modern crops were developed. Farmers select seed from superior plants. Today, molecular analysis allows quick identification of desirable traits.

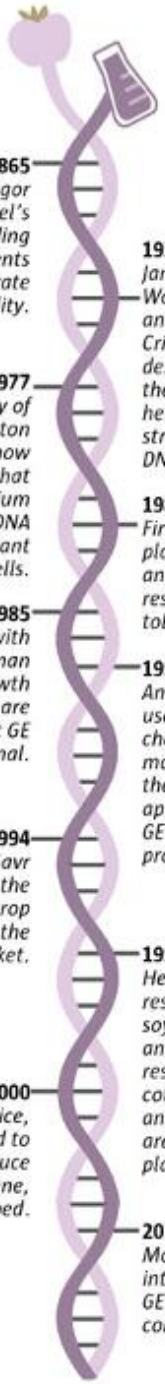
Cross-breeding

The mainstay of modern plant breeding combines desirable traits within and between species. Rutabagas are a cross between turnips and cabbage; triticale is a cross between wheat and rye.

Mutation breeding

Plants or seeds are exposed to chemicals or radiation to speed the mutation rate. Thousands of crops, including red grapefruit and some organically grown rice, were developed this way.

GMO milestones



1865 *Gregor Mendel's pea-breeding experiments demonstrate heredity.*

1953 *James Watson and Francis Crick describe the double helix structure of DNA.*

1977 *University of Washington scientists show that Agrobacterium injects DNA into plant cells.*

1983 *First GE plant, antibiotic-resistant tobacco.*

1985 *Pigs with human growth hormone are the first GE farm animal.*

1990 *An enzyme used in cheese-making is the first approved GE food product.*

1994 *Flavr Savr tomato is the first GE crop on the market.*

1996 *Herbicide-resistant soybeans and insect-resistant cotton and corn are widely planted.*

2000 *Golden rice, engineered to produce beta-carotene, is developed.*

2012 *Monsanto introduces GE sweet corn.*

Sources: Safety of Genetically Engineered Foods: Approaches to Assessing Unintended Health Effects. 2004, National Research Council; Food & Water Watch; "Straight Talk on Genetically Engineered Foods, Center for Science in the Public Interest; Nathanael Johnson, Thought for Food blog, Grist magazine; Toby Bradshaw, UW

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