

Genetic variation is the raw material of evolution. Natural sources of variation include genetic mutations, the recombination of alleles during sexual reproduction, gene flow, genetic drift, and various methods of gene transfer between bacteria. Biotechnology now adds genetic engineering to this list of processes. Will biotechnology result in the evolution of new species? Can biotechnology help us preserve species?

Engineering new species?

Biotechnology—the use of organisms to benefit humanity—includes methods as old as artificial selection and as current as genetic engineering. Modern artificial breeding techniques have been used to develop plant crosses, such as triticale, which is a hybrid of wheat (*Triticum aestivum*) and rye (*Secale cereale*). Genetic engineering allows scientists to combine traits from different species that are incapable of breeding with one another. A gene from a bacterium, for example, can be made to function in a corn (*Zea mays*) plant. This does not mean that bacteria and corn share a breeding population, nor that the transgenic organism is a hybrid. But is the transgenic corn a different species because it has characteristics that are not shared by other corn plants?

All members of a species—interbreeding populations of similar organisms—share a common gene pool. By altering a gene pool, is biotechnology altering the course of evolution? Unlike biotechnology, natural selection acts on individuals, not on isolated genes, and it results in adaptive traits. Genes function in interlocking relationships with other genes in a cell. As a result, biotechnology—in particular, genetic engineering— can have unexpected effects on non-target genes. For example, adding a trait, such as herbicide resistance, to a plant may produce offsetting physiological changes in the plant that will reduce its overall survival rate. For this reason, engineering a transgenic organism that will be useful in industry or agriculture can be a challenge.

Some forms of biotechnology have the potential to affect wild populations, as well. In Canada, nearly 90 percent of the field tests of genetically engineered plants involve crop plants with introduced genes for herbicide tolerance. Studies show that the added genes can spread to populations of related wild plants by cross-pollination. Should cross-pollination occur, it could result in new populations of herbicide-tolerant weeds.

Cloning to save species

Although the tools of biotechnology can change gene pools in both intended and unintended ways, some of these tools can also be used to preserve gene pools. Cloning is one method that may help reverse the threat to endangered species. The first endangered animal to be cloned was the Asian gaur (*Bos gaurus*), a rare, ox-like mammal native to India and Southeast Asia. The animal was cloned from a dead gaur’s skin cells, which were fused with a domestic cow’s egg cell from which the nucleus had been removed. The egg was then transplanted into a surrogate mother, also a domestic cow (*Bos taurus*). The cloned gaur was born in November 2000, in Iowa in the United States. The same technique may one day be used to resurrect species that have already become extinct.



This baby gaur was the first endangered species to be cloned. It died a few days after birth. Its death highlights how difficult it is to clone mammals successfully and produce healthy

1.) In your opinion are transgenic organisms a new species? Explain your answer.

2.) How might genetic engineers prevent the spread of introduced genes into wild populations?

3.) How might the release of transgenic organisms into the wild affect natural populations?

4.) Discuss the benefits and disadvantages of using cloning as a method for protecting endangered species.

5.) Choose one of the following biotechnologies and use google

- Artificial selection
- Transgenic organisms
- Cloning

The technology I chose is _____

a.) Will this biotechnology result in the evolution of new species?

b.) Does biotechnology have the potential to impact wild populations?

c.) Can this biotechnology help preserve species?
