

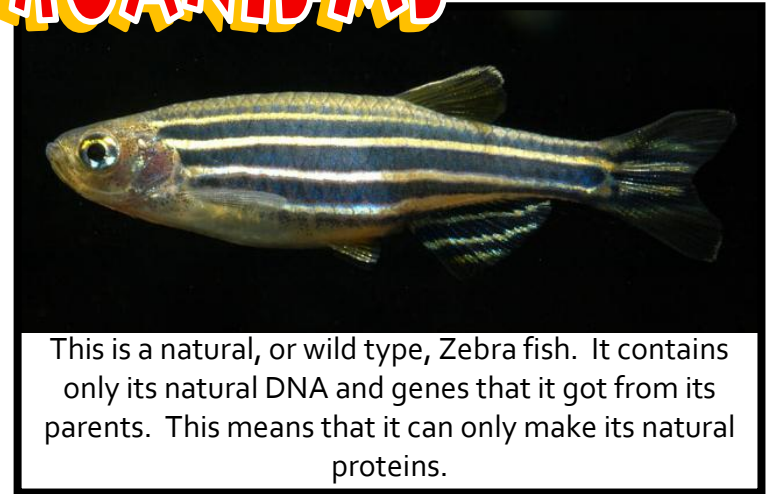
GENETICALLY MODIFIED ORGANISMS

A **Genetically Modified Organism or GMO** is an organism whose genome (DNA) has been altered to include a few genes from a different organism.

GMOs like these zebra fish are becoming more and more common in our everyday lives. These Zebra fish (*Danio rerio*), which have a few genes from a jellyfish, can be found in local pet stores.

Since it has genes from a jellyfish that means that it has some of the jellyfish's recipe to make proteins. The recipes that the Zebra fish now has code for different florescent proteins. These are the same proteins that make jellyfish appear to glow.

These fish were initially developed in an effort to develop a fish that could detect different environmental pollutants in water. The idea is that a fish would look normal until the pollutant was present, and then it would make the jellyfish protein in the presence of a specific environmental pollutant. This would give scientists an easy visual way to tell if there were any pollutants in the water.



This is a natural, or wild type, Zebra fish. It contains only its natural DNA and genes that it got from its parents. This means that it can only make its natural proteins.



The fish above are the same species as the Zebra fish in the first picture. However, these Zebra fish are **GMOs**. They contain genes from jellyfish that allow them to produce different colors of florescent proteins. These are the same proteins that make a jellyfish "glow."

Though this research is not complete, scientists use the profits from the sale of these fish to fund their continuing research.

RECOMBINANT DNA

The DNA of a **GMO** would be considered "recombinant" DNA. **Recombinant DNA** is DNA that has been artificially combined with

the DNA of another organism. In other words, recombinant DNA is DNA that has the code from 2 or more organisms. In this case of our Zebra fish, their DNA has been combined with DNA from a Jellyfish to make **recombinant DNA**.



Other GMOs Agricultural plants are of the most frequent examples of genetically modified organisms (GMOs). Some benefits of GMOs in farming are increased # of crops, reduced costs, more nutrients in the food, resistance to pests and disease, and medical benefits. Crops have been developed that grow faster and in poor soil and weather conditions, allowing plants to grow where they might not otherwise have grown. A number of animals have also had their DNA changed to increase their population & decrease disease. Salmon have been made to grow larger and faster; cattle have shown resistance to mad cow disease all through changing their DNA.



Sometimes scientists insert human DNA into other organisms, like cows or pigs, so that these GMOs can become sources for human proteins. One example of this is the protein insulin. People with Type I Diabetes do not produce enough insulin (a natural human protein). Medical research & pharmaceutical companies have developed GMO bacteria, pigs & cows with recombinant DNA which allows them to produce HUMAN insulin. As long as these organisms have the human gene (the recipe for a human protein) their ribosomes will make the human protein.

Other times this same gene from jellyfish is added with other inserted genes to check whether those genes were actually inserted into the organism. Some traits that a gene may affect can be hard to see. Adding the jellyfish gene for florescent proteins allows scientists to make sure the genes are working that may not be so easy to see.

Risks and Controversies Surrounding the Use of GMOs Despite the fact that the genes being transferred occur naturally in other species, there are unknown consequences to changing the natural DNA of an organism. It can change the organism's metabolism, growth rate, and/or response to external environmental factors. These consequences influence not only the GMO itself, but also the natural environment in which that organism lives. Potential health risks to humans include the possibility of exposure to new allergens in genetically modified foods, as well as the transfer of antibiotic-resistant genes.

