

A CASE STUDY

## Genetically engineered zebra fish-fluorescent beauties with practical applications

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**G**low fish or fluorescent zebra fish are beautiful and unique creations of science. Glofish is the name given to genetically modified zebra danios (*Brachydanio rerio*). Their name is correctly spelled as glofish, but is sometimes incorrectly spelled as glowfish. This is a common mistake because the fish do seem to glow when they encounter environmental toxins. The now infamous luminescent zebrafish, sold as glofish, the only transgenic fish commercially available, as of 2004, was originally developed in a laboratory in Singapore to be a living indicator of water pollution. The difference between regular zebra danios and glofish are that researchers in Singapore added a fluorescence gene from a sea coral to zebra danio eggs to produce glofish. This gene causes the genetically modified fish to fluoresce or light up in the presence of environmental toxins. Other than this, they are identical to regular zebra danios, with the exception that the genetically modified glofish have neon colours. Regular zebra danios are gold and blue striped or gold and silver striped fish. Both glofish and regular zebra danios are peaceful fish that do well in a community tank. Originally created to detect environmental toxins, glofish have been for sale in pet stores since 2003 for the general public to buy and place in their aquariums. There is some concern about what might happen if these genetically altered fish find their way into natural rivers and streams. The creators of glofish state that they don't pose an ecological threat because glowfish, like regular zebra danios, won't survive in the wild because they are tropical fish and need a water temperature of about 24-26 °C (75-79 °F). It has been five years now and so far there doesn't seem to be a problem. Although some people do question the

ethics of selling genetically altered fish to the public just because they are prettier than the original fish. Glofish come in a variety of colours, including red, green, and orange. They can be purchased for about \$6-7 each. Glofish are reported to be as healthy as regular zebra danios and their care is identical. They reach an adult size of approximately 2 inches (5 cm). They are omnivores that eat a variety of aquarium fare.

### *Development of transgenic fluorescent zebra fish:*

#### *Mechanism:*

The process, illustrated in this chart, begins by adding a fluorescence gene to the fish before it hatches from its egg. Once the gene integrates into the genome (*i.e.*, genetic code) of the embryo, the developing fish will be able to pass the fluorescence gene along to its offspring upon maturity. Because of this, the gene only needs to be added to one embryo; from that point forward, all subsequent fluorescent fish are the result of traditional breeding.

The gloFish was produced by injecting zebra fish eggs with the gene of a sea anemone which makes it red coloured. The researchers have also produced green fish by injecting the eggs with a fluorescent marker gene from jellyfish, which is commonly used in experiments.

To enable the fishes' use as pollution detectors, the scientists have pinpointed gene promoters which act as on/off switches in the presence of certain triggers. One type of switch is activated by the sex hormone oestrogen, which can contaminate water. Other glow switches can be stress-induced and will respond to the presence of damaging chemicals like heavy metals.

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