

Genetic resistance to lethal virus found in key farmed fish species

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Resistance to a deadly disease that is affecting the second most farmed fish in the world has been found to be mainly due to differences in genes

between families of the same fish.

The breakthrough could help protect stocks of Tilapia fish, which is an important food source in Africa, Asia and South America and worth nearly \$10 billion to the global economy.

Since its detection in 2014, Tilapia Lake Virus (TiLV) has ravaged Tilapia populations in 16 countries across three continents.

Clinical signs of the virus observed in [tilapia](#) include behavioral changes, discoloration, skin hemorrhages, loss of scales, eyeball protrusion and abdominal swelling. There are currently no treatments or vaccines for TiLV.

Experts believe that selective breeding of fish with the resistance genes may be one way of limiting the damage of this disease, with up to 90 per cent of fish dying once infected.

Researchers from University of Edinburgh's Roslin Institute and WorldFish analysed the genes of 1,821 Genetically Improved Farmed Tilapia (GIFT), which were tagged and placed in a pond that had an outbreak of TiLV.

The fish used in this experiment were members of 124 families, and the team discovered that there was a large variation in family survival. Some family groups had no deaths, whereas others found to have a 100 per cent death rate.

The team then used statistical models to show that resistance to the virus was very heritable, and this means that selective breeding to produce more resistant tilapia strains is likely to be effective.

The variation in TiLV resistance were found to be independent of

genetic variation in growth, meaning that any future breeding programmes for GIFT that produce fish resistant to TiLV will not adversely affect the growth of the fish, and will benefit farmers' yields.

The GIFT strain was been selectively bred to be fast growing and adaptable to a wide range of environments. The strain is produced in at least 14 countries, helping to reduce poverty and hunger.

Tilapia is an affordable food source for many people, particularly in developing countries. It is the fourth most consumed fish in the United States.

Fast growing and a healthy source of protein, nutrients and essential fatty acids, Tilapia is easily grown on small or large fish farms.

Professor Ross Houston, lead author and Personal Chair of Aquaculture Genetics at the Roslin Institute, said: "Tilapia Lake Virus poses a real problem to fish famers worldwide, impacting on the livelihoods and food security of millions of people. This research is the result of a long term collaboration between Roslin and WorldFish, and is the first step to breeding tilapia strains with improved resistance to the virus."

This research project was funded with UK aid from the UK government and was undertaken in the framework of the CGIAR Research Program on Fish Agri-Food Systems. The research findings have been published in the journal *Aquaculture*.

Michael Phillips, Director of CGIAR Research Program on Fish Agri-Food Systems Aquaculture and Fisheries Sciences, WorldFish, said:

"This is a truly exciting finding at the frontier of fish genetics.

WorldFish will build on this research, with our partners in the [research](#), donor and investment community, to accelerate the further development of resilient TiLV resistant tilapia strains and their wide accessibility to

small scale [fish](#) farmers."

More information: Agustin Barría et al, Genetic parameters for resistance to Tilapia Lake Virus (TiLV) in Nile tilapia (*Oreochromis niloticus*), *Aquaculture* (2020). [DOI: 10.1016/j.aquaculture.2020.735126](https://doi.org/10.1016/j.aquaculture.2020.735126)

Provided by University of Edinburgh

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