Frogs with disease-resistance genes may escape extinction

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As frog populations die off around the world, researchers have identified certain genes that can help the amphibians develop resistance to harmful bacteria and disease. The discovery may provide new strategies to protect frog populations in the wild.

New work, published in the online, open-access journal *PLoS ONE,* examines how genes encoding the major histocompatibility (MHC) complex affect the ability of frogs to resist infection by a bacterium that is commonly associated with frog population declines.

"In the short term, captive management of frogs with complementary disease-resistance genes may offer the best hope for saving species from extinction," says Bruce Waldman, a biologist at Lincoln University in New Zealand and one of the paper's authors. "Management practices that maintain or enhance diversity in MHC genes may prove the key to safeguarding frog populations in the wild."

"Massive die-offs of frogs may indicate environmental problems that ultimately will affect other species, including humans," Waldman says. "But, despite the concern, little is known about factors that make individuals susceptible to disease."

Doctoral students Seth Barribeau and Jandouwe Villinger, working with Waldman, exposed African clawed frog tadpoles to several doses of the bacterium Aeromonas hydrophila. They examined the number of tadpoles that survived and measured how fast they grew.

Certain genes allowed tadpoles to survive bacterial infection but at a cost, as these tadpoles sometimes grew more slowly. Among siblings, patterns of disease resistance corresponded to tadpoles' MHC genes rather than other genes that they shared, demonstrating that the MHC genes conferred immunity.

Programs currently are underway to rescue frogs from declining wild populations and breed them in captivity to ensure that species are not lost to extinction. This study suggests that selective breeding of individuals with known disease-resistance genes might produce frogs that can survive infection by pathogens, even after the frogs are reintroduced into the wild.

The research team studied the African clawed frog because its immune system already had been well characterized, but as most frogs and toads have similar immune systems, they believe that their results will be generally applicable to all threatened and endangered amphibians.

Source: Public Library of Science