Hybridization partially restores vision in cavefish

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Hybridizing blind cave fish from different cave populations can partially restore the vision of their offspring, biologists at New York University have found. The study suggests that genetic engineering can override, at least in part, half a million years of evolutionary change in one generation.

“Evolution has many ways to accomplish the same end result, which in the case of cave fish is blindness,” said NYU Biology Professor Richard Borowsky, the study’s lead author. “For this reason, the genes that are mutated in one population that lead to blindness are different in other, independently evolved populations. Thus, when you cross them, the genetic deficiencies in one lineage are compensated for by strengths in the other, and vice-versa.”

The research, supported by grants from the National Science Foundation and the National Institutes of Health, appears in the most recent issue of the journal *Current Biology*.

The study examined four populations of blind cave fish, Astyanax mexicanus, which inhabit different caves in northeast Mexico. Blind for millennia, these fish evolved from eyed, surface fish. The researchers’ genetic analysis showed that the evolutionary impairment of eye development, as well as the loss of pigmentation and other cave-related changes, resulted from mutations at multiple gene sites.

In order to gauge how genetic make-up could bring about the restoration

of vision, the researchers created hybrids of the different cave fish populations. Among these various hybrids, they found that nearly 40 percent in some hybrid crosses could see.

“These fish are descended from ancestors that have been isolated in the dark for nearly one million years and most likely haven’t had the capacity for vision for at least half that time,” said Borowsky. “But by recombining the right genes through hybridization, you can partially restore vision. Not only are the structures of the eye restored to the point where they regain function, but all the connections to the brain for proper processing of information not used for that enormous length of time are restored.”

Borowsky added that the findings could pave the way for greater understanding of human eyes.

Source: New York University