Blind cave fish may provide insight on eye disease and other human health issues

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A closeup of our Blind Cave Fish, for the mexican tetra page. Credit: CC BY-SA 3.0

Blind cave fish may not be the first thing that comes to mind when it comes to understanding human sight, but recent research indicates they may have quite a bit to teach us about the causes of many human ailments, including those that result in loss of sight. A team of researchers, led by Suzanne McGaugh, an assistant professor in the University of Minnesota's College of Biological Sciences, is looking to the tiny eyeless fish for clues about the underpinnings of degenerative eye disease and more.

A new study, published in the October 20 online edition of *Nature Communications*, opens the doors to research that could illuminate the mechanisms behind human disease.

Cave fish exhibit repeated, independent evolution for a variety of traits including eye degeneration, pigment loss, increased size, number of taste buds and shifts in behavior. The researchers are investigating how organisms adapt to cave environments and which genes are involved in a range of traits. "The cavefish genome sequence is similar to the human genome sequence, and we share many of the same pathways and genes with them," says McGaugh. "They're an ideal subject for study, because they have traits that are directly translatable to human health."

McGaugh and colleagues from 10 institutions around the world, including Harvard University and the University of Maryland, detail the first-ever de novo genome assembly for a species of blind cave fish (*Astyanax mexicanus*) commonly known as the Mexican tetra fish. The work is notable because the *Astyanax* genome will allow dissection of the genetic bases of traits that make the cave fish distinctive and facilitate future studies investigating the paths of repeated evolution, which may help advance understanding of human disease.

The researchers identified repeat elements in the genome of the cavefish and compared those to similar species and reported the results of tests of specific genes for potential functional and expression differences. They were able to generate a list of candidate genes for hallmark cave fish traits. "Many of those traits are really important for human health, such as the fishes' eye loss, which could be analogous to human diseases such as retinal degeneration," McGaugh says. She notes that the research may also form the basis for a model for sleep disturbance studies since cave fish sleep about a quarter as much as surface fish do.

McGaugh plans to continue research that builds on the current work.

"There are three to five different events in Mexico of the same species going into caves and evolving these traits, so we're hoping to see if it replays the same way, and discover if there is anything consistent about the genes and where genetic changes occur."

Provided by University of Minnesota

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