Study finds flu ravages muscles of zebrafish with muscular dystrophy

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Credit: University of Maine

This time of year, doctors often recommend flu shots for people who are young, old, pregnant or immunocompromised.

Michelle Goody suggests adding people with muscular dystrophy to the list.

After the University of Maine research assistant professor injected the flu virus into the bloodstream of zebrafish with Duchenne muscular dystrophy (DMD), damage to their muscles was greatly exacerbated.

DMD is the most common type of muscular dystrophy and is characterized by progressive muscle degeneration and weakness. The genetic disease is caused by the absence of dystrophin, a protein that helps muscle cells remain intact. People with DMD—almost all males—have difficulty standing up and walking, and may have heart and lung problems.

Goody first injected human Influenza A virus (IAV) into the bloodstream of 2-day-old healthy zebrafish.

Within 24 hours, they exhibited symptoms of an influenza infection—their hearts were swollen, their mobility was reduced and they were shaking.

The data, says Goody, indicate IAV can enter and infect live zebrafish muscle cells, and that "muscle degeneration, pain, and weakness may be, at least in part, due to direct infection of muscle cells by IAV."

Muscle complications with viral infections also could be due to collateral damage by an activated immune system, she says.

Goody, the first person to discover that the flu virus can enter and infect muscle cells in a live animal, then injected the same dose of the flu virus into the bloodstream of zebrafish with muscular dystrophy.

These zebrafish soon displayed severe muscle damage. This suggests "that muscle damage caused by Dystrophin-deficiency and IAV infection is synergistic," wrote Goody, who earned her Ph.D. in biomedical science at UMaine.

This indicates that getting a flu vaccine is key for people with muscular dystrophy, says Goody.

The Orono High School graduate conducted the research in the UMaine labs of Carol Kim, professor of microbiology and associate vice chancellor for academic innovation and partnerships at the University of Maine System; and Clarissa Henry, her adviser and associate professor of biological sciences.

Goody enjoys learning about cell and organ development. She says zebrafish are valuable for studying human genetics and disease. In addition to being nearly transparent in the larval stage, they have a similar genetic structure to people. And, as a vertebrate, they have the same major organs and tissues as humans.

The zebrafish genome has been fully sequenced, which allows researchers to create mutations—including those causing muscular dystrophy—to study.

Kim and Henry and former microbiology graduate student Denise Jurczyszak also took part in the research, which was funded by the National Institutes of Health and the March of Dimes.

The team's results are in the paper "Influenza A Virus Infection Damages Zebrafish Skeletal Muscle and Exacerbates Disease in Zebrafish Modeling Duchenne Muscular Dystrophy" published online in *PLOS Currents: Muscular Dystrophy*.

More information: Goody M, Jurczyszak D, Kim C, Henry C. Influenza A Virus Infection Damages Zebrafish Skeletal Muscle and Exacerbates Disease in Zebrafish Modeling Duchenne Muscular Dystrophy. *PLOS Currents Muscular Dystrophy*. 2017 Oct 25 . Edition 1. DOI: 10.1371/currents.md.8a7e35c50fa2b48156799d3c39788175

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