Painkillers relieve zebrafish larvae discomfort

April 19 2017

Lynne Sneddon is a myth buster. Having debunked the fisherman's legend that fish don't feel pain, Sneddon, from the University of Liverpool, UK, has become a leading figure in the movement to reduce, replace and refine the use of animals in scientific research.

Uncomfortable with the increasing use of adult fish in pain research, Sneddon and Javier Lopez-Luna decided to test whether tiny zebrafish larvae feel pain. "Previous studies have identified multiple subtypes of nociceptors [pain receptors] in zebrafish...even as early as a few days post-fertilization", the team says. Could they replace the adult fish that

are used in research with larvae that are a matter of days old? Only if they could prove that the fish respond to pain and any discomfort could be relieved.

Lopez-Luna and Sneddon exposed 5-day-post-fertilization zebrafish embryos to dilute concentrations of acetic acid and citric acid, both of which are known to irritate adult fish, and tracked the larvae's activity with software produced by Qussay Al-Jubouri and Waleed Al-Nuaimy.

Analysing the minute fish's motion, Lopez-Luna and Sneddon noticed that the larvae became less active in the two most dilute concentrations of acetic acid (0.01 and 0.1%). However, the most concentrated acetic acid (0.25%) and all three concentrations of citric acid (0.1, 1 and 5%) stimulated the fish to swim harder and farther, possibly in a bid to escape the uncomfortable sensation. But when Lopez-Luna administered pain relief to the disturbed fish larvae - in the form of aspirin, morphine and lidocaine—their discomfort appeared to be relieved and their behaviour returned to normal.

Having confirmed that larval fish are capable of experiencing pain and benefit from pain relief, Sneddon and Lopez-Luna recommend, "Larval zebrafish can be used as a model for the study of pain and nociception", sparing many of the adult fish that are currently used in toxicity tests.

More information: Lopez-Luna, J., Al-Jubouri, Q., Al-Nuaimy, W. and Sneddon, L. U. (2017). Reduction in activity by noxious chemical stimulation is ameliorated by immersion in analgesic drugs in zebrafish. *J. Exp. Biol.* 220, DOI: 10.1242/jeb.146969

Provided by University of Liverpool