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research highlights

IN BRIEF

NEURAL CIRCUITS

Oxytocin & nociception in the larval zebrafish

Wee, C.L. et al. *Nat. Neurosci.* <https://doi.org/10.1038/s41593-019-0452-x> (2019)

Encountering a noxious stimulus usually drives a motor response in animals: most will attempt to get away from whatever is causing that ‘pain.’ How the nervous system senses and processes that information, however, has been unclear. Recent research suggests that oxytocin neurons might be involved, but these can be challenging to study in rodent models. But, an ortholog exists in zebrafish, whose larval heads are a bit easier to see into and manipulate with optic and genetic techniques.

A new paper uses the larval zebrafish to follow nociception from sensory input to behavioral output *in vivo*. They show that response to noxious stimuli is mediated by oxytocin neurons and a cation channel called TRPA1 in the fish hypothalamus. Activating these neurons prompts defensive behaviors, while getting rid of them eliminates response to noxious challenge. *EPN*

<https://doi.org/10.1038/s41684-019-0383-x>

REGENERATION

Regrowing lobed fins

Darnet, S. et al. *PNAS* **116**, 15106–15115 (2019)

The ability to regrow lost tissue is common to some groups of animals while quite rare among others. The latter includes humans and most members of our ‘lobe-finned’ evolutionary lineage. The exceptions (among adults) are the salamanders and the lungfishes. An international team of collaborators took a closer look at how the lungfishes regrow their fins.

The team directly assessed the regenerative ability of several different fishes and then looked more closely at one in particular: *Polypterus senegalus* bichirs. They transcriptionally profiled the blastema—the bud from which new tissue grows after an amputation—from bichir and the axolotl, a well-established salamander model of limb regeneration. The comparison revealed that similar genetic programming seems to be involved in the process, suggesting evolutionary conserved mechanisms for further study. *EPN*

<https://doi.org/10.1038/s41684-019-0385-8>

NEURAL CIRCUITS

Reconstructing worm connectomes by sex

Cook, S.J. et al. *Nature* **571**, 63–71 (2019)

Caenorhabditis elegans is one of just two animals to have had its entire nervous system connectome mapped. Every synapse is thus known in the worm, allowing researchers to dissect the neural circuitry that controls normal and abnormal behavior. A new resource published in *Nature* reconstructs the *C. elegans* connectome, to distinguish between the two worm sexes—an adult hermaphrodite and an adult male.

The resource diagrams the connections between neurons, between neurons and muscles; and between muscles. Hermaphrodites have 302 neurons, while males have a few more—385. The connectome also includes detail about how ‘strong’ those neuronal connections are. Those involved in reproduction were notably different between the sexes, but so too were a number of other non-reproductive circuits. *EPN*

<https://doi.org/10.1038/s41684-019-0384-9>

ZEBRAFISH

The FBI assesses welfare

Deakin, A.G. et al. *Sci. Rep.* **9**, 9042 (2019)

Assessing welfare in fish can be a challenge, especially in large facilities with many fish in many tanks that need to be monitored. To help make those assessments more feasible for large-scale operations, and to reduce the risk of human bias in welfare scoring, researchers at the University of Liverpool developed the automated Fish Behaviour Index, or FBI.

Recent studies suggest that fish that are stressed tend to be less active and linger near the bottoms of their tanks. The FBI is thus based on swimming activity and swimming distance, recorded by cameras. The researchers developed the FBI with female AB strain zebrafish after different invasive procedures, such as fin clipping and PIT tagging, and to evaluate the effects of different analgesics. Against human assessment, welfare scores calculated by the FBI correlated well. *EPN*

<https://doi.org/10.1038/s41684-019-0386-7>