

Better housing conditions for zebrafish could improve research results

May 3 2012

Changing the conditions that zebrafish are kept in could have an impact on their behaviour in animal studies and the reliability of results, according to scientists from Queen Mary, University of London.

Zebrafish, like rats and mice, are often used by neuroscientists to explore mechanisms controlling behaviour and in the search for new compounds to treat behavioural disease such as addiction, attention deficit disorders or [autism](#).

It is known that housing and handling affects the results of behavioural studies done in rats and mice, but until now there have been few studies of how the environment the fish are kept in before they are tested can impact on the results.

Writing in the journal *PLoS ONE*, Dr Caroline Brennan from Queen Mary's School of Biological and Chemical Sciences explains: "Practical considerations make [zebrafish](#) a very useful species in which to explore mechanisms controlling behaviour. Their small size (less than 2 cm) and prolific breeding (approx. 300 eggs per pairing) makes it easy and cheap to keep large numbers of zebrafish in a small space. It is also relatively easy to change the zebrafish genome to explore how changes in different genes affect behaviour.

"As fish have many proteins and [brain circuits](#) in common with humans, factors that affect the [fish behaviour](#) can tell us about things that may affect human behaviour."

One of the most commonly used zebrafish behavioural tests is the 'tank diving' test that is considered a measure of the fish's stress level. When a zebrafish is placed in a new tank it shows a characteristic 'diving' response where the fish will dive to the bottom of the tank and remain there more or less stationary for a brief period of time before rising to shallower depths. The interpretation is that the longer it takes the fish to rise, the more stressed it is. This test has been suggested as a means of screening for new compounds to treat stress disorders.

They are also a shoaling species, which means they prefer to group together. Dr Brennan and her team predicted that the environment they were kept in would affect their stress levels and, therefore, their response in the tank diving procedure.

They tested various aspects of how the fish were housed in a series of experiments. Some were kept in large groups, some in pairs; some were allowed only visual contact with other fish and some only could only smell each other.

They found that individually housed fish spent less time on the bottom of the tank compared to their group housed colleagues.

The team also studied how the fish reacted to ethanol, which is known to have an anti-anxiety effect on zebra fish. Their results showed that fish kept on their own responded to the ethanol, but those in a group did not.

In a third experiment, the team tested the levels of cortisol - a common hormone produced when animals are under stress - of both the group and individually housed fish, and found that individually housed fish had lower levels.

In their final experiment, they examined the effects of changing the fishes' water prior to tank diving. It had no effect on individually housed

fish, but appeared to affect the typical tank diving responses of the group housed individuals.

Dr Brennan believes that the way in which the zebrafish are housed plays an important factor in obtaining reliable data from tests like this, and should be considered by researchers interested in comparative models of anxiety or indeed any behavioural test in zebrafish in order to refine their approach and increase experimental power.

She adds: "Not only will publication of our results improve the reliability of zebrafish behavioural analysis, but, by demonstrating that by refining housing one can increase the power of our analysis and reduce the number of animals used, we contribute to the 3Rs aim of UK and international science policy - to reduce, refine and replace animals in research."

Provided by Queen Mary, University of London

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