

Zebrafish as a model organism in behavioral neuroscience

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Zebrafish, *Danio rerio*, has served as a vertebrate model organism in biomedical research for decades. It is relatively cost-efficient and easy to breed and keep in the laboratory. We have developed automated assays to study different behaviors in both larval and adult zebrafish. The initial assay was a simple test to quantify locomotion in freely moving animals in a high throughput manner in an environmentally controlled setting. The animals were of different ages (from 5 days post-fertilization up to one year-old animals) and traced for different periods of time (from seconds to days). Depending on whether the experimental animals were young or old, the assay had slight variations. This assay was helpful in studies of physiological sleep-wake cycle and mechanisms of neurodegenerative disorders such as Parkinson's disease. Further, we have set up assays to look at the response of fish to different stimuli, such as dark-flash response, chemicals, objects and other individuals. The dark-flash response assay helped to identify neurons involved in wakefulness in the developing brain. Furthermore, we have studied fast movements in millisecond range, memory, hierarchical behavior and social interactions in zebrafish to model dominance. Hierarchy is quickly established both in pairs of male-male and pairs of female-female adult zebrafish and can be traced in the offspring. Social interaction was further studied in experimental models of autism. All in all, we have developed a battery of useful behavioral tools to strengthen the use of zebrafish as a model organism in behavioral neuroscience.