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Research Interests

Dr. Kuwada is interested in genes that regulate the development and function of neural circuits and the behaviors they subserve. The lab uses zebrafish since they are transparent, accessible and manipulable at all stages of development, and are vertebrates in which genes can be manipulated by mutagenesis and by the generation of transgenic animals. The main project involves the generation, phenotypic analysis and molecular identification of behavioral mutations. The phenotype of the nervous system mutants are characterized by electrophysiology, Ca2+ imaging, and imaging of fluorescently labeled proteins important for neural circuit function in living zebrafish in addition to other cellular and molecular genetic methods. The genes responsible for the mutant phenotypes are then identified by genetic mapping and using the genomic tools and genome sequencing information for zebrafish. Once the genes are identified, the biological function of their products are examined by taking advantage of the accessibility, transparency, manipulability and genetics of zebrafish. Mutations being examined include ones that affect the localization of neurotransmitter receptors and regulation of signaling within the CNS. Recently the lab identified genes for several zebrafish behavioral mutations that in humans cause diseases that lead to hyperexcitability of the CNS and hypercontractions of muscles. Another mutation is in a gene that is a target for anti-psychotic drugs.

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