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Embryonic development of the gonadotropin-releasing hormone neuronal system in transgenic Zebra-fish

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Understanding the biology of the Gonadotropin-Releasing Hormone (GnRH) neuronal system is the key towards understanding the mechanism of central control of reproduction. In zebrafish, two forms of GnRH have been identified: GnRH2 and GnRH3. Here we have generated a transgenic zebrafish model system in which the GnRH3 promoter drove the expression of a bright variant of the green fluorescent protein (GnRH3: EMD). The unprecedented sensitivity allowed us to detect and image GnRH3 neurons dynamically during early embryogenesis in the transparent embryo. Using time-lapse confocal imaging to monitor the time course of the GnRH3: EMD expression *in vivo*, we described multiple populations of GnRH3: EMD neurons with details of emergence, development and interaction, including in the Terminal Nerve (TN) associated with the olfactory region, Hypothalamus (HYPO), Preoptic Area (POA), and Trigeminal Ganglion (TG). Immunohistochemistry of Synaptic Vesicle protein 2 (SV2) suggests that the potential for synaptic transmission is occurring during early development of the GnRH3 neural network. Further, we successfully recorded electrical activity from TN-GnRH3 neurons in live embryos as early as 48 hours post fertilization. We found that neuron maturation was related to the pattern of the electrical activity. Kisspeptin is a neuropeptide essential for pubertal maturation and fertility. With the combination of electrophysiology and confocal imaging analysis, we further explored the effect of kisspeptin on the morphological and electrophysiological development of the GnRH3 neuronal system. Our findings suggest that kisspeptin regulates both the morphology and electrical activity of multiple populations of GnRH neurons within a complex neural network during zebrafish embryogenesis.

Biography

Yali Zhao received her MD and PhD in China. She undertook her Post-doctoral training in Neuroscience at Clinical Research Institute of Montreal in Canada. Her research is focused on neural circuits and synaptic plasticity in memory and reproduction. Currently, she serves as a Research Scientist in the Department of Physiology at the David Geffen School of Medicine at UCLA studying the Development and Plasticity of the Gonadotropin-Releasing-Hormone Neuronal System in Zebra-fish. She has published over 20 articles in peer-reviewed journals and also served as reviewer for numerous journals.

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