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RIKEN Brain Science Institute
The laboratory for Neurobiology of Synapse
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Identification of Robo2 as a Crucial Gene for Neural Circuitry Formation in the Zebrafish Olfactory System

The laboratory for Neurobiology of Synapse (Laboratory Head: Yoshihiro Yoshihara), RIKEN Brain Science Institute, in joint research with the U.S. University of Utah, has discovered the gene necessary for the formation of olfactory neural circuitry.

Olfactory sensory neurons located deep inside the nose detect chemical substances emitted from a source of scent, and send information through their nerve fibers (axons) to the olfactory bulb, the first relay station of odor information processing in the brain.

The research group discovered that the gene, "Robo2," which appears in olfactory sensory neurons only at the initial stage of development, perceives the concentration gradient of the secretory protein "Slit," and correctly leads the axons to the olfactory bulb.

The researchers visualized olfactory sensory neurons with fluorescent proteins in transparent embryo of zebrafish (a tropical fish species) to monitor the process of axon pathfinding from the nose to the brain. In mutant zebrafish lacking functional Robo2 gene, olfactory axons cannot reach the olfactory bulb, instead reaching incorrect places in the brain. In addition, adult fish of the Robo2 mutant have abnormality in the neural network between the nose and the brain, despite the fact that olfactory sensory neurons continuously renew throughout life.

From these results, the researchers propose that the neural connections at the initial stage of development are the basis for the establishment of a sound neural circuitry in adulthood.

The research results were published in the online version of the U.K. science journal "*Development*" dated February 25.

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