

Japan-U.S. Brain Research Cooperation Program
Researchers Dispatched to the U.S. Program FY2013: Report

Field: behavior, system, cognition

1. Researcher

Name Shinji Kanda

Title: Assistant Professor

Affiliation: Department of Biological Science, Graduate School of Sciences, The University of Tokyo

2. Research Title:

Electrophysiological study of escape behavior after physiological and environmental changes

3. U.S. Joint Researchers/Institutes

Please give the name, title and affiliation.

Ono, Fumihito

National Institute on Alcohol Abuse and Alcoholism

Chief

4. Research Period, from/to (mm/dd/yyyy):

from

06/26/2013

to

11/26/2013

5. Abstract, Results, and Research Significance (300 Words):

Escape behavior is modulated by environmental, and physiological conditions. Yokogawa et al., reported that serotonergic neurons in dorsal raphe modulate arousal states of individuals in zebrafish (Yokogawa et al., 2013). Thus, it is suggested that these serotonergic neurons may modulate escape behavior. Recently, 5HT3, the only ionotropic receptor among monoamine receptors, was suggested to be involved in zebrafish escape behavior by using 5HT3 specific antagonist (Ikeda, personal communication). Here, to elucidate the mechanism, we cloned the zebrafish *5ht3* gene by 5' and 3' RACE. After cloning, we examined the serotonin induced current of the channel that is transfected on HEK293 cells. However, we did not observe any current from the zebrafish *5ht3* clone, while we did observed current from the mouse *5ht3a* clone in a similar experimental procedure. By using a FLAG-tagged construct, we found histochemically that zebrafish 5HT3 protein are not transported to the membrane. Based on the finding that nicotinic acetylcholine receptors of zebrafish, which belongs to the same cysteine loop family as 5HT3, were transported to the membrane in *Xenopus* oocyte, but not in HEK293 cells (Ono, personal communication), we determined to examine the physiological properties and the ligand selectivity for known agonists and antagonists using *Xenopus* oocytes in the future study. This study represents only initial steps for elucidating the functions and mechanisms of vertebrate 5HT3. To date, however, the mechanisms and the action site of 5HT3 specific agonist are not fully understood even in mammals. Using small fish models, which have many merits not available in mammals, the functions and mechanisms of 5HT3 channels are expected to be understood in greater detail in near future.

6. Other (Research concerns, particular points of note):

US government shutdown disrupted ordering of reagents and materials used for the experiments.

*Please attach any reference materials as necessary.