

Japan-U.S. Brain Research Cooperation Program
Researchers Dispatched to the U.S. Program FY2014: Report

Field: 3.Behavioral/ Systems/ Cognitive

1. Researcher

Name Hiroshi Nomura
Title Assistant professor
Affiliation: The University of Tokyo

2. Research Title: Neural circuits underlying negative emotion.

3. U.S. Joint Researchers/Institutes

Please give the name, title and affiliation.

Garret Stuber, Assistant professor, The University of North Carolina, Chapel Hill

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

From 9/14/2014 to 2/19/2015

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

Excessive expression of fear and anxiety is involved in psychiatry disorders including depression and anxiety disorders. However, the neuronal circuits underlying fear and anxiety remain poor understood. Since a neuronal population is a functional unit in the brain, recording a neuronal population activity is needed to understand functional neuronal circuit. Many brain regions that is involved in emotion are located in a deep area of the brain. For example, the bed nucleus of the stria terminalis (BNST), which is a key region for fear and anxiety, is located in a deep area of the brain. Therefore, recording from a deep area is needed to understand circuit for fear and anxiety. In addition, recording from awake animals is essential for analyzing neuronal activity related to fear and anxiety. In this study, I put a miniaturized microscope on the head of an awake mouse and worked on a calcium imaging from BNST neurons. I injected adeno-associated virus encoding GCaMP6m or GCaMP6s into the BNST and implanted a lens with diameter of 0.2 mm above the BNST. I found the AAV dilution by which the fluorescence signal is bright and not saturated. An activity level was low under isoflurane anesthesia, but increased to a high level in an awake condition. I succeeded a calcium imaging from the BNST of an awake mouse that is exposed to the open field and elevated plus maze tests. Imaging of specific BNST neurons over a few weeks was possible. This imaging method is helpful to understand neuronal activities related to fear and anxiety.

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

*Please attach any reference materials as necessary.