NANYANG TECHNOLOGICAL UNIVERSITY

School of Biological Sciences

Reg. No. 200604393R

Research Theme: **Neuroscience**

Research Project Title: **Roles of astrocyte-neuron signaling in neuronal information processing in the hippocampus**

Principal Investigator/Supervisor: **Asst/Prof Ayumu Tashiro**

Project Description

a) Background

It has been believed that major computational units in the brain are neurons and that glial cells provide neurons with structural and energetic supports. However, recent studies have revealed that astrocytes, a type of glial cells, have active roles in shaping neuronal information processing (Halassa & Haydon, 2010). Upon activation, astrocytes release gliotransmitters, such as glutamate and ATP, which binds receptors on neurons and regulate neuronal activity (Pascual et al., 2005; Palygin et al., 2010). Although the knowledge in such mechanism of astrocyte-neuron interaction has been accumulated, how the astrocyte-neuron signalling controls behaviourally-relevant information processing in intact brains has not been investigated.

b) Proposed work

In this project, we examine a role of astrocyte-neuron signalling in generation of place-cell activity in the hippocampus. Place cells are electrophysiologically defined cell type in the hippocampus, which fires spikes when animals traverse specific locations in given environments (Moser et al., 2008). This property makes many researchers believe that place cells perform information processing underlying animals' spatial perception.

We will examine how place-cell activity is affected by blocking astrocyte-neuron signaling through gliotransmitters. To interfere with gliotransmitter release, we will use inducible transgenic mouse line, called dnSNARE. By characterizing place cell activity in behaving dnSNARE mice with unit recording technique, we aim to reveal physiological functions of astrocyte-neuron singnalling in information processing in the hippocampus. Further using brain slices from dnSNARE mice, we will understand cell biological basis of observed effects in dnSNARE mice.

The project involves multiple cutting edge technology in the interface of neurophysiology and molecular genetics, including unit recording in behaving animals, the whole cell patch clamp technique, and the use of transgenic mice.

Supervisor contact:

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