



Title of Project : Cellular and Molecular Basis for Neuro-vascular Wiring

Term of Project : FY2010-2014

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【Purpose of the Research Project】

In vertebrate body, blood vessel (vascular) network and neural network enable elaborate physiological functions. These two major networks interact each other (called “neuro-vascular wiring”). The neuro-vascular wiring is evidenced, for instance, by their anatomical associations, and their reciprocal homeostatic interactions. Thus, the neuro-vascular wiring must play a central role in exhibiting and supporting our physiological functions. Indeed, such importance of neurovascular wiring was already appreciated in 16th century, where anatomical similarity was reported by Vesalius. However, how the neuro-vascular wiring is established remains unknown at the molecular and cellular level. In our project, toward understanding how the neuro-vascular wiring operates in the body, we explore the mechanisms by which neural and vascular tissues/cells interact. We particularly focus on cellular dynamism and molecular signaling that are involved in establishment and maintenance of the neuro-vascular wiring. Our project will open a new way to explore interdisciplinary fields between conventional neurosciences and vascular biology.

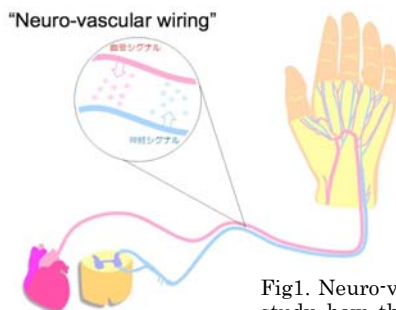


Fig1. Neuro-vascular wiring. We study how the interdependency is established.

【Content of the Research Project】

1. Cellular dynamics during neuro-vascular wiring. Neuro-vascular wiring is essential in a variety of developmental processes. For instances, interactions between neural precursors and forming blood vessels, or between a neural axon

and blood vessels are expected to regulate sprouting of blood vessels and axonal extensions, respectively. We therefore investigate the cellular dynamism that regulates such neuro-vascular interactions. The studies will be performed both in peripheral nervous system and central nervous system, and we will determine common principles of neuro-vascular wiring. These studies are corroborated by live-imaging analyses using whole embryos and tissues, where blood vessels and nervous tissues are simultaneously manipulated with various genes. 2. Intercellular signaling in neuro-vascular wiring: We will determine intercellular signals that enable the neuro-vascular wiring at the molecular level. These studies will focus on the roles of soluble factors (i. e. morphogens), and extracellular matrices and their receptors. In addition, we look for novel molecules that are involved in the neuro-vascular wiring using high-throughput screening technologies.

【Expected Research Achievements】

Our project is expected to open a new way to cross-bridge between conventional neurobiology, vascular biology, and developmental biology. Such interdisciplinary exploration in the neurovascular wiring will make a contribution to etiology where previously unsolved diseases in neuro- and vascular pathologies can be explained at the molecular/genetic level.

【Key Words】

Wiring: Morphogenetic events where different tissues undergo morphogenesis inter-dependently.

Neuro-vascular network: A physiologically functional unit where neural- and vascular networks coordinately crosstalk each other.

【Homepage Address】

<http://bsw3.naist.jp/takahashi/neurovascular.html>