

**Title of Project : Cilium-centrosome system regulating biosignal flows**

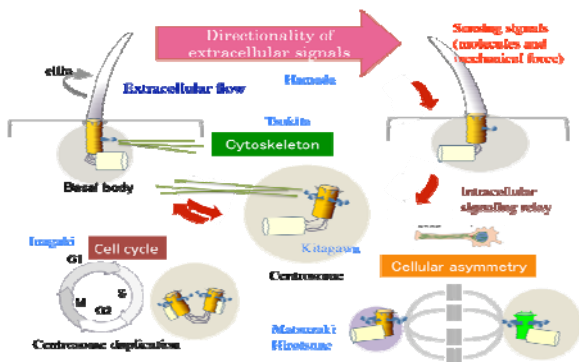
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**【Purpose of the Research Project】**

Centrosome serves as the microtubule organizing center during cell division. In quiescent cells, however, its core component centriole is transformed to basal body and functions as the basis of cilium formation. Cilia not only generate extracellular flow but also sense various extracellular signals, either molecules or mechanical force. In particular, primary cilium serves as a cellular antenna, and its defects result in a variety of human disorders (collectively called ciliopathy). In this project, we will consider the cilium and centrosome as a single cellular system that changes depending on cellular dynamics. By studying structure, dynamics and function of the cilium-centrosome system, we would like to understand how biosignal flows are regulated by the cilium-centrosome system.

**【Content of the Research Project】**



The cilium and centrosome have the common structure, the centriole. When cell cycle reaches G0/G1, the centrosome moves to the apical side of a cell. The mother centriole is transformed to the basal body, from which the cilium will be formed. Therefore, the centrosome and cilium are closely related organelles that changes mutually depending on the cell cycle. However, they have been treated as separate organelles.

In this project, we will treat the centrosome and cilium as a single system that changes dynamically and will study its role in cellular signaling. In particular, we will address the following issues.

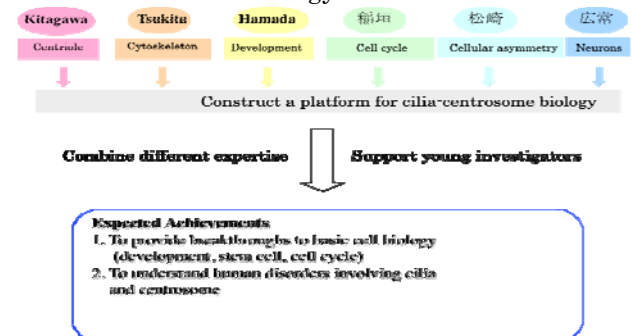
1) Structures of the cilium, centrosome and

centriole.

- 2) Interaction with cytoskeleton
- 3) How is the transition between the cilium and centrosome achieved and regulated?
- 4) How is the motility of the cilium regulated and how is the flow generated?
- 5) How does primary cilium senses extracellular signals such as biochemical signals and mechanical force?
- 6) How is cilium formation regulated by cell cycle?
- 7) How do centrosome/cilium-mediated signals regulate asymmetric cell division?
- 8) How does the centrosome/cilium system regulate neuronal activity?

**【Expected Research Achievements and Scientific Significance】**

This project will provide breakthroughs to basic cell biology, in various research fields such as development, stem cell, cell cycle. It will also help understanding the mechanisms underlying human disorders involving cilia and centrosome. In all, this project will greatly contribute to basic biology and medicine.



**【Key Words】**

Centrosome, cilium, cell cycle, asymmetric cell division

**【Term of Project】** FY2012-2016

**【Budget Allocation】** 1,185,900 Thousand Yen

**【Homepage Address and Other Contact Information】**

<http://www.nig.ac.jp/labs/NigPrjct/cilia-centrosome/>