

【Grant-in-Aid for Scientific Research(S)】

Biological Sciences (Biology)



Title of Project : Understanding of Molecular Mechanisms of Membrane Traffic by Live Imaging and Its Extension to Plant Higher Systems

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Research Area : Biology

Keyword : Organelle Biogenesis and Dynamics, Membrane Traffic

【Purpose and Background of the Research】

Membrane traffic (Figure 1) is a process of protein transport between organelles mediated by small membrane vesicles. Complex sets of machinery sort and convey proteins through multiple rounds of vesicle budding and fusion. Many questions remain to be answered, which will be approached in this project by the state-of-the-art imaging. Live cell imaging using our custom-made high-speed confocal microscope will be particularly powerful to solve problems that have been otherwise unable to attack. Elucidation of molecular mechanisms of membrane traffic will then be extended to understanding of their roles in higher plants from the viewpoints of morphogenesis and responses to environments.

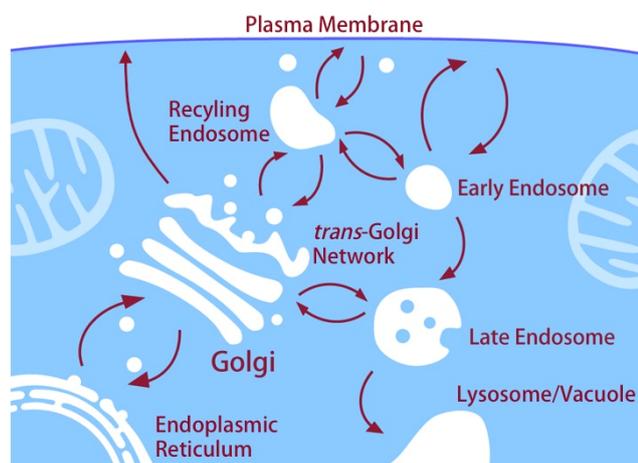


Figure 1. Membrane Traffic

【Research Methods】

Budding yeast will be used to elucidate detailed molecular mechanisms of membrane traffic. Super-resolution live imaging microscopy (SCLIM) will be further developed to tackle many unsolved questions. Arabidopsis and tobacco will be used to study roles of membrane traffic in higher plants. Advantage of plants, e.g. elaborate architecture of the Golgi apparatus and evolutionary differentiation of post-Golgi trafficking pathways, will be fully exploited.

1. Elucidation of molecular mechanisms of protein sorting during traffic by live imaging (SCLIM)
 - (1) Cisternal maturation of the Golgi
 - (2) Formation of Golgi from the ER
 - (3) Post-Golgi traffic
 - (4) Further development of SCLIM
2. Membrane traffic in plants.
 - (1) Rab5 GTPases and traffic
 - (2) Roles of Golgi and TGN in regulation of traffic
 - (3) Formation and maintenance of cell polarity

【Expected Research Achievements and Scientific Significance】

Our previous work has been successful in elucidating many molecular aspects of membrane traffic. Live imaging has played a great role there. In the present project, we will further apply it to analyze not only dynamics, but also many quantitative parameters of trafficking. Membrane traffic in higher plants represents a wonderful system to understand its roles in multicellular organisms and will be pursued with an evolutionary point of view.

【Publications Relevant to the Project】

- A. Nakano and A. Luini (2010). Passage through the Golgi. *Curr. Opin. Cell Biol.* 22:471-478.
- Y. Suda and A. Nakano (2012). The yeast Golgi apparatus. *Traffic* 13:505-510.
- T. Ueda, M. H. Sato, and T. Uemura (2012). The role of Rab GTPases and SNARE proteins in plant endocytosis and post-Golgi trafficking. *Endocytosis in Plants* (ed. J. Samaj). pp. 201-216, Springer-Verlag, Berlin, Heidelberg.

【Term of Project】 FY2013-2017

【Budget Allocation】 159,500 Thousand Yen

【Homepage Address and Other Contact Information】

<http://www.biol.s.u-tokyo.ac.jp/users/hasseipl/HP/english/index.html>