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

Title of Project：Studies on regulation of developmental fates of plant vascular stem cells

Hiroo Fukuda
（The University of Tokyo, Graduate School of Science, Professor）

Research Area：Biology
Keyword：Plant molecular function, stem cell, intracellular signaling

【Purpose and Background of the Research】

Plant meristems, which occur at shoots, roots and the vascular system, produce all the plant tissues. In meristems, stem cells proliferate to maintain their number and differentiate into specific cells. The balance of cell proliferation and differentiation of stem cells supports the infinite growth of plants.

The plant vascular system is composed of xylem, phloem and procambium/cambium. Procambium/cambium cells as vascular stem cells proliferate and differentiate into xylem and phloem cells. We have identified various factors regulating vascular stem cell fates. In this study we aim at elucidating the function of these factors and their interrelationship, which results in an overview of the regulation of vascular stem cell fates.

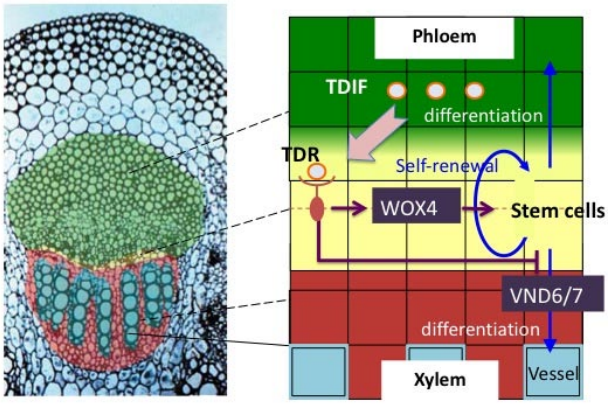

Fig. 1: Regulation of vascular stem cell fates.

【Research Methods】

Figure 1 summarizes our previous findings on vascular stem cell fates. In this study we will identify intracellular signaling pathways leading to maintenance of stem cell activity via activation or suppression of key transcription factors such as WOX4 and VND6/7 by using genetic and cell biological methods. In addition, we will search key transcription factors governing vascular stem cell establishment.

【Expected Research Achievements and Scientific Significance】

It is expected that this study will bring about the overview of the regulation of vascular stem cell fates; TDIF intercellular signaling machinery, intracellular signaling pathways downstream of TDIF/TDR, network of key transcription factors regulating vascular stem cell fates and feedback mechanisms of signaling between distinctive vascular cells. These findings are important for understanding vascular meristem but also mersitems in general. On the other hand, vascular tissues occupy the major part of territorial biomass. Therefore this study will provide the excellent base for artificial increase and/or modification of biomass for human use.

【Publications Relevant to the Project】

Ito, Y., Nakanomyo, I., Motose, H., Iwamoto, K., Sawa, S., Dohmae, N., and Fukuda, H.: Dodeca-CLE peptides as suppressors of plant stem cell. **Science** 313: 842-845, 2006.

Hirakawa Y., Shinohara, H., Kondo, Y., Inoue, A., Nakanomyo, I., Ogawa, M., Sawa, S., Ohashi-Ito, K., Matsubayashi, Y. and Fukuda, H.: Non-cell-autonomous control of vascular stem cell fates by a CLE peptide/receptor system. **Proc. Natl. Acad. Sci. USA**, 105: 15208-15213, 2008.

Oda, Y., Iida, Y., Kondo, Y. and Fukuda H.: Wood cell-wall structure requires local 2D-microtubule disassembly by a novel plasma membrane-anchored microtubule-associated protein. **Curr Biol**. 20: 1197-1202, 2010.

【Term of Project】 FY2011-2015

【Budget Allocation】 165,200 Thousand Yen

【Homepage Address and Other Contact Information】

http://www.biol.s.u-tokyo.ac.jp/users/seigyo/lab.html