筑波大学遺伝子実験センター
形質転換植物デザイン研究拠点
研究セミナー

日時: 2013 年 7 月 25 日　15:30 － 17:00
場所: 遺伝子実験センター内セミナー室　(2 階)

Novel cytoskeleton dynamics for fertilization in *Arabidopsis thaliana*

演者:Dr. Tomokazu Kawashima, Research Fellow
(Temasek Life Sciences Laboratory, Singapore)

Fertilization in flowering plants comprises several successive events starting from pollen tube guidance, pollen tube and synergid interaction for sperm cell discharge, gamete fusion (plasmogamy), sperm cell pronuclear migration, to karyogamy and zygotic activation. Early steps such as pollen tube guidance and arrival are plant-specific, the later steps are common to both animals and plants. However, there is one critical cellular difference: the absence of centrosomes in flowering plants. In most animal species, microtubules organized by centrosomes are essential for pronuclear migration and subsequent fertilization events. By contrast, flowering plants lost genes fundamental to centrosome generation during evolution. Moreover, genetic studies of mutants lacking microtubules indicated that microtubules are not required for plant fertilization, suggesting that flowering plants evolved novel processes for pronuclear migration. Very recently, the loss of centrosomes in planarians was reported, raising now a fundamental question: “how do animals and plants cope with the loss of centrosomes for successful fertilization?”

To investigate cellular dynamics of female gametes during fertilization, we used fluorescent markers to visualize cytoskeleton (F-actin and microtubules) in *Arabidopsis* female gametes. We found that F-actin organizes as dynamic thick F-actin bundles that associate with the sperm pronucleus during migration. Loss of F-actin filaments prevents sperm pronucleus migration, resulting in karyogamy failure. By contrast, microtubules do not show strong association with the sperm pronucleus during migration, consistent with the result that mutants defective in microtubule assembly factors show successful fertilization. Furthermore, we identified that one of small Rho-GTPase, regulators of cytoskeleton dynamics in plants, is specifically expressed in the female gamete and the disruption of its function caused the loss of F-actin structure, leading fertilization failure. Taken together, we demonstrated that in contrast to most metazoans, F-actin filaments play a more important role than microtubules in plant fertilization, and the functional switch between microtubules and F-actins might be the key to evolve successful fertilization without centrosomes.

世話人：三浦　謙治 miura.kenji.ga@u.tsukuba.ac.jp