Graduate School Event

Thesis Defense: The role of dynamin related protein 2A in cytokinin regulated plant growth and development

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Auxin plays a central role in plant growth and development by establishing local concentration gradients through polar transport. This process is mediated by the coordinated action of auxin influx (AUX1/LAX) and efflux (PIN) carriers. The proper localization and recycling of PIN proteins are crucial for auxin distribution and are regulated by clathrin-mediated endocytosis. Notably, cytokinin has been shown to promote the degradation of PIN1, particularly its dephosphorylated form, in a transcription- and translation-independent manner. However, the mechanistic link between cytokinin signaling and the endocytic machinery remains insufficiently understood. Here, we identify dynamin-related proteins DRP2A and DRP2B as key components in cytokinin-regulated PIN trafficking in Arabidopsis thaliana root epidermal cells. Although DRP2A and DRP2B are often considered functionally redundant in gametophyte development, our findings reveal their distinct roles in cytokinin-mediated PIN trafficking. Single mutants of drp2a or drp2b exhibit altered cytokinin-induced PIN1 degradation and PIN2 membrane dynamics, indicating non-redundant contributions to these processes. Importantly, cytokinin specifically modulates the plasma membrane localization, protein stability, and clathrin pit recruitment of DRP2A, but not DRP2B. We further explored the role of cytokinin receptor signaling in these effects and examined how cytokinin influences the phosphorylation status of DRP2A, which governs its membrane recruitment and functional assembly. Our results highlight a previously unrecognized regulatory mechanism whereby cytokinin fine-tunes clathrin-mediated endocytosis via post-translational modulation of DRP2A, ultimately impacting auxin transporter dynamics. These findings uncover a novel layer of hormone crosstalk and provide mechanistic insights into the regulation of membrane trafficking during plant development.

Monday, June 23, 2025 02:00pm - 03:00pm
Central Bldg / O1 / Mondi 3 (I01.O1.010) and Zoom

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