岡山大学大学院ヘルスシステム統合科学研究科

細胞機能設計学セミナー（１５）

Molecular and Epigenetic Mechanisms Governing Fe Homeostasis in Plants

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Abstract: Iron (Fe) is an essential micronutrient that plays a critical role in plant growth, development, and productivity, yet its limited bioavailability in soils poses a major challenge to agriculture. Plants employ tightly regulated molecular networks to maintain Fe homeostasis; however, the epigenetic mechanisms governing these responses remain insufficiently understood. Using *Arabidopsis thaliana* as a model system, NON-RESPONSE TO Fe-DEFICIENCY 2 (NRF2), also known as EARLY FLOWERING 8 (ELF8), was identified as a key positive regulator of Fe deficiency responses. Loss of NRF2 function resulted in defective induction of Fe uptake genes, reduced shoot Fe accumulation, and pronounced developmental abnormalities. At the molecular level, NRF2 regulates the expression of the 14-3-3 protein GENERAL REGULATORY FACTOR 11 gene (*GRF11*) through histone H3 lysine-4 trimethylation (H3K4me3), establishing a direct link between chromatin modification and transcriptional activation under Fe-deficient conditions.

These findings demonstrate that Fe deficiency elicits a chromatin-based regulatory framework that modulates gene expression and developmental outcomes. Building on these mechanistic insights, ongoing research extends epigenetic regulation of Fe homeostasis to crop plants, particularly rice, to improve nutrient use efficiency and stress resilience. Current efforts focus on identifying and functionally characterizing chromatin modifiers and transcriptional regulators involved in Fe signaling pathways. Together, this research advances fundamental understanding of nutrient-responsive epigenetic regulation and provides translational strategies for enhancing Fe acquisition and sustainable crop productivity.

皆さん奮ってご参加下さい。

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