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LIFE SCIENCES & IBB SEMINAR

The Long and Short of Sphingolipid Biosynthetic Regulations and Its Importance in Plant Pathogen Defense

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Sphingolipid biosynthesis in Arabidopsis is tightly regulated to ensure sufficient biosynthetic flux to support cell viability and growth and to rapidly respond to perturbations such as those induced by bacterial pathogenesis that trigger production of the bioactive sphingolipid metabolites, including long-chain bases (LCBs) and ceramides that signal programmed cell death (PCD) for plant defense. Sphingolipid biosynthetic regulations is mediated primarily through reversible physical interactions of serine palmitoyltransferase (SPT), the initial enzyme in LCB biosynthesis, with ORM proteins (orosomucoid-like proteins). Consistent with their role as repressors of SPT activity, overexpression of the two Arabidopsis ORM proteins AtORM1 and AtORM2 strongly reduced LCB accumulation in response to treatment with the mycotoxin fumonisin B1 (FB1), a ceramide synthase inhibitor. These plants also displayed increased resistance to the PCD-inducing cytotoxicity of FB1. Conversely, RNAi suppression of AtORM1/2 resulted in large increases in LCBs in response to FB1 treatment and increased FB1 sensitivity. AtORM1 and 2 overexpressing plants also had decreased activity of Class I ceramide synthase that generates ceramides with C16 fatty acids and dihydroxy LCBs and increased activity of Class II ceramide synthases that produce ceramides with very-long chain fatty acids and trihydroxy LCBs. The reverse effect on ceramide synthase activities was observed in AtORM RNAi lines. These findings suggest an extended role of ORMs as regulators of the production of functionally distinct ceramides for glycosphingolipids that support plant growth and LCB homeostasis. In addition, we observed loss of bacterial innate immunity in AtORM-overexpressing lines and increased immunity in AtORM-RNAi lines. Based on these observations, an unexpected link between ORM proteins and stability of the FLS2 bacterial flagellin receptor and the underlying mechanism for this link were identified. These findings point to a broader role of ORMs in the regulation of cellular processes.

- **Date: Dec 15 (Fri) 4:30PM**
- **Place: Auditorium(1F), POSTECH Biotech Center**
- **Inquiry: IBB Tel: 279-8284**