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Molecular Dissection of Dysbiosis in Plants

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The aboveground parts of terrestrial plants (collectively called phyllosphere) represent one of the most abundant habitats for microbiota colonization on Earth. How plants control phyllosphere microbiota to ensure plant health is not well understood. We recently found that the Arabidopsis quadruple mutants (*min7 fls2 erf cerk1*; *mfec* hereinafter and *min7 bak1 bbk1 cerk1*; *mbbc* hereinafter) simultaneously defective in pattern-triggered immunity and the MIN7 vesicle traffic pathway display leaf tissue damages associated with dysbiosis. Dysbiosis was associated with global alterations in the composition and level of the phyllosphere microbiota, bearing some cross-kingdom resemblance to what occurs in dysbiosis in humans. Bacterial community transplantation experiments using potting mix-based gnotobiotic systems showed a causal role of a properly assembled leaf bacterial community in phyllosphere health. These results highlight critical roles of pattern-triggered immunity and the MIN vesicle trafficking pathway in regulating phyllosphere microbiome homeostasis. We are currently taking a genetic approach to identify additional Arabidopsis mutants, hoping to discover other plant metabolic and signaling pathways that might be involved in regulating phyllosphere microbiome. A better understanding of how plants prevent dysbiosis has significant basic and applied implications.