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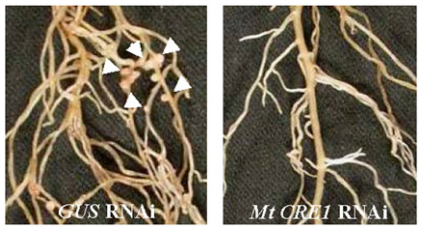
**IN BRIEF**

# *Medicago truncatula* CRE1 Cytokinin Receptor Regulates Nodulation and Lateral Root Development




RNA interference of Mt *CRE1* inhibits nodulation of *M. truncatula* roots.

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The plant hormone cytokinin is implicated in the control of root architecture and development, including legume root nodulation. **Gonzalez-Rizzo et al. (pages 2680–2693)** identified a *Medicago truncatula* homolog of *Arabidopsis*, *CYTOKININ RESPONSE1* (*CRE1*), which encodes a cytokinin receptor histidine kinase, and made use of RNA interference of Mt *CRE1* to investigate the role of cytokinin in the nodulation process in this legume. The results demonstrate that Mt CRE1 acts as a negative regulator of lateral root formation and as a positive regulator of nodulation. The authors identified two other putative cytokinin signaling genes in *M. truncatula* based on homology to *Arabidopsis RR4* and *RR1*, which encode A- and B-type response regulators, respectively, that act downstream of *CRE1* in cytokinin signaling. Expression analysis of these genes and the early nodulin gene *Nodule Inception 1* (Mt *NIN*) in *M. truncatula* suggests that Mt NIN, Mt RR1, and Mt RR4 are involved in crosstalk between the Nod factor and cytokinin signaling pathways depending on *CRE1*.

# Pushing the Envelope: The Role of Outer Envelope Proteins PVD1 and PVD2 in Plastid Division

Molecular genetic studies in *Arabidopsis* have defined several nuclear-encoded homologs of cyanobacterial cell division proteins that function in plastid division in photosynthetic eukaryotes, suggesting horizontal transfer from the ancestral cyanobacterial endosymbiont genome to the host genome in evolutionary history. These include the tubulin-like protein FtsZ, which forms a ring structure at the division site, and several other proteins that regulate positioning and stabilization of the FtsZ ring. However, recent work suggests that many genes regulating cyanobacterial cell division were lost after endosymbiosis, and other genes of eukaryotic origin have been recruited to function in plastid division. The best-characterized of these is *ARC5*, which encodes a member of the dynamin superfamily of eukaryotic membrane-remodeling GTPases that is recruited from patches in the cytosol to the plastid outer envelope surface at the division site. *Arabidopsis arc5* mutants exhibit arrest of chloroplast division, suggesting that the protein functions in severing the envelope membranes. **Miyagishima et al. (pages 2517–2530)** identified two new integral outer envelope membrane proteins, PVD1 and PVD2, through analysis of mutants similar to *arc5*. The authors present detailed topological and mutational analyses of protein function that show that PVD1 and PVD2 together mediate recruitment of ARC5 to the site of constriction at a late stage of division.

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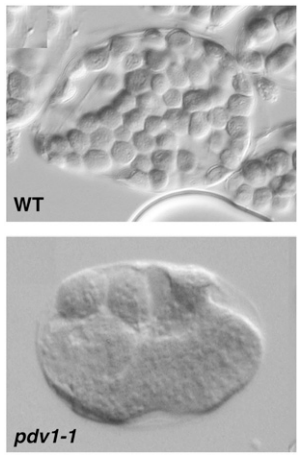


Chloroplasts of *pvd* mutants appear constricted and larger than those in wild-type plants.

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