M-149

A key plant immune protein is required for the formation of soybean-rhizobium symbiosis

*Katalin Toth**, Divisions of Plant Sciences and Biochemistry, University of Missouri, Missouri, USA

Gary Stacey, Divisions of Plant Sciences and Biochemistry, University of Missouri, Missouri, USA

A paradigm shift is occurring in the field of symbiotic nitrogen fixation with a growing realization of the central importance of the plant immune response in the earliest steps of rhizobial infection and establishment of the symbiosis. Our data describe novel and important findings that, for the first time, provide a mechanistic link between legume-rhizobia symbiosis and plant immunity. In order to better understand the biology of this mutualistic interaction, we conducted a phosphoproteomic study on soybean root and root hairs in response to the compatible symbiont *Bradyrhizobium japonicum*. A protein well characterized in plant immune responses was found to be phosphorylated in soybean root hairs within one hour of inoculation. Silencing of this gene using RNAi resulted in a significant reduction in nodule formation. One of the identified phosphorylation sites was previously described as responsive to MAMP (Microbe-Associated Molecular Pattern) treatment in Arabidopsis. A phosphomimic (a point mutation to D) mutation if this phospho-site was introduced into the gene and constitutively expressed in soybean transgenic roots. The expression of the phosphomimic version resulted in a significant reduction in nodule formation. On this same protein, a second phosphorylation site was identified within a 15 amino acid region, which appears to be present only in proteins from leguminous plants. When a phospho-minus (a point mutation to A) version of this phosphorylation site was introduced into transgenic soybean roots, significantly fewer nodules were formed, suggesting that the site might be required for the symbiotic signaling. Our data provide evidence for a key regulatory link between the Nod factor signaling pathway and well characterized pathways involved in plant innate immunity.