

Dr. Catalina I. Pislariu

Assistant Professor, Department of Biology, Texas Woman's University

New Legume Signaling Peptides Required for the Nitrogen-Fixing Symbiosis and Host-Strain Specificity

Legumes can thrive in less fertile soils because they establish symbiotic associations with nitrogen (N_2)-fixing soil bacteria (rhizobia). Several resources have been developed for functional genomics in the model legume *Medicago truncatula*, including the genome sequence, the Gene Expression Atlas (MtGEA), and tobacco retrotransposon *Tnt1*-insertion mutant populations. SNF is a complex process, regulated by thousands of plant and bacterial genes. Only a fraction of these genes has been characterized functionally. *Tnt1*-tagging is an efficient approach to introduce multiple insertions into the plant genome. We previously reported the isolation of 179 *Medicago Tnt1*-insertion symbiotic mutants. Only 39 mutants are insertion alleles of known genes, indicating that many new symbiotic genes will be discovered in this collection. One of these mutants lacks the activity of a Nodule-Specific PLAT (Polycystin-1; Lipoxygenase, Alpha-Toxin Domain) protein (MtNPD1), and will be discussed in more detail. *MtNPD1* belongs to a cluster of 5 nodule-specific genes encoding new signaling peptides with non-redundant putative functions. MtNPD1 is critical for root nodule development, accommodation and maintenance of rhizobia inside host cells, and nitrogen fixation. Single PLAT domain proteins in plants have so far only been linked to plant responses to abiotic factors and pathogens. MtNPD1 is the first PLAT domain protein involved in a beneficial plant-microbe interaction. An important discovery is that MtNPD1 appears to be a crucial determinant of host-strain specificity, therefore, uncovering the role of MtNPD1 opens a new line of research, with potential benefits for agriculture. A spatially-resolved nodule transcriptome, co-expression gene regulatory networks, which facilitate reverse genetics projects targeted to specific stages of nodule development, will also be presented.

