Poster #32

Phytochemical Signaling and Symbiosis:
Potential Threats from Endocrine Disrupting Chemicals

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Flavonoids are hormone-like compounds produced by leguminous plants, including soybeans and alfalfa, that regulate the symbiosis between these plants and nitrogen-fixing bacteria. Due to the ability of some phytoestrogens and synthetic chemicals to mimic the activity of steroid hormones in various animal species, they are classified as endocrine-disruptors. Although endocrine disrupting chemicals have been reported to affect numerous signaling pathways, there is little known about the biological function of many of these chemicals in plants or bacteria. We have taken an evolutionary approach to understand the effects of phytoestrogens and endocrine-disruptors on biological systems from bacteria to mammals. We examine the possibility that synthetic hormonally active chemicals in the environment may alter the signaling required between leguminous plants and nitrogen-fixing bacteria. In order to study the disruption of this signaling, synthetic chemicals, including DDT, its metabolites, and other pesticides, have been evaluated for their effect on activation of nodulation genes that regulate plant-bacteria symbiosis in nitrogen-fixing bacteria. To this end, we have used a strain of nitrogen-fixing bacteria, *Rhizobium meliloti*, containing a *lacZ* reporter gene under the control of the *NodD* transcription factor. Many of the synthetic chemicals tested suppress induction of key nodulation genes by interfering with signaling between the phytochemical ligand and the *Rhizobium* NodD transcriptional activator. Previous studies have shown that DDT and other pesticides are able to disrupt normal endocrine signaling in laboratory animals and exposed wildlife. Similarly, our results indicate that some of these same endocrine-disrupting chemicals can interfere with signaling crucial to the symbiosis between nitrogen-fixing bacteria and leguminous plants. Therefore, signaling components used by plants and pathways present in nitrogen-fixing bacteria may have previously unrecognized similarities to those present in animals, and all of these systems may be vulnerable to endocrine-disruptors present in the environment.