

Title: Pathogenesis: Lessons from the Viroid World

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Abstract:

One of the most intriguing groups of plant pathogens disrupts normal host metabolism, resulting in serious disease, without itself encoding any proteins. Viroids, the smallest known self-replicating pathogenic agents of plants, are also distinguished from plant viruses by their lack of a protein coat. Covalently-closed, circular, highly-structured RNA molecules ranging in size from 239-401 nucleotides, viroids replicate and move from cell to cell and systemically without a helper virus, and thus appear to be dependent upon interactions with host components to facilitate these functions. Genetically, there are two groups of viroids - the pospiviroids replicate and accumulate in the nucleus, while the avsunviroids replicate and accumulate in the chloroplast. Symptoms of viroid infection include stunting, abnormal development of root and vascular tissues, leaf deformation, and necrosis, and the severity of symptoms is dependent upon the viroid strain and the host genome. The molecular basis of symptom formation in viroid-infected plants is actively being studied by several groups. Symptoms suggest an imbalance in growth hormones, altered photosynthetic capacity, and changes in oxidative metabolism. Viroid infection results in increased transcription of defense-related genes and induction or suppression of genes encoding proteins involved in stress responses, cell wall structure, chloroplast function, protein metabolism, and protein kinase signaling pathways. RNA silencing has been proposed as the underlying mechanism of viroid pathogenesis, and several studies identifying potential host target genes reveal that complex metabolic interactions are likely to be involved.