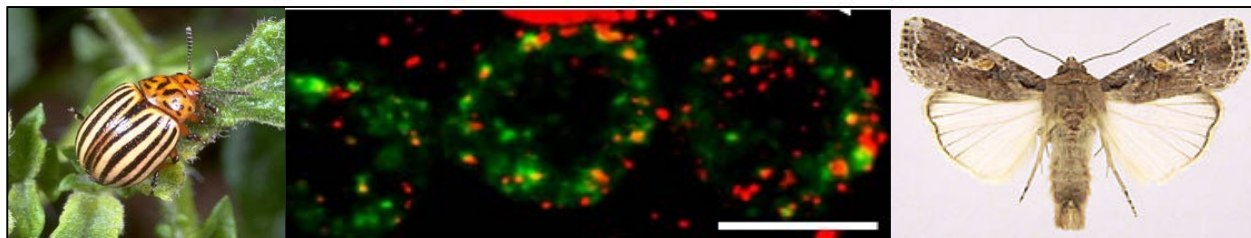


# RNA INTERFERENCE

## Mechanisms of RNA Interference



### DESCRIPTION

RNAi works well in coleopteran insects. However, RNAi efficiency in insect pests belonging to other orders including Lepidoptera and Hemiptera is variable limiting widespread application of this approach in pest management. It has been proposed that 1) degradation by RNases, 2) uptake and intracellular transport of dsRNA and 3) dsRNA processing are responsible for differences in RNAi efficiency among insects. In this project, we performed comparative analysis of dsRNA degradation, uptake and processing in the Colorado potato beetle, *Leptinotarsa* and the fall army worm, *Spodoptera*.

- The key players involved in RNAi have been identified.
- Fed or injected dsRNA was degraded faster in *Spodoptera* than in *Leptinotarsa*.
- Surprisingly, fed or injected dsRNA was transported into tissues of both *Spodoptera* and *Leptinotarsa*.
- The dsRNA taken up by *Leptinotarsa* cells was processed into siRNA and caused silencing of target genes.
- In contrast, the dsRNA taken up by *Spodoptera* cells accumulated in endosomes, was not processed into siRNA and target genes were not silenced.

### HOW THIS IS DIFFERENT THAN RELATED RESEARCH

Although there is a large body of research on mechanisms of RNAi in individual insect species, there has been no systematic comparison of the degradation, transport and processing of dsRNA between insects where RNAi works well and those where RNAi does not work well. Contrary to published conclusions, this project has shown that the primary reason for differences in the efficiency of RNAi among insects is likely due to inefficient escape of dsRNA from endosomes rather than from limited dsRNA uptake.

### MEMBER BENEFITS

- Methods to study differential efficiency of RNAi among insects.
- Information on mechanisms that govern the differential efficiency of RNAi between coleopteran and lepidopteran insects. This information could be used for improving RNAi efficiency in Lepidoptera.
- The identity and expression of dsRNases involved in degradation of dsRNA and proteins involved in transport and processing of dsRNA.