Development of Species Specific and Environmentally Friendly Insect Control
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The Problem:
• Feeding the >7,000,000,000 people on the earth requires agricultural inputs, such as pesticides.
• A major limitation in the use of pesticides is the effect they have on non-target organisms.

RNA Interference (RNAi):
• The application of double-stranded RNA (dsRNA) can lead to the silencing of the target gene; a phenomenon called RNAi.
• Sequences used in RNAi are specific to the target species; they are based on the unique gene sequence of that species.
• RNA is readily degraded in the environment.

Progress/Results:
• Using an agriculturally important insect (Colorado Potato Beetle (CPB)), we have confirmed that ingestion of dsRNA for actin (on treated potato leaves) leads to silencing of this gene (data not shown) and mortality in larvae (Fig. 1).
• Poly-lactic acid (PLA), made from corn, has already been developed as a biodegradable and compatible drug delivery system in humans.
• Employing PLA encapsulation technology, dsRNA has been formulated to retain its biological activity to CPB (Fig. 2).

Future Directions:
• Define environmental conditions that degrade RNA in the environment.
• Optimize the encapsulation method so that less dsRNA is needed for 100% kill of CPB larvae.
• Identify additives to the encapsulation formulation that will enhance the stability of dsRNA in the environment.
• Examine the utility of dsRNA treatments against other key insect pests.
• Explore the use of this novel encapsulation process for other environmentally labile pesticides.
• Partner with industry to find optimal genes for RNAi.

Fig. 1: Ingestion of Actin-dsRNA is Toxic to CPB.
Feeding 2nd instar CPB potato leaves coated with Actin-dsRNA causes mortality within 5 days.

Fig. 2: Ingestion of PLA Encapsulated Actin-dsRNA is Toxic to CPB.
Feeding 2nd instar CPB potato leaves coated with PLA encapsulated Actin-dsRNA causes mortality within 5 days.

References: