

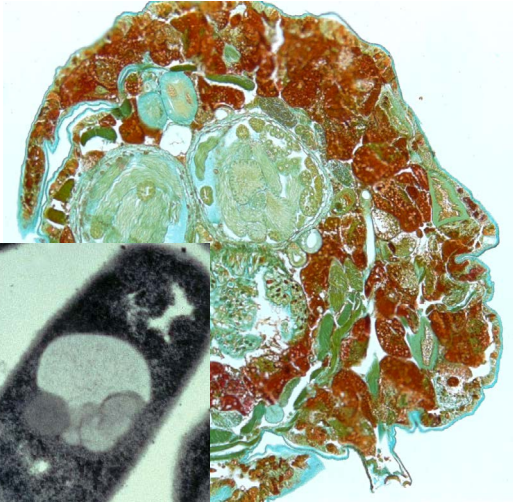


Discovery of Insect Pathogens and Integration and Safety in IPM

Using insect diseases as an alternative to broad-spectrum chemical pesticides has enhanced insect pest management strategies, thus preventing property, crop, and landscape damage; lowering costs; and reducing threats to human, livestock, and environmental safety.

Who cares and why?

Insect pests are an expensive problem for farmers, natural resource managers, and communities and are economic limitations to a safe and abundant food supply. The chemical pesticides commonly used to control these pests can also pose health risks to livestock, humans, and the environment when they enter soil and water. The Food Quality Protection Act (FQPA) has defined limits on the use of many chemical pesticides, creating a need for novel pest management tactics that are cost-effective and safe. Insect diseases (entomopathogens) are a possible alternative way to control insect pests. The prevalence of an insect disease in a pest population can be enhanced by introducing the pathogen or by manipulating the environment to make conditions more favorable for natural disease outbreaks. Using insect diseases to control pests directly benefits farmers, consumers, and the environment. In addition to limiting damage from pests, the use of entomopathogens to control insect pests lessens reliance on chemical pesticides, which can help reduce the risks of insecticide resistance among the pest population, environmental pollution, and potential health hazards from toxic chemicals. Discovery of insect-specific diseases and development into environmentally-friendly microbial insecticides ensures that effective pest control options are available to farmers, natural resource managers, and communities.



Bt bacterium (left) is a commonly used biological pesticide that has more recently been used in genetically modified crops. The potato tuber worm granulovirus (above) is a pathogen used to control some insect pests. Images courtesy of Lerry Lacey.

What has the project done so far?

S-1024 scientists from various universities, industry representatives, and the USDA have established formal collaborations to study insect-specific pathogens, formulate microbial insecticides from these pathogens, and determine ways to effectively use insect diseases against target pests. Researchers have discovered that many insect diseases can provide excellent control of a variety of serious crop pests, including pecan weevil, peachtree borer, white grub, and potato tuber moth. They have also identified new diseases, including ones that infect soybean aphids, glassy-winged sharpshooters, European fire ants, and imported fire ants. Teaming up with colleagues from Russia, S-1024 scientists have completed genetic sequencing of a mosquito virus, with an eye toward how the virus could be used to control mosquito populations. In addition, scientists have outlined ways to detect viruses in flies and to

introduce the viruses into fly populations. Research addressing environmental safety concerns has verified that diseases that are effective against cotton and corn pests have no impact on non-target species that naturally control pests. S-1024 team members have extended their research about insect diseases to the public by developing educational materials that can be used in training modules for IPM practitioners and county agents in rural and urban environments.

Impact Statements

Brought together researchers, regulators, natural resource managers, farmers, and urban clients, raising awareness and use of insect diseases as an effective part of IPM.

Identified new insect diseases that have the potential to selectively control specific insect pests, thus reducing reliance on chemical pesticides and minimizing input costs and safety concerns. In particular, this research has given organic farmers new tools to manage pests without harming the quality of their organic crops. Similarly, it has helped small and medium-sized farms produce sufficient yields without the high costs of frequent chemical pesticide use.

Discovered viruses that could be used as new ways to control mosquitoes and house flies, reducing inconveniences and health risks for humans, livestock, and wildlife.

Characterized environmental factors that affect insect disease performance against pests, helping scientists know when and where diseases will be most effective.

Demonstrated that insect diseases have minimal impact on non-target species and the environment, giving vital information to regulators and environmentalists as they consider approving diseases for pest control.

Want to know more?

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Compiled and designed by Sara Delheimer

What research is needed?

Insect pests are consistent problems. Federal, state, and industry researchers must work together to create standard guidelines for monitoring insect pests and for determining the long-term effects of using insect diseases as components of integrated pest management systems. Scientists must continue to look at the genetics of insect diseases and track how they spread in order to estimate persistence and effectiveness. Continued collaboration with industrial partners will develop new products and technologies to manage pest problems.



Metarhizium, a pathogen that affects grasshoppers, is applied over fields by aerial sprays (above). The grasshoppers that are exposed to the spray become infected (below). Photos by Stefan Jaronski USDA-ARS.

