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Molecular Targets to Enhance Insect Susceptibility to Entomopathogens

Using molecular methods to target insect immunity enhances the effectiveness of natural microbial pesticides for superior pest control.

A termite population does not only pose a risk because of the significant structural damage they are capable of inflicting on buildings, crops, and forests, but their subterranean, eusocial lifestyle creates a breeding grounds for disease and microbial growth. Despite decades of research, no commercially viable biocontrol agent targeted at termites has been developed. Recent research has suggested termites possess superior defense mechanisms that provide them with virtual immunity against fungal and bacterial pathogens.

Researchers at Purdue University have developed a technology that can identify genes and proteins in termites that increase susceptibility to pathogens. Whereas much research and development have gone into non-specific chemical insecticides that attempt to brute force their way through the termites' defenses, this new technology aims to dismantle the defense outright. Using treatments of an immune-suppressive nicotinoid insecticide and fungi and bacterial pathogens, hundreds of genes that encode potential defense mechanisms have been identified; the expression of these genes can be suppressed, increasing the termites' susceptibility to pathogens. Several protist symbiont enzymes were also identified which may have played a central role in protecting termites from fungal entomopathogens, and a recombinant form of these enzymes may have uses as novel drugs to fight fungal infections.

Advantages:

-More biorational and environmentally friendly than chemical insecticides

-Protein-based enzymatic treatment offers a more "organic" approach than conventional drugs

Potential Applications:

Technology ID
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Category
Biotechnology & Life Sciences/Synthetic Biology & Genetic Engineering
Agriculture, Nutrition, & AgTech/Livestock & Animal Health Solutions

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-Termite control

-Fungal infection treatment

Related Publication:

Molecular Signatures of Nicotinoid-Pathogen Synergy in the Termite Gut. PLoS ONE 10(4): e0123391. https://doi.org/10.1371/journal.pone.0123391

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