INVESTIGATING THE ROLE OF THE CADHERIN-LIKE PROTEIN FROM GYPSY MOTH AS A *BACILLUS THURINGIENSIS* CRY1A TOXIN RECEPTOR

Algimantas P. Valaitis[1], Karen J. Garner[1], Juan L. Jurat-Fuentes[2] and Michael J. Adang[2,3]

[1]USDA Forest Service, Delaware, OH 4301

Departments of [2]Entomology and [3]Molecular Biology, University of Georgia, Athens, Georgia 30602

Abstract

Bacillus thuringiensis (Bt) crystal proteins are pore-forming toxins which have been used for over 40 years as an alternative to chemical pesticides. Due to environmental and health concerns, there has been a major increase in the proportion of areas in North America treated with Bt at the expense of chemical insecticides, and this trend is expected to continue. As an insecticide, Bt is valued for its low developmental cost and its specificity. Although more than 3,000 insects from 16 orders are susceptible to Bt toxins, only a limited number of Bt toxins are highly effective against important forest and agricultural insect pests. Additional limitations, including the resistance to Bt in older larvae justify the search for approaches to develop new Bt-based products with increased insecticidal activity and specificity towards target insect pests.

The specificity of Bt Cry1Aa toxins is mainly determined by the presence of specific midgut receptors in susceptible target insects. Cadherin-like proteins from several insect species have been demonstrated to function as Cry1A toxin receptors when expressed in non-susceptible insect cell lines. Thus, a cDNA encoding a homolog of these cadherins (LdCad) from the gypsy moth, *Lymantria dispar*, was cloned and inserted into an expression vector to construct a system that displays LdCad on the surface of *Drosophila* S2 cells. Expression of LdCad was detected using antibodies raised to a short amino acid region of the cadherin protein from *Heliothis virescens*. Current efforts are concentrated on testing Cry1A toxin binding and cytotoxicity towards S2 cells expressing LdCad. Development of a functional cell-based assay system for exploiting the gypsy moth Bt receptor will be valuable for identifying key residues involved in toxin recognition and for designing new toxins with increased effectiveness and specificity towards gypsy moth.