

# Molecular Cloning of Acetylcholinesterases from the Oriental Tobacco Budworm, *Helicoverpa assulta* (Guenée)

**Sung-Su Kim, Dae-Weon Lee and Kyung Saeng Boo**

School of Agricultural Biotechnology, Seoul National University, Seoul 151-742

Acetylcholinesterase (AChE) plays an important role in neurotransmission at insect cholinergic synapses. Since an orthologous AChE was identified from *Drosophila*, it has been suggested that only a single AChE existed in all insect genomes. However recently paralogous AChE has been isolated from mosquitoes and aphids. We fully cloned and isolated two AChE genes, *ace1* and *ace2* from the oriental tobacco budworm, *Helicoverpa assulta*. *ace1* and *ace2* encode 664- and 647-amino acid residues, respectively, for the first time in Lepidopterans. Both *ace* genes have the conserved catalytic triads (*ace1*: 314S, 440E and 554H; *ace2*: 275S, 404E and 518H), and contain the six cysteines which form the three intramolecular disulfide bonds. The signal peptide of *ace1* and *ace2* has 17- and 32-amino acid residues from the start methionine, indicating that both *ace1* and *ace2* are secreted proteins. In addition, 11 and 7 aromatic residues lining the active site gorge in *ace1* and *ace2*, respectively. Phylogenetic analysis showed that insect AChEs are divided into two clusters, of which *ace1* is the paralogous gene whereas *ace2* is the orthologous gene of *Drosophila* AChE.