

## **Abstract**

Baculoviruses are specific insect pathogens used as selective biological insecticides on lepidopteran insects. We have tested a recombinant baculovirus expressing a chitinase gene for its efficacy as a tick bioacaricide. The recombinant *Autographa californica* multiple nuclear polyhedrosis virus expressing a chitinase enzyme (AcMNPV-CHT1) from the hard tick, *Haemaphysalis longicornis*, was constructed and found to have a novel bioacaricidal effect against ticks. The recombinant baculovirus was used to express the chitinase enzyme in *Spodoptera frugiperda* (Sf9) insect cells. Topical application of the supernatant harvested from the insect cell culture was found to cause mortality in nymphal ticks of *H. longicornis*. High temperature (>30 degrees C) and infrared radiation affected the chitinase enzyme activity and recombinant baculovirus infectivity by reducing the speed of tick killing by 60%. A mixture of recombinant virus and chitinase was found to kill ticks faster ( $p < 0.01$ ) than pure chitinase and recombinant virus alone. Thus, the recombinant virus showed a synergistic effect with the foreign chitinase gene. In order to reduce the excessive use and cost of acaricides, it was found that a mixture of recombinant virus and flumethrin could halve the dose of the chemical acaricide used. These findings are important for the safe use of the recombinant virus expressing chitinase as a bioacaricide against ticks.