Characterization of a novel baculovirus, gonad-specific virus, GSV

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Abstract

A newly discovered, nonoccluded baculovirus GSV has been reported to be a causative agent of sterility in adult corn ear-worms, Helicoverpa zea. Previous studies conducted by Hamm et al. (1996) and our laboratory indicated that it is an unusual insect virus with strict tissue tropism and the ability to establish persistent infections in vivo.^ After acquiring purified virus from infected adult insects, two permissive cell culture systems, TN-368 and Ld652Y were established for GSV replication in vitro. The cell culture-derived virus was confirmed to have the same morphology, biological activity and genetic identity as that of GSV recovered from insects. Using a cell culture system, several genetically pure GSV cloned isolates were acquired by plaque purification. The replication cycle of the virus including ultrastructural studies, viral DNA replication and virus specific protein synthesis were investigated in these two cell lines and interestingly, it was found that the exact same virus isolate had a different biology in the different permissive cell lines. Difference in the molecular biology of virus replication in these two cell lines was also observed. This suggests that host factors play an important role in determining the different host-viral interaction of the virus. In addition, biochemical properties of the GSV genome were investigated. The genome size was estimated using pulse-field gel electrophoresis to be 215-235 kb. CsCl-EtBr density gradient centrifugation indicated that GSV has a supercoiled, circular genome. Purified viral structural proteins, envelope proteins and glycoproteins were analyzed by SDS-PAGE and a total 16 of viral structural proteins were identified, three of them are glycosylated and five of these proteins are likely to be virus envelope or matrix components.^ Studies of GSV specific protein synthesis, DNA replication and transcription in the presence of specific inhibitors suggests that as with other most baculoviruses, GSV gene expression is temporally regulated and can be separated into early and late phases based on viral DNA replication and differential responses to the cellular RNA polymerase inhibitor, alpha-amanitin. That is, early gene expression is likely mediated by cellular RNA polymerase whereas a viral encoded or viral-modified host RNA polymerase likely mediates late viral gene expression.^ GSV persistent infection in vitro has been investigated using a persistently infected cell line, GSVP. GSV viral sequences and a very low level of infectious virus were detected from this normal-looking, persistently infected cell line. Co-culture of GSVP cells with another permissive cell line, Ld652Y, resulted in productive replication of GSV. ^

Subject Area

Molecular biology|Entomology|Microbiology

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