VIRAL PATHOGENESIS

Baculoviruses 'ride' actin

Baculoviruses migrate in the host cell by polymerizing actin during early-stage infection, according to a study by Welch and colleagues. This is in contrast to most viruses, which use microtubules for transport to and from the nucleus, and to vaccinia virus, which polymerizes actin only after replication to release its extracellular form.

Using fluorescent imaging, the authors observed that, early after infection, the nucleocapsid of the baculovirus *Autographa californica* multiple nucleopolyhedrovirus (AcMNPV) migrated in the cytoplasm and was followed by actin tails. Nucleocapsid motility was inhibited by treatment with the depolymerizing agent latrunculin A, suggesting that it is driven by actin polymerization. Actin polymerization was mediated by binding of the nucleocapsid protein P78/83, a known nucleation-promoting factor, to the host actin-related protein 2/3 (ARP2/3) complex.

This motility of the nucleocapsid corresponded with migration to the nucleus, which is the site of viral replication. Indeed, actin facilitated entry into the nucleus by undergoing corkscrew-like motions until the nucleocapsid detached and entered the nucleus. Moreover, latrunculin A-mediated inhibition of actin polymerization interfered with viral gene expression, confirming the importance of actin-based motility for nuclear entry and subsequent replication.

In addition to early-stage motility, actin was found to have a role in virus transport to the cell surface. Specifically, following the onset of early-gene expression, a subpopulation of nucleocapsids (possibly those that did not enter the nucleus) colocalized with actin-rich cell surface spikes, and this was greatly reduced in viruses carrying mutated P78/83 that cannot bind ARP2/3. Together, these findings show that the baculovirus AcMNPV uses actin-based motility to migrate to the nucleus and, after the onset of early-gene expression, to migrate to the cell surface. The authors propose that actin-based motility ensures rapid transmission of the virus to neighbouring cells.

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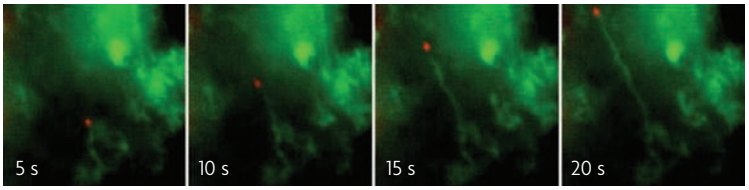
ORIGINAL RESEARCH PAPER Ohkawa, T., Volkman, L. E. & Welch, M. D. Actin-based motility drives baculovirus transit to the nucleus and cell surface. *J. Cell Biol.* **190**, 187–195 (2010)



Time course of the intracellular migration of *Autographa californica* multiple nucleopolyhedrovirus 77 minutes after infection. The nucleocapsid (red) is trailed by actin tails (green). Image courtesy of T. Ohkawa, University of California, Berkeley, USA.