Concomitant deletion of the pUL11 and gM proteins from herpes simplex virus 1 does not severely impair virion maturation

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The conserved herpesvirus tegument protein pUL11 and envelope glycoprotein M (gM) are involved in secondary envelopment of nucleocapsids in the cytoplasm. In the alphaherpesvirus pseudorabies virus (PrV) deletion of either protein had only moderate effects on viral replication in cell culture, whereas simultaneous deletion of both resulted in a severe impairment of virion morphogenesis (M. Kopp et al. 2003, J. Virol. 78:3024-3034). To test whether a similar phenotype occurs in the related herpes simplex virus 1 (HSV-1), we generated single and double deletion mutants based on a newly constructed bacterial artificial chromosome (BAC) clone of HSV-1 strain KOS. We could show that deletion of either UL11 or gM from HSV-1 resulted in approx. 5-fold reduced titers and 40-50% smaller plaques on Vero cells compared to HSV-1 KOS. Electron microscopy revealed that in the absence of either gM or pUL11 nuclear stages of virion formation were not affected. However, unenveloped nucleocapsids accumulated in the cytoplasm, which is in line with the phenotypes of corresponding PrV mutants. PrV pUL11 partially complemented the replication defect of HSV-1 UL11 deletion mutants, but not vice versa indicating a functional overlap. In contrast to PrV, where simultaneous deletion of pUL11 and gM led to an almost complete inhibition of secondary envelopment, the corresponding double deletion in HSV-1 resulted in only slightly enhanced defects compared to the single mutants. Our findings suggest that the functions of herpesviral pUL11 and glycoprotein M homologs in virion assembly are similar but not identical, and also differ among alphaherpesviruses.

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