Herpes simplex virus UL17 protein is associated with B capsids and colocalizes with ICP35 and VP5 in infected cells

Brief Report

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Summary. A previous study using a mutant lacking the UL17 gene has suggested that the UL17 protein of herpes simplex virus type 1 (HSV-1) is required for the cleavage/packaging of viral DNA. In this study, we have raised a rabbit polyclonal antiserum which specifically reacted with the UL17 protein which has an apparent molecular mass of 78-kDa in the lysates of HSV types 1- and 2-infected Vero cells. Western blot analysis of intracellular capsids demonstrates that the UL17 protein was associated with B and C capsids. Indirect immunofluorescence studies reveal that it colocalized with the major capsid protein VP5 and the scaffolding protein ICP35 within the nucleus. These results suggest that the association of the UL17 protein with immature B-type capsids is important for its role in cleavage/packaging.

* The genome of herpes simplex virus (HSV) is approximately 152,260 bp in size and encodes at least 74 distinct gene products [7, 11]. Although extensive efforts have been made to determine the role of each gene product in HSV life cycle, the precise function of many of them remains unclear.

The capsid maturation of HSV is a complex process which involves the cleavage/packaging of concatameric viral DNA [17]. Three types of capsids, which differ in density and electron microscopic appearance, accumulate in the nuclei of infected cells [8, 14]. A and C capsids have similar protein compositions but only C capsids contain viral DNA. B capsids contain the internal scaffolding proteins VP21 (UL26 gene product) and VP22a (UL26.5 gene product) and immature B-type capsids are thought to be precursors to C and A capsids. Studies with
temperature-sensitive (ts) mutants have shown that at least six HSV genes (UL6, UL15, UL25, UL28, UL32, and UL33) are involved in the cleavage/packaging of viral DNA and in the process of capsid maturation [1–4, 10]. Recently, Salmon et al. have reported that the UL17 gene is also required for the cleavage/packaging process [18]. They showed that mutants lacking a functional UL17 gene accumulate immature empty capsids in the nuclei of infected cells although the mutants can synthesize the normal amounts of viral DNA. However, their attempt to detect the UL17 protein in immunoblots of polypeptides associated with purified B capsids was unsuccessful, while the protein was detected in the tegument fraction of the virion. On the other hand, the UL6, UL15, UL25 and UL28 proteins are known to be associated with B capsids [12, 16, 23, 24]. From these observations, it has been suggested that the UL17 protein plays a unique role in the process of capsid maturation [18]. In this study we examined the association of the UL17 protein with intracellular capsids and its subcellular distribution in HSV-1 and HSV-2 infected cells.

To identify the UL17 protein, we first generated anti-UL17 rabbit antisera by using a recombinant HSV-1 UL17 fusion protein as antigen. For this purpose the plasmid pET28-UL17 was constructed as described previously [6, 22]. Briefly, the UL17 coding sequences were cloned by PCR amplification from HSV-1 KOS genomic DNA, using UL17f (CCC CGG ATC CA TGAA CGC GCA CTT GGC CAA C) as the forward primer and UL17r (AAG GAA GCT TCT AGC GAG ACC GGC CGT TCC) as the reverse primer. Bam HI and Hind III sites were incor-