Detection of Virus Particles in Trigeminal Ganglion Cells in a Calf Recurrently Infected with Infectious Bovine Rhinotracheitis Virus

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Calves experimentally infected with infectious bovine rhinotracheitis (IBR) virus have been found to develop nonsuppurative encephalomyelitis and ganglionitis after nasal or vaginal inoculations [1, 6–8]. Activation and excretion of IBR virus from infected calves have been shown to occur under experimental treatment of synthetic corticosteroids or dexamethasone (DM) [4, 5, 9–12]. The trigeminal and lumbo-sacral spinal ganglia were postulated to be a site of latency with the virus by histopathology, immunofluorescence and virus recovery [4, 5, 9–12]. This report is to reveal a morphological evidence of IBR virus reactivation within trigeminal ganglion cells of a calf in which the recrudescence was induced by DM treatment.

Materials used were taken from the same 9 Holstein Friesian calves 5 to 10 months of age which appeared in our previous report [9]. Five months after intranasal inoculation with \(4 \times 10^6\) TCID\(_{50}\)/ml of IBR virus, the infected calves were given intravenously daily doses of 0.1 mg of DM/kg body weight for consecutive 5 days. They were killed on Days 4 to 11 after the start of DM treatment. At necropsy, various tissues were fixed in 10% neutral-buffered formalin, embedded in paraffin and stained with hematoxylin and eosin (HE). Formalin-fixed samples of the trigeminal ganglia were fixed in 1% osmium tetroxide in 0.1 M phosphate buffer solution at pH 7.3 for 60 min, dehydrated in alcohol and embedded in epon 812. Thin sections were stained with uranyl acetate and lead citrate, and observed with a JEOL-TEM 100 CX electron microscope.

No macroscopic lesions were seen in the DM-treated calves. Microscopically, however, trigeminal ganglionitis was found in 8 of 9 calves sacrificed on Days 3 to 11th. By electron microscopy, the lesions in the trigeminal ganglia were characterized by accumulation of many mononuclear cells and a few neutrophils. The nucleus had a convoluted nuclear membrane and various-sized nuclear bodies (Fig. 1). A small number of herpesvirus-like particles were scattered in the nucleus as well as cytoplasm of degenerated ganglion cells in a calf killed on Day 4 (Fig. 2). Two types of capsids were noted in the nuclei, one with an electron-dense core and the other with an electron-lucent one. A small number of enveloped particles were detected within cytoplasmic vesicles of the ganglion cells (Fig. 3).
The trigeminal ganglionitis with neuronophagia and cellular infiltration was demonstrated as characteristic changes in the recurrent IBR virus infection [9-12]. The present electron microscopic study was focussed on correlation of the lesion in the trigeminal ganglion with the latent infection. The findings in a calf killed on Day 4 might have resulted either from a latent infection with herpesvirus or from spontaneous infection during experiment. Herpes simplex virus (HSV) is well known for its ability to cause recurrent oral or genital infections and to induce latent ganglionic infection in humans and in experimentally infected animals. The virus can be recovered from the sensory and autonomic ganglia of mice and rabbits by explantation and co-cultivation conducted many months after infection [2, 13]. Baringer and Swoveland [3] detected the HSV particles within the nuclei of abnormal ganglion cells up to 16 weeks after infection. In the recurrent infection of IBR virus, the virus was also recovered from the trigeminal ganglion in a cultured explant from DM treated animals [4, 5]. We did not attempt at virus isolation from the trigeminal ganglion of this case, however, specific immunofluorescence revealed that the herpes virus detected in the degenerated ganglion cells might represent the reactivation of latent IBR virus induced by DM treatment.

References

Explanation of Figures

Fig. 1. Accumulation of mononuclear cells and a few neutrophils and the convoluted nuclear membrane in a trigeminal ganglion on Day 4. ×5000.
Fig. 2. Several capsids in the nucleus of a ganglion cell on Day 4. ×26000.
Fig. 3. Small number of capsids in the nucleus and enveloped virus particles (arrows) in the cytoplasmic vesicles of a ganglion cell on Day 4. ×26000.

要 約

牛伝染性鼻気管炎再発牛の三叉神経節細胞におけるウイルス粒子の検出（短報）：成田 實・乾 純夫・齋波元一・清水悠紀臣（農林水産省家畜衛生試験場）——牛伝染性鼻気管炎（IBR）ウイルス感染耐過牛に、デキサメタゾン（DM）0.1mg/kg を投与して IBR の再発を試み、三叉神経節炎を認め免疫蛻光法でウイルス抗原が検出された側の三叉神経節を電子顕微鏡で検索したところ、神経細胞の核および原形質内に少数のヘルプスウイルス粒子が認められた。