GENERALIZED CYTOMEGALOVIRUS INFECTION IN A GORILLA*

Cytomegaloviruses (CMV), alternatively referred to as salivary gland or cytomegalic inclusion disease viruses in the earlier literature, are a group of highly species-specific agents infecting various species of mammals. Cytomegaly and prominent nuclear inclusion formation in the affected cells are pathognomonic features of the infection of the viruses. Although CMV manifest a low degree of pathogenicity in the hosts, generalized infection may end fatally (Welley, 1965). In subhuman primates, the pathological evidence of CMV infection has been reported in *Cebus fatuellae* (Cowdry and Scott, 1935a), rhesus monkeys (Cowdry and Scott, 1935b) and chimpanzees (Vogel and Pinkerton, 1955). CMV strains have been isolated from African green monkey kidney cell cultures (Black, Hartley and Rowe, 1963; Malherbe and Harwin, 1963). Recently, a new herpesvirus with properties similar to those of CMV was also isolated from squirrel monkey kidney cell cultures (Meléndez *et al.*, 1968). In the gorilla, however, CMV infection has not been reported. This communication describes histopathological findings in a gorilla in which the characteristic features of CMV infection were observed.

The animal was a 3-year old lowland gorilla, *Gorilla gorilla gorilla*, which had been kept at Hirakata Park, Hirakata City, Osaka, for one and a half years. The animal was found ill on August 28, 1961. Clinically, intermittent bloody diarrhea, anorexia, anemia, abdominal pain, dehydration and emaciation were observed. The symptoms changed in the balance for 38 days and the animal was dead on October 5, 1961. The animal did not respond to antibiotic, chemotherapeutic or symptomatic treatments. Repeated attempts to isolate *Shigella* organisms from the feces during the course of illness failed.

The main pathological findings were severe colitis with ulceration, focal interstitial pneumonia, toxic nephrosis, atrophy and sclerosis of the spleen and worm nodule formation in the colon caused by *Oesophagostomum stephanostomum* as identified by Katae, Terauchi and Yamada (1962). Markedly hypertrophied cells with eosinophilic nuclear inclusions were frequently found in the alveolar walls and lumen of the lungs, the red pulp of the spleen, the parenchymal cells of the liver and the interstitium of the kidneys. Only one inclusion-bearing cell was found in one of several preparations taken from the submaxillary glands. The inclusion-bearing cells (Fig. 1) measured up to 30 μ in diameter and the inclusion stained positive with Feulgen reagents. Little cellular infiltration or necrosis was observed in the affected organs except in the lungs in which interstitial pneumonia was found. Multinucleated giant cells were not observed in the affected sites.

The severe colitis with ulcers may be the cause of the general conditions of the animal. The ulcers reached the submucosae and showed the features of bacillary dysentery. It seems unlikely, however, that dysentery bacilli caused the

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Fig. 1. Spleen of the gorilla. A greatly hypertrophied inclusion-bearing cell is seen. Hematoxylin and eosin.

colitis, since *Shigella* organisms could not be isolated from the feces nor did the animal respond to antibiotic and chemotherapeutic treatments. No protozoan parasites were found in and around the ulcers. The ulcers were clearly distinct from the worm nodules which were encapsulated and infiltrated with eosinophils. Inclusions were not found in the ulcers. Thus, the cause of the colitis remains unclear. Colitis with ulcers was also observed in 3 of 14 human adult autopsy cases of CMV infection reported by Wong and Warner (1962).

The characteristic morphology of highly hypertrophied cells with Feulgen positive nuclear inclusions, a rather mild cellular response in the affected organs and the lack of tendency to form multinucleated giant cells suggest that the causative agent in this case may be CMV being clearly distinct from other viral agents such as B virus. Inclusions induced by CMV are located predominantly in the vascular endothelium and macrophages in generalized human adult cases, while those in infants are located primarily in the epithelial cells (Wong and Warner, 1962). In this respect, the present case resembled human adult cases. Virological and serological examinations on the animal was not performed.

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