NOTE

Experimental Infection of Canine Parvovirus in Specific Pathogen-Free Cats

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(Received 19 April 1984/Accepted 22 May 1984)

\textbf{ABSTRACT.} In SPF cats inoculated with canine parvovirus, no clinical signs of the disease could be seen throughout the observation period. However, there was a reverse correlation between the development of serum antibody and the propagation of the virus in organs of the experimental cats.\textemdash\textbf{Key words:} canine parvovirus, SPF cats.

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Canine parvovirus (CPV) infection has a wide distribution throughout the world since the year 1978 [3], and this infection has received special attention as a new canine virus disease. The disease is characterized clinically by severe vomiting and diarrhea, anorexia and leukopenia. The symptoms well accord with those of feline panleukopenia virus (FPLV) infectin in cats. Antigenically CPV is closely related to FPLV in various serological methods [1, 2, 4, 8, 9, 10]. Moreover, CPV and FPLV are very similar in many physicochemical and biological properties [1, 4, 6, 8, 9, 10]. In our previous reports, specific pathogen-free (SPF) cats inoculated with FPLV produced mild clinical signs such as transitory fever and slight diarrhea [7], while SPF cats inoculated with CPV did not develop any symptoms [6]. The present paper deals with a quantitative study on the virological and serological features of the SPF cats inoculated with CPV.

Five SPF cats of both sexes, aged 4 months old, were inoculated subcutaneously with 1.0 ml of CPV, strain Kushiro [6]. The virus was serially passaged 8 times in feline lung cell line, FLF-3 cells, before the inoculation. The virus had a titer of 10^6 TCID\textsubscript{50} per ml (abbreviated to 10^6 hereafter). The SPF cats were supplied from the same colony, the inoculated animals were maintained for a maximum of 11 days, blood samples were taken at intervals of one to 2 days, and the cats were sacrificed for virus titration of the organs as described previously [7]. Virus recovery was carried out with 0.1 ml of five-fold dilutions of 10\% (w/v) organ suspension. The organs used were liver, spleen, lungs intestines, mesenteric lymph nodes, thymus and bone marrow. Evidence of virus infection was determined by the presence of 5 or more typical intranuclear inclusions in a confluent monolayer of FLF-3 cells cultured on a 9\times18 mm coverslip and stained with May-Grünwald Giemsa stain. Details of these methods have been fully described before [7].

Serum antibody to CPV was examined by hemagglutination-inhibition (HI) test using a microtiter system [5]. The HI titer was represented as a reciprocal of the highest dilution of serum showing 100\% inhibition of hemagglutination.

None of the inoculated cats developed clin-
Fig. 1. Relationship between virus titers of organs and serum antibody titers in the experimental cats sacrificed at 3 to 11 days postinoculation (○ Liver, ● Spleen, △ Lungs, ▲ Intestines, □ Mesenteric lymph nodes, ■ Thymus, × Bone marrow). The virus titer was expressed as the highest dilution of the 10% organ suspension showing 5 or more typical intranuclear inclusions in at least one among 2 to 4 coverslips examined.

Pathological signs of the disease throughout the observation period. There was also no marked decrease of leukocyte count in any of the cases. All the cats had an HI antibody titer of < 4 to CPV before the inoculation. Fig. 1 represents the relation of serum antibody titers to distribution of CPV in the organs of the experimental cats. No serum antibody to the virus was detected in cat No. 1 that was sacrificed at 3 days postinoculation (DPI), whereas the virus could be recovered in titers of $10^{1.0}$ to $10^{3.1}$ from all the organs except liver. Although cat No. 2 sacrificed at 4 DPI had an HI titer of 32, the virus titers of the organs were $10^{1.7}$ in lungs, $10^{2.4}$ in thymus and bone marrow, and $10^{3.1}$ in mesenteric lymph nodes and intestines. In cat No. 3 sacrificed at 5 DPI, the virus was detected in very high titers ($10^{4.5}$ and $10^{5.2}$) from the bone marrow and intestines, in moderate titer ($10^{2.4}$) from the liver, spleen, mesenteric lymph nodes and thymus, and in low titer ($10^{1.6}$) from the lungs, though the animal had an HI titer of 16. However, the virus was not detected from any of the organs of cats Nos. 4 and 5, having a high HI titer of 512 at 7 and 11 DPI respectively.

The results clearly demonstrate that the development of serum antibody is inversely proportioned to the propagation of CPV in organs of the experimental cats. This tendency is in agreement with the result found after experimental infection of SPF cats with 0.5 ml of FPLV ($10^{4.0}$) in our previous study [7]. Especially the distribution of CPV in organs was the same with FPLV. In the titer of virus in the organs, however, there was great difference between CPV and FPLV. A large amount of FPLV ($10^{3.8}$ to $10^{5.9}$) was detected in many organs at 4 and 5 DPI, although FPLV inoculum size ($10^{3.7}$ TCID$_{50}$ per cat) was one-200th smaller than for CPV ($10^{5.0}$ TCID$_{50}$ per cat). On the contrary, the CPV titers were as low as $10^{1.0}$ to $10^{3.1}$ in all the organs with the exception of bone marrow ($10^{4.5}$) and intestines ($10^{5.2}$) on the same days. These results indicate that SPF cats were relatively less susceptible to the infection of CPV than to the infectin of FPLV. The finding is of particular interest with respect to
the possible origin of CPV that might mutate from wild-type or attenuated vaccine strain of FPLV to a mutant capable of productive infection in dogs [8, 9].

ACKNOWLEDGEMENT. The authors wish to thank Dr. K. Maejima, of the Laboratory Animal Center, Keio University School of Medicine, Tokyo, for useful advice on the transportation and maintenance of specific pathogen-free cats.

REFERENCES


要約

SPFネコにおけるイヌ・パルボウイルスの実験感染（短報）: 後藤 仁・内田英二1)・一条 茂2)・清水亀平次・諸星康雄3)・中野健司3)（帯広畜産大学家畜産生物学教室, 1)家畜内科教室, 2)北里大学医学部実験動物系）——イヌ・パルボウイルスを SPFネコに実験的に接種し、ウイルス増殖と血中抗体上昇の関係を検討した。ウイルス接種後3～5日では血中抗体価が低値を示したのに反し、回収されたウイルス価は高値で最も高く、肝、脾、腸間膜リンパ節および胸膜では中等度、肺では比較的低かった。これに対して、血中抗体価が高値を示した接種後7～11日では、すべての臓器でウイルス分離は陰性であった。