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Canine parvovirus management: Nutritional, environmental, and vaccination strategies

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Abstract
Canine parvovirus (CPV) stands as a significant pathogen affecting domestic dogs, particularly puppies, with severe consequences for morbidity and mortality. This research paper aims to provide the dynamics of canine parvovirus (CPV) infection, focusing on diagnostic conventional methods and preventive strategies. It delves into the history, clinical manifestations, and diagnostic advancements of CPV, using a case study of a German Shepherd to illustrate diagnosis and treatment protocols. The study emphasizes the global prevalence of CPV, susceptibility in different breeds, and the importance of a holistic approach to prevent and manage infections. Key preventive measures include vaccinations, owner education, hygiene practices, and proper nutrition.

Keywords: Canine parvovirus, CPV-2, bloody diarrhoea, prevention

Introduction
Canine parvovirus (CPV) represents a highly contagious viral ailment in dogs, predominantly inducing acute gastrointestinal illness, particularly in puppies. While the disease typically targets pups aged between six and 20 weeks, there are instances of its occurrence in older animals as well. The causative agent commonly referred to as "parvo" is canine parvovirus type 2 (CPV), which initially surfaced among dogs in Europe circa 1976. The initial viral strain, known as CPV-2 to differentiate it from the pre-existing CPV-1, precipitated severe and fatal outbreaks of haemorrhagic gastroenteritis and subacute myocarditis in kennels and shelters on a global scale [9]. The CPV genome consists of a single-stranded DNA molecule, with distinct open reading frames encoding structural and non-structural proteins crucial for viral replication. CPV specifically targets tissues for viral replication, with a primary focus on the intestinal crypts and lymphoid organs. However, it is noteworthy that the virus can disseminate to all tissues within the host [7]. Following penetration through the oronasal route, canine parvovirus undergoes replication in the gastroenteric-associated lymphoid tissues. Subsequently, it is disseminated by infected leukocytes to the germinal epithelium of the crypts in the small intestine, leading to the manifestation of diarrhoea. The infection of leukocytes, predominantly circulating and tissue-associated lymphocytes, results in acute lymphopenia, often correlated with neutropenia [3]. The physical examination of puppies afflicted with parvoviral enteritis frequently discloses symptoms such as fever, reaching up to 41 °C or 105 °F, along with lethargy, weakness, dehydration, vomiting, diarrhoea, and abdominal tenderness. Palpation may reveal a fluid-filled intestinal tract. The virus is shed for a brief period preceding the onset of clinical signs, and the shedding significantly diminishes after approximately 7 days [8].
Canine parvovirus is transmitted through oral contact with infected faeces or contaminated surfaces, such as soil, shoes, and dog toys. The primary source of CPV infection is faecal waste from dogs already infected with the virus. CPV diagnosis is prevalent in various areas where groups of dogs congregate, including dog shows, obedience trials, breeding and animal shelters, parks, and playgrounds [2]. Puppies benefit from protection against infection through maternal antibodies, with the half-life of these antibodies lasting approximately 10 days for

parvovirus during the initial weeks of life. Certain breeds, such as the Labrador Retriever, German Shepherd, and American Pit Bull Terrier, exhibit a heightened susceptibility to canine parvovirus (CPV). The substantial loss of proteins and fluids from the gastrointestinal tract leads to the rapid development of dehydration and hypovolemic shock [5] in affected individuals. The occurrence of this disease is typically associated with non-vaccinated dogs, often stemming from the unawareness of owners, the high cost of vaccines, and inadequate biosecurity practices. In this study, a dog infected with canine parvovirus was conventionally diagnosed and control and prevention strategies were detailed.

History

A dog belonging to the breed German Shepherd (Fig, 1) aged between 9 to 10 months, presented with a medical history characterized by off-smelling bloody diarrhoea, anorexic for 3 days, depressed, and vomiting. Clinical examination of the dog indicated the heart rate: 98/min, respiration rate: 26/min, presence of pyrexia (104.6°F), severe dehydration, and pale conjunctival mucous membranes. This case was reported at Referral Veterinary Clinic, Deesa, Gujarat, India.

Diagnosis

The diagnosis was established through a faecal examination and microscopic examination of the blood smear that revealed no parasitic infection. The combination of the historical information, clinical signs, symptoms, and haematological findings provided clues for diagnosing the case as a canine parvovirus infection as displayed in Fig 2.

Fig 1: A German shepherd dog presented to the clinic suffering with canine parvo viral infection

Fig 2: Clinical signs and Haematological findings

Treatment

Symptomatic and supportive treatment was administered (Fig. 2), involving the use of 5% Ringer's Lactate infusion. Additionally, intravenous administration of antibiotics such as Intacef tazobactam 562.50 mg, Rantac, Metronidazole, and Ondansetron was provided daily for dog throughout the treatment period of 5 days. The owner of the dog was advised to give curd 2 times a day to the dog. Oral medications were also given to enhance immunity against the infection and address the anaemic condition. The treatment protocol adhered to the recommended dosages. Throughout the treatment period, the owner received guidance to feed the dogs with curd and electoral powder exclusively. Additionally, the owner was advised to separate unaffected dogs from infected and maintain a clean environment on the premises.

Prognosis

The prognosis for the presented cases was deemed satisfactory, primarily due to the full cooperation of the owner throughout the treatment duration.

Fig 3: A German Shepherd dog being treated with I/M injections against canine parvo viral infection.

Discussion

Canine parvovirus type 2 (CPV-2) infection is a globally prevalent disease. All dog breeds are susceptible to the disease notably the German Shepherd and Doberman, who are

considered more prone to infection. Infected dogs commonly display clinical signs that include anorexia, vomiting, dehydration, bloody diarrhoea, and pale conjunctival mucous membranes and these symptoms collectively characterize the manifestation of canine parvovirus infection supported by previous study [1]. A variety of diagnostic methods are presently available to detect canine parvovirus infection other than conventional methods, enabling the assessment of viral quantity and genotype in samples like electron microscopy (EM), virus isolation (VI), hemagglutination (HA), enzyme-linked immunosorbent assay (ELISA), loop-mediated isothermal amplification (LAMP), and polymerase chain reaction (PCR). Each of these diagnostic techniques plays a crucial role in accurately identifying and characterizing canine parvovirus, facilitating comprehensive understanding and effective management of the infection [6]. The elevated incidence of canine parvovirus in young puppies is theorized to result from the virus's attraction to rapidly multiplying intestinal crypt cells, which possess the highest mitotic activity. The virus's preference for these actively dividing cells contributes to its ability to establish infection and replicate quickly, particularly in the gastrointestinal tract of susceptible young pups [4]. The management of this infection involves maintaining proper nutrition, ensuring a clean environment, minimizing overcrowding, and adhering to a timely vaccination schedule for dogs.

Preventive Strategies

Preventing the recurrence of canine parvovirus infection in similar cases involves a multifaceted approach. First and foremost, the implementation of a stringent vaccination program, specially tailored for susceptible breeds like the German Shepherd, is imperative. Educating dog owners on the importance of vaccinations and regular veterinary check-ups plays a crucial role in disease prevention. Additionally, emphasizing strict hygiene practices, such as regular cleaning and disinfection of living spaces and communal areas, minimizes the risk of viral contamination. By incorporating these preventive measures, the research case study highlights a comprehensive strategy for mitigating the risk of canine parvovirus infection and ensuring the well-being of dogs.

Conclusion

This research paper provides a comprehensive synthesis of the current knowledge on CPV, focusing on diagnostic methods, and preventive strategies. The information presented herein contributes to the broader understanding of CPV and aids in the development of targeted interventions for disease control.

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