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# Dog and Cat Infectious Viral Enteritis: Review of Causes, Diagnosis, Management, Prevention, and Control

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## ABSTRACT

Infectious viral enteritis can pose significant health risks to dogs and cats. Early diagnosis, effective management, and robust preventive measures are crucial for controlling these diseases and ensuring the health of pets. Regular vaccination and good hygiene practices play pivotal roles in reducing the incidence of these viral infections. In this review, we tried to spot highlights about the causative agents, epidemiology, pathogenesis as well as diagnosis and managemental measures that can help in prevention and control of the disease. The current information will add an important overview for pets owners and veterinarians that deal with pets about this problem and the applicable method to deal with these cases. Infectious viral enteritis can pose significant health risks to dogs and cats. Early diagnosis, effective management, and robust preventive measures are crucial for controlling these diseases and ensuring the health of pets. Regular vaccination and good hygiene practices play pivotal roles in reducing the incidence of these viral infections. In this review, we tried to spot highlights about the causative agents, epidemiology, pathogenesis as well as diagnosis and managemental measures that can help in prevention and control of the disease. The current information will add an important overview for pets owners and veterinarians that deal with pets about this problem and the applicable method to deal with these cases.

**Keywords:** Dogs, Cats, Diagnosis, Vaccination, Epidemiology.

## INTRODUCTION

Both dogs and cats are frequently affected by viral enteritis, representing an important possible diagnosis in veterinary medicine (Parrish, 2006). This disease can be defined as an inflammatory condition of the intestinal tract, characterized by fever, depression/lethargy, inappetence/anorexia, vomiting and/or diarrhea, dehydration, with or without acute abdominal pain (Parrish, 1995). Common causative viral agents include

parvoviruses, coronaviruses, reoviruses, caliciviruses, pestiviruses, and rotaviruses (Alves et al., 2018; Mósena et al., 2019). The capacity of these viruses to cause morbidity and mortality in young, susceptible, and non-vaccinated animals is widely known, especially in dog kennels, catteries, and other groups of dogs or cats kept in intensive housing conditions (Greene, 2012; Gizzi et al., 2014).

To date, the transmission pathways of this group of etiological agents are not completely elucidated. While the most important routes in disease dissemination are the fecal-oral and respiratory secretions, virus transmission through fomites is a topic of great concern (Mia & Hasan, 2021; Sykes & Parrish, 2021). In order to implement effective preventive and therapeutic strategies for these infections, it is important to understand the clinical manifestations, transmission, and pathophysiological aspects of these infections (Hartmann, 2017; Kelman et al., 2020).

Viral enteritis results from multiple intertwined factors, including the etiological agent characteristics and virulence, the host genetics, age, immune status, environmental factors, management conditions, gestation, lactation, the weaning process, or even the pregnancy status at the time of viral exposure (Ling et al., 2012; Sayed-Ahmed et al., 2020; Rehme et al., 2022). Traditionally, the diagnosis of viral gastroenteritis follows a multi-step protocol including; anamnesis and clinical examination, patient management and supportive therapy, laboratory diagnostic surveys, and possibly an ethical, as well as economical, post-mortem examination ( Desario et al., 2005; Sun et al., 2019; Abdelbaky et al., 2024).

In this report, the current information about etiology, pathogenesis, epidemiology, clinical signs, diagnosis, prevention and control are summarized.

## ***1. Etiology and Pathogenesis***

Canine infectious viral enteritis is an acute, highly contagious, and often fatal infection of dogs causing necrosis of the crypt epithelium of the small intestine villi (Mia & Hasan, 2021). In cats, panleukopenia also affects other tissues such as the myocardium and cerebellum (Barr, 2020).

Infectious causes of acute viral enteritis are of paramount clinical importance in small animal practice because they are highly associated with morbidity and mortality in young animals (Parrish, 2006). The etiological agents causing enteritis in dogs and cats have some specific characteristics. The immune response depends on a range of factors such as the age of the host and the etiological agents involved (which may be exacerbated by coinfection with other agents) (Pollock & Parrish, 2019). Furthermore, the genetic and strain differences within the etiological agents make the success of the available vaccines problematic (Eugster, 1980; Alves et al., 2018; Paul et al., 2023).

Understanding the etiology and pathogenesis of infections is an essential hypothesis for potentially better drugs and vaccines to prevent this important health problem in small animals. Viral agents of acute enteritis cause profound pathological changes in the gastrointestinal system that can result in the profuse diarrhea characteristic of this syndrome. The pathophysiological changes associated with infections can

explain many of the clinical signs associated with the disease, including vomiting and diarrhea (Parrish, 2006). The immune response also has a profound influence on the severity of the disease in patients affected by these organisms ( Stuetzer & Hartmann, 2014; Mortari et al., 2023).

The most important viral agents in acute enteritis in dogs are Canine Parvovirus types 2b, 2c, and 2cp, while in cats, it is the Feline Panleukopenia Virus. Other viral agents can also contribute to this syndrome; for example, Canine Coronavirus, Canine adenovirus, and feline astrovirus. Inclusion bodies can also be occasionally visualized in feces through electron microscopy from canine coronavirus and feline astrovirus infections (Dezengrini et al., 2007; Sykes, 2014; Sykes & Parrish, 2021).

### ***1.1. Canine Parvovirus (CPV)***

Canine parvovirus (CPV) is a non-enveloped, single-stranded, negative-sense linear DNA virus that represents one of the most prevalent and contagious viruses of dogs worldwide, belonging to the Parvoviridae family. The size of CPV is approximately 17–25 nm, and its genome length is 5100 base pairs. The virus has a capsid protein encoded by the VP2 gene (Vannamahaxay & Chuammitri, 2017).

The lifecycle of CPV involves replication in the nucleus of host cells. Firstly, CPV attaches to host cells, and then viral proteins are internalized by clathrin-dependent endocytosis. After endosomal uptake and membrane penetration, the viral DNA is released into the nucleus, and mRNA starts to synthesize, undergoing post-translational modifications, and ends with the replication of the virus. Clinical signs of CPV infection mainly target the rapidly proliferative cells of the body, having severe clinical effects principally in young puppies (less than six months), but it can also infect older dogs that have not been vaccinated. The disease morbidity is up to 80%, and the fatality decreases to 10–20% with successful case management (Meunier et al., 1985; Parrish, 2006).

Therefore, two-thirds of dogs die due to severe enteritis from CPV infection. Clinical manifestations of CPV infection vary from mild to severe, including anorexia, vomiting, fever, depression, sudden heart failure, and massive diarrhea, characteristically with a smell (Sykes, 2014). CPV infects its host through direct contact with an infected dog and is also transported via fomites (Behdenna et al., 2019).

The virus survives in the environment for several months or years most of the time. Because of high contagiousness and many genetic lineages, an initial treatment attempt is possible when CPV is suspected in dogs with characteristic clinical signs of infection. Earlier detection and treatment capabilities result in less damaged areas with controlled CPV replication and a successful return to normal immune function in dogs (Tuteja et al., 2022).

### ***1.2. Feline Panleukopenia Virus (FPV)***

Feline Panleukopenia Virus (FPV), also known as infectious enteritis, infectious gastroenteritis, or feline distemper, FPV, is considered to be a genetic derivative of canine parvovirus. Feline Panleukopenia is a highly contagious viral disease in wild and domestic carnivores. However, the host spectrum of FPV is relatively narrow, and specific antibodies to FPV have been found only in cats. It can

strike at all ages and sexes of domestic cats without racial discrimination, but cats in a period of weaning are more susceptible. Most unvaccinated cats are infected (Barr, 2020).

FPV is icosahedral with a size of 20–22 nm and contains linear single-stranded DNA, which is about 5200 nucleotides. FPV shows high resistance in the external environment. Commonly, it is inactivated for 10 minutes at 70 °C and withstands repeated freezing and thawing cycles (Battilani et al., 2006).

Clinical symptoms first appear in the central lymphoid organs as the disorder of the immune system progresses, and the mortality rate of kittens is as high as 90%. FPV spreads through blood, feces, nasal secretions, saliva, urine, and all of these exudates and excretions (Parrish, 2006). The vectors include contaminated food and water, bedding and cages, feeding bottles, animal feed, and kennel workers and their hands. FPV is initially isolated from an oropharyngeal swab, conjunctival secretions, feces, urine, and blood (Abdelbaky et al., 2024).

### ***1.3. Other Viral Agents***

In addition to CPV and FPV, there are a number of other viral agents that can contribute to the development of enteritis in dogs and cats. Parvoviruses, and herpesvirus are the most well-known of the enteric viral agents affecting the stomach and the small intestine, rather than the large. Other considerations include non-CPV, non-FPV parvo-like agents, caliciviruses, and toroviruses. These pathogens can cause enteric symptoms alone, or in combination with, other known viral agents. It is suspected that they may sometimes act as disease enhancers, potentiating more rapid or severe disease processes with other pathogens (Sykes, 2014).

Though the following agents can all cause signs consistent with gastroenteritis, common to many forms of coronavirus, in general, the syndromes differ greatly among different agents. Direct fecal-oral spread is the most common route of transmission for all of the following agents. The main clinical impact is damage to and loss of epithelial cells of the small intestine with associated malabsorption and inflammation. Coronaviruses are generally considered to be more prevalent than other agents, such as circoviruses (Dezengrini et al., 2007; Zobba et al., 2021).

Infectious agents will often cause a complex interaction with each other in a susceptible group that leads to complex, often difficult to resolve, clinical symptomatology. Multiple infectious agents are often identified in cases of chronic, idiopathic diarrhea. This makes the pathogens discussed here a broader issue, intricately linked with potentially many other agents as a piece of the puzzle in diagnosing enteritis (Greene, 2012; Sykes, 2014).

## ***2. Epidemiology and Transmission***

Viral infectious enteritis is a major threat for both dogs and cats (Stuetzer & Hartmann, 2014; Sykes, 2014).

Canine parvovirus (CPV) and feline parvovirus (FPV) are highly contagious viral diseases that primarily affect the gastrointestinal tract of dogs and cats, respectively. These viruses, along with other viral causes of enteritis, have distinct epidemiological characteristics that are essential for veterinarians, pet owners, and animal health professionals to understand for effective prevention,

control, and management (Sun et al., 2019).

### ***2.1. Canine Parvovirus:***

CPV spreads through direct contact with infected dogs or contaminated feces, environments, and fomites. The virus is extremely resilient and can survive in the environment for months, making it challenging to eradicate. The incubation period for CPV ranges from 3 to 7 days. During this time, infected dogs may not show symptoms but can still shed the virus, contributing to its rapid spread. Puppies between 6 weeks and 6 months of age are most vulnerable to CPV infection. This vulnerability is due to the waning of maternal antibodies and the immature immune system of young puppies. CPV infections show a higher incidence during summer months. This seasonal pattern may be attributed to increased outdoor activities and social interactions among dogs during warmer weather. CPV has a worldwide distribution, with varying prevalence across different regions. The virus has evolved into different strains, with CPV-2c being the most prevalent in many countries (Hong et al., 2007; Charoenkul et al., 2019; Hao et al., 2020).

### ***2.2. Feline Parvovirus (Feline Panleukopenia Virus):***

FPV transmission is similar to CPV, occurring through direct contact with infected cats or contaminated environments. The virus can persist in the environment for extended periods, making it highly contagious. The incubation period for FPV ranges from 2 to 7 days. During this time, infected cats may appear asymptomatic but can still spread the virus. Kittens are most susceptible to FPV infection, especially those between 3 and 5 months old. This vulnerability is due to the decline in maternal antibodies and the developing immune system of young kittens. FPV infections are more common in summer and early fall. This seasonal pattern may be related to increased outdoor activity and interactions among cats during these months. FPV has a worldwide distribution, affecting domestic cats and wild felids across various regions (Battilani et al., 2006; Hartmann, 2017;Barr, 2020; Rehme et al., 2022).

### ***2.3. Other Viral Enteritis:***

#### ***2.3.1 Rotavirus:***

Rotavirus affects young animals of various species, including puppies, kittens, calves, and piglets causing acute gastroenteritis, leading to severe dehydration in young animals. The incubation period is typically 1-3 days. The transmission of rotavirus occurs through the fecal-oral route, with the virus shedding in large quantities in feces. The virus is common in crowded environments such as kennels, shelters, and farms (Osterhaus et al., 1980; Mochizuki et al., 1986).

#### ***2.3.2. Coronavirus:***

Coronavirus causes feline infectious peritonitis (FIP) in cats, a severe and often fatal disease manifested clinically in two forms: wet (effusive) FIP and dry (non-effusive) FIP. The incubation period can range from weeks to months. The transmission of Coronavirus occurs through close contact and bodily fluids, including saliva, feces, and urine. The virus is more prevalent in multi-cat environments such as catteries and shelters (Osterhaus et al., 1980; Decaro & Buonavoglia, 2011).

### *2.3.3. Canine Distemper Virus:*

Canine Distemper Virus affects dogs and wildlife, including foxes, wolves, and ferrets causing multisystemic disease affecting respiratory, gastrointestinal, and nervous systems. The incubation period is typically 1-2 weeks. The transmission is mainly airborne through respiratory secretions and bodily fluids. Vaccination has significantly reduced incidence in domestic dogs, but outbreaks still occur in unvaccinated populations (Zaghawa et al., 1990; Vandevelde & Zurbriggen, 2005; Sykes & Vandevelde, 2021).

### *2.3.4. Feline Calicivirus:*

Feline Calicivirus primarily affects the upper respiratory tract but can cause enteritis in some cases. Feline Calicivirus can cause a range of symptoms, from mild upper respiratory signs to more severe systemic disease. The incubation period is usually 2-6 days. Feline Calicivirus transmission occurs through direct contact and aerosols, with infected cats shedding the virus in oral and nasal secretions. The virus is common in shelters and multi-cat households due to its highly contagious nature (Radford et al., 2007; Radford et al., 2009).

## *3. Clinical Signs and Symptoms*

Clinical signs of pet infectious viral enteritis are characterized by symptoms such as vomiting, diarrhea, fever, and dehydration. The degree and type of symptoms depend on the type of virus and the immune strength of the individual host. Some infected pets are anorexic without showing any specific symptoms, making it difficult to suspect viral enteritis. Stools of dogs and cats are usually watery and reddish-brown. Body fluid is shed with the feces, resulting in liquid eggs that do not become solid but spread flat. An increased level of leukocytes in the blood, polykaryophagocytic cells, is considered a characteristic. Especially in many cases of feline panleukopenia, symptoms will initially appear after 2 to 3 days thereafter (Greene, 2012; Stuetzer & Hartmann, 2014; Sykes, 2014; Tuteja et al., 2022).

Clinical signs and symptoms of pet viral enteritis may vary depending on the causative virus, but they are quite common among pet felines and dogs. Cats often experience depression, while pet dogs and puppies have vomiting and diarrhea mixed with some yellow-green-colored signs. Like adult felines, symptoms of upper respiratory infection may appear. The symptoms include vomiting from 3 to 4 times or in some cases yellow-green colored diarrhea, and colonies are found only rarely. In dogs and cats, they become anorexic and are dehydrated soon. Furthermore, if infected dogs and cats are not treated, they become weak, and finally, convulsions and death occur about 5 to 7 days after onset. Early signs are mostly lighter. In general, diarrhea appears first, and usually, vomiting is followed. Bloody stool, convulsions, and coma may occur in severe cases due to delayed treatment (Stuetzer & Hartmann, 2014; Sykes, 2014).

### *3.1. Dogs*

Clinical signs of viral enteritis that may be exhibited by dogs can include tachypnea, tachycardia, paleness, jaundice, abdominal pain, and abdominal effusion. The predilection of the viruses for target cells can cause anemia, leukopenia, and/or thrombocytopenia. Dogs can also vomit once or not at all, less frequently, or continuously. If intestinal enteritis is expelled with mucus

and blood-containing feces, the severity of the infection may affect the volume of vomiting and diarrhea. It may reduce the circulating plasma, which may correspond to a loss of 5% before signs of dehydration appear. Affected puppies are rarely dehydrated due to continuous feeding and nutrition. The vast majority of deaths occur when puppies are less than 3 months of age. The signs of viral enteritis in dogs are highly suggestive (Meunier et al., 1985; Sykes, 2014; Kelman et al., 2020; Mia & Hasan, 2021).

Clinical signs have to be taken into consideration: they help to approach a diagnosis without further examination. Therefore, the correct characterization of the signs can often indicate the underlying infection long before laboratory results are available. Leakage in the liver has been reported but is an unusual complication. The existence of digestive abscesses or seromas is a new occurrence related to canine coronavirus. Fortunately, most dogs affected by viral enteritis recover, though in some cases, they may experience long-term dysfunction (Teramoto et al., 1984; Rypula et al., 2004; Tuteja et al., 2022).

### ***3.2. Cats***

With cats, signs of viral enteritis are much more largely confined to the digestive system and tend to be more severe than what is seen in dogs. Affected adult cats, especially those persistently vaccinated, may show only very mild signs and might go completely unnoticed clinically. Animals that are particularly at risk are kittens, especially if under weaning age and born to unvaccinated mothers, and non-vaccinated adults. In severe cases, signs of viral enteritis include the following: Severe lethargy, an affected kitten or cat is often described as very 'flat' and 'quiet'. Vomiting, the vomit produced is usually clear or brown (the latter due to dried blood). Diarrhea, some true kittens with the classic, very virulent forms of the viruses can die with substantial hemorrhaging of the digestive system and passage of very bloody diarrhea. Rapid dehydration is a big concern, mostly where there is severe vomiting and diarrhea. Untreated, an affected kitten or cat can die from dehydration very quickly. Therefore, blood tests are usually performed to assess the extent of dehydration before treatment (Radford et al., 2009; Greene, 2012; Litster & Benjanirut, 2014; Barr, 2020; Abdelbaky et al., 2024).

Other signs that can be seen with viral enteritis are a raised temperature and a loss of appetite, especially as the disease progresses, although fever and anorexia are less likely to be particularly evident compared to dogs. Less commonly, signs such as abdominal pain and a cough might be seen. Any deterioration in clinical signs is usually a very bad prognostic indicator; as is the presence of any secondary complications such as a bacterial lung infection. Early detection and treatment are crucial; although treatment must be given carefully to prevent vomiting of the medications. Differential diagnosis for viral enteritis in cats is largely the same as in dogs and the advice given for managing owners is very similar (Hartmann, 2017).

## ***4. Diagnosis***

The diagnosis of viral enteritis in dogs and cats is based on a thorough history, clinical examination, and at least confirmatory laboratory evidence. It has to be stressed that the clinical suspicion of a viral etiology is a critical step in the diagnostic process (Tuteja et al., 2022;

Abdelbaky et al., 2024). The evolution of molecular methods has definitely improved the sensitivity of such tests and increased the number of cases in which a viral agent can be identified. Moreover, advances in immunodiagnostic methods have led to the production of several rapid, on-site available tests for antigen detection in feces, swabs, or even whole blood (Teramoto et al., 1984; Zaghawa, 1993; Abdelbaky et al., 2024) .

Differentiation between viral and non-viral etiological agents is important in order to establish a first-line empiric therapy and implement additional measures, such as barrier nursing, in the clinical setting. The differential diagnosis of enteritis is established not only on the basis of the compatible clinical signs, leukogram, and biochemical changes but also on evidence of the presence of an infectious trigger. When the concurrence of health problems is present, a differential diagnosis based on the clinical impact or the life-threatening potential of the associated clinical signs is important to plan the active intervention based on actual critical health problems. Ongoing prophylactic interventions focus on reducing the infectious pressure in the same environment. The mainstay of this approach is the correct recognition of cases of viral etiological agents. An integrated approach that allows the general practitioner to interpret the presence of the most frequently identified viral enteritis is necessary (Stuetzer & Hartmann, 2014; Sykes, 2014; Sun et al., 2019).

### ***4.1. Physical Examination***

Physical examination is an essential tool in the investigation of patients suspected to have viral enteritis. Attention should be particularly focused on: assessment of hydration status, presence of abdominal pain or peritonism, and an overall body condition assessment. In many cases of gastroenteritis, pets can have a positive overall body condition despite substantial chronic disease. After a physical examination, initial impressions about the severity of the illness and the likelihood of an animal's survival should be formed. Then the subsequent diagnostic workup can be established and performed as needed. When transmissible virulent enteritis is suspected, thorough decontamination of the examination area, increased attention to infection control protocols, and a heightened awareness of personal hygiene is essential. When a vet seeks a rapid diagnosis, a physical examination is essential to identify findings pointing towards or away from viral enteritis. When specific viral enteritis testing is difficult to obtain, such clinical suspicion may lead to rapid decisions about the treatment of individual animals and will influence the prioritization for testing (Raj & Haryanto, 2020; Abdel-Baky et al., 2022) .

By careful although systematic inspection and palpation of an animal using skilled palpation techniques, superficial and more severe disease can be detected. The more detailed anamnesis and the more detailed a physical examination, the more information can be collected. Further, the physical examination can also provide information on the severity of the disease. However, physical examination is also the most difficult doctor's examination to learn and requires the most experience in daily practice. Medical details can be learned from books, but physical examination requires reading the behavior of the animal, being able to interact with the animal, and

gaining experience of the protocols and physical examination methods for individual animal species (Taylor & Harvey, 2014; Judge, 2015; Raj & Haryanto, 2020).

### ***4.2. Laboratory Tests***

Because of the variety of infectious diseases and the large area covered by enteritis, an equally large panel of laboratory tests can be utilized (Greene, 2012;Alves et al., 2018).

Serological assays are a valuable tool to diagnose an infectious disease or to demonstrate the presence of acquired immunity, even if antibodies are present only after a few weeks (Rimmelzwaan et al., 1990).

Polymerase chain reaction has been for years the gold standard to identify the nucleotide sequence of viruses: accurate, rapid, and sensitive (Teramoto et al., 1984).

Some in-situ diagnostic tools are also listed. Rapid antigen tests certainly have potential utility in clinical settings, especially when a rapid result is needed, and/or just a presumptive diagnosis will suffice. They have recently started to be commercially available for cats, although the results have to be interpreted with caution (Abdelbaky et al., 2024).

The interpretation of diagnostic tests for the infectious enterocolitis of dogs is often quite complex, and the clinician has to carefully consider the limitations and the strength of each test (Shojai, 2018; Marenzoni et al., 2020).

In all cases, the diagnosis should never rely on the results of a single test, but the results should be compared with the history, the clinical presentation, and the results of the general lab work. Indeed, laboratory findings are highly accurate in some diseases and low in others, and therefore, dramatically affect patient management, while test specificity might lead to a more complex differential diagnosis. Also, the speed of the diagnostic process together with an accurate early laboratory diagnosis enables clinicians to begin early specific treatments at the right time. (Marenzoni et al., 2020)

## ***5. Treatment and Management***

Treatment and management involve mainly supportive care for the patient. Typically, anyone who is vomiting and/or having diarrhea is losing fluids and becoming dehydrated. That dehydration can lead to even less desire to drink, worsening dehydration, acid-base and electrolyte disturbance, hypovolemic shock, and death. So, the first line of defense is indeed fluid therapy and making sure the patient can be kept hydrated without vomiting again. This sometimes mandates hospitalization for the appropriate fluid replacement when the patient is so severely dehydrated that they keep vomiting (DiBartola & Bateman, 2006; Bhat et al., 2013).

Lactated Ringer's solution is given slowly at first for the comatose, then progressively faster as signs improve. For home care, water or an electrolyte solution may be utilized as long as no vomiting persists (DiBartola & Bateman, 2006; KOZAT, 2020). Oral antibiotics are not shown to affect any of the viruses, but often the intestine is the initial point of bacterial invasion. Antimicrobial drugs may, therefore, help in preventing a sequela of secondary infection (Hartmann, 2017; Tuteja et al., 2022).

A notable exception is feline panleukopenia therapy, as antiviral treatments, symptomatic solutions, and supportive treatment can play a key role in the overall success of that patient; but these would not be used in every patient, only on an individual basis. Any animal with severe diarrhea or vomiting must have a vet visit to determine if a more serious therapy or systemic illness is required (Ulas et al., 2024). Prevention is truly often the best treatment (Hartmann, 2017; Kelman et al., 2020). Vaccinations against all the above viruses in dogs and cats are excellent plans and include indoor living and clean, hygienic, sterile food preparation areas (Eugster, 1980; Paul et al., 2023).

### ***5.1. Supportive Care***

Supportive care is a mainstay of treatment for viral enteritis. Many hospitalized kittens and puppies will require the administration of intravenous fluids. Oral rehydration solutions may be given orally, subcutaneously, or via naso-oesophageal tube to outpatients. The importance of maintaining nutritional status in these animals should not be underestimated, as many of them will have a reduced appetite as a result of upper gastrointestinal tract damage. Hospitalized patients or animals that are severely dehydrated should be monitored and receive supportive care until an improvement is seen in clinical response and laboratory results. All veterinarians should be experienced in monitoring and responding to the vital signs of animals under their care (Rice, 2017; Horecka et al., 2020).

Stress will also reduce the return to normal health. This can be minimized by simple nursing techniques such as a quiet environment, warmth, gentle handling with minimal restraint, and a box or blanket with a familiar non-contaminated odor. Animals undergoing environmental and social separation may need additional emotional support for some weeks until they are able to eat and play normally (Crawford, 2010).

Additional therapies to be considered that may help cases recover include anti-emetic therapy to reduce nausea and vomiting, appetite stimulants, and probiotics to restore the intestinal bacterial flora. In all cases, a multidisciplinary approach to nursing care should be encouraged, involving veterinarians, qualified veterinary nurses, assistants, and owners (Horecka et al., 2020).

### ***5.2. Antiviral Medications***

The use of antiviral medications in treating viral enteritis in dogs and cats can yield some benefits depending on the conditions of use and the patient. Unfortunately, not all viruses have effective antiviral treatments. One deterrent to the use of some antiviral therapies is the cost. Several antiviral treatments are extremely expensive and the cost of validated apparatus and staff training to proliferate may not be elucidated (Ulas et al., 2024).

Antiviral drugs are most effective in diminishing viral shedding if given promptly after clinical signs appear. Certain viruses require an intracellular stage of medication to be beneficial. Antiviral medication available is beneficial for the following viral infection etiologies: CPV (feline and canine) in oral, SC, or IV oseltamivir, CsA, boceprevir, remdesivir, and scTNFR1. However, the recurrence rate of FHV-1 remains high even with antiviral medication. The dosages and applications for CPV oseltamivir are

extrapolated from human pharmacokinetic trials and Simbadol (0.24 mg/kg IM Q 24 hrs for 7 days or SQ depomedrol), cesarean anesthesia (CsA) - dosage of 10 mg/kg IV on the day of surgery has been extrapolated to a dosage of 15 mg/kg IV on the day of surgery with 90% degradation resulting in 5% extrasystemic opacity per hour for 2 hours pre-CsA. Boceprevir only as a last resort. Long-term side effects have been noted in human trials. Strategies must be in place to maximize oxygenation and pulmonary function immediately following tocilizumab infusion. Clinical monitoring for signs of adverse effects (such as mild infusion reactions, hypotension, urticaria, pruritus, rash, erythema, cough, dyspnea, and acute bronchospasm) is mandatory both during and following administration, with acute hypersensitivity being considered. Animals should be pre-medicated with oral corticosteroids or injectable should there be concern for acute hypersensitivity (dosage extrapolated from human dose to a 10 mg/kg dose in dogs) (Savigny, 2008; Sykes, 2014;; Markham, 2015; Colombo & Sartori, 2018).

## ***6. Prevention and Control Strategies***

Vaccination is the primary preventive measure to decrease the incidence and severity of viral enteritis. Development of an adequate protective immune response is dependent on age, previous vaccinations, environment including hygiene management, and the presence of maternal antibodies in puppies and kittens. Booster vaccinations should be given to ensure continued immunity. Nursing queen animals should be given booster vaccinations 2 to 3 weeks before parturition in order to provide adequate viral-specific immunity to the neonates. A strict vaccination schedule from 6 to 16 weeks of age is suggested to confer optimal protection until the vaccination-induced immunity is developed. Vaccination of adult animals with unknown vaccination history should follow a full priming course. Otherwise, a booster vaccination after the whole priming course has been proven to confer a prompt and protective immune response (Eugster, 1980; Larson & Schultz, 2021; Paul et al., 2023).

Preventive measures involving hygiene and sanitation in multi-pet environments greatly reduce the possibilities of transmission of viruses among resident animals or when new pets are introduced. Owners should be educated in recognizing early symptoms of enteritis diseases in their pets, in order to allow prompt veterinary diagnosis and early control of the disease (Radford et al., 2009; Hartmann, 2017; Shojai, 2018; Kelman et al., 2020).

Quarantine and isolation are very important in controlling the outbreak of enteritis when it occurs, involving the use of separate rooms, cages, and materials, dedicated staff, protective clothing including gloves, shoe covers, and masks. In case of an outbreak of illness, pet owners should consult their veterinarian and a public health official if they are in any doubt regarding their methods and recommendations (Crawford, 2010; Litster & Benjanirut, 2014 ; Horecka et al., 2020).

### ***6.1. Vaccination***

Vaccination against pet animal enteric viruses is critical to prevent infection. For dogs, the current recommendation is to vaccinate puppies at 6, 8, 10, and 14 weeks of age against CPV using modified live virus vaccine with a

subsequent booster for dogs at one year, followed by three yearly vaccinations with MLV or live but attenuated virus. For cats, the recommendation is to vaccinate kittens with FPV or MLV against the herpes virus and calicivirus at 6, 8, 10, and 14 weeks, with revaccination at one year, followed by three yearly vaccinations. For both species, a titer may indicate long-term immunity for both, but for the cats, the level of MDA present and prior exposure to the virus may moderate a vaccine reaction (Davis-Wurzler, 2006, 2014).

### ***6.2. Hygiene and Sanitation Measures***

Sanitation procedures decrease or eliminate the sources and reservoirs of infection, and personal hygiene prevents the contamination of susceptible animals. Owners need to be advised properly to achieve the success of such procedures. A veterinarian can play a key role in educating the clients on the importance of routine veterinary care and related matters. Starting with the reception, the animal hospital, shelters, or grooming industries have to be kept in a hygienic condition. This may be a long-term preventive solution. The severe failure to implement this method led to the spread and outbreak of parvovirus toward the end of the 20th century. Sanitation procedures are necessary in both animal shelters and breeding kennels because contaminated environments greatly increase the severity and frequency of virus shedding (Dvorak & Petersen, 2009; Addie et al., 2015).

During the treatment of animals, cleaning and disinfection of food dishes, the living quarters, gloves, scrubs, and overalls should be cleaned and disinfected properly. Owners need to cooperate by cleaning their living area, properly disposing of food and other debris, and they should be encouraged to clean their hands or wear gloves. The animals should be kept in areas that can be cleaned and disinfected properly. Zoos and animal stands should maintain a certain standard of cleanliness in their compounds. Proper sanitation and hygiene do not only reduce the risk of infection in housed animals but are a means to protect the public (Sykes & Weese, 2014).

Many individuals have to be educated about this aspect of pet ownership. It is necessary to teach owners the principles of cleanliness and the transmission route of disease from pets to people. They need to know how to clean, what to use, how to recognize an infected animal, and to report this to their veterinarian. It may be necessary to have public health officers involved in such programs to ensure adequate knowledge reaches the public (Petersen et al., 2008).

Products that have proved to be successful against infectious agents should be used. They should have a virucidal effect against past and current viral pathogens. They are in powder or liquid form and can be used via a compressed sprayer. The best hygiene protocol is hand washing with antiseptic soap after handling any animal and before handling food or placing fingers in mouths. The use of disposable gloves is recommended when handling infectious animals. Gloves should be changed between animals. Prior to their disposal, gloves should be carefully removed and hands washed with antiseptic soap. Waterless hand cleaners can be used and can have a potent antiviral effect (Dvorak & Petersen, 2009; Addie et al., 2015).

## ***7. Zoonotic Potential***

Although there are enteric diseases that can affect humans and animals, the viral agents causing enteritis in dogs are not considered to be pathogens with zoonotic potential, which may cause concerns to pet owners regarding the risk of animal-to-human transmission (Sykes, 2014).

There are some viral agents that may pose a risk to humans when infecting pet dogs. Among these, canines infected with coronavirus and rotavirus may act as primary reservoirs for transmitting the human coronavirus and rotavirus (Charoenkul et al., 2021). In the case of cats, several enteroviruses are known to infect different species, but the feline parvovirus and feline coronavirus are not considered to show zoonotic potential and usually exhibit a host-specific clinical course, resulting in specific diseases (Tuzio et al., 2005).

Although the zoonotic potential of cat calicivirus has not been reported, the Japanese cat calicivirus and severe acute respiratory syndrome may share factors and portals of exit in common. Thus, the possibility of cat-to-human transmission should not be underestimated, especially when the animal is present (Radford et al., 2021).

Since many viral agents are host-specific, pet owners can be relieved from unnecessary fears through careful precautionary measures based on accurate information. When the caregiver of a pet with viral infectious enteritis is worried, the caregiver should discuss with a veterinarian about the exposure and test if necessary. When symptoms appear in humans exposed to dogs or cats, it is important to treat the cause immediately by consulting a specialist, as they can result in serious consequences such as superficial inflammation or systemic infection, depending on the cause and immune status. In addition, it is important to always maintain good hygiene practices (Lappin, 2005).

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