

PARVOVIROSIS: A CASE REPORT AND A REVIEW OF LITERATURE

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Abstract

This paper aims to present a case report of three young Labrador puppies six months old, puppies living in three different homes, but belonging to the same litter in Cluj-Napoca. In addition to this this paper aims to review the literature regarding parvovirus. Parvovirus is an extremely contagious and fatal disease that occurs especially in young dogs, affecting the gastrointestinal tract and in more extreme cases it also affects the heart of the patients. Parvovirus is produced by a virus of the Parvoviridae family, the Parvovirus genus, more exactly CPV-2. Preventable through vaccination, the newest cases have shown that even the best vaccines are ineffective, resulting in the apparition of the horrible disease. The diagnosis is quite simple to put, the clinical signs being extremely relevant. Additional tests may be used, helping with the assessment regarding the evolution of the disease. The prognosis of this disease depends of the virulence of the virus strain as well as the response of the organism to the treatment. However, it is also important that the treatment is started as soon as possible, because without it, the prognosis is fatal. These three young Labrador puppies are the living example that the vaccines used in them for the prevention of this fatal disease were not efficient. The disease first appeared in cats 1978, but since then the disease has appeared to dogs as well. Lately in Cluj there has been an explosion of cases, the virus attacked without considering the vaccine status of patients. This paper will present the outcome of the treatment in these particular cases, more exactly two males and one female, belonging to the same litter, all three being treated inside the Infectious Diseases Clinic of the Veterinary Medicine Faculty in Cluj Napoca.

Key words: parvovirus; dogs; infectious.

INTRODUCTION

Parvovirus is a infectious, highly contagious disease, which was first described in cats in 1978, but it had rapidly evolved and developed in dogs as well (Carmichael, 2005). This is one of the most important viruses that infect both the wild and domestic canids, being found worldwide. Parvovirus type 2-c (CPV-2) is a small non-enveloped virus, belongs to the *Parvoviridae* family and contains a single stranded DNA of about 5.2 kb in length (Miranda et al., 2015). The virus has a , non-enveloped icosahedral capsids (Xie & Chapman, 1996). The capsid contains 60 protein subunits of VP1 and VP2 (54–55 copies). These all share the same structure and are produced by the alternative splicing of viral mRNAs (Miranda et al.,2016).

The central core of the capsid is highly conserved that is composed of an eight-stranded, antiparallel β -barrel with flexible loops between the β -strands. These strands

form the surface of the capsid which has a 22 Å spike on the threefold axes, a 15 Å deep canyon that surrounds the cylindrical structures at the fivefold axes, and as well as a 15 Å deep depression “dimple” at the twofold axes. Moreover the threefold axes are the most antigenic region of the capsid. They serve as a target for neutralizing antibodies (Agbandje et al., 1993).

Studies have shown that the disease occurs in 6–12 week-old pups; while younger dogs are generally protected from infection by maternally-derived immunity (Desario C., et al., 2005). Other studies have shown that puppies between 6 weeks and 6 months are more vulnerable to the disease (Prittie, 2004). In contrast with the literature findings, the oldest patient with parvovirus was 12 months old.

Regarding the breed susceptibility, literature cites that certain black and tan colored dogs have a higher sensitivity to the disease. Rottweilers, Doberman Pinscher and Pitbull

terriers being some of them (Nelson et al. 1998). Another research quotes the Labrador Retriever and German Shepherd as two breeds that commonly develop parvovirus (Nandi et al., 2010). Goddard and Leisewitz (2010) declare that male that are not neutered have twice the bigger risk of developing CPV, than the sexually intact females.

There are two ways of contamination, the direct one, that takes place through the fecal-oral route, and the indirect one through exposure to infected objects, clothes, people. It is extremely important to be noted that the fecal excretion will take place up to 4 weeks after the clinical sign have been ameliorated. The replication begins in the lymphoid tissue of the oropharynx, mesenteric lymph nodes and thymus. From here it is spread to the intestinal crypts of the small intestine via hematogenous spread (Amelia Goddard).

Diagnosis of CPV can be based on the clinical signs but literature cites the tests that can detect viral antigens by means of antibody based methods, because they are handy and available on the field. However, their sensitivity, has been proven inferior to molecular testing. An immunochromatographic (IC) test was compared to molecular techniques, and it was revealed that the sensitivity of the test did not exceed 50%, whereas the specificity was 100%. It was believed that these poor results were because the virus doesn't always shed in the feces or it is shed in low amounts (Desario et al., 2005).

Some studies have revealed that hemagglutination and virus isolation were tried as alternative techniques to diagnosing CPV but it is rather difficult and only well equipped laboratories are prepared for this.

Subsequently, several PCR assays were developed that displayed increased sensitivity and specificity in comparison with traditional methods (Marulappa et al, 2009).

Treatment ideally also consists of crystalloid IV fluids and/or colloids, antiemetics and broad-spectrum antibiotic injections (Macintire et al, 2008).

Fluid therapy is extremely important, combating dehydration and electrolyte imbalance. The fluids are typically a mix of a sterile, balanced electrolyte solution, with an appropriate amount of B-complex vitamins,

Haes. Some authors recommend enrofloxacin as a broad spectrum antibiotic but some of them not, because it affects the growing cartilage.

There have been some reports saying that oseltamivir can reduce the severity of the disease and shorten the disease. This neuraminidase inhibitor may limit the virus ability to invade the intestinal crypt cells, decreasing the toxin production (Macintire, et al, 2006). Without the treatment CPV is fatal.

This is a preventable disease through vaccination and rigorous disinfection (Ettinger et al 1995), (Oh et al, 2006).

MATERIALS AND METHODS

Three Labrador Retrievers, 6 months old puppies, two males and one female, (Marco fig 1, Missy, fig. 2 and Spark fig. 3) presented in the fall of 2017 at the Emergency Hospital from the University of Agricultural Sciences and Veterinary Medicine in Cluj-Napoca. They live in separate homes but they come from the same litter, all presented vomiting and haemorrhagic diarrhea and they were further redirected to the Infectious Diseases clinic. The health books shown that all three subjects were vaccinated with the vaccination scheme complete, the vaccines used are believed to be good and efficient. The last vaccine was 3 months before the signs developed. Internal deworming was as well done properly. Rapid snap tests were taken and all three came out as positive. Haematology revealed leukopenia in different stages for the three puppies. Copro-parasitologic exam revealed that one of the puppies has *Sarcocystis* spp. After further questioning the owner we learned that the fed him raw meat. In Table 1 it is shown the medication treatment applied to the dogs, describing the action mechanism and the general use of them.

The treatment plan for all of the three patients varied on body weight and the dehydration degree. Parvovirus being a viral disease, the only treatment that is appropriate is a symptomatic one. It aims to combat dehydration by stopping vomiting and diarrhea as well as strengthening the immune system through vitamin therapy. An important step in the process is general antibiotic therapy as well

as an anti-infectious medication. In addition to this autohemotherapy was done to all three puppies.



Fig. 1. Marco one of the Labradors (original)



Fig. 2. Missy the female Labrador (original)



Fig. 3. Spark the third puppy (original)

Table. 1. Therapy medication, dosage and their action

Medication	Dosage	Action
Ringer Solution	Depends on the dehydration	It is used to supplement fluids and salts in the blood.
Duphalyte	25-50 ml/5 kg	Solution made from vitamins (B1, B6, B12, Nicotinamide, Dexpantenol), Electrolytes (Ca, Mg, Cl) and Aminoacids (Arginine, Cysteine, Anhydrous dextrose)
Tetraspan	10-20 ml/kg	It promotes retention of the fluid in the vascular system through the exertion of oncotic pressure
Metronidazole	10-15 mg/kg	The mechanism is not entirely known but it appears that in anaerobic conditions it binds to DNA and causes cell death.
Pantoprazole	2 mg/kg (can be divided into two doses)	"Selective proton pump inhibitor", a medicine that reduces the amount of acid produced by the stomach.
Hyoscine Butylbromide	1 ml/10 kg	Is effective against spastic pain in the gastrointestinal organs, bile and urethral tract
C Vitamin	1 g/day	It stimulates tissue oxidation processes and has antitoxic and anti infectious action; helps maintain the integrity of the capillaries. It interferes with the healing of the lesions and the blood clotting. It increases the effectiveness of antimicrobial therapy.
Etamsylate	2 ml	Improves platelet adhesion, increases capillary resistance and reduces its permeability, shortening bleeding time and reducing blood loss.
Carbazochrome	2,5-5 ml	It is capable of stopping low-intensity bleeding.
Amoxicillin + clavulanic acid	8,75 mg/kg (once a day)	Broad spectrum antibiotic, efficient against both Gram negative and Gram positive bacteria
Maropitant	1 mg/kg	Inhibits vomiting reflex by blocking NK-1 in medullary vomiting centre.
Enteroguard	1 tablet/ 3 kg	Enteroguard M tablets are used to prevent and combat primary and secondary enteropathy produced by bacteria and protozoa
Eridiarom	1tablet/3 kg	Eridiarom reduces intestinal peristalsis without constipation; is astringent of the gastrointestinal mucosa, bacteriostatic, antiseptic, antihistaminic, antiparasitic and hypoglycemic.
No-Spa	2 mg/kg	Drotaverine is an antispasmodic agent whose action is based on significant inhibition of phosphodiesterase enzyme (PDE), responsible for AMP-cyclic hydrolysis (AMPC) in AMP, resulting in smooth muscle relaxation
Autohaemotherapy	5 ml of the patient	Injected in the sc axillary region

RESULTS AND DISCUSSIONS

The treatment lasted between 8 days, each patient receiving medical care as needed, the longest treatment being in the Spark patient, a patient who was also diagnosed with Sarcocystosis. The patient Marco was the first of the brothers who showed appetite for food and water, consuming them without vomiting or without diarrhea. This happened on day 4 of treatment, the next day again vomiting. Treatment of this patient continued until day 6, when body temperature was normal, present appetite, consciousness and joy, consumed food without any problems, and the haematological examination revealed an excellent state of health. Missy the female patient has developed an easier form of the disease, which only vomits one time during the course of the disease. From the very beginning hematology revealed a moderate leukopenia compared to her siblings. This supports the literature that states that females are more resistant to this virus. Given that it contacted a mild form, recovery was shorter. The third patient, Spark suffered from a slightly increased form of hemorrhagic gastroenteritis due to the presence in the feces of the *Sarcocystis* parasite. The treatment of this patient lasted 8 days, but at the end of the patient, the patient was clinically healthy.

Dog owners have been informed throughout the treatment of the evolution of the cases, as well as the measures to be taken to prevent as far as possible the spread of the virus. They were familiar with disinfectants that have the ability to destroy the virus (ecocide, sodium hypochlorite).

It is important to remember that dogs that pass through parvovirus and survive, remain bearers and eliminators of the virus for a period of time that may vary from week to month.

The prognosis of this disease is generally reserved. For these cases, the prognosis was favorable because they were already vaccinated, being more or less immunized, as well as the fact that they were presented to the doctor as soon as they discovered that their puppies feel ill. Samples from each dog were taken for further analysis, regarding the strain producing parvovirus.

CONCLUSIONS

Parvovirus is a worldwide spread infectious disease that affects young dogs and it can be fatal without treatment.

It seems like even if the dogs were vaccinated and well taken care of they still developed the disease, lighter forms of it, all thanks to the immunity the vaccination conferred them. It is not known why they contracted the disease, giving that they were immunized. This remains still unclear, but there are steps to solve the puzzle. Parvovirus is a fairly studied disease, but it seems that the strains are very powerful and there are still so many aspects unknown.

REFERENCES

- Agbandje M., McKenna R., Rossmann M.G., Strassheim M.L., Parrish C.R., 1993, Structure determination of feline panleukopenia virus empty particles. *Proteins* 16, 155–171;
- Carmichael, L. E. ,2005, An annotated historical account of canine parvovirus. *J Vet Med B Infect Dis Vet Public Health* 52, 303–311.
- Decaro N., Buonavoglia C., 2012. Canine parvovirus—a review of epidemiological and diagnostic aspects, with emphasis on type 2c. *Vet. Microbiol.* 155 (1), 1–12;
- Desario C., Decaro N., Campolo M., Elia G., Martella V., Ricci D., Lorusso E. & Buonavoglia C., 2005, Clinical and virological findings in pups naturally infected by canine parvovirus type 2 Glu-426 mutant. *J Vet Diagn Invest* 17, 133–138;
- Ettinger, Stephen J., Feldman, Edward C. , 1995, *Textbook of Veterinary Internal Medicine* (4th ed.). W.B. Saunders Company.
- Goddard A., Leisewitz A. L. , 2010, Canine Parvovirus, *Vet Clin Small Anim* 40, 1041–1053;
- Macintire, Douglass K., 2006, "Treatment of Parvoviral Enteritis". Proceedings of the Western Veterinary Conference. Retrieved 2007-06-09;
- Macintire, Douglass K. , 2008, "Treatment of Severe Parvoviral Enteritis". Proceedings of the CVC Veterinary Conference, Kansas City. Retrieved 2011-08-10;
- Marulappa S.Y., Kapil S., 2009. Simple tests for rapid detection of canine parvovirus antigen and canine parvovirus-specific antibodies. *Clin. Vaccine Immunol.* 16, 127–131;
- Miranda C., Calvarheira J., Parrish R.C., Thompson G., 2015, Factors affecting the occurrence of canine parvovirus in dogs, *Veterinary Microbiology*, Volume 180, Issues 1–2, 59-64;
- Miranda C., Thompson G., 2016, Canine parvovirus: the worldwide occurrence of antigenic variants , *Journal of General Virology* (2016), 97, 2043–2057;
- Nandi S., Kumar M., 2010, Canine Parvovirus: Current Perspective, *Indian J Virol.* 21(1): 31–44;

Nelson, Richard W.; Couto, C. Guillermo, 1998, Small Animal Internal Medicine (2nd ed.). Mosby. ISBN 0-8151-6351-7;

Oh J, Ha G, Cho Y, Kim M, An D, Hwang K, Lim Y, Park B, Kang B, Song D (2006). "One-Step Immunochromatography Assay Kit for Detecting

Antibodies to Canine Parvovirus". Clin. Vaccine Immunol. 13 (4): 520–4;

Prittie, J., 2004, Canine parvoviral enteritis: a review of diagnosis, management, and prevention. J. Vet. Emerg. Crit. Care 13, 167–176.