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Canine distemper virus in Chile: Up date

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Abstract

The canine distemper virus unleashes ambiguities in Chile. There are academics from our Faculty who have begun to study it and have not yet yielded credible results, there are those who recently obtained funding to "begin" the antigenic and genomic characterization of the virus, and there are others who have described the existence of at least two of the fourteen Described genotypes: American-1 and European-1.

The subject is exciting and jokingly he always said that when I am no longer here, even the Faculty will change its name incorporating "and canine distemper", because on that date someone else would take charge of the subject and then it would be interesting to study it. I fell short, it already started...

Keywords: Canine distemper; Detection; Extinction animals; Virus

1. Introduction

Canine distemper (CD) an infectious disease is caused by Canine distemper virus (CDV), a lipid-enveloped pleomorphic virus from the genus *Morbillivirus* of the *Paramyxoviridae* family, *Mononegavirales* order . As the name of its order indicates, it is a negative-sense single-stranded RNA virus. Its unsegmented genome is about 15.7 kilobases (kb) [1]. The genome encodes for six structural proteins: the nucleocapsid protein (N), the phosphoprotein (P), the matrix protein (M), the polymerase (L), and the envelope glycoproteins: the fusion protein (F) and hemagglutinin (H). The N, P, and L proteins together with the viral RNA form the ribonucleoprotein complex (RNP), which directs the sequential synthesis of mRNA from viral genes and the replication of antigenomes. The F and H proteins are integral proteins, associated with the M protein, which carry out the interaction between the RNP complex and the membrane. The integral membrane proteins are responsible for virion recognition for entry into host cells, being the main targets of the immune system [2, 3]. The hemagglutinin, is the main determinant of cell tropism [4] and the virus is very sensitive to the environment. In addition to this, there are animals that excrete the virus before showing signs [4, 5].

1.1. Host Range

The VDC has numerous hosts from *Carnivores* orders such as *Canidae* (dogs, foxes, wolves, dingoes, coyotes), *Procionidae* (raccoons, coatis), *Mustelidae* (ferrets and mink), *Felidae* (tigers, lions, leopards) and even in marine mammals [4, 5, 6]. On the other hand, a possible relationship between Paget's disease in humans and CDV infection has been demonstrated, due to the detection of viral RNA in affected tissues [7, 8]. In Chile, in 1994, the first isolation of the virus in cell cultures was carried out, it was reported inoculated with reactions from a canine with clinical signs of CD, where the clinical diagnosis was achieved by electron microscopy and histopathological studies [9]. In 2003, an outbreak of CD occurred in the endemic populations of foxes in the Fray Jorge National Park (Coquimbo Region) and it was speculated that it could be related to the existence in native mustelids such as chingue and quique [10]. Four years

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later, in 2007, an outbreak of DC occurred on Robinson Crusoe Island. (Valparaíso Region), where several domestic dogs were affected, but not the island's endemic sea lions [11].

1.2. Pathogeny

The course of the disease is variable and largely depends on the efficacy of the host's immune response. Those affected are puppies between three and six months of age, since their immune system is poorly developed and they have already lost the main maternal results [4, 6]. The virus enters the respiratory tract and during the first 24 hours it affects the regional lymph nodes and after 7 days all the lymphoid tissue, producing immunosuppression due to the decrease in the appearance of T and B lymphocytes [3]. In the following weeks, the animal may recover or present symptoms associated with a secondary viremia, since the infected mononuclear cells transport the virus to the epithelial surface of the digestive, respiratory, urogenital, cutaneous and/or central nervous system tracts, with the respective clinical manifestations of each affected organ [5]. Currently, in addition to antibiotic treatment to prevent secondary infections, which are very common in immunosuppressed animals, there is no effective treatment against CDV (6]. Most of the vaccines used correspond to polyvalent attenuated virus vaccines, which provided limited protection and also have the risk of causing diseases, because they maintain their lymphotropism and ability to induce immunosuppression [6, 12]. Recombinant vaccines are a safer option as they spare the pathogen and use some of its boosters to stimulate a host immune response. These vaccines show high efficacy, with higher affinity and duration of test production than attenuated virus vaccines [13].

1.3. Diagnostic methods

There is a wide variety of laboratory diagnoses that can be performed to differentiate other diseases with similar symptoms. Among them are:

- ELISA for the detection of specific IgM against VDC: This test is quite useful, since immunoglobulin M in dogs terminated by VDC persists for 5 weeks to 3 months depending on the strain and the immune response of the recipient. Sampling should be done at least 3 weeks after vaccination against the virus, since IgM persists around this time in the animal, which can result in a false positive [14].
- Molecular techniques (PCR): The polymerase chain reaction associated with the reverse transcription of the viral genome (RT-PCR) is used for the epidemiology of the virus and the dynamic circulation of the different existing strains. [15].Using this technique and based on the sequencing of the H gene, it has been possible to determine the existence of at least 14 different strains of the virus: Europe-1/South America-1, South America-2, South America-3, Europe wild, Asia-4, America-2, Rockborn-Like, Africa-2, Asia-1, Arctic, Africa-1, Asia-2, Asia-3, and America-1 [16]. Of these lineages, it has been proven that in Chile, there are at least two of them, the America 1 and Europe-1/South America-1 lineage [17].

Therefore, in this short review we point out that in Chile there are at least the America-1 and European-1 genotypes based on the use of the RT-PCR protocol for the detection and genotyping of the canine distemper virus in Chile by means of the obtaining specific primers for the detection of both the VDC N gene and the H gene of VDC and proposing the conditions for the development of a multiplex RT-PCR protocol

2. Material and methods

The infrastructure of the Faculty of Veterinary Sciences of the University of Chile has been used, particularly the Microbiology and Virology laboratories of the Department of Animal Preventive Medicine.

2.1. Samples and controls

Various samples from dogs with signs compatible with CD have been used and the viral RNA has been obtained, using to date various protocols using the N, P, M and L genes as detection targets, reserving the H gene for genotyping [18-26]

The positive controls used initially corresponded to the available vaccines. Then, for each protocol used, their own positive controls are kept frozen.

The negative controls used have included RNA from other viruses existing in the laboratory and nuclease-free water has always been used as reagent control.

Collaborative studies have been carried out in dogs, foxes and maned wolves (Buin Zoo), detecting the CDV virus in two of these species; it has not yet been detected in foxes [18-29]

2.2. Protocols that use the Design of primers

All the protocols that use this activity have had the Genbank® as a database and the use of the Clustal Omega program, to finally use an excellent program for the generation of primers: Invitrogen's OligoPerfect Desig ® [18-26]

3. Discussion

In this text, the ways of detecting and genotyping the canine distemper virus have been described, taking as an example the current situation in Chile regarding the pathogen that causes the disease. Obviously, the idea can be applied to any geographical reality and especially to animals in danger of extinction. If we can, you can too! And this final sentence not only involves students, professors, and researchers from all over the world, but also those who are even closer to us and who have made our work invisible in this regard. Cheer up…!

4. Conclusion

Kary Mullis's fantastic idea together with the primer design can make the difference between current diagnostic methods. The CDV virus has been studied in our Faculty since 2010 which has made some uncomfortable, but the result is also fantastic: 12 new veterinarians physicians for Chile and our Faculty will not change its name yet.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

No conflict of interest.

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