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Canine distemper: epidemiological findings of 250 cases*

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Cinomose: achados epidemiológicos de 250 casos

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SUMMARY

A review of the number of dogs submitted for necropsy at the Department of Veterinary Pathology of the Federal University of Santa Maria, RS, between 1985-1997 has shown that 11.7% (250/2136) had lesions and inclusion bodies characteristic of infection by canine distemper virus (CDV). Most of these cases occurred during the winter months in dogs that were less than 1.5 year old, which were submitted by residents from the city of Santa Maria. Canine distemper is considered endemic in this city. Significant differences in susceptibility were not observed between males and females. Mongrel dogs were super-represented, but dolichocephalic breeds were more affected than brachycephalic ones. Distemper encephalopathy with typical CDV inclusion bodies, especially in astrocytes, was the main lesion and occurred in 82% of these cases. Eosinophilic inclusion bodies characteristic of canine distemper were also observed in epithelial cells of the urinary bladder (15%), lung (6%), stomach (3%), kidney (1%), and tonsil (0.5%).

UNITERMS: Epidemiology; Distemper virus; Dogs.

INTRODUCTION

Canine distemper virus (CDV) belongs to the genus *Morbillivirus* (Paraxyviridae)[8,19,23], has world-wide distribution[19,25], and is one of the most important infectious agents within canine populations[8,26].

Clinical manifestations of distemper occur in all members of the Canidae, Mustelidae, and Procyonidae families[2,19,23,25]. Canine distemper virus has also been related with encephalitis in large felines, such as the tiger (*Panthera tigris*)[4,6,11], lion (*Panthera leo*), leopard (*Panthera pardus*), and jaguar (*Panthera onca*)[4], and with systemic lesions in a masked palm civet (*Paguma larvata*)[17]. Distemper-like diseases have been diagnosed in seals (*Foca vitulina*)[15,19], porpoise and dolphins[8,23]. Although domestic cats and pigs have been infected experimentally, these are not considered important in the transmission of canine distemper[3].

The difference in susceptibility between males and females to CDV infection has not been well elucidated. Some authors[1,13] have indicated that a difference exists, but Gorham[10] believed otherwise. Although racial preference to CDV has not been described, brachycephalic dogs are considered less susceptible to encephalitis than dolichocephalic breeds[10]. Young dogs, especially neonates and recently weaned dogs, are generally more susceptible to CDV infection, demonstrating a relationship between susceptibility and age[15].

Epidemiological studies of canine distemper have been described in many countries, including India[1], Denmark[5], Finland[9], Brazil[12], and North America[13,14]. In these studies evaluating methods ranged from serological surveys of neutralising antibodies[13], examination of clinical reports[12], mail surveillance surveys[14,18], to the evaluation of antibodies and antigens[5,9].

Although the seasonal occurrence of CDV infection has been described by some authors[10,18], its exact relation with infectivity has not been well-defined[21]. In one study more cases were observed during the winter than summer months[1], while a change in the occurrence of more CDV cases from winter to summer months was observed in another[18].

This article describes the epidemiological findings of canine distemper virus in dogs submitted for necropsy at the Department of Veterinary Pathology, Federal University of Santa Maria (DVP/UFSM), Santa Maria, Rio Grande do Sul, Brazil, between 1985 and 1997.

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MATERIAL AND METHOD

All cases of CDV in dogs submitted for necropsy and diagnosed by histopathology, at the DVP/UFSM, between 1985 and 1997, were reviewed. Data relative to age, sex, breed, city of origin, type of lesion, and time of death were collected and analysed.

Cases were considered CDV positive by the finding of nonsuppurative demyelinating encephalitis, nonsuppurative interstitial pneumonia, and eosinophilic inclusion bodies characteristic of canine distemper in nervous tissues and epithelial cells of body organs[8]. The Veterinary Hospital (VH/UFSM), being a shelter for animals during undetermined periods, was included as local of origin.

Point and period prevalence were determined by methods already described[22]: point prevalence was based on the number of dogs annually diagnosed CDV positive, while the period prevalence was related to the number of dogs diagnosed positive during the entire study period. The number of positive cases was used as the numerator, while the total number of dogs attended and submitted for necropsy was used as the denominator. Climatic data[a] were compared with the time of death, while the number of dogs attended[b] at the VH/UFSM was compared with the number of dogs submitted for necropsy.

RESULTS

During 1985 to 1997, 250 of 2,136 dogs submitted for necropsy at the DVP/UFSM had lesions and inclusion bodies characteristic of CDV infection.

The point prevalence for dogs attended at the VH/UFSM varied between 0.67% (1996) and 5.74% (1986), while for those submitted for necropsy ranged from 4.73% (1996) to 20.28% (1993). However, the period prevalence for dogs attended was 1.98%, and 11.7% for dogs submitted for necropsy (Tab. 1).

Most (87.2%) of the distemper cases were submitted by residents from the city of Santa Maria; 6.8% from the VH/UFSM, and 6% were from neighbouring cities.

Age ranged from 11 days to 12 months, but the overall average was 1.79 year. Significant age differences were not observed between males and females infected by CDV (Tab. 2). Young dogs, between 0 and 1.5 year, were more affected, and contributed to 62.8% (157/250) of all CDV diagnosed cases, while a reduced percentage 6.4% (16/250) of CDV infection was observed in dogs that were six years of age or older.

Mongrel dogs were super-represented in this study, and contributed to 54% (136/250) of all CDV diagnosed cases. Within the established canine breeds, German Shepherd, with 10% (25/250) of all positive cases, was the most expressive. Other breeds that were significant in this study included Cocker Spaniel, Fox, and Siberian Husky, with 4% (10/250), "Fila Brasileiro" 3.6% (9/250), Doberman 3.2% (8/250), Pointer and Poodle 2.8% (7/250), and Collie 2.4% (6/250). Breeds with less than 2% of positive cases included Boxer, Chow Chow, Great Dane, Pinscher, and Rottweiler, among others (Tab. 3).

There was a direct relationship between the number of distemper cases and the relative humidity of the air and temperature. The global increase in the number of cases corresponded to a decrease in temperature and relative humidity. Alternatively, a decline in the number of cases was observed when the relative humidity was low and the temperature began to rise. This resulted in an increase in

Table 1

Annual prevalence of canine distemper virus in dogs attended at the Veterinary Hospital and submitted for necropsy between – Santa Maria – 1985 -1997.

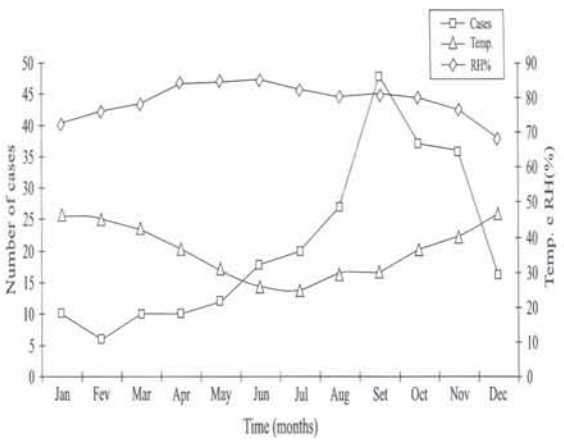

Table 2

Age range and sex distribution of dogs infected by canine distemper virus – Santa Maria – 1985 -1997.

Age range (years)	Number of cases	Sex		Prevalence (%)
		Males	Females	
0 - 1.5	157	75	82	62.80
1.6 - 3.0	37	21	16	14.80
3.1 - 6.0	40	20	20	16.00
> 6	16	8	8	6.40
Total	250	124	126	100.00

[a] Santa Maria Air Base.

[b] Veterinary Registry and Statistical Service da UFSM.

Table 3

Breed distribution of dogs infected by canine distemper virus – Santa Maria – 1985 -1997.

Breed	Number of cases	Percentage
Mongrel	136	54.4
German shepherd	25	10.0
Cocker Spaniel	10	4.0
Fox	10	4.0
Siberian husky	10	4.0
Fila Brasileiro	9	3.6
Doberman	8	3.2
Pointer	7	2.8
Poodle	7	2.8
Collie	6	2.4
Pinscher	4	1.6
Dachshund	3	1.2
Others[a]	15	6.0
Total	250	100.0

[a] Others (Boxer, Chihuahua, Great Dane, Basset, Chow Chow, Dalmatian, Danish, Belgian shepherd, and Rottweiler).

the number of cases during winter and spring, and a corresponding decrease during summer and autumn. This seasonal prevalence of distemper began to increase with effect from July, having a peak in September, a decline in November, and the consistency in the number of cases maintained during the following months (Fig. 1).

In many cases, typical CDV inclusion bodies were seen in several body tissues of the same dog. Nonsuppurative demyelinating encephalitis with characteristic CDV inclusion bodies, especially in astrocytes, was the main lesion and occurred in 82% (205/250) of all CDV diagnosed cases. Interstitial nonsuppurative pneumonia with typical CDV inclusion bodies in epithelial cells was diagnosed in 6% (15/250) of CDV cases. Inclusion bodies were also seen in epithelial cells of the urinary bladder 15% (39/250), stomach 3% (8/250), kidney 1.2% (3/250), and tonsils 0.8% (2/250).

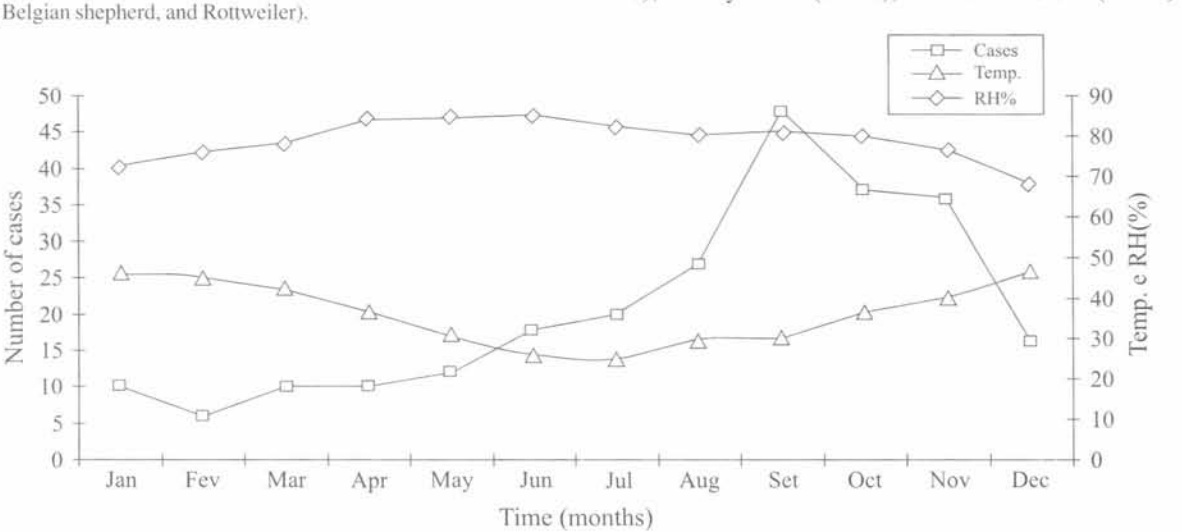

Figure 1

Monthly distribution of CDV cases with relation to temperature and relative humidity of the air. (Temp.: temperature; RA (%): relative humidity of the air).

DISCUSSION

This study has shown that CDV infection was responsible for the death of 11.7% (250/2136) of the dogs submitted for necropsy at the DVP/UFSM, which corresponded to 1.98% (250/12638) of all dogs attended at the VH/UFSM during 1985 to 1997. These figures have indicated that CDV is the main cause of death in dogs submitted for necropsy in our laboratory, and perhaps within the city of Santa Maria, RS.

Although the epidemiology of canine distemper in Santa Maria and neighbouring cities was not the purpose of this study, data collected suggest that CDV is enzootic in Santa Maria. The enzootic prevalence of CDV in this city is directly related to the fact that 87% (217/250) of all positive cases were submitted from residents of Santa Maria associated with the annual distribution of these cases, which demonstrated an endemic pattern[22]. However, the exact prevalence of canine distemper in Santa Maria would only be discovered upon realisation of an extensive survey.

Due to the fact that 6.8% (17/250) of CDV cases in this study were submitted from the VH/UFSM, this local should be considered as an important source of transmission of CDV between healthy and sick dogs. The close proximity between healthy and diseased dogs during clinical attendance associated with the oro-nasal dissemination of viral particles[8] increases the risk of healthy dogs being contaminated by diseased ones. Dogs submitted at the VH/UFSM for necropsy were involved in experiments or utilised during practical teaching classes,

and were maintained for undetermined periods with other animals. Further, CDV is known to remain in dogs housed in shelters[24].

Data collected in this study indicate that there was no difference in susceptibility to CDV infection between males and females. Similar results were described in Indiana, USA[18]. These findings support the theory that the sex of the host does not have any effect on CDV prevalence[10]. However, different results were obtained in other studies. More males than females (60:40%) were infected in Madras City, India[1], while the contrary (45:55%) was related in Texas, USA[13].

More than half (54%) of the dogs infected in this study were mongrels. Elevated indices (35% and 62%) of CDV infection in mixed-breed than pure-breed dogs have already been described[1,18]. Although the exact reason for mixed-breed predominance to CDV infection is unknown, mongrels may receive less attention, and are considered more apt to roam and contact CDV carrier dogs than their pure-breed counterparts[18], thereby increasing their risk of infection. However, within pure-breed dogs, dolichocephalic breeds, such as German shepherd, Fox, Siberian husky, and Doberman, were more affected than brachycephalic ones in this study. This significantly greater number of dolichocephalic breeds (dogs with long and pointed nose) infected agrees with the theory that brachycephalic breeds (dogs with broad heads and short faces) are less likely to have encephalitis than dolichocephalic ones[10]. This theory, however, was not sustained by the results of another study in which the contrary was reported[18].

The occurrence of the distemper encephalitis in 82% (205/250) of the diagnosed cases and in 63% (157/250) of dogs with less than 1.5 year of age in this study suggests that high indices of mortality are normally associated with distemper encephalitis[21,24]. This finding is similar to the results of other authors[9,12], and is in agreement with the affirmation that neonates, recently weaned[16], or young dogs[24], are more affected by CDV, establishing a relationship between susceptibility and age[16]. The susceptibility of neonates or young dogs to CDV is directly related to the beginning of the gradual reduction of maternal antibodies soon after birth[21,24], this being directly proportional to the growth rate of these animals[7].

The prevalence (11.7%) of dogs submitted for necropsy in this review is greater than that of 1.35% described by Alex; Dhanapalan[1], and the 6.1% of Gouveia *et al.*[12], but is less than the 21.7% indicated by Ek-Kommonen *et al.*[9], 56%; Guo *et al.*[13], and the 42% (by direct immunofluorescence evaluation) and 74% (by ELISA) Blixenkrone-Møeller *et al.*[5]. However, the prevalence rate (1.98%) of dogs attended at the Veterinary Hospital is similar to the results described by other authors[1,12] who used similar method of evaluation. This large variation of CDV prevalence may be related to the degree of specificity of the evaluation method utilised, phase of distemper present, immunological state of these dogs when evaluations were taken, and the peculiarities of each location.

The reduced CDV prevalence in animals attended at Veterinary Hospitals[1,12], and as was observed in this study, in comparison with other field survey reports[5,9,13], indicates that the exact prevalence of canine distemper in normal animal populations is actually higher than has been revealed by Hospital surveys. Thus, Hospital-based surveys may not reveal the real prevalence of canine distemper in urban dog populations when compared with field surveillance studies.

Although the seasonal occurrence of CDV infection is not well-defined[21], data from this review demonstrated a significant increase in the number of cases during winter months and a corresponding decline during the hot seasons (Fig. 1). Other authors[1,10] have described similar observations. The colder season favours viral survival[24], and perhaps induces immunodepression in neonates and recently weaned animals. This induced immunosuppression may become more pronounced by the absence or unavailability of adequate maternal antibodies, or by the presence of another concomitant debilitating disease.

Even though a case of CDV infection was described in a wild dog (*Cerdocyn thous*) in Brazil[20], the domestic dog, which is the main host of this virus[7], continues to be the principal animal species affected in Brazil. Therefore, adequate prophylactic methods must be implemented to prevent the dissemination of canine distemper, since the only efficient and practical method to control CDV infection is by acquired immunisation using vaccination[2,7,19].

Although canine distemper has been known to occur in vaccinated dogs[9,12], vaccination should be practised wherever canine distemper is enzootic, and such programme should begin when the quantity of maternal antibodies in the neonate begins to decline, and followed by periodic boosters until the animal is completely immunised, or has attained a serum virus-neutralising titter that is greater than or equal to 1:100[21]. This transitional period appears to be breed-related[7], but generally varies from six to eight months of age in most dogs[21]. Vaccination strategies are described elsewhere[7,21,25]. Nevertheless, the objectives of vaccination programmes and the efficiency of commercially available vaccines should be evaluated periodically to ensure that adequate immunity has been achieved within urban canine populations. Additionally, since distemper-like diseases are not common in other animal species in our country, caution must be taken to prevent close proximity between mongrels and wild animals in Brazil in an attempt to restrict the spread of this disease to other animal species.

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RESUMO

Um levantamento nas necropsias de cães realizado de 1985-1997 no Departamento de Patologia Veterinária da Universidade Federal de Santa Maria (UFSM), RS, revelou que 11,7% (250/2136) dos caninos necropsiados apresentaram lesões histológicas e corpúsculos de inclusão consistentes com aqueles produzidos pelo vírus da cinomose. A maioria dos casos ocorreu durante os meses de inverno, em cães com menos de 1,5 ano de idade, provenientes da cidade de Santa Maria. A cinomose é considerada endêmica nessa cidade. Não houve diferença significativa na suscetibilidade entre machos e fêmeas infectados. Cães sem raça definida foram super-representados, mas as raças dolicocefálicas eram mais afetadas do que as braquicefálicas. Encefalopatia pelo vírus da cinomose com corpúsculos de inclusão característicos de cinomose, especialmente nos astrócitos, foi a lesão principal e ocorreu em 82% dos casos. Inclusões eosinofílicas características dessa enfermidade também foram encontradas nas células epiteliais da bexiga (15%), pulmão (6%), estômago (3%), rim (1%) e tonsilas (0,5%).

UNITERMOS: Epidemiologia; Vírus da cinomose canina; Cão.

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