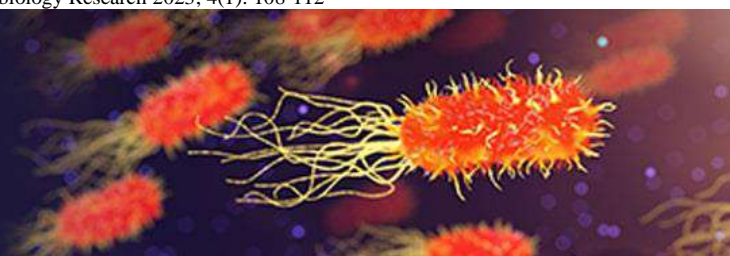


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Serological and antigenic detection of canine distemper virus (CDV) among Nigerian local hunting dogs at dog markets of plateau state, north central Nigeria

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Abstract

Canine distemper is a common fatal disease caused by canine distemper virus (CDV). This study investigated the serological and antigenic detection of Canine Distemper among Nigerian local hunting dogs at dog markets in Plateau State, North Central Nigeria. Blood, fecal nasal swabs samples were aseptically collected from 200 dogs in the two locations in the State and were analyzed using rapid test kits detection of canine distemper virus antibody and antigen. Canine distemper antibody was detected from the study area from all the study animals (100%) at different levels. Antigen was detected from 84% of the dogs sampled with puppies and exotic breeds being more susceptibility to the virus than the adults and local breeds. Adequate vaccinations of dogs were recommended, regular checks using canine distemper rapid Ag test kit and awareness campaign programs are recommended among dog owners/breeders to curb the menace of CDV infection in the study area.

Keywords: Canine distemper virus, Serology, Antigen, Hunting dogs, Plateau State

Introduction

Canine distemper virus (CDV) is a single-stranded, non-segmented, negative sense RNA virus belonging to the genus morbillivirus, firstly described in Spain and isolated by Carre in 1791 and 1905 respectively (Appel and Gillespie, 1972). It is antigenically related to human measles virus (HMV) (Hall *et al.*, 1980; Taylor *et al.*, 1991) ^[30, 31]; with the difference that it has more tropism to the nervous system (Greene, 2012) ^[33] and causes encephalomyelitis in half of the dogs (Appel and Gillespie 1972; Mamaev *et al.*, 1996) ^[32, 33]. CDV is a highly contagious viral infection of different carnivores that belong to numerous animal families, such as *Canidae*, *Mustelidae*, *Procyonidae*, *Felidae*, *Phocidae*, *Viverridae*, *Ursidae* and many others (Appel, 1995; Barret, 1999) ^[4, 6]. Canine distemper causes a devastating, fatal and multi systemic disease which was recognized as one of the leading cause of death in dogs (Eghafona *et al.*, 2007) ^[10]. CDV was also recognized as a wide host range enzootic disease which has been reported in most parts of the world, Nigeria inclusive (Eghafona *et al.*, 2007) ^[10]. It is transmitted by aerosols or contact with oral, respiratory, and ocular fluids and exudates containing the virus but nonetheless entirely all secretions and discharges could still harbor the virus (Frolich *et al.*, 2000, Eghafona *et al.*, 2007) ^[12, 10]. Interspecies transmission frequently occurs and in recent years distemper has been observed in species that were previously not considered to be susceptible. In affected dogs, Canine distemper virus causes primary systemic and central nervous system (CNS) disease (Greene & Appel, 1998) ^[18] and it is also known to cause a large variety of clinical signs, depending mainly upon the age and immune status of the host as well as the virus strain. Infection can lead to abortion, clinical or subclinical disease courses (Greene, 2006 and Blixenkrone-Moller *et al.*, 2009) ^[17, 7]. The virus primarily affect young dogs (Vahini, 2016) ^[34], at a time when they have lost their maternally derived antibodies. Similar to other paramyxoviruses, such as the closely related measles virus (MV), CDV infection causes lymphoid depletion and enduring immunosuppression, which favor secondary infections. Clinical signs in affected dogs include catarrhal respiratory and gastrointestinal disorders, alterations of the skin, and central nervous system (CNS) disease (Blixenkrone-Moller *et al.*, 2009) ^[7].

In Nigeria, CDV vaccines are polyvalent vaccines commercially available, sold and given in combination with other vaccines such as leptospirosis, infectious canine hepatitis, parainfluenza and parvovirus vaccines (DHLP+P combined vaccine) (Oyedele *et al.*, 2004) [26]. Despite the development of efficient and safe vaccines against canine distemper virus (CDV), several recent reports suggest both the re-emergence and increased activity of CDV worldwide (Bolt *et al.*, 1997; Davis, 2014) [8, 9].

Currently, there is not any specific antiviral treatment against CD (Latha *et al.*, 2007) [22] and only supportive therapy including fluid, antibiotic and corticosteroid therapy are available. Although the dog may recover with supportive treatment, the prognosis of nervous signs is poor, and the symptoms are usually irreversible, and euthanasia is often recommended (Greene, 2012) [33]. The study was aimed at serological and antigenic detection of Canine Distemper among Nigerian local hunting dogs at dog markets in Plateau State, North Central Nigeria.

Materials and Methods

This study was carried out at the two major dog markets in Plateau State: Bwandang dog market in Bukuru, Jos South Local Government Area and Dawaki dog market in Kanke Local Government Area of the State where dogs are sold for consumption within and outside the State.

Study animals: The animals used for this study were apparently healthy unvaccinated Nigerian local hunting dogs.

Sample Collection

Swab samples: A total of 200 dogs were selected among the study animals from the two locations for this experiment, nasal and fecal swabs were aseptically collected from each dog making the total of 400 samples (i.e. 200 nasal swabs and 200 fecal samples) using swab sticks. The samples were preserved in an ice bag and transported to the Veterinary clinic side laboratory of Federal College of Animal Health and Technology Vom, Plateau State.

Blood samples: For serological analysis, 5mLs of blood was collected in a test tube without anticoagulant and the test tube left undisturbed in a standing position for 30 minutes to allow clotting. The clotted blood was centrifuged for 3 minutes at 100,628 g-force using a micro centrifuge. The serum supernatant was immediately aspirated into labeled sample bottles and refrigerated at 4°C until used.

Sample analysis

Swab samples: Faecal and nasal swabs from the study animals were tested using a rapid CDV antigen kit (SensPERT® Canine Parvovirus Test Kit, VetAll Laboratories, Gyeonggi-do, Korea), for detection of CDV antigen according to the manufacturer's instructions. This kit is a chromatographic immunoassay for the qualitative detection of CDV antigen in canine faeces.

Firstly, a faecal swab was collected per rectum or a swab was from freshly voided stool was dipped assay diluents. The mixture was stirred evenly. Four (4) drops of supernatant from extracted sample were added into the sample hole. As the test begins to read, purple coloration moved across the result window in the center of the test device. The test results were interpreted within 5-10 minutes

(Esfandiari and Klingeborn, 2000) [35].

Blood samples: The sera were transported to the Morbiliviruses Research Laboratory of the National Veterinary Research Institute (NVRI) Vom for analysis. The samples were analyzed using an immunochromatographic assay (Ogbu *et al.*, 2017) [36] according to manufacturer's instruction.

Statistical analysis

The data obtained were presented in tables and using simple percentages, association between the factors were analyzed using Chi-square method and $p < 0.05$ were considered statistically significant.

Data Analysis

The data obtained was analyzed using chi-square test and result presented in tables and percentages.

Results

Canine distemper antigen was detected from the study area among the study animals. Out of the total 200 dogs that were examined from the two locations, the antigen was detected from 84% (168/200) of the dogs sampled.

Table 1: Occurrence of Canine distemper virus antigen among Nigerian local hunting dogs at dog markets of Plateau State, North Central Nigeria

No. of dogs	Positive	% Occurrence
200	168	84

Based on sex, a total of 116 males and 84 females dogs were examined out of which 72% (88/116) dogs tested positive among males while 95% (80/84) tested positive among females. The occurrence of CDV antigen was significantly higher in females than in males (p -value=0.03; $p < 0.05$) when compared based on sex.

Table 2: Occurrence of Canine distemper virus antigen among Nigerian local hunting dogs at dog markets of Plateau State, North Central Nigeria base on sex

Sex	No. of sample	Positive	% Prevalence	P-Value
Male	116	88	75.86	0.03
Female	84	80	95.23	
Total:	200	168	84	

Based on location, it was shown that CDV antigens was found in 76% (76/100) of dogs sampled in Bukuru dog market while at Dawaki dog market, 92% (46/50) tested positive for CDV antigen. The result showed that there was an association between location and occurrence of CDV antigen as it occurred more at Dawaki dog market (P -value = 0.027; $p < 0.05$).

Table 3: Occurrence of Canine distemper virus antigen among Nigerian local hunting dogs at dog markets of Plateau State, North Central Nigeria in relation to location

Locations	No. of sample	positive	% Prevalence	P-Value
Bukuru	100	76	76	0.027
Kanke	100	92	92	
Total	200	168	84	

A total of 200 nasal and 200 faecal samples were collected from two hundred dogs out of which 10% (20/200) tested positive only in nasal sample, 26% (52/200) tested positive only in faecal sample and 48% (96/200) tested positive in both sample types. The result showed that there was no significant difference ($p>0.05$) in the occurrence of CDV antigen when compared based on the sample types.

Table 4: Occurrence of Canine distemper virus antigen among Nigerian local hunting dogs at dog markets of Plateau State, North Central Nigeria in relation to location based on sample type

Sample type	No. of sample	positive	%Prevalence	P-Value
Nasal only	200	20	10	0.3
Fecal only	200	52	26	
Both	200	96	48	

Out of the total samples, majority (48%) showed presence of the antigen in both animal samples.

Table 5: Serological detection of Canine Distemper based on sample size

Sample size	Number positive	Prevalence (%)
200	200	100
Total	100	200

A total of 200 dogs were sampled, with 100 (100%) prevalence of Canine Distemper.

The dogs examined are those that have no history of vaccination and allow to scavenge for food.

Table 6: Seroprevalence of Canine Distemper based on level

Level	Positive	Prevalence (%)
Poor	86	43
Good	56	28
Excellent	58	29
Total	200	100

Table 6 Shows the seroprevalence of Canine Distemper based on level. Out of the 100 dogs sampled, 43(43%) was poor, 28(28%) turn out to be Good while 29(29%) was excellent.

Table 7: Seroprevalence of Canine Distemper based on sex

Sex	Positive	Prevalence (%)
Male	106	53
Female	94	47
Total	200	100

Table 7 shows that out the 100 dogs were sampled, 53(53%) of the dogs been males and 47(47%) are females.

Table 8: Seroprevalence of Canine Distemper based on age

Age (Year)	Positive sample	Prevalence (%)
< 1	50	25
1-2	94	47
> 2	56	28
Total	200	100

Table 8 shows the seroprevalence of Canine Distemper based on age. Dogs less than (<) 1 year have 25(25%), dogs between 1-2years have 47(47%) while those greater than (>) 2years have 28(28%) seroprevalence respectively.

Table 9: Seroprevalence of Canine Distemper based on location

Location	Positive	Prevalence (%)
Kanke	58	29
Riyom	36	18
Jos East	30	15
Jos South	32	16
Jos North	44	22
Total	200	100

Table 9 shows the seroprevalence of Canine Distemper in dogs based on location. Out of the 100 dogs sampled, 29(29%) was from Kanke, 18(18%) Riyom, 15(15%) from Jos East, while 16(16%) Jos South and 22(22%) from Jos North.

Table 10: Seroprevalence of Canine Distemper based on Kit performance for sex.

Sex	Poor	Good	Excellent
Male	42(50%)	30(51.72%)	32(55.17%)
Female	42(50%)	28(48.28%)	26(44.83%)
Total	84(100%)	58(100%)	58(100%)

Majority of the male dogs (55.17%) have high antibody titre compared to the female dogs (44.83%)

Table 11: Seroprevalence of Canine Distemper based on Kit performance for age

Sex	Poor	Good	Excellent
<1	10(24.40%)	7(24.12%)	9(30.00%)
1-2	21(51.20%)	13(44.83%)	12(40.00%)
>2	10(24.40%)	9(31.03%)	9(30.00%)
Total	41(100%)	29(100%)	30(100%)

Table 12: Seroprevalence of Canine Distemper based on Kit performance for location.

Location	Poor	Good	Excellent
Kanke	14(32.55%)	6(21.42%)	7(18.92%)
Riyom	6(13.95%)	5(17.85%)	7(18.92%)
Jos East	6(13.95%)	5(17.85%)	5(12.82%)
Jos South	7(16.27%)	6(21.42%)	5(12.82%)
Jos North	10(23.25%)	6(21.42%)	5(12.82%)
Total	43(100%)	28(100%)	39(100%)

Discussion

Canine distemper, one of the most fatal diseases in dogs remains an important viral disease in the veterinary field. Thou, there is still no effective therapy for canine distemper, it is treated symptomatically (Kajita *et al.*, 2006) [37]. However, it has been shown that half of CDV infections are mild that they do not require veterinary care, mild disease in dogs may develop into severe disease in dogs and in this case, the initial clinical condition which is often restricted to fever, respiratory, ocular signs, apathy and in-appetence may result in severe impairment of gastrointestinal tract (vomiting and diarrhea) and central nervous system (paraparesis or tetraparesis with sensitive ataxia and myoclonus), (Beineke *et al.*, 2015) [38].

Immunity to canine distemper can be effectively determined with the measurement if the serum antibody titers can be helpful in determining the level of the CDV infection (Bohm *et al.*, 2004) [39].

The study showed that the presence of CDV antibody did not differ based on sex of the sampled dogs. It is in agreement with the findings of Latha *et al.*, (2007) [22] and

Ogbu *et al.*, (2017) [36] who stated that the sex of dogs does not affect the prevalence of dogs for the infection to be established.

Thou the sampling was carried out basically on local breed of dogs, the result showed that 100% of the dogs examined were positive indicating that the breed might also have effect on the CDV infection which is in disagreement with Ogbu *et al.*, (2017) [36] who recorded that local breed of dogs has lesser susceptibility when compared with unvaccinated exotic breeds which can have a higher percentage. It could be as a result of management systems practiced by dog owners as local dogs are not well fed and are left to stray without adequate vaccination on like exotic breeds that are properly confined well fed with adequate vaccination.

Conclusion and Recommendation

In conclusion, the result showed that CDV infection is not affected by sex as both males and females are at risk of having the CDV infection. There were reasons that suggest that puppies and exotic breeds are more susceptibility to the virus than the adults and local breeds.

Adequate vaccination of dogs are recommended as it produces produces Sera antibody which helps in the protection of dogs against CDV. Regular checks should be done using the canine distemper rapid Ag test kit as it helps detect if vaccination was a success or failure.

Awareness campaign programs are also recommended among dog owners/breeders on the effects of canine distemper on dogs and laying more emphasis on vaccination.

Conflict of Interest

Not available

Financial Support

Not available

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