

Seroprevalence of Bovine Parainfluenza Virus Type 3 (bPI-3V) in Ruminants from Grenada

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Received 18 January 2016; accepted 14 February 2016; published 18 February 2016

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Abstract

Respiratory viral infections are known for serious economic losses in ruminants. Bovine parainfluenza 3 virus (bPI-3V) a member of *Respirovirus* genus in association with other respiratory viruses causes respiratory disease complex in ruminants. The aim of this study was to estimate the seroprevalence of bPI-3V in non vaccinated cattle, sheep and goats from Grenada. Sera were collected randomly from 60 sheep, 60 goats and 60 cattle from all six parishes of Grenada. Sera were tested for antibodies to bPI-3V using an indirect Enzyme Linked Immunosorbant Assay (ELISA) kit. Antibodies to bPI-3V were detected in 13.4% (Confidence Level (CL): 95%; Confidence Interval (CI): 4.76% to 22.02%) in cattle; 16.7% (CL: 95%; CI: 7.26% to 26.14%) in sheep and 11.7% (CL: 95%; CI: 3.57% to 19.83%) in goats. There was statistically no significant difference in prevalence ($p > 0.05$) of antibodies to bPI-3V in cattle, sheep and goats in Grenada. This is the first report on seroprevalence of bPI-3V in ruminants in Grenada, West Indies.

Keywords

Grenada, Bovine Parainfluenza-3 Virus, Seroprevalence, Ruminants

1. Introduction

Bovine Parainfluenza-3 virus (bPI-3V) is in the genus *Respirovirus* of the subfamily *Paramyxovirinae*, order *Mononegavirales*, of the family *Paramyxoviridae*. The genus *Respirovirus* also includes the genetically and an-

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tigenetically related human parainfluenza viruses types 1 and 3 (hPI₁V and hPI₃V) [1]. RNA of bPI-3V is single and continuous with a molecular weight of 4.5×10^6 Daltons [2]. Various genotypes of the bPI-3 virus have been identified. Harwood *et al.* [3] proposed 2 distinct bPI-3 V genotypes (bPI-3Va and bPI-3Vb). The virulence of the virus varies with different isolates.

Respiratory viral infections cause serious economic losses in ruminants. It has been reported that bovine parainfluenza virus (bPI-3V), bovine respiratory syncytial virus (BRSV), and bovine herpes virus-1 (BHV-1) are the main viral etiological agents involved in respiratory disease complex in ruminants. Along with bacteria and *Mycoplasma* these viruses cause serious illness. Clinical disease in small and large ruminants is usually mild, with symptoms of fever, nasal discharge and cough. Complications occur with co-infection of other respiratory viruses due to immunosuppressive effects of bPI-3V [1].

The bPI-3V infects both large and small ruminants and is transmitted primarily by droplets. Cross transmission can also occur among these species.

The bPI-3V was first isolated in the United States in 1959 from dairy cattle [4]. Following this study, Abinanti *et al.* [5] reported bPI-3 antibodies in a wide geographical distribution in cattle in the USA. bPI-3V has been recognized to be endemic in beef and dairy cattle populations in Europe, Asia, Africa and North and South America. Reports of bPI-3 infection in bovines are available from Nigeria [6], Turkey [7] [8], India [9], Canada [10], Iran [11] [12], Lithuania [13], Saudi Arabia [14] [15], Mexico [16] [17], Brazil [18], Syria [19] and France [20].

Limited reports are available on bPI-3V infection in small ruminants. Available reports are from Egypt [21], Romania [22], Turkey [23] [24], Canada [25], Brazil [18] and Japan [26].

Grenada is the southernmost island country in the southeastern Caribbean Sea, with an area of approximately 348.5 km² and a population estimated at 100,000. The country consists of 6 parishes. The country with low hills, small trees and shrubs, and tropical climate is most suitable for small ruminant production. Sheep and goats are kept for meat and milk. Estimated population size is 3000 sheep, 2500 goats and 1500 cattle in Grenada (Dr. Bowen Louison, Chief Veterinary Officer, Ministry of Agriculture, Land, Forestry, Fisheries and Environment: personal communication). Cattle in Grenada are kept for meat purpose.

As far as we are aware, there is no published report on the presence of bPI-3V infection of ruminants in the Caribbean region. The aim of this project was to estimate the prevalence of antibodies to bPI-3V in ruminants of Grenada.

2. Materials and Methods

2.1. Collection of Sample

Peripheral blood from a total of 180 ruminants: 60 sheep, 60 goats and 60 cattle were collected randomly from all six parishes of the country in 2014. Serum was separated by centrifugation at 1500 g for 15 minutes and stored at -80°C until it was analyzed using *ELISA*. *ELISA* kit for the detection of antibodies to bPI-3V was obtained from IDvet Innovative Diagnostics, France. *ELISA* was performed following the manufacturer's instructions.

2.2. Statistical Analysis

The data were analyzed by the statistical methods: Fisher's exact test, using a graphpad statistical software (<http://www.graphpad.com/quickcalcs/contingency2>).

3. Results

The seroprevalence of bPI-3V in cattle, sheep and goats was 13.4%, 16.7% and 11.7% respectively. The results are summarized in **Table 1**.

4. Discussion

Diagnosis of bPI-3 V is difficult using clinical signs only. Diagnosis is mostly based on isolation and identification of the virus coupled with demonstration of increasing antibody titer in paired sera [27]. Hemagglutination inhibition (HI) test and virus neutralization (VN) test are tests of choice for serology, but *ELISA* test is more

Table 1. Seroprevalence of parainfluenza virus type 3 in ruminants from Grenada.

Species	Number of Samples	Positives	Percentages
Bovine	60	8	13.4
Ovine	60	10	16.7
Caprine	60	7	11.7
Total	180	15	8.4

The prevalence of antibodies between ruminants (cattle, sheep and goats) is not statistically significant ($p > 0.05$).

rapid [1]. Assaf *et al.* [28] while comparing the results of HI test and *ELISA*, found the *ELISA* to be 4 - 64 times more sensitive than HI test. *ELISA* was used in present serology work for bPI-3V antibody detection in ruminants.

We found 13.4% (CI \pm 8.62; 4.78% to 22.02%; Confidence Level: 95%) cattle positive for antibodies to bPI-3V. A great variation in seroprevalence of antibodies for bPI-3V has been reported in cattle from various countries of the world. In the USA seroprevalence ranged from medium (53%) to high (95%) in different states [5], high seroprevalence (97.5% to 100%) in Central and South Western France [20]. Peter and Lori [10] found a very high (93.9%) seroprevalence in cattle in Saskatchewan and Alberta; Sakhaee *et al.* [11] report 100% seropositivity in dairy herds of Iran, where as in another study in Iran Ezzi *et al.* [12] report 95% seropositivity. In Mexico 75% seropositivity was reported [16]. Moderate seropositivity (50% to 70%) has been reported from Turkey [7] [8], North-Western Nigeria [6], Lithuania [13], and Soudi Arabia [13] [14]. Reports of low prevalence of antibodies to bPI-3V in cattle are scanty. However, similar to our findings of low seroprevalence, Mahajan *et al.* [9] found 20.0% seropositivity in dairy cattle of Punjab, India. The variation in the seropositivity may be because of the ubiquitous nature of the virus [29] and significant difference in weather in various countries of the world [12].

The result of our study on seroprevalence in small ruminants showed antibodies to bPI-3V in sheep 16.7% (CI \pm 9.44; 7.26% to 26.14%; CL: 95%) and in goats 11.7% (CI \pm 8.13; 3.57% to 19.83%; CL: 95%). There was no significant difference ($p > 0.05$) in seropositivity among these species of small ruminants. Following the first isolation of bPI-3V from sheep in 1966 [30] serological survey in many countries has shown a wide spread distribution of this virus in sheep. Jehan *et al.* [21] on isolation and characterization of bPI-3 virus from sheep and goats in Egypt opined that infection in sheep was higher than that in goats. We also report higher rate of seropositivity in sheep (16.7%) than in goats (11.7%). However, Yesilbag and Gungor [23] reported in Turkey a lower prevalence of antibodies to bPI-3V in sheep (8.8%) than in goats (13.2%).

None of the literature reviewed investigated all three ruminants: cattle, sheep and goats in one area at the same time. We examined antibodies to bPI-3V simultaneously in cattle, sheep and goats in Grenada and found low level of seropositivity in all three ruminant species. Ruminants in Grenada are not vaccinated against bPI-3V, thus, presence of antibodies to bPI-3V indicates exposure of bPI-3 virus. There is evidence of transmission of this virus between cattle and sheep and goats [27]. Grenadian famers practice housing of various livestock species in close proximity exposing them to potential cross infection.

5. Conclusion and Recommendation

This is the first report on the seroprevalence of bPI-3V in ruminants in Grenada. Further research to find out the exposure of ruminants in Grenada with other respiratory viruses is suggested.

Acknowledgements

This research was supported by Small Research Grant Initiative (SRGI # 14006) from the St. George's University, Grenada (West Indies). Logistic support from Dr. S. Kumthekar and Mr. G. Stratton is sincerely acknowledged.

Competing Interest

The authors declare that there is no competing interest.

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