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(RESEARCH ARTICLE)



## Prevalence of rotavirus infection in diarrheic newborn calves in Abidjan region, Ivory Coast

Monney Jacques D. <sup>1</sup>, Adjogoua Valery E. <sup>2</sup>, Karamoko Yahaya <sup>1,\*</sup> and Akran Veronique <sup>2</sup>

<sup>1</sup> Nature Sciences Training and Research Unit, Animal Biology and Cytology Laboratory, Nangui Abrogoua University. 02 BP 801 Abidjan 02, Ivory Coast.

<sup>2</sup> Virology departement of Institut Pasteur, 01 BP490 Abidjan 01, Ivory Coast.

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### Abstract

The aim of the current study was to identify the prevalence of rotavirus infection in newborn calves aged from 1 day to 3 months old in Abidjan region. A total of 145 fecal samples were collected from both diarrheic (n=135) and non-diarrheic (n=10) neonatal calves. Neonatal calves' fecal samples were collected in dry seasons and in rainy seasons in Abidjan and suburbs from 2015 to 2017. Investigated calves were divided into 4 age groups (1–10 days old, 10–25 days old, 25–60 days old and ≤90 days old). All samples were screened for the presence of rotavirus antigen by ELISA kit. Among the 145 feces samples examined by ELISA, 19 were identified positive (13.10%). Infection prevalence peaked have been obtained at 10 – 25 days of age and in the rainy season. The prevalence was higher in suburbs and during the rainy season. The present study showed that rotaviruses are involved in the neonatal calves' diarrhea in Abidjan area.

**Keywords:** Calf; Diarrhea; Rotavirus; Prevalence; ELISA

### 1. Introduction

Rotaviruses are the important etiological agents of acute viral gastroenteritis in young one of many animals' species and human [1, 2]. Rotavirus infections cause significant economic losses in neonates of many domestic animals. Neonatal calf mortality in the first month of age is accounted to be 80 to 85% of the total mortality and is particularly high in the third week of life [3, 4]. Rotaviruses are classified in the genus *Rotavirus* in the family *Reoviridae*. They are characterized by segmented genome including 11 segments of double stranded RNA contained within a triple layered protein shell composed of a core, inner capsid and outer capsid. Three structural proteins, VP1, VP2 and VP3, form the core of the rotavirus particle [5, 6]. The high frequency and persistence of calves' neonatal diarrhea in farming has gained the interest of many researchers. The purpose of the present study is to estimate the prevalence of rotavirus using ELISA assay in diarrheic feces from calves and it's interaction with parameters such us age-group, sex, localities and seasons.

### 2. Material and methods

#### 2.1. Study area

The study area is located in Abidjan (south of Ivory Coast).The breeding system encountered in Ivory Coast is the extensive system. Some samples are from Yopougon and Port- Bouet of Abidjan city; and others from Bingerville (about 10 km from Abidjan) and Anyama (about 20 km from Abidjan), which are Abidjan suburbs (Figure 1). Four seasons are observed in south of Ivory Coast: two rainy seasons and two dry seasons.

\* Corresponding author

E-mail address: [y.karamoko@gmail.com](mailto:y.karamoko@gmail.com)



**Figure 1** Map of Abidjan indicates sampling sites

## 2.2. Samples collection

145 fecal samples (135 diarrheic and 10 non-diarrheic) were collected in dry and rainy season during study period 2015-2017. The population was stratified into four age groups: 14 calves were 1 to 10 days old, 69 were 10 to 25 days old, 40 were 25 to 60 days old, and 22 were 60 to 90 days old. Samples were from both sexes of calves. The sample sizes for the sites and seasons are shown in Table 1. Stools were collected directly into the rectum using gloves in sterile flasks. The samples were transported in a frost containing cold accumulators and stored at -20 °C until further processing.

**Table 1** Sample sizes and provenance

Sampling sites	Dry season		Rainy season	
	D calves	N D calves	D calves	N D calves
Yopougon	5	1	16	2
Port-Bouet	3	1	15	1
Bingerville	15	1	33	1
Anyama	21	1	27	2

D= diarrheic and N D= non-diarrheic

## 2.3. Rotavirus detection

### 2.3.1. Screening by ELISA

ELISA was performed to detect group A rotavirus antigen in the fecal samples as described by the kit manufacturer (ProSpecT™ Rotavirus, reference R240396). After adding stop solution (0.46 mol/L of H<sub>2</sub>SO<sub>4</sub>), the optical density (OD) of each well was measured at 450 nm. Calculating the net OD of each sample and interpreting the results were performed as described by manufacturer instruction. Briefly, all samples were considered positive if the value of sample is upper or equal to the threshold value. The threshold value is obtained by adding 0.1 absorbance unit to the negative control value.

## 2.4. Statistical analysis

$$\text{The prevalence (\%)} = \frac{\text{Number of samples positive for bovine rotavirus}}{\text{Total number of diarrhoea samples screened}} \times 100$$

The proportions of the various studied parameters were subjected to a chi-squared test to evaluate their significant level. The statistical tests were carried out with the R version 2.12.1 software. The prevalences were significant at 5%.

### 3. Results

Results have shown a rotavirus prevalence of 13.10% of calves 'diarrheic fecal in group A. Non diarrheic samples were negative (Table 2).

**Table 2** Distribution of bovine rotavirus in screened diarrhoeic samples

Type of distributions		Number of diarrhoea samples screened	Number of samples positive for bovine rotavirus	Prevalence (%)	$\chi^2$
Diarrheic		135	19	13.10	
Non-diarrheic		10	0	0	
Sex	Males	80	11	13.75 <sup>a</sup>	0.081
	Females	65	8	12.30 <sup>a</sup>	
Age	Group I (1-10days)	14	1	7.14 <sup>b</sup>	4.07
	Group II (10-25days)	69	11	15.94 <sup>b</sup>	
	Group III (25-60 days)	40	5	12.5 <sup>b</sup>	
	Group VI (60-90 days)	22	2	9 <sup>b</sup>	
Seasons	Dry season	48	4	8.33 <sup>c</sup>	2.170
	Rainy season	97	15	15.46 <sup>c</sup>	
Localities distribution	Yopougon	29	3	10.34 <sup>d</sup>	4.263
	Port-Bouet	15	1	6.66 <sup>d</sup>	
	Bingerville	58	9	15.5 <sup>d</sup>	
	Anyama	43	6	13.95 <sup>d</sup>	

In the same column, the values followed by the same letter are not statistically different ( $P > 0.05$ ).

#### 3.1. Age distribution of bovine rotavirus in neonatal calves

Distribution of antigen positive samples corresponding to ages was shown in table 2. The results indicate a prevalence of 15% for calves aged 10 to 20 days of age. This shows that new born calves of 10 to 25 days age group were more susceptible to rotavirus infection. The rotavirus prevalence's was not significant ( $P > 0.05$ ) between age classes.

#### 3.2. Prevalence of rotavirus according localities

The prevalence was higher in the suburbs than communes of Abidjan city, with a prevalence of 29% (Table 2).The rotavirus prevalence was not significant ( $P > 0.05$ ) between localities.

#### 3.3. Prevalence of rotavirus according seasons

New born calves were more susceptible to rotavirus infection in rainy seasons (Table 2). The result showed a prevalence of 15.46%. The rotavirus prevalence was not significant ( $P > 0.05$ ) for seasons.

#### 3.4. Sex distribution of bovine rotavirus in neonatal calves

The result indicated that 13, 75% male calves were found positive, whereas rotavirus was detected in 8 of 65 (12.30%) samples of female calves (Table 2). The prevalences were not significant ( $P > 0.05$ ) for rotavirus between male and female.

### 4. Discussion

Rotavirus infection is considered as the basic cause of diarrhea and enteritis in calves [7- 9]. In this study, 145 fecal samples screened using ELISA, rotaviral infection of group A was found in n=19 of diarrheic calves when all non-diarrheic calves were negative. The overall prevalence was found to be 13.10% in diarrheic calves with a higher rate in suburbs of Abidjan. A study conducted by Akran et al. [10] in 2004, the prevalence of 2.94% from 68 samples has been reported from different parts of Ivory Coast (Toumodi and Abidjan region).The discrepancy of results could be

attributed to the time elapsed since 2004 and the sample size. Prevalence rate of rotavirus have been reported from many countries including 8.92% in Turkey [11], 14.63% in Algeria [12], 15% in Vietnam [13], 16.8% in Southern Italy [14], 27.02% in India [15] and 58.7% in Switzerland [16]. Prevalence of rotaviral infection varies depending on the country and region under study [17-18].

The result showed that 11 of 80 (13.75%) male calves were found positive whereas rotavirus was detected in 8 of 65 (12.30%) samples of female calves. The possible reason for this might be that more number of samples were collected from male calves. Another possible justification for this could be due to immune system. Odde [19] reported higher IgG concentrations for heifers compared to male calves. Observations reported by Ammar [20] and Dash et al. [21] showed higher susceptibility of male bovine calves were found in comparison to female calves.

Age wise susceptibility was also evaluated. The result indicated that newborn calves of 10 to 60 days of age were more susceptible to rotavirus infection. The most exposed were calves from 10 to 25 days of age and the occurrence of rotavirus infection declined with advancing age. Similarly, the earlier workers also reported higher occurrence of rotavirus diarrhea in neonatal calves from 1<sup>st</sup> week to 8<sup>th</sup> week of age [22- 24].

The results show that the prevalence is higher in the suburbs (Anyam and Bingerville) than in the city of Abidjan. The possible justification could be attribute to population behaviour in these areas. Children defecate in the scrub and near farms; this can be a source of contamination for animals.

Fecal samples collected during the rainy season showed higher rotavirus positivity than in dry season. This corroborate with Nourmohammadzadeh et al. [25] and Fields et al. [26] who reported low temperature and relative humidity increase the survival of rotavirus.

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## 5. Conclusion

This study indicates the presence of rotavirus infection in calves' diarrhea fecal in Abidjan. It would be important to understand the dynamics of rotavirus transmission, cycle and to identify alternative management practices to minimize the risk factors.

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## Compliance with ethical standards

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### *Disclosure of conflict of interest*

The authors have no conflict of interest to declare.

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