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ROTAVIRUS INFECTION IN CALVES, PIGLETS, LAMBS AND GOAT KIDS IN TRINIDAD

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SUMMARY

Faecal samples from diarrhoeic and non-diarrhoeic calves, piglets, lambs and goat kids were collected and screened by a latex agglutination test to detect the presence of group A rotavirus antigen. Of a total of 470 animals screened, 138 (29.4%) had faecal samples positive for rotavirus antigen. The prevalences of infection were 27.7% (73/264) in calves, 27.8% (45/162) in piglets, 48.6% (18/37) in lambs and 28.6% (2/7) in goat kids. Rotavirus antigen was not detected in calves and lambs <1 week old and in piglets <2 weeks old. The highest prevalence was found in calves between the ages 1–6 weeks (72.6%); piglets, 2–8 weeks (91.1%) and in lambs 1–8 weeks (88.9%). The overall prevalence of infection was 39.9% for diarrhoeic and 13.4% for non-diarrhoeic animals and the difference was statistically significant ($P \leq 0.001$; X^2). Differences among husbandry systems in relation to the prevalence of rotavirus infection were not statistically significant ($P \geq 0.05$; X^2).

The relatively high prevalence of rotavirus infection in the young animals tested, coupled with the detected significantly higher infection rates in diarrhoeic animals, indicate that rotavirus may be important in livestock diarrhoea in Trinidad.

KEYWORDS: Rotavirus; diarrhoea; newborn; Trinidad.

INTRODUCTION

Rotavirus infection has been reported in man and in various animal species, particularly in connection with newborn animals (Mebus *et al.*, 1969; Snodgrass *et al.*, 1976; Woode *et al.*, 1976; Flewett, 1977; Saif *et al.*, 1977; McNulty *et al.*, 1980). Infection is sometimes associated with diarrhoea either caused by rotavirus alone (Tzipori, 1981; Blood & Radostits, 1989) or together with some other enteropathogens (Moon *et al.*, 1978; McNulty, 1983; Hess *et al.*, 1984). Under field conditions, rotaviruses have been isolated from scouring animals (Snodgrass *et al.*,

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1976; Scott *et al.*, 1978; De Leeuw *et al.*, 1980; Tzipori, 1981). However, detection of rotavirus in faeces from diarrhoeic and from asymptomatic animals has also been described (De Leeuw *et al.*, 1980; Tzipori, 1981; McNulty & Logan, 1983; Crouch & Acres, 1984; Archambault *et al.*, 1990; Gelberg *et al.*, 1991a).

Rotaviruses found in many animal species have been designated group A (Chasey & Banks, 1984; Tzipori, 1985) as the viruses possess a common group antigen; detection is based on serological tests capable of recognizing this group antigen (Woode *et al.*, 1976; McNulty, 1978; Chasey & Davies, 1984; Chasey & Banks, 1984; Magar *et al.*, 1991). However, such tests cannot detect atypical rotaviruses or pararotaviruses which are serologically divided into groups B, C and D because they lack the common group antigen. The detection of these groups is dependent on the analysis of faecal samples from infected animals by polyacrylamide gel electrophoresis (PAGE) or by the use of specific antisera prepared against the known atypical rotavirus groups (Bohl *et al.*, 1982; Chasey & Davies, 1984; Chasey & Banks, 1984; Tzipori, 1985; Magar *et al.*, 1991).

A latex agglutination (LA) test has been employed to detect rotaviruses in pig and calf faeces (Sukura & Neuvonen, 1990; Sanekata *et al.*, 1991). Since group A rotaviruses share a common group antigen, rotaviruses in the faeces of one species should be detectable using latex particles prepared from another species (Sukura & Neuvonen, 1990). There is no known published information on rotavirus infection in livestock in Trinidad, but there is a report of rotavirus infection in human beings (Hull *et al.*, 1982). The present study was carried out to determine the prevalence of group A rotavirus infection in diarrhoeic and non-diarrhoeic calves, piglets, lambs and goat kids on selected farms, using the slide latex agglutination (LA) test.

MATERIALS AND METHODS

Animals

Calves <24 weeks old and piglets, lambs and goat kids <12 weeks old were sampled from farms under intensive, semi-intensive and extensive management systems. Farms were visited routinely and when cases of diarrhoea were reported. Each animal was sampled once only. The sampling protocol has been described (Adesiyun *et al.*, 1992).

Collection of specimens

A faecal sample was collected from the rectum of each animal and placed in a sterile container which was appropriately labelled. A prepared questionnaire form was used to record animal's age and sex; date and place of collection of specimens; whether or not the animal had diarrhoea and the husbandry system used on the farm. Specimens were received at the laboratory ice-cooled <2 h after collection. Approximately 5 g faeces from each sample were transferred into a plastic bag that was labelled and kept at −20°C until required for testing.

Faecal examination

A commercially available kit (Rota Screen^{R}, Mercia Diagnostics Limited, Code

M802, Surrey, UK) was used to screen the faecal samples for the presence of rotavirus according to the manufacturer's instructions. A 10% suspension of each sample was prepared by mixing 0.1 ml or 0.1 g of the specimen with 1.0 ml extraction fluid. After mixing well, the suspension was left to stand at room temperature for 2 min. It was then centrifuged at 1000 *g* for 10 min at 4°C. Recommended 50 μl volumes of the clear supernate and respective reagents were used. Agglutination patterns were examined macroscopically, after 2 min of gently shaking the slide.

RESULTS

The distribution of samples positive for rotavirus amongst diarrhoeic and non-diarrhoeic animals, and management system is shown in Tables I and II, respectively.

An overall prevalence of rotavirus infection in livestock (29.4%; 138/470) was found in this study. A higher prevalence was observed in diarrhoeic (39.9%) than in non-diarrhoeic (13.4%) animals and the difference was statistically significant ($P \leq 0.001$; X^2). A similar trend was detected in each of the four species studied and the differences in rotavirus detection between diarrhoeic and non-diarrhoeic

Table I
Frequency of rotavirus infection in diarrhoeic and non-diarrhoeic animals

Animal species	*Total No. tested*	*No. (%) positive*	*Diarrhoeic*		*Non-diarrhoeic*	
			No. tested	*No. (%) positive*	*No. tested*	*No. (%) positive*
Calf	264	73 (27.7)	155	60 (38.7)	109	13 (11.9)
Piglet	162	45 (27.8)	94	33 (35.1)	68	12 (17.6)
Lamb	37	18 (48.6)	30	18 (60.0)	7	0 (0.0)
Goat kid	7	2 (28.6)	4	2 (50.0)	3	0 (0.0)
Total	470	138 (29.4)	283	113 (39.9)	187	25 (13.4)

Table II
Distribution of rotavirus infection by management systems

Animal species	*Total No. tested*	*Management system*					
		Intensive		*Semi-intensive*		*Extensive*	
		No. tested	*No. (%) positive*	*No. tested*	*No. (%) positive*	*No. tested*	*No. (%) positive*
Calf	264	248	66 (26.6)	8	3 (37.5)	8	5 (62.5)
Piglet	162	104	28 (26.9)	58	17 (29.3)	0	0 (0.0)
Lamb	37	33	15 (45.5)	4	3 (75.0)	0	0 (0.0)
Goat kid	7	3	0 (0.0)	3	1 (33.3)	1	1 (100.0)
Total	470	388	109 (28.1)	73	24 (32.9)	9	6 (66.7)

faecal samples for each animal species had significance as follows: calves and lambs ($P \leq 0.001$; X^2); piglets ($P \leq 0.05$; X^2).

The prevalences of rotavirus infection were highest in the extensive (66.7%) husbandry systems; followed by the semi-intensive (32.9%) and intensive (28.1%) systems. However, the differences in prevalences of rotavirus infection in animals under different husbandry systems were not significant ($P \geq 0.05$; X^2).

The youngest animals positive for rotavirus infection were calves and lambs aged 1 week and piglets aged 2 weeks. The prevalence rate was highest in calves between the ages 1 to 6 weeks, 72.6% (53/73); piglets 2 to 8 weeks, 91.1% (41/45) and lambs 1 to 8 weeks, 88.9% (16/18). The prevalence rates peaked at 3 weeks, 20.5% (15/73) for calves, 8 weeks for piglets 31.1% (14/45) and lambs, 38.9% (7/18).

DISCUSSION

Group A rotavirus antigen was not detected in calves and lambs younger than 1 week and in piglets under 2 weeks of age in the present study. Gomwalk *et al.* (1988) detected rotavirus at low prevalence rates in 1 to 2-week old calves but the prevalence increased with age until it reached 36% between the ages 8 to 16 weeks. McNulty and Logan (1983) first detected rotavirus in calves of about 6 days old. Others have found rotavirus infections in calves after the third day following birth (Woode, 1978; De Leeuw *et al.*, 1980; Sibalin *et al.*, 1980; Gelberg *et al.*, 1991a, b). Gelberg *et al.* (1991a) found that the shedding of rotavirus in piglets peaked at 3 to 4 weeks of age and Utrera *et al.* (1984) reported that rotavirus infection was detected more frequently in piglets that were 2 to 6 weeks old than in younger animals. In sheep, rotavirus has been isolated from the faeces of lambs with diarrhoea under 3 weeks old (Snodgrass *et al.*, 1976). However, lambs that were 4 days old or older were reported to be only asymptomatically infected (Tzipori *et al.*, 1981). Thus overall, the age related distribution of rotavirus infection in calves and piglets, in our findings and those of others are in agreement.

There is serological evidence of rotavirus infection in sheep and goats (Woode *et al.*, 1976) and Scott *et al.* (1978) reported the presence of rotavirus in goat kid faeces. However, there appears to be a scarcity of data on age related distribution of rotavirus in lambs and goat kids (Blood & Radostits, 1989). The very small number of goat kids (7/470) sampled and tested in the present study makes it difficult to draw any firm conclusions from the results.

The detection of rotavirus infection in non-diarrhoeic animals agrees with other reports (Snodgrass *et al.*, 1976; De Leeuw *et al.*, 1980; Perrin *et al.*, 1981; Tzipori, 1981; De Rycke *et al.*, 1982; NcNulty & Logan, 1983), although the rates of infection vary from 42% (McNulty & Logan, 1983), 23.8% (De Rycke *et al.*, 1982) to 12.5% (Perrin *et al.*, 1981). Gelberg *et al.* (1991a) found that close to 30% of faecal samples from normal pigs contained rotavirus antigen. The occurrence of rotavirus antibodies in all ages of certain animal species has led to the conclusion that asymptomatic infections are common in those species (Brüssow *et al.*, 1990).

The possible reasons given for low rates of rotavirus detection in non-diarrhoeic animals include excretion of undetectable levels of virus in the faeces (Crouch &

Acres, 1984) or the method of detection employed. A more sensitive method would detect more asymptomically infected animals than a less sensitive method (Crouch & Acres, 1984; Sukura & Neuvonen, 1990; Sanekata *et al.*, 1991). Moreover, only serological tests which are performed using atypical rotavirus group specific antisera can detect atypical rotaviruses present in faecal samples (Chasey & Davies, 1984; Chasey & Banks, 1984; Magar *et al.*, 1991).

The detection in our study of a significantly higher prevalence of rotavirus infections among diarrhoeic animals than non-diarrhoeic animals in all four animal species samples is of clinical significance. Rotavirus has been shown to be an important aetiological agent in diarrhoea in animals (Mebus *et al.*, 1969; Snodgrass *et al.*, 1976; Woode *et al.*, 1976; Saif *et al.*, 1977; Scott *et al.*, 1978) and human beings (Kapikian *et al.*, 1976; Flewett, 1977).

The rather higher prevalences of rotavirus infection detected amongst animals reared extensively and semi-intensively than in those kept under the intensive husbandry systems cannot be readily explained. Intensification of management systems would be expected to facilitate spread of infection among animals. It is, however, pertinent to mention that the differences in prevalence rates of rotavirus infections under the three systems were not statistically significant.

The LA test detected rotavirus in all four species indicating the presence of group A rotavirus in these animal species which, hitherto, had not been documented in Trinidad. In the only reported study on rotavirus infection in children in Trinidad, Hull *et al.* (1982), using counterimmune electrophoresis, found 23% of children were gastroenteritis positive for rotavirus infection while only 1% of apparently healthy children were positive. These authors suggested that rotavirus had an aetiological significance in diarrhoea in children. Based on data generated in our study, it is also evident that rotaviruses have clinical significance in diarrhoea in livestock in Trinidad and that there is a prevalence of group A rotaviruses in the species sampled. Further analysis of faecal samples by the PAGE is required in order to determine the presence of atypical rotaviruses or pararotaviruses.

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