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CHANGE IN RIFT VALLEY FEVER NEUTRALIZING
ANTIBODY PREVALENCE AMONG SMALL DOMESTIC
RUMINANTS FOLLOWING THE 1987 OUTBREAK
OF THE SENEGAL RIVER BASIN

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BRIEF NOTE

Changes in Rift Valley fever neutralizing antibody prevalence among small domestic ruminants following the 1987 outbreak of the Senegal River Basin

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SUMMARY

Two series of sero-survey have been done in 1988 and 1989 following the Rift Valley Fever (RVF) epizootic of 1987 in the Senegal River Basin. Respectively 303 and 331 randomly selected small domestic ruminants were investigated and sera tested for the presence of specific RVF virus neutralizing antibodies.

In 1988, 24.4% of the sera were found to have RVF neutralizing antibody and 19.3% in 1989. In 1988, we observed for the Dagana district including the 1987 epizootic area, a prevalence (71.1%) significantly higher than for the two other more distant districts of Podor (21.5%) and Matam (9.7%). From 1988 to 1989 the antibody seroprevalence dropped significantly from 71.7 to 23.9 % within the Dagana district. In 1989 young animals showed a significantly lower antibody prevalence (7.9%) than adults (25.3%).

The RVF virus did circulate at a low level in 1988-89 without any epizootic manifestation. The population turn over generated an important non immune population potentially at risk.

KEY-WORDS: RVF Serosurvey, Neutralizing antibody, Senegal river basin.

ABBREVIATIONS

RVF = Rift Valley Fever

NUT = Neutralizing Test

ELISA = Enzyme Linked Immunosorbent Assay

INTRODUCTION

The Rift Valley Fever (RVF) is an african arboviral zoonosis transmitted by mosquitoes. Severe epizootic and epidemic manifestations occurred during the past two decades in Africa (Peters & Meegan, 1988). Epizootics are precursive manifestations of epidemics (Ksiazek *et al.*, 1989; Lancelot *et al.*, 1989). Enzootic maintenance of the virus is dependent on physical factors in relation with the relative abundancy of potential vectors and hostes (Davies *et al.*, 1985; Peters & Meegan, 1988). Despite the degree of knowledge of such risk factors within a specific area, an intensive sero-survey of domestic ruminants remain the most convenient way to detect any RVF virus activity even at a low level.

Moreover, there is a need of a longitudinal study for the understanding of the real impact on the livestock in tropical Africa.

Recent epidemic and epizootic manifestations in the southern Mauritania (Jouan *et al.*, 1989) prompted us to start a serosurvey for RVF in the domestic ungulates from the Senegal River Basin and assess annually the risk for the none immune populations.

MATERIAL AND METHODS

Study area (fig. 1)

The delta, lower and middle Senegal River Basin including the 1987 area of major epidemic and epizootic manifestation, were targeted to identify any change in the specific RVF virus antibody prevalence. The localities understudy are all together included in the Sahelian edaphic zone of West Africa with an annual rainfall $\leq 600\text{mm}$, and are fdescribed in detail elsewhere (Jouan *et al.*, 1989. Guillaud *et al.*, 1989).

Sampling method

Small ruminants randomly selected were bled in August during two years, at the beginning of the rainy season that last for 3 to 4 monthes.

Blood samples were drawn from sheep and goats by jugular venipuncture, sera decanted following clot formation and stored at -20°C prior to laboratory test.

Neutralizing test

Neutralizing antibody test was performed using Vero monolayer cells infected with a viral suspension titering $10^{6.5}$ PFU/ml at a dilution of 1/160 of RVF virus Smithburn strain (Smithburn *et al.*, 1949). According with a previously described method, antibody positive sera were determined by the lack of cytopathogenic effect at the serum dilution of 1/160 (Davies *et al.*, 1988).

RESULTS AND DISCUSSION

In 1988 there is an highly significant difference between RVF antibody prevalence of the Dagana district (71.7%) and the two others of Podor (21.5%) and Matam (9.7%) ($p < 0.001$ by chi-square test). Consequently, a negative gradient of RVF virus antibody prevalence from the delta to the upper Senegal River Basin is observed.

The Dagana district, closely related to southern Mauritania where a major epidemic was recorded in 1987 showed the highest positive rate. Moreover highest antibody prevalence in small ruminants were found by Kiazeck *et al.* (1989) and by Guillaud *et al.* (1989) in the same Dagana area on both side of the River compared to the coastal area and middle and upper river basin where RVF antibody prevalence remained significantly lower. In 1989 no more significant difference did exist ($p > 0.05$).

From 1988 to 1989, the RVF antibody prevalence dropped globally from 24.4% to 19.3% (table I). For the Dagana district, only the loss of neutralizing antibody is significant from 71.7 to 23.9 % ($p < 0.001$).

A more detailed analysis done on the 1989 serum samples (table II) showed no significant difference in antibody prevalence ($p > 0.05$) between sheep and goats as previously observed in this area by Guillaud *et al.* (1989) using an ELISA test. However, young animals had a significantly lower antibody prevalence (7.9%) than

adults (25.3%) ($p < 0.001$). This latest observation can be explained by change in the structure of the population: Older specimens are slaughtered first decreasing the immune population, and herders favored an intensive reproduction to supply the dramatic loss by abortion from the 1987 epizootic (Lancelot et al., 1989) increasing the non-immune population.

Conclusively, on one hand Guillaud et al.(1989) showed in 1988 only a low percentage of RVF virus infected animals by detecting IgM in some of them by ELISA; On the other hand the percentage of the non immune population increased dramatically each year. Due to declining antibody protection of the flocks and the presence of the RVF virus in the population, the risk for an epizootic and in that course of an epidemic will increase in the coming rainy seasons in relation with the activity of potential vectors.

RESUME

Deux séries d'enquêtes sérologiques ont été menées en 1988 et 1989 dans la région du bassin versant du fleuve Sénégal où a eu lieu une manifestation épidémo-épzootique du virus de la Fièvre de la vallée du Rift (FVR) en 1987. Successivement deux échantillons de 303 et 331 petits ruminants pris au hasard ont été testés pour la mise en évidence d'anticorps neutralisants. Sur le total des animaux testés et respectivement en 1988 puis en 1989, la séoprévalence est de 24,4 et 19,5 %.

En 1988, dans le département de Dagana particulièrement touché par l'épzootie de 1987, la prévalence en anticorps est significativement plus élevée (71,7%) par rapport aux départements de Podor (21,5%) et de Matam (9,7%) situés plus en amont sur le cours du fleuve.

De 1988 à 1989, on observe une chute de prévalence des anticorps neutralisants de 71,7 à 23,9% dans le département de Dagana. Cette diminution est due en grande partie à une prévalence significativement moins élevée chez les jeunes animaux (7,9%) que chez les adultes (24,3%).

Dans la période post épzootique de 1988 à 1989 une surveillance suivie est en faveur d'une absence de circulation du virus de la FVR chez les ruminants domestiques du Nord-Sénégal.

Le renouvellement rapide de la population non immune de petits ruminants représente un risque potentiel épzootique et secondairement épidémique dans cette zone sahélienne d'enzootie connue.

MOTS CLES: Sero surveillance de la FVR, anticorps neutralisants, bassin versant du fleuve Sénégal.

**FIG.1.- Map of locality where animal population are surveyed
for RVF in the Senegal River Basin**

The darkened area on the map represents a major enzootic and epizootic region that was recorded during the 1987 RVF outbreak.

Study localities: 1- Raïnadé, 2- Rosso, 3- Colonat, 4- Niassante, 5- Thille Boubacar, 6- Podor, 7- NDioum, 8- Dere Lao, 9- Goudoude, 10-Ourossogui, 11- Kanel

Dashed lines stand for the district limits.

I = Dagana district including the delta and lower Senegal River Basin.

II and III = Podor and Matam districts including the middle Senegal river basin and part of the upper Senegal River Basin up-stream from Matam.

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TABLE I. - Prevalence of RVF virus neutralizing antibodies in small ruminants from the Senegal River Basin in 1988.

Department of origin	date of sampling	
	1988	1989
Dagana	28/39 (71.7)*	38/159 (23.9)
Podor	37/172 (21.5)	18/115 (15.7)
Matam	9/92 (9.7)	8/57 (14.0)

* positif/total tested (%)

**TABLE II.- Comparative seroprevalence on small ruminants by specie,
age and origin in the Sénégal River Basin in 1989**

District	age	sheep	goat
Dagana	adult	14/43 (32.6)	22/58 (37.9)
	Juvenil	2/39 (5.1)	0/19 (0.0)
Podor	adult	8/56 (14.3)	3/17 (17.6)
	Juvenil	6/33 (18.2)	1/9 (11.1)
Matam	adult	6/24 (25.0)	2/19 (10.5)
	Juvenil	0/11 (0.0)	0/3 (0.0)
Total	Adult	28/123 (22.7)	27/94 (28.7)
	juvenil	8/83 (9.6)	1/31 (3.2)
	all	36/206 (17.4)	28/125 (22.4)

*positive/total tested (%)

Temporal evolution of the RVF virus seroprevalence from the domestic ruminants of the Dagana district.

Year of sampling	Total tested / % of positive	Test	Authors
1982	23/0.0	ELISA	Ksiazek <i>et al.</i> 1988
1985	63/0.3	ELISA	Ksiazek <i>et al.</i> 1988
1987	87/85	ELISA	Ksiazek <i>et al.</i> 1988
1988	39/71	NUT	
1988		ELISA	Guillaud <i>et al.</i> , 1989
1989	159/23	NUT	

