

BRIEF NOTE

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

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### SUMMARY

Following the Rift Valley fever (RVF) epizootic of 1987 in the Senegal River basin, 2 series of serosurveys were carried out. In 1988 and 1989, respectively, 303 and 331 randomly selected sheep and goats were investigated and sera tested for the presence of specific RVF-virus-neutralizing antibodies.

In 1988, 24.4 % of the sera was found to have anti-RVF neutralizing antibodies and in 1989, 19.3 % was found. In 1988, we observed in the Dagana district, including the 1987 epizootic area, a significantly higher prevalence (71.1 %) than in 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. Young animals showed a significantly lower antibody prevalence (7.9 %, N = 114) than adults (25.3 %, N = 217).

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

*Key-words:* Senegal, RVF, Neutralizing antibody; Serosurvey, Senegal River basin, Sheep, Goats.

### INTRODUCTION

Rift Valley fever (RVF) is an African arboviral zoonosis that is transmitted by mosquitoes. Severe epizootic and epidemic manifestations have occurred during the past two decades in Africa (Peters and Meegan, 1988).

Epizootics are precursor manifestations of epidemics (Ksiazec *et al.*, 1989; Lancelot *et al.*, 1989). Enzootic maintenance of the virus is dependent on physical factors related to the relative abundance of potential vectors and hosts (Davies *et al.*, 1985; Peters and Meegan, 1988).

Despite the degree of knowledge of such risk factors within a specific area, an intensive serosurvey of domestic ruminants remains the most convenient way to detect any RVF virus activity even at a low level. Moreover, there is a need for a longitudinal study in order to understand the real impact of the virus on livestock in tropical Africa.

Recent epidemic and epizootic manifestations in the southern Mauritania (Jouan *et al.*, 1989) prompted us to start a serosurvey of RVF in domestic ungulates from the Senegal River basin and to annually assess the risk for the non-immune populations.

## MATERIALS AND METHODS

### Study area

The delta, lower and middle Senegal River Basin (fig. 1) including the 1987 area of major epidemic and epizootic manifestation, were targeted to identify any change in the rate of specific RVF virus antibody prevalence. The localities under study are all included in the Sahelian edaphic zone of West Africa with an annual rainfall of less than 600 mm, and are described in detail elsewhere (Jouan *et al.*, 1989; Guillaud *et al.*, 1989).

### Sampling method

Sheep and goats randomly selected were bled in August 1988 and 1989, at the beginning of the rainy season, which lasts for 3 to 4 months. Blood samples were drawn by jugular venipuncture, sera decanted following clot formation and stored at  $-20^{\circ}\text{C}$  prior to laboratory testing.

### Neutralizing test

Neutralizing antibody test was performed using Vero monolayer cells infected with a viral suspension of titre  $10^{6.5}$  PFU/ml at a dilution of 1/1,600 RVF virus Smithburn strain. In accordance 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 was a highly significant difference between the RVF antibody prevalence in the Dagana district (71.7 %) and the two others, 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 was observed. The Dagana district, which is closely related to southern Mauritania where a major epidemic was recorded in 1987, showed the highest positive rate. Moreover, the highest antibody prevalence in small ruminants was found by Kiizeck *et al.* (1989) in the same Dagana area on both sides of the river, compared to the coastal area and middle and upper river basin where RVF antibody prevalence remained significantly lower. In 1989, a significant difference no longer existed ( $p > 0.05$ ). From 1988 to 1989, the RVF antibody prevalence dropped globally

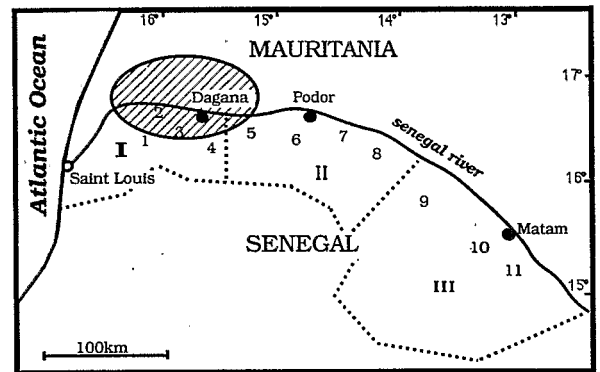


Fig. 1. Map of locality where animal populations are surveyed for RVF in the Senegal River basin.

Darkened area on the map represents the major enzootic and epizootic region recorded during the 1987 RVF outbreak. Dashed lines stand for district limits.

Study localities: 1 = Rainadé, 2 = Rosso, 3 = Colonat, 4 = Niassante, 5 = Thille Boubacar, 6 = Podor, 7 = NDioum, 8 = Dere Lao, 9 = Goudoude, 10 = Oourossogui, 11 = Kanel.

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 upstream from Matam.

from 24.4 % to 19.3 % (table I). For the Dagana district, only the loss of neutralizing antibody was 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.* (1988) using an ELISA test. However, young animals had a significantly lower antibody prevalence (7.9 %,  $N=114$ ,  $x=9$ ) than adults (25.3 %,  $N=217$ ,  $x=55$ ) ( $p < 0.001$ ). This last observation can be explained by a change in the structure of the population, with older animals being slaughtered first, thus decreasing the immune population,

and herders favouring intensive animal reproduction to recover the dramatic loss by abortion from the 1987 epizootic (Lancelot *et al.*, 1989), thereby increasing the non-immune population.

On one hand, low level RVF virus activity was observed on detecting IgM seropositive sheep during the interepizootic period in the Senegal River basin (Saluzzo *et al.*, 1987; Gonzalez *et al.*, 1989), and on the other hand, in the present paper, a dramatic increase in the non-immune population during these two past years is shown. Conclusively, the declining antibody protection in the flocks and the presence of RVF virus in the Senegal River basin, increases the risk of an epizootic, and hence an epidemic, in the coming rainy seasons in relation to vector activity.

**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)
Total	74/303 (24.4)	64/331 (19.3)

Results shown = positive/total tested (%).

**Table II.** Comparative seroprevalence on small ruminants by species, age and origin in the Senegal River basin in 1989.

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

Results shown = positive/total tested (%).

*Modifications de la prévalence des anticorps neutralisants anti-virus de la fièvre de la Vallée du Rift chez les petits ruminants domestiques à la suite de l'épidémie de 1987 dans le bassin versant du fleuve Sénégal*

Deux séries d'enquêtes sérologiques ont été menées dans la région du bassin versant du fleuve Sénégal où a eu lieu une manifestation épidémoépzootique du virus de la fièvre de la Vallée du Rift (FVR) en 1987. Deux échantillons de sérums ont été prélevés respectivement en 1988 et en 1989 chez 303 et 331 petits ruminants (chèvres et moutons) pris au hasard et ont été testés pour la mise en évidence d'anticorps neutralisants. Sur les 634 animaux testés au total et respectivement en 1988 et en 1989, la séroprévalence est de 24,4 et 19,3 %.

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 la prévalence des anticorps neutralisants de 71,7 à 23,9 % dans le département de Dagana.

La prévalence en anticorps neutralisant contre l'antigène RVF est significativement moins élevée chez les jeunes animaux (7,9 %) que chez les adultes (25,3 %).

Dans la période post-épzootique de 1988 à 1989, une surveillance suivie permet de conclure en faveur d'une absence de circulation active 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 épizootique et secondairement épidémique dans cette zone sahélienne d'enzootie connue.

**Mots-clés:** Sénégal, FVR, Anticorps neutralisant; Bassin versant du fleuve, Petits ruminants domestiques, Epidémiologie.

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