POST-EPIZOOTIC PREVALENCE OF RIFT VALLEY FEVER ANTIBODY IN SMALL RUMINANTS FROM THE SENEGAL RIVER BASIN (1988-1990)

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(RVF virus, Bunyaviridae genus Phlebovirus, is an arthropod-borne vira! disease primarily affecting domestic animals, first isolated during an epizootic in 1930 in Kenya.)

(in human, pathology was reported as an non-fatal febrile illness , but during the !ast epizootics hemorrhagic fever syndroms and high fatality rate were observed. Encephalitis and chorioretinitis were also observed.)

Egyp?: (80-100% of the ewes aborted, 860% of the adult animals died, and mortality in the few lambs present approached 100%.)

(Severe clinical manifestations in human with high mortality rate were reported.)

(The question of endemicity of RVF virus in epizootics areas was unresolved and needed definitive investigation.)

(in southern Mauritania with 15% positive domestic animal). !gM anti bodies detected in the sera of came! breeders indicated a recent circulation of ?he virus. No correlation was observed in animals with reported abortion. Saluzzo et al. (1986) suggested that ample opportunity for epidemic-epizootic RVFV transmiision existed in the Senegal River Basin of northern Senegal and Sou?hern Mauritania.

1987 outbreak 385 cases reported (with 11% fatality rate) during an epizootic among domestic ruminants. Strains of RVFV were isolated from people coming from 225 kms (135 miles) east of Rosso and 60kms (35 miles) west of Rosso. RVFV infected a high proportion of the domestic animals in the areas where human disease reports were received. A much higher proportion of the animals tested had RFV antibodies than tha? found among the human popuiation. This once emphasizes the important role of domestic animals as amplifying hosts of RVFV.

The ecological environment of the Senegal River Basin was recently modified, in a large water conservation scheme, by the bulding of dams on the Senegal river: in the Delta the Diama dam as a salt water barrier dam and in the upper curse in south-eastern Mali (Manantali dam). This possibly was an additive factor in the occurence in the fal! of 1987. Developments in the areas have encouraged migration and RVFV risk outbreak increased.

Results

Between the 1988- 1990 period , a significant decrease was giobaly observed either by Elisa (24% in 1988 to 10,5% in 1990) or by neutralization test ($X2= 29,76$ ddl=2 $p<0,001$) was observed by Elisa and by NT (23 % in 1988, 19% in 1989 and 7% in 1990) ($X2= 43,58$ ddl=2 $p<0,001$)

A negative gradient from West to East was reported: by ELISA: delta 46%,

middle basin 19% and upper basin 25%

In the middle basin area, no significant variations of RVFV prevalence were detected during the three year observation: 19 % in 1988 and 1989, 16% in 1990. but by NT, significative variation X2= 7,88 ddl=2

We observed a similar pattern of antibody prevalence by neutralization test: a high 1988 RVFV antibody prevalence 77% in the lower basin, 19 % in the middle basin and in the upper basin: (X2 = 70,7 ddl=2 p<0,001) between the 3 areas). in the lower basin for the 3 years period the decrease is highly significant. X2= 65,14 ddl=2 p <0,001.

ovine-yoat : In 1990 non significant difference: X2= 0,56 ddl=1, with 6,6% positive ovine and 7,2%caprine.

(in 1989, non significant difference: X2= 1,68 ddl=1)

juveniie , young adults (2 to 6 adult teeth by jaw or moreless 1 to 3 yeras-old) and adults (8 teeth).

- in juveniles the percentage was significatively lower than in another age groups (adults) In 1989 X2= 48,71 ddl=2 , in 1990 X2= 28,70 ddl = 2

The rapid renewal (turn-over) of small ruminant population, estimated in sahelian conditions to about 50% animals one year old or less, is an important factor for the RVFV prevalence decrease observed. In our samples, the young age group represented 33% of the total.

A national RVFV prevalence survey conducted in november 1987- february 1988 in several places as indicated in the map

northern area:St-Louis, Louga isohyete 300mm

central area: Thies, Fatick, Kaolack Diourbel isohyete 600mm

southern area: Tambacounda,Zigunchor, Kolda isohyete 900mm

T. The results prsented correlate with negative attempts of RVF virus isolations from susceptible vectors collected in the delta area in the last 2 years, indication of a viral low activity (1988-I 990).

SLIDE 1

TITLE AUTHORS

SLIDE 2

PREVALENCE IN SOUTHERN MAURITANIA 1985

SLIDE 3

MAP OF NORTH SENEGAL

SLIDE 4

1988-1990 SEROSURVEY RESULTS TABLE

SLIDE 5

GRAPHE ELISA REPARTITION BY AREAS

SLIDE 6

GRAPHE NEUTRALIZATION TEST REPARTITION BY AREAS

SLIDE 7

GRAPHE REPARTITION BY AGE GROUP AND SPECIES IN 89-90

SLIDE 8

GRAPHE COMPARISON OF PREVALENCE FROM 1982 TO 1990 LOWER BASIN

SLIDE 9

MAP OF SENEGAL; NATIONAL SEROSURVEY IN NOV 1987-FEB 90

SLIDE 1

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THIS WORK IS PART OF A COLLABORATIVE STUDY BETWEEN THE SENEGALESE INSTITUTE FOR AGRICULTURE RESEARCH, THE PASTEUR INSTITUTE AND ORSTOM.

THE RIFT VALLEY FEVER IS AN ARTHROPOD-BORNE VIRAL DISEASE PRIMARLY AFFECTING DOMESTIC ANIMALS AND SECONDARLY CAUSING SEVERE OUTBREAKS IN THE HUMAN POPULATION OF AFRICA.

IT PRODUCES A ZOONOSIS AMONG RUMINANTS, CAUSING HEPATITIS WITH NECROSIS, ABORTION IN ADULTS AND MORTALITY IN YOUNG OFFSPRING.

---IN EASTERN AFRICA, IN 1977 AND AGAIN, IN 1978, EXTENSIVE EPIZOOTICS OCCURRED IN SEVERAL AREAS OF THE NILE DELTA AND VALLEY IN EGYPT.
--- AGAIN THE VIRUS WAS ISOLATED IN 1979 AND 1980 ALTHOUGH WIDESPREAD EPIZOOTICS DID NOT OCCUR IN THESE YEARS.

--IN WESTERN AFRICA, RVF VIRUS WAS ISOLATED FROM AEDES AEDIMORPHUS IN BURKINA FASO IN 1983, FROM AEDES DALZIELI IN SOUTH-EAST PART OF SENEGAL IN KEDOUGOU IN 1974 AND 1983 AND FROM CULICOIDES IN NIGERIA IN 1967.

SLIDE 2

IN 7985, A LARGE FOCUS OF RVF VIRUS CIRCULATION WAS IDENTIFIED IN THE SENEGAL RIVER AREA. (15% PREVALENCE AMONG DOMESTIC ANIMALS)

IGM ANTIBODIES DETECTED IN THE SERA OF CAMEL BREEDERS INDICATED A RECENT CIRCULATION OF THE VIRUS.

DURING THE 1987 RAINY SEASON, EXTENSIVE EPIZOOTICS OF RVF VIRUS OCCURED IN THE SENEGAL RIVER BASIN AMONG DOMESTIC RUMINANTS.

MOREOVER A TOTAL OF 385 HUMAN CASES WERE REPORTED IN MAURITANIA AT THE ROSSO HOSPITAL .

AGAIN, IN OCTOBER 1988, AN ACTIVE CIRCULATION OF RVF VIRUS WAS OBSERVED IN MAURITANIA AND HERDS OF DOMESTIC ANIMALS SHOWED SIGNIFICANT PERCENTAGES OF RVFV IGM.

THE OCCURENCE OF SUCH VIRAL MANIFESTATIONS PROMPTED US JO EVALUATE THE DEGREE OF IMMUNITY AMONG SMALL RUMINANTS IN WHATAPPEARED TO BE A RISK AREA

SLIDE 3

WE STUDIED THE PREVALENCE OF RVFV ANTIBODIES IN SMALL RUMINANTS (SHEEP AND GOATS) ALONG THE LEFT BANK OF THE SENEGAL RIVER BASIN.

THREE AREAS WERE DEFINED: ON THE MAP:

- UPPER BASIN (MATAM), MIDDLE BASIN (PODOR) AND LOWER BASIN (DAGANA).

SELECTED LOCATIONS WERE RANDOMLY CHOOSEN.

ANIMALS OF 2 OR MORE HERDS BY LOCATION WERE BLEEDED WITHOUT INDIVIDUAL TAGGING.

SPECIES, SEX AND AGE (ADULT TEETH) OF THE ANIMALS WERE REPORTED, **SO** ABORTIONS, HIGH MORTALITY...

SERA WERE TESTED:

- BY ELISA (USING A HUMAN STRAIN FROM THE 1987 MAURITANIAN OUTBREAK) FOR IGG AND IGM DETECTION
- AND BY NEUTRALIZATION TEST (USING THE VACCINE SMITHBURN STRAIN) IN TWO DIFFERENT LABORATORIES AND RESULTS WERE COMBINED.

SLIDE 4

293 SERA FROM SHEEP AND GOATS WERE COLLECTED IN AUGUST 1988,324 IN AUGUST 1989 AND 583 IN SEPTEMBER 1990

BETWEEN THE 1988- 1990 PERIOD , A SIGNIFICANT DECREASE WAS GLOBALY OBSERVED EITHER BY ELISA (24% IN 1988 TO 10,5% IN 1990) OR BY NEUTRALIZATION TEST (23 % IN 1988 TO 7% IN 1990)

IN A MORE DETAILED ANALYSIS, WE OBSERVED A SIGNIFICATIVE DECREASE OF ANTIBODY PR-VALENCE IN THE LOWER BASIN AND IN THE UPPER BASIN EITHER BY ELISAAND NEUTRALIZATION TEST.

IN THE MIDDLE BASIN AREA, NO SIGNIFICANT VARIATIONS OF RVFV PREVALENCE WERE DETECTED DURING THE THREE YEAR OBSERVATION PERIOD BY ELISA :
19% IN 1988 AND 1989, 16% IN 1990.

SLIDE 5

IN AUGUST 1988, AN HIGHER PREVALENCE WAS OBSERVED IN THE LOWER BASIN WHERE THE '987 OUTBREAK OCCURED.

IN AUGUST 1989, A HIGHLY SIGNIFICANT DECREASE OF PREVALENCE IN THE LOWER BASIN WAS OBSERVED : 45,7% IN 88, 25,6% IN 89, AND, AGAIN, IN 1990: 10,5%.

IN THE UPPER BASIN AREA THE DECREASE IS SIGNIFICANT IN THE PERIOD 1988-1990.

IN 1388, RVFV IGM WERE DETECTED IN 4 ANIMALS FROM THE THREE STUDIED AREAS.

IN 2 CASES, SERA WERE IGM POSITIVE, IGG NEGATIVE BY ELISA AND POSITIVE BY NEUTRALIZATION TEST.

IN 1989, ONLY TWO IGM SERA WERE DETECTED (ONE FROM THE UPPER BASIN AND ONE FROM THE MIDDLE BASIN).
AND IN 1990 AN ABSENCE OF RVFV IGM POSITIVE SERA

SLIDE 6

A S'MILAR PATTEHN OF RVFV ANTIBODY PREVALENCE WAS OBTAINED BY NEUTRALIZATION TEST :

THE 1988 HIGH PREVALENCE IN THE LOWER BASIN (77% VERSUS 46% BY ELISA)

A GLOBAL DECREASE OF ANTIBODY PREVALENCE ON THE 3 YEAR-PERIOD
AND A NOTICEABLE DECREASE IN THE MIDDLE BASIN AREA (19% IN 1988, 16% IN 1989 AND 11% IN 1990)

SLIDE 7

THE PREVALENCE OF RVF VIRUS ANTIBODY AMONG SMALL RUMINANTS SHOWED NO SIGNIFICANT DIFFERENCES BETWEEN SHEEP AND GOATS.

HOWEVER, THERE WERE VARIATIONS OF PERCENTAGE OF POSITIVE ANIMALS BY AGE GROUP:
JUVENILE, YOUNG ADULTS AND ADULTS.

IN JUVENILES THE PERCENTAGE WAS SIGNIFICATIVELY LOWER THAN IN ANOTHER AGE GROUPS (ADULTS)

SLIDE 8

THE COMPARISON OF PRE- AND POST-EPIDEMIC RVF VIRUS IGG AND IGM ANTIBODY AS SHOWN HERE AMONG DOMESTIC ANIMALS IN THE LOWER BASIN OF THE SENEGAL RIVER SHOWED:

- AN ABSENCE OF VIRAL ACVTIVITY IN 1982,
- A 3% PREVALENCE IN 1983 AND 85% PREVALENCE IN NOVEMBER 1987, WITH 80% IGM,
- POSITIVE ANIMALS SINCE 1987.

AN IMPORTANT DECREASE IS OBSERVED WITH NOT NOTICEABLE VIRAL ACTIVITY IN THE STUDIED SENTINEL LOCATIONS.

THE RAPID RENEWAL (TURN-OVER) OF SMALL RUMINANT POPULATION, MIGHT BE AN IMPORTANT FACTOR FOR THE RVFV ANTIBODY PREVALENCE DECREASE OBSERVED.

SLIDE 9

A NATIONAL RVFV PREVALENCE SURVEY CONDUCTED IN NOVEMBER 1987-FEBRUARY 1988 IN SEVERAL PLACES AS INDICATED IN THE MAP SHOWED A NEGATIVE GRADIENT FROM NORTH TO SOUTH (19,2% IN THE NORTH, 8% IN THE CENTRAL AREAAND 2,3%IN THE SOUTH AREA).
NORTHERN AREA:ST-LOUIS, LOUGA ISOHYETE 300MM
CENTRALAREA: THIES, FATICK, KAOLACK DIOURBEL ISOHYETE 600MM
SOUTHERN AREA: TAMBACOUNDA,ZIGUNCHOR, KOLDA ISOHYETE 900MM

THE 1990 PREVALENCE OF RVFV ANTIBODY IN THE SENEGAL RIVER BASIN IS NOW SIMILAR TO THE CENTRAL AREA PREVALENCE WHERE NO RVFV OUTBREAKS WERE REPORTED, NEITHER IGM WERE DTECTABLE IN HUMAN AND ANIMAL POPULATIONS, TRADUCING A LOW VIRUS ACTIVIN

IN OTHER AREAS (AS FERLO) WHERE PUNCTUAL SEROSURVEYS WERE CONDUCTED, A DECREASE OF RVF VIRUS ACTIVITY WAS ALSO OBSERVED SINCE 1987.
LIGHT ON
IN 1988 RVFV ACTIVITY WAS STILL PRESENT IN SOUTHERN MAURITANIA.
THE ACTUAL RVFV IMMUNITY LEVEL IN THE SENEGAL RIVER BASIN INCREASES THE RISK OF OCCURENCE OF OTHER OUTBREAK.

THE ECOLOGICAL CHANGES IN THE SENEGAL RIVER BASIN WITH EXTENSIVE IRRIGATION SCHEMES ATTRACT ANIMAL AND HUMAN POPULATIONS AND COULD INCREASE SUCH RISKS.

THE SEROSURVEY WE PRESENTED WILL BE PURSUED

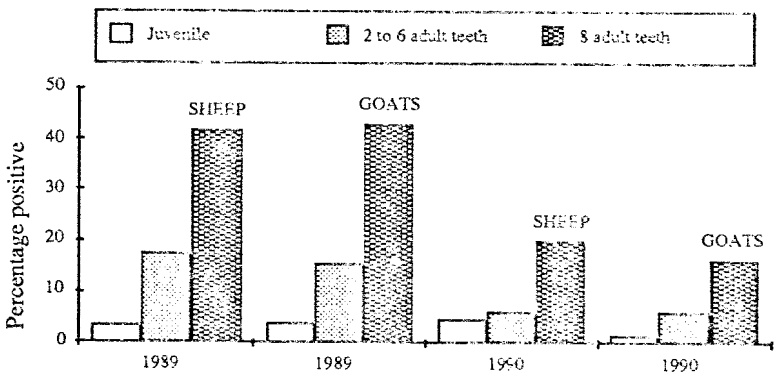
THE MAINTENANCE CYCLE OF RIFT VALLEY FEVER VIRUS IN WEST-AFRICA IS STILL UNRESOLVED AND WILL NEED FURTHER INVESTIGATIONS WITH A MULTIDIMENSIONNAL APPROACH INCLUDING HUMAN SURVEY, CLIMATOLOGICAL, ENTOMOLOGICALAND ECOLOGICAL ASPECTS.

RVF virus IgG antibody prevalence in domestic animais in Southern Mauritania (1982-1985).

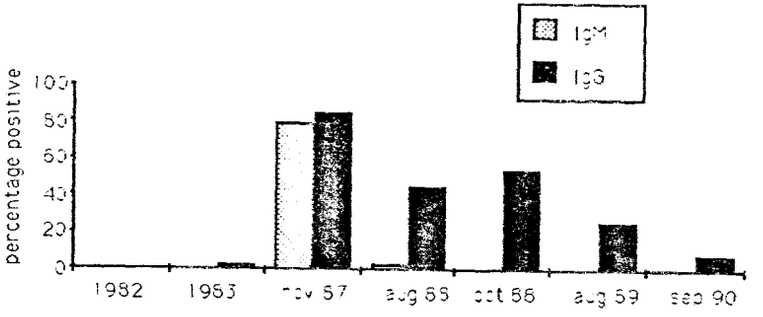
Animals	number tested	positive	%
sheep	84	12	14,3
goats	262	42	16,0
cattle	62	8	12,9
camels	58	19	32,8

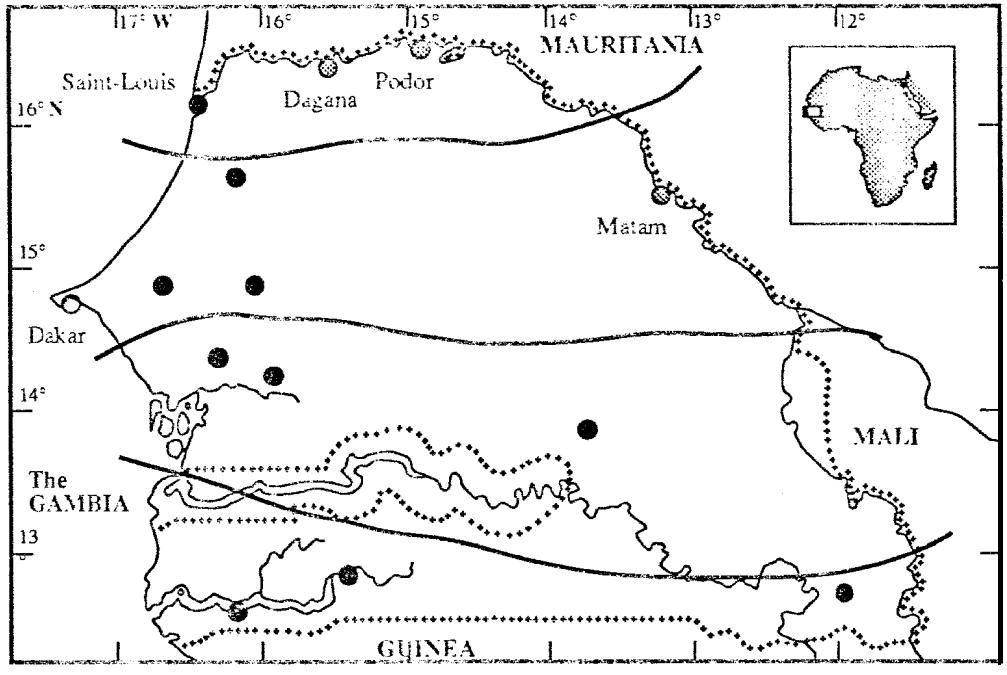
Source: Saluzzo et al., Lancet 28/02/87

PREVALENCE OF RVF VIRUS IgG POSITIVE BY ANIMAL SPECIES AND AGE GROUP IN1989-1990



Comparison of pre- and post-epidemic RVF IgG and IgM antibody prevalence among domestic animals in the Lower Basin area of the Senegal River

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MAURITANIA
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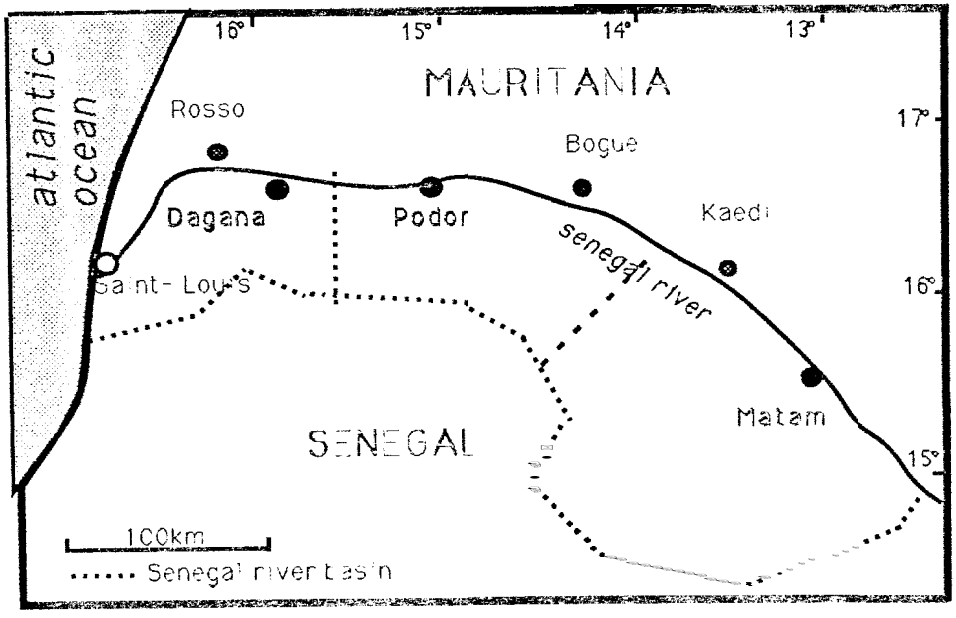
13
GUINEA


16°
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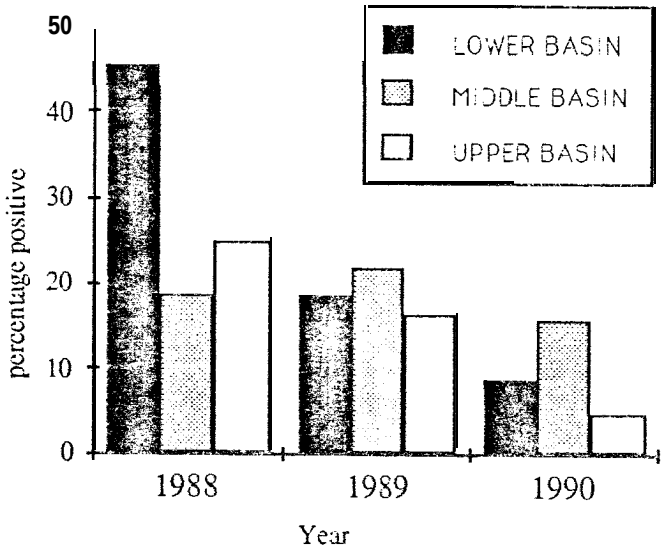
MAURITANIA
Rosso
17°
Bogue
Dagana
Podor
Kaedi
atlantic ocean
Saint-Louis
senegal river
16°
Matam
SENEGAL
15°
100km
Senegal river basin

Changes in RVFV IgG antibody prevalence among small ruminants in the Senegal river Basin from 1988 through 1990.

Area	Year	No. tested	% pos. (ELISA)	% pos (NT)
UPPER BASIN	1988	88	25.0	20,5
	1989	55	15.1	14.5
	1990	230	4,8	2,6
MIDDLE BASIN	1988	170	18,8	19.4
	1389	85	19.3	15.6
	1990	253	15.8	10.5
LOWER BASIN	1988	35	45,7	77.1
	1989	160	25.6	23,1
	1990	100	9,0	9.0
Total	1988	293	23.9	22.3
	1989	324	18,8	19.1
	1990	573	10,5	7.0

PREVALENCE OF RVFV ANTIBODY IN SMALL RUMINANTS
FROM THE SENEGAL RIVER BASIN : 1988 - 1990 (ELISA)



RVFV neutralizing antibody prevalence in small ruminants in the Senegal river basin (1988-I 990)