PRELIMINARY STUDIES ON THE ENDEMICITY OF ARENAVIRUS INFECTIONS IN TANZANIA

B.S. Kilonzo

Department of Veterinary Microbiology and Parasitology
Sokoine University of Agriculture
P.O. Box 3019, Morogoro.

SUMMARY

Field and commensal rodents were live — trapped from various parts of Morogoro, Igunga, Kilwa, Liwale, Nachingwea and Lindi districts from 1983 to 1985. Cardiac blood was recovered from each captured *M natalensis* and serum was separated and preserved at 0 — 4°C in the field and at - 20°C after returning to the Central Laboratory. The sera were tested against *Lassa* and *Mopeia* viruses, using the Indirect Immunofluorescence Antibody technique. A total of 395 sera were tested. Of these, 17 (4.3%), mostly collected from August to October, reacted with both viruses at dilutions ranging from 1:8 to 1:256. In 11 of the 17 positive sera, titres were significantly higher against Mopeia than Lassa. Differentiation of the two viruses was not possible as they are antigenically related and hence tend to crossreact in the immmunofluorescense test. The observations generally suggested that the multimammate rat populations in question carried an arenavirus of some type but further investigations were desirable in order to further characterise it and determine its distribution pattern, possible seasonality and pathogenicity.

INTRODUCTION

Arenaviruses originate their name from the Greek word, "Arenosus" (i.e. sand-sprinkled) characterised by an electron - dense material inside the virion. They are all related antigenically, especially in the Fluorescence Antibody (FA) and Complement Fixation (CF) tests and are mostly restricted to their natural geographical distribution (Casals, 1979). The oldest arenavirus, Lymphocytic Choriominingitis Virus (LCMV) which was first isolated in 1933 is regarded as the type species and it has been detected all over the world except Africa and Australia. The remaining species which are pathogenic in humans, namely the Junin virus (causative agent of Argentinian haemorrhagic fever), Machupo virus (aetiologic agent of Bolivian haemorrhagic fever), and Lassa virus (pathogen for Lassa fever) are respectively found in parts of Argentina, Bolivia and West Africa only (Casals, 1979; Monath, 1973). Furthermore, most arenaviruses have limited hosts, usually rodents, which are mostly tolerant to the illness and hence serve as suitable carriers of the pathogens, although the latter are not known to be vector-borne.

In general, numerous cases of "Fevers of Unknown Origin (FUO)" are usually observed in most rural areas of Tanzania and elsewhere in the third world. Although most rural medical authorities administer antimalarials and later on antibiotics if the patient does not respond to the former, many victims lose their lives and the deaths are religiously attributed to the "wishes of God". The possibility that at least some of these fevers are caused by arenaviruses cannot be ruled out unless absence of these agents in the area is substantiated. Moreover, the ever-increasing simplicity and fastness of intercontinental and international transportation can easily facilitate introduction of any disease from endemic to non-endemic areas (WHO, 1975).

According to Casals (1979), only twelve arenaviruses have been isolated in the world. Two of these, Lassa and Mozambique (Mopeia) viruses are found in Africa. The latter virus which was isolated from *P. (M) natalensis* caught at the village of Mopeia Vilha, Mozambique during the course of epidemiological studies of arbovirus and which is not pathogenic in humans, is closely related to the former species. Indeed it has been reported that Mopeia virus is probably a non-pathogenic form of Lassa virus (Clegg, 1984). A possible presence of more species of arenaviruses cannot be ruled out in view of the lack of adequate surveillance for the agents.

In Tanzania, like most developing countries, little has been done on the endemicity of arenavirus infections. The observed fluctuations of population densities of *P. (M). natalensis* and other rodent species in the country are generally atributed to changes in climatic conditions and agricultural activities (Kilonzo, 1984; Telford, 1985). It is quite

possible that some of these mortalities are due to viral infections some of which might be pathogenic to humans and livestock. A high mortality observed among the laboratory colony of white mice at the Rodent Control Project, Morogro Tanzania (Kilonzo, 1983 — personal observation) could also be due to some viral infections, but further investigations including attempts to isolate the pathogen are desirable.

In order to substantiate the possible involvement of arenaviruses as the cause of "FUO' and mortalities of laboratory animals in the country, a wide scale survey for endemicity of these agents is desirable. The present paper is the first of a series of investigations whose aim is to fulfil this desirability.

MATERIALS AND METHODS.

Studies were carried out in various villages of Morogoro, Kilombero, Igunga, Lindi, Nachingwea and Kilwa districts where either rodents were trapped for routine ecological and biological studies (breeding patterns, karyotype studies and feeding habits) or rodent epidemics had occurred and species involved were being investigated. Rodents captured alive for the above purposes were anaesthetised with ether and bled from the heart, using the normal techniques (Kilonzo and Mhina, 1982, 1983; Kilonzo and Mtoi, 1983). Serum was separated by standing the blood in centrifuge tubes covered with pieces of cottonwool overnight or centrifugation at 2000 - 3000 rpm for about 10-15 minutes. It was then preserved at 0 - 4°C in the field and at -20°C upon returning to the central laboratory. Each of the *P. (M) natalensis* serum samples was divided into two portions. One portion was processed and tested for haemagglutination plague antibodies as described elsewhere (Bahmanyar and Cavanaugh, 1976) while the other half was sent to the WHO Colloborating Centre for Virus Reference and Research, Porton Down, Salisbury, U.K. where the samples were tested against antigens of African arenaviruses, using the Fluorescence Antibody Technique (FAT),.

RESULTS

A total of 395 *P. (M) natalensis* sera were tested. Out of these, 17 (4.3%) reacted positively with both Lassa and Mopeia viruses at a dilution of 1;8 (Table 1). Eleven of the seventeen positive sera reacted to a higher extent against Mopeia than against Lassa (Table 2).

DISCUSSION

The present results basically show presence of an arenavirus in *P. (M) natalensis* populations in Tanzania which is closely related to Mopeia and to a lesser extent Lassa, the already established African arenaviruses. According to WHO (1974), a possible presence of Lassa virus in other parts of Tropical Africa cannot be ruled out in view of the current lack of surveillance services for the agents. According to Clegg (1984), Mopeia virus could be a non-pathogenic form of Lass virus. Moreover, it is also possible that the observed virus was introduced from endemic countries such as Moambique which shares a common border with Tanzania.

The observations further indicate a high infection rate in Morogoro as compared to other districts, a fact which is probably due to the small numbers of specimens examined in the other districts. Furthermore, the observations can be interpreted to suggest seasonal prevalence of this virus. Indeed 13 (76.5%) of the positive sera were collected from August to October while only 4 (23.5%) were collected during other periods of the year. This suggests that August - October is the optimum period for prevalence of this virus in the areas studied. In fact the observations are partly consistent with the pattern of Lassa fever infection in Nigeria where it mostly occurs in January - February (Wulff and Lange, 1975).

In view of the currently demonstrated presence of arenavirus(es) in Tanzania, further studies to establish presence/absence and epidemiology of more types of the viruses in the country, their pathogenicity and possible roles as aetiological agents of fevers of unkonwn orgin and their control are recommended. It is further suggested that medical practitioners should always consider possible arenavirus infections when dealing with fevers of unknown origins that do not respond to antimalarials and/or antibiotics.

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Table 1:

Results of Fluorescence Antibody tests of P. (M) natalensis sera against arenaviruses.

Area (District) of origin	No. Sera tested	No. sera =+ e	% sera = + :
Morogoro	314	16	51.1
Igunga	42	—	—
Kilwa	13	—	—
Liwale	13	—	—
Nachingwea	8	1	12.5
Lindi (rural)	5	—	—
Total	395	17	4.3

Table 2:

Titres of P. (M) natalensis sera tested against Lassa and Mopeia viruses

Serum No.	Area of collection	Titre with Lassa (1:x)	Titre with Mopeia (1:y)
4	Morogoro	32	64..
6	Morogoro	32	64··
7	Morogoro	256	256
10	Morogoro	16	32··
173	Morogoro	16	16
176	Morogoro	16	16
181	Morogoro	8	32··
189	Morogoro	8	16··
190	Morogoro	32	64··
228	Morogoro	8	16··
245	Morogoro	16	16
246	Morogoro	32	64··
251	Morogoro	64	128··
258	Morogoro	128	256··
379	Nachingwea	32	128··
457	Morogoro	16	16
458	Morogoro	16	16

Tests against Mopeia showed higher titres than tests against Lassa.