Antibodies to haemorrhagic fever viruses in Madagascar populations

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Abstract

Sera of 381 adult people from 5 areas in Madagascar were tested by the indirect immunofluorescence method for antibodies against Congo-Crimean haemorrhagic fever and Rift Valley fever viruses (Bunyaviridae), Ebola (strains Zaire and Sudan) and Marburg viruses (Filoviridae), and Lassa virus ( Arenaviridae). The highest prevalence rate was that of Ebola virus (4.5%). As no haemorrhagic syndrome has been found associated with this virus, the possible presence of a less pathogenic, antigenically related, strain is discussed. The prevalences of Congo-Crimean haemorrhagic fever and Rift Valley viruses were very low, despite previous viral isolations from potential vectors. No serum reacted against Lassa or Marburg antigens. The results are analysed in the light of the geographical and bioecological characteristics of Madagascar, which is a true 'microcontinent' very different from the African mainland.

Introduction

An epidemiological research programme on arboviruses has been in progress in Madagascar since 1976, including both serological and virological surveys of human and animal populations (Fontenille, 1988). Several viral strains have been isolated, especially Rift Valley fever virus from mosquitoes caught in a primary forest area (Mathiot et al., 1984), and Congo-Crimean haemorrhagic fever virus from ticks (Boophilus microplus) collected on cattle in the slaughterhouse in Antananarivo, the capital of Madagascar (Mathiot et al., 1988). Furthermore, a previous serological survey of wild rats and people who had been working for a long time with rat populations (Rollin et al., 1986), indicated that a strain antigenically related to Hantaan virus was circulating through rat populations, but with a low transmission rate to man.

As the main other viruses responsible for haemorrhagic fever were not included in the initial seroepidemiological surveys, a study was undertaken to evaluate the activity of these viruses in the human population. This study focused on detection by the indirect immunofluorescence test of antibodies against the following viruses: Congo-Crimean haemorrhagic fever (CON), Rift Valley fever (RVF), Ebola strain Zaire (EBO Z), Ebola strain Sudan (EBO S), Marburg (MBG) and Lassa (LAS) viruses (Meunier et al., 1987). Positive sera were then titrated on monospecific spot slides and on uninfected cells. Specimens were considered positive if they reacted with virus-infected, but not with uninfected, cells. The endpoints for the serological titrations were recorded as the last dilution which produced a positive reaction with infected cells.

Table. Human haemorrhagic fever serology in different areas of Madagascar

<table>
<thead>
<tr>
<th>Area</th>
<th>CON</th>
<th>RVF</th>
<th>EBO Z</th>
<th>EBO S</th>
<th>MBG</th>
<th>LAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antananarivo</td>
<td>0/45</td>
<td>0/45</td>
<td>6/45</td>
<td>0/45</td>
<td>0/45</td>
<td>0/45</td>
</tr>
<tr>
<td>Mandoto</td>
<td>2/149</td>
<td>1/149</td>
<td>7/149</td>
<td>0/149</td>
<td>0/149</td>
<td>0/149</td>
</tr>
<tr>
<td>Andasibe</td>
<td>0/56</td>
<td>0/56</td>
<td>3/56</td>
<td>0/56</td>
<td>0/56</td>
<td>0/56</td>
</tr>
<tr>
<td>Tsiramanyandidy</td>
<td>0/105</td>
<td>0/105</td>
<td>0/105</td>
<td>0/105</td>
<td>0/105</td>
<td>0/105</td>
</tr>
<tr>
<td>Ampijoroa</td>
<td>0/26</td>
<td>0/26</td>
<td>1/26</td>
<td>0/26</td>
<td>0/26</td>
<td>0/26</td>
</tr>
<tr>
<td>Totals</td>
<td>2/381</td>
<td>1/381</td>
<td>17/381</td>
<td>0/381</td>
<td>0/381</td>
<td>0/381</td>
</tr>
<tr>
<td>Percentages</td>
<td>0.5</td>
<td>0.3</td>
<td>4.5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*CON=Congo-Crimean haemorrhagic fever, RVF=Rift Valley fever, EBO Z=Ebola (Zaire), EBO S=Ebola (Sudan), MBG=Marburg, LAS=Lassa fever.

Results

The antibody prevalence rates are given in the Table. The highest rates were obtained against EBO Z. Seroprevalence was highest in Antananarivo, with 13-3% seropositive, while no serum positive for Ebola antigens was found in the cattle-breeding sera of Tsiramanyandidy. Titres ranged from 1:16 to 1:512. The highest titres were also obtained in Antananarivo. The 2 positive sera against CON antigen from
Mandoto had titres of respectively 1:16 and 1:32. Only 1 serum, from Mandoto, was positive for RVF: it had a low titre of 1:16. No positive serum was found for EBO S, MBG or LAS antigens.

Discussion
The most prevalent haemorrhagic fever virus in Madagascar appears to be EBO Z. The lack of seropositivity against MBG and EBO S antigens suggests that only one member of the filovirus family is present in Madagascar.

These viruses are in fact widespread throughout much of Africa, with seroprevalence rates ranging from 1-4% in Kenya (JOHNSON et al., 1983) to 27% in the Central African Republic (MEUNIER et al., 1987) for the Ebola strains. But, except for the epidemics which occurred during the 1970s in Zaire and Sudan, the active viral circulation suggested by these significant antibody rates is generally accompanied by a very low morbidity rate. It has been suggested that these antibodies could be related to the activity of an unidentified strain of the Filoviridae (MEUNIER et al., 1987; TOMORI et al., 1988). The lack of reports of haemorrhagic syndromes ascribable to this virus family in Madagascar reinforces this hypothesis.

Both the high endemicity level in wild fauna in Madagascar and the presence of higher levels of antibodies against Ebola virus in the principal towns suggest a comparable epidemiological pattern to mainland Africa and suggest that any animal reservoir may be a species closely associated with man. Only two sera had antibodies against CON virus. This situation is similar to that in West and Central Africa, where few human cases have been reported in spite of numerous viral isolations from ticks and mammals (GEORGES & GONZALEZ, 1986; SALUZZO et al., 1985; TOMORI et al., 1988). In addition the tick Hyalomma, which is the main vector of this virus (HOOGSTRAAL, 1979), is not present in Madagascar (BAUBERG et al., 1979). We suggest that the virus is maintained in Madagascar through a natural cycle involving the tick Boophilus, which feeds essentially on cattle, and has been found very rarely on humans. In this situation, man could be only accidentally infected.

A similar analysis can be made concerning RVF virus. The only isolations ever made in Madagascar were from mosquitoes collected in the primary forest of Andasibe, where the virus seems to have a primary, unidentified natural cycle without human involvement. However, the potential vectors and the vertebrate hosts for this virus are present in Madagascar, where it could find favourable conditions for an epizootiological extension. Such epidemiological evolution has been observed in West Africa where the presence of RVF virus has been known for several years, but overt human disease in West Africa associated with this virus is a very recent finding (JOUAN et al., 1988).

Similarly to RVF and CON viruses, Hantaan virus constitutes a permanent risk of haemorrhagic fever for the Malagasy population, especially since the first human clinical cases due to this virus in Africa have recently been reported from the Central African Republic (GONZALEZ et al., 1988).

Finally, as expected because of the absence from Madagascar of the rodents Mastomys and Praomys, the natural vertebrate hosts for viruses of the Lassa complex in Africa (GEORGES et al., 1985; GONZALEZ et al., 1986), no sample reacted with LAS antigen.

References


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