Itaqui virus, a new member of arthropod-borne group C*

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Many strains of arthropod-borne viruses belonging to group C¹ have been isolated near Belém, Brazil, since 1954². In the course of studies on the hemagglutination-inhibition (HI) relations of 200 of these viruses, it was noted that several of them differed from the five prototypes previously described. These strains constitute a 6th type, the members of which have been shown to be identical or closely related by their HI and complement-fixation (CF) reactions, and to be different from the five reported types in group C.

It is proposed to call this 6th prototype of group C Itaqui, after the name of the stone quarry near which the virus was 1st isolated from the blood of a sentinel Cebus monkey on April 26, 1956.

Itaqui virus is pathogenic suckling and adult mice by all routes of inoculation, although adults sometimes survive intraperitoneal or subcutaneous injection. Average survival time (AST) of three day old mice inoculated intracerebrally (i.c.) is 1.0 day, intraperitoneally (i.p.) 1.2 days; the AST of adults inoculated i.c. is 3.2 days. As with the other types of group C, infant mice appear apneic and cyanotic shortly before death, and die following a tonic spasm. Adults show ruffled fur before death and usually are not paralyzed. The virus is infectious after passing through a Seitz filter.

Since 1956, Itaqui virus has been isolated from 22 infections in man, sentinel monkeys and mice and a wild rodent. The one human infection by Itaqui recorded to date occurred in a 17 year old male from Bragança, who noted headache and feverishness on the afternoon of November 23, 1959, while working in a clearing at the margin of the Oriboca forest near Belém. At the time blood was obtained on the following day, his temperature was 100.2°F, pulse 80, and he complained of headache, photophobia, dizziness and epigastric discomfort. He had mild coryza and cough. Leukocyte count was 6,600 per cmm and blood examination for malaria parasite was negative.

Four sentinel monkeys have harbored Itaqui virus, in no case showing apparent illness. Viremia in one monkey lasted at least five days as shown by isolation from two successive bleeding on February 21 and 25, 1985. Itaqui has been isolated from 16 sentinel mouse groups, in ten of which more than one individual harbored the virus. Itaqui also was isolated from the blood of a wild rat (*Proechimys*) which did not appear ill. All animals tested developed neutralizing antibodies in convalescent sera.

The following viruses were used in identification of Itaqui: Oriboca (Be An 17), Murutucu (Be An 974), Marituba (Be An 15), Apeu (Be An 848), Caraparu (Be An 3994) and Be An 12797, a strain of Itaqui isolated from blood of a sentinel mother mouse. HI testing was performed by the methods of Clarke and Casals³, using acetone-extracted serum antigens and kaolin-treated sera prepared in mice by single subcutaneous injection of infected brain, followed by bleeding one to two weeks later. CF testing was in block titrations by microtechnique adapted from Fulton and Dumbell⁴. Sera were made in the same way as for HI testing.

Neutralization (NT) testing was by the constant serum-varying virus dilution technique, i.p. in three day old swiss mice, using

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³ This animal was trapped and bled by a field team of the Oswaldo Cruz Institute under the direction of dr. Hugo Laemmert.
either brain or serum as virus source. Serum-virus mixtures were incubated at 37°C for one hour. Immune sera were made in Cebus monkeys rather than in mice because monkey sera have been found to be more effective in differentiating group C agents than mouse sera made by comparable technique.

Itaqui is serologically distinct from the five other group C prototypes, as shown in Table 1. By HI and NT there is relationship to Oriboca virus, and by CF Itaqui is indistinguishable from Caraparu virus. Of 17 Itaqui strains tested, all show a common CF relationship to Caraparu.

Itaqui has not been isolated from mosquitoes, although its occurrence in sentinel animals placed in cages off ground and accessible only to flying insects, as well as its serological relationship to other arthropod-borne viruses, suggests that it is also a mosquito-borne agent.

Like other group C viruses, Itaqui appears to be endemic in the forests near Belém, Brazil. The isolation of this agent from the blood of a forest rat may indicate that the small forest rodents are a possible source of infection for arthropod vector, with man becoming infected incidentally when he ventures into the forest.
Table 1 – Serological relationships of Itaqui virus

<table>
<thead>
<tr>
<th>Antigen</th>
<th>Sera</th>
<th>Hemagglutination-inhibition testing</th>
<th>Neutralization testing</th>
<th>Complement-fixation testing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Itaqui</td>
<td>Oriboca</td>
<td>Marituba</td>
<td>Murutucu</td>
</tr>
<tr>
<td>Itaqui</td>
<td>320+*</td>
<td>40</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Oriboca</td>
<td>0</td>
<td>320+</td>
<td>640+</td>
<td>160</td>
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<tr>
<td>Marituba</td>
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<tr>
<td>Murutucu</td>
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<tr>
<td>Apeu</td>
<td>0</td>
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</tr>
<tr>
<td>Caraparu</td>
<td>0</td>
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</tbody>
</table>

* Reciprocal of serum dilution giving complete inhibition of agglutination of eight units of antigen. + = endpoint not reached. 0 = negative at 1:10 dilution.
† Log neutralization index 0 = less than 1.3 log neutralization index.
‡ Reciprocal of serum dilution over reciprocal of antigen dilution giving greater than 50% fixation. 0 = negative at 1:4 dilution.
SUMMARY

Itaqui virus, a new of arthropod-borne group C, has been isolated from 22 infections in a febrile human being, sentinel animals and a forest rat near Belém, Brazil, since 1956. It is related by HI and NT to Oriboca virus and is indistinguishable by CF from Caraparu virus.

REFERENCES


