VIROLOGY

Bats and Arboviruses in East Africa

The natural cycles of the majority of the arboviruses are unknown. Even with yellow fever virus—which belongs to Casals's Group *B*—where extensive investigations have shown the natural cycle to involve forest dwelling primates and mosquitoes, many workers think that there still remains at least one other as yet undiscovered cycle of virus maintenance.

In Africa, bats which are abundant and attractive to mosquitoes[1] have as yet been surprisingly little investigated in relation to yellow fever and other arboviruses. Investigations at this Institute during 1951 with the fruit bat *Eidolon helvum* (Kerr) showed that 1/40 serum samples from bats collected in Kampala contained neutralizing antibodies to yellow fever virus, and circulation experiments with this virus detected in one instance a low level of viræmia[2]. We understand that recent work in the United States supports this finding.

In West Africa, Lagos bat virus was isolated from the brain of a fruit bat, *Eidolon helvum* (Kerr)[3], and recently two virus strains belonging to Casals's Group *A* and numerous strains belonging to Casals's Group *B* have been isolated from bats of the genus *Scotophilus* in Senegal[4–6].

In East Africa a Group *B* virus, Entebbe bat salivary gland virus, was isolated from *Tadarida* (*Chaerephon*) *limbata* (Peters) in 1957 (ref. 7). A continuation of this work on bats, which will be reported fully elsewhere, has during the past year led to a number of findings:

(1) Seven strains of two other Group *B* viruses and two further strains as yet unidentified have been isolated from the salivary glands of 479 bats belonging to the genus *Tadarida*.

(2) Hæmagglutination inhibitory antibodies to Group *B* virus antigens have been found in 91 out of 98 (93 per cent) acetone-extracted sera collected from *Tadarida* spp.

(3) Hæmagglutination inhibiting antibodies to chikungunya virus have been found in the serum of one bat and hæmagglutination inhibiting antibodies to Bunyamwera virus have been found in that of another.

(4) In the laboratory it has been shown that two species of the genus *Tadarida* will circulate Bunyamwera virus in titres greater than 3·0 log LD_{50} for at least 6 days. Yellow fever circulation experiments have so far been unsuccessful.

(5) Zika virus circulated in low titres in a bat of the genus *Rousettus*.

The findings suggest that there is an exceptional relationship between bats and Group *B* viruses, for we cannot find records of other apparently healthy vertebrates from which such a high rate of arbovirus isolation can be made and which at the same time show such a high percentage of antibodies. The view that the relationship between Group *B* viruses and bats is not an exceptional local occurrence is supported by the finding of antibodies neutralizing dengue virus in the sera of bats of the genus *Pteropus* in Australia[8] and antibodies neutralizing Tick-borne encephalitis virus in Europe[9]. Furthermore, in America the Group *B* Rio Bravo virus was isolated from bats in Texas[10] and a Group *B* virus has been isolated from bats in Montana[11]. That Group *B* viruses may be found circulating in the blood of bats and thus be available to infect hæmatophagous arthropods is shown by laboratory investigations with Japanese *B*, St. Louis and tick-borne encephalitis viruses[12–14].

The viræmia investigations with Bunyamwera virus indicate that bats may circulate arboviruses of another group. In this respect it appears of great interest that Downs *et al.* have recently reported the isolation from bats of a number of strains of Tacaribe virus, which complement fixation shows to be related to Argentinian hæmorrhagic fever (Junin) virus[15].

It is apparent, therefore, that bats are potentially of great importance in the wild-cycle of arboviruses and warrant further investigation on a wide international basis.

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Recovery of the Viral Antigen in a Cell by means of Double Radioactive Labelling

The use of isotopes has rendered possible the examination of virus development at the cellular level[1,2].

We have investigated the reproduction of the fowl plague virus (FPV) using the method of autoradiography. A double labelling with radioactive isotopes was used for the differentiation of the synthesis of viral RNA and proteins (antigens).

The strain Waybridge of FPV and dermo-muscular cells of human embryos were used. Trypsinized tissue cultures, 2×10^6 cells/ml. suspended in Medium 199 with 10 per cent of bovine serum, were placed on cover slips, 2 cm × 2 cm, and incubated at 37° C for 6 days, and then infected with FPV, 100 ID_{50} per cell. A rat serum with the hæmagglutination-inhibition titre 1 : 1,280 was labelled with iodine-131 according to the techniques of Francis *et al.*[3] and Liebster *et al.*[4], having used sodium salt of iodine, specific activity 6 μc./ml. γ-globulins were obtained by the rivanol method; their specific activity was 0·05 μc./ml.

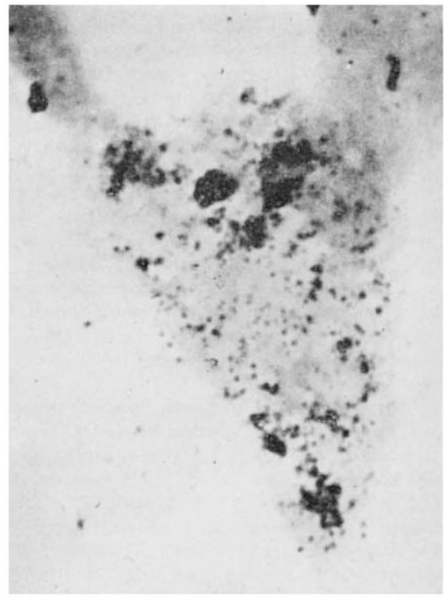

Fig. 1. Autoradiograph of the cell, infected with fowl plague virus