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NOTES

Comparison of the Virion Polypeptides of Group B Arboviruses

DANIEL SHAPIRO, DENNIS TRENT, WALTER E. BRANDT, AND PHILIP K. RUSSELL[1]

Department of Virus Diseases, Walter Reed Army Institute of Research, Washington, D.C. 20012 and Department of Microbiology, University of Texas Medical School at San Antonio, San Antonio, Texas 79229

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The virion polypeptides of eight group B arboviruses were compared by polyacrylamide gel coelectrophoresis. All contained three polypeptides, V-1, V-2, and V-3. The mosquito-borne viruses had electrophoretically similar small membrane polypeptides (V-1); the tick-borne viruses had a V-1 of significantly decreased mobility.

Group B arboviruses have been found to contain three virion polypeptides by polyacrylamide gel electrophoresis (1, 3, 4, 6, 7); a fourth radioactive peak is sometimes present. We have designated the three polypeptides of Japanese encephalitis (JE) virus as V-1 (a small membrane polypeptide, molecular weight approximately 8,700), V-2 (the "core" polypeptide, molecular weight approximately 13,500) and V-3 (the large membrane glycoprotein, molecular weight approximately 53,000) (1). However, substantial differences in the molecular weights of the virion polypeptides of other group B arboviruses have been reported. We therefore examined the virion polypeptides of eight group B arboviruses by coelectrophoresis through polyacrylamide gels in order to compare them directly. Since there are major biologic and antigenic differences between subgroups within group B, we included both tick-borne and mosquito-borne viruses to determine whether structural difference may be correlated with the other parameters.

The viruses were studied in two series of coelectrophoretic experiments. Series A viruses were: (i) Suckling mouse brain passage (SMP) 34 of New Guinea "C" strain of dengue-2 (DEN-2); (ii) SMP 27 of M1/311 strain of JE; (iii) SMP 109 of Hubbard strain of St. Louis encephalitis (SLE); (iv) highly mouse-adapted French neurotropic yellow fever; (v) high mouse passage of TP-21 strain of Langat (LAN); and (vi) SMP 6 of Moscow B-4 strain of Russian spring-summer encephalitis (RSSE) virus. These viruses were grown in LLC-MK_2 cells that were radioactively labeled with either ^3H- or ^{14}C-amino acids and then purified by rate zonal centrifugation through linear sucrose gradients by previously described methods (1, 3). The virions were dissociated with 1% sodium lauryl sulfate and 2-mercaptoethanol, mixed, and subjected to electrophoresis through 8 or 10% polyacrylamide gels either 70 or 180 mm long, as previously described (3). Series B viruses all had high mouse passage histories: (i) KB cell-adapted New Guinea B strain of DEN-2 (1); (ii) Nakayama strain of JE; (iii) Tampa Bay Human-28 strain of SLE; (iv) Ar-248 strain of West Nile $(WN)_2$ (v) TP-21 strain of LAN; and (vi) Byers strain of Powassan (POW). They were grown in LLC-MK_2 cells, labeled, purified, and subjected to electrophoresis through 10% polyacrylamide gels by previously described methods (6).

The results indicate that all eight viruses had fundamentally similar polypeptide compositions (Fig. 1-3). Nevertheless, two distinct subgroups could be identified, based on the electrophoretic mobility of the small membrane polypeptide V-1. Subgroup I was exemplified by the mosquito-borne viruses JE, DEN-2, SLE, and WN (Fig. 1). Each had a V-1 of similar mobility. The mobility of the V-1 of yellow fever was slightly decreased relative to that of the above four viruses (Fig. 2A), but was greater than that of the tick-borne viruses (Fig. 2B). Subgroup II was exemplified by the members of the tick-borne complex, LAN, POW, and RSSE (Fig. 3); the mobility of V-1 was decreased relative to that of subgroup I. Within this

[1] Present address: Dept. of Microbiology, Dartmouth Medical School, Hanover, N.H. 03755.

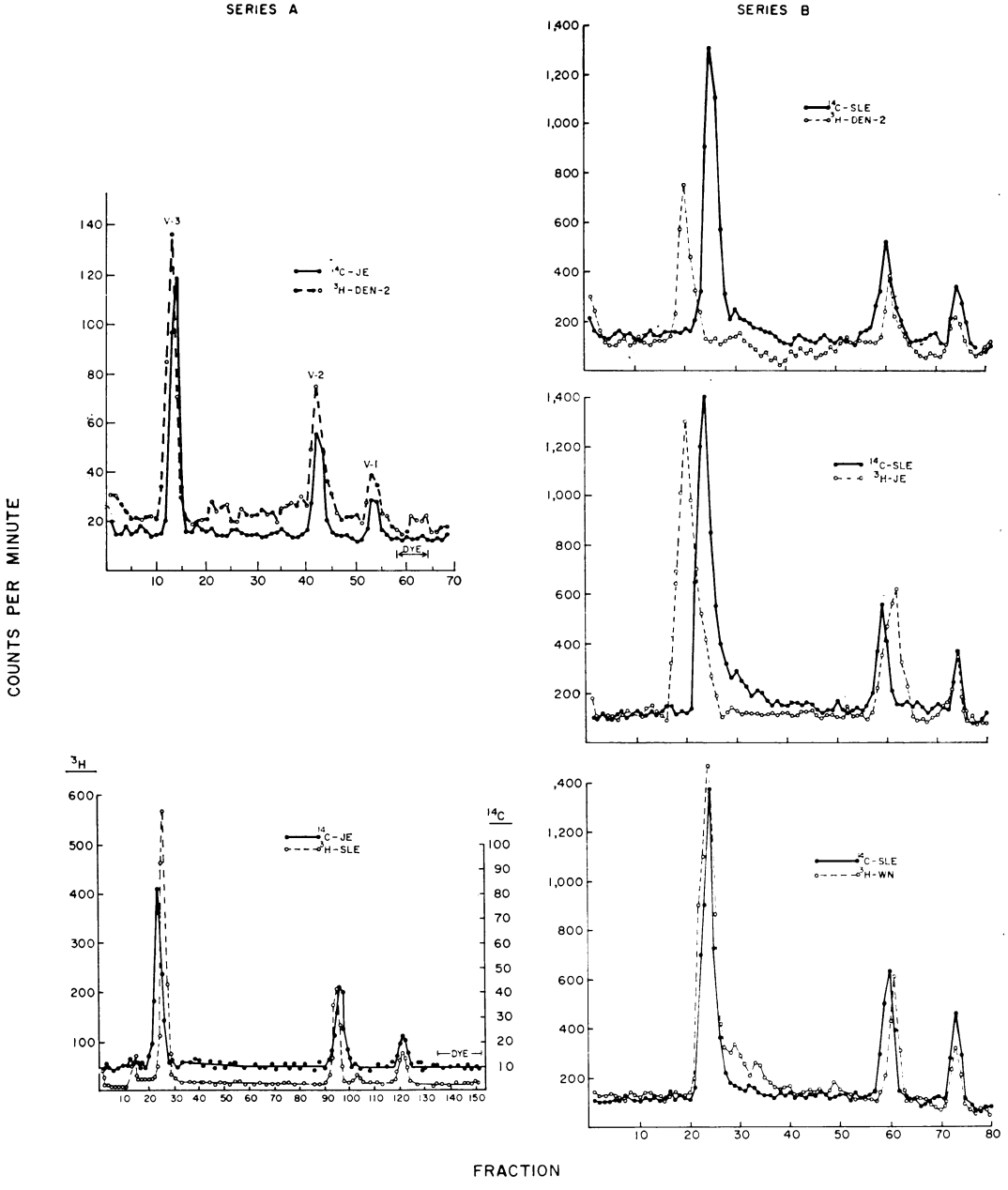

FIG. 1. *Electrophoresis of subgroup I, mosquito-borne viruses. Series A: top, 40 μliters of ^{14}C-amino acid-labeled Japanese encephalitis (JE) virions was mixed with 20 μliters of ^{3}H-amino acid-labeled dengue-2 (DEN-2) virions, and the mixture was subjected to coelectrophoresis through a 70-mm, 10% acrylamide gel; bottom, 50 μliters of ^{14}C-JE was mixed with 50 μliters of ^{3}H-St. Louis encephalitis virus (SLE) and subjected to coelectrophoresis through a 180-mm, 10% acrylamide gel. Series B: top, 100 μliters of ^{14}C-SLE was subjected to coelectrophoresis with 50 μliters of ^{3}H-DEN-2; center, 100 μliters of ^{14}C-SLE was subjected to coelectrophoresis with 100 μliters of ^{3}H-JE; bottom, 100 μliters of ^{14}C-SLE was subjected to coelectrophoresis with 75 μliters of ^{3}H-West Nile virus (WN).*

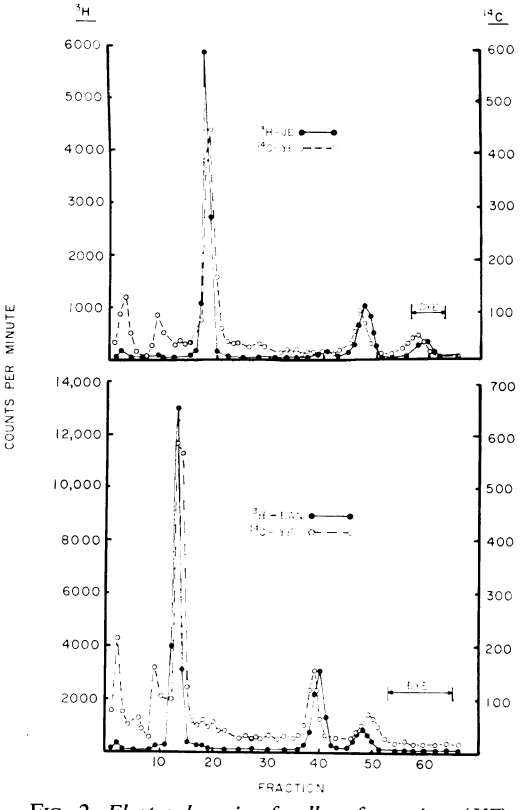

FIG. 2. *Electrophoresis of yellow fever virus (YF). Series A (only): top, 40 μliters of ³H-Japanese encephalitis virus (JE) was mixed with 20 μliters of ¹⁴C-YF and subjected to coelectrophoresis through a 70-mm, 8% acrylamide gel; bottom, 20 μliters of ¹⁴C-YF was mixed with 40 μliters of ³H-Langat virus (LAN) and subjected to coelectrophoresis on a 70-mm, 10% acrylamide gel.*

subgroup, the mobilities of V-3 and V-2 were more similar than within subgroup I.

These data indicate that the mosquito-borne group B arboviruses can be distinguished from the tick-borne group B arboviruses on the basis of the mobility of the small membrane polypeptide V-1; the tick-borne V-1 is either larger (2) or less negatively charged (5) than the mosquito-borne V-1. These observations, although strictly empirical, would raise the possibility that the small membrane polypeptide, V-1, plays a role in determining host range and may be of taxonomic significance.

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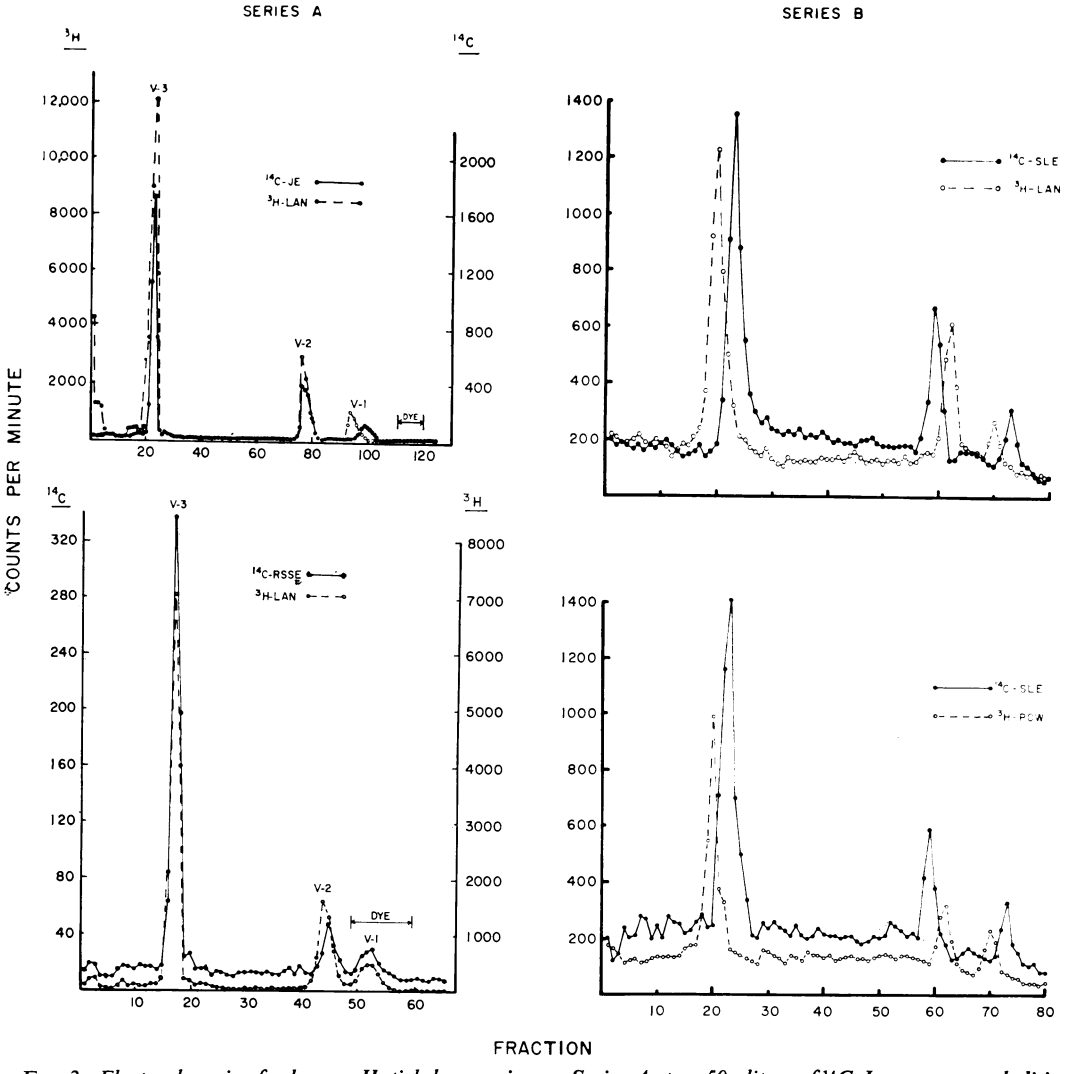

FIG. 3. *Electrophoresis of subgroup II, tick-borne, viruses. Series A: top, 50 μliters of ^{14}C-Japanese encephalitis virus (JE) was mixed with 50 μliters of ^{3}H-Langat virus (LAN) and subjected to coelectrophoresis through a 180-mm, 10% acrylamide gel; bottom, 50 μliters of ^{14}C-Russian spring-summer encephalitis virus (RSSE) was mixed with 20 μliters of ^{3}H-LAN and subjected to coelectrophoresis through a 70-mm, 8% acrylamide gel. Series B: top, 100 μliters of ^{14}C-St. Louis encephalitis virus (SLE) was subjected to coelectrophoresis with 80 μliters of ^{3}H-LAN; bottom, 100 μliters of ^{14}C-SLE was subjected to coelectrophoresis with 100 μliters of ^{3}H-Powassan virus (POW).*