## NOTES

## Comparison of the Virion Polypeptides of Group B Arboviruses

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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 tickborne 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<sub>2</sub> cells that were radioactively labeled with either 3H- or 14C-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 celladapted 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)<sub>2</sub> (v) TP-21 strain of LAN; and (vi) Byers strain of Powassan (POW). They were grown in LLC-MK<sub>2</sub> 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 mosquitoborne 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

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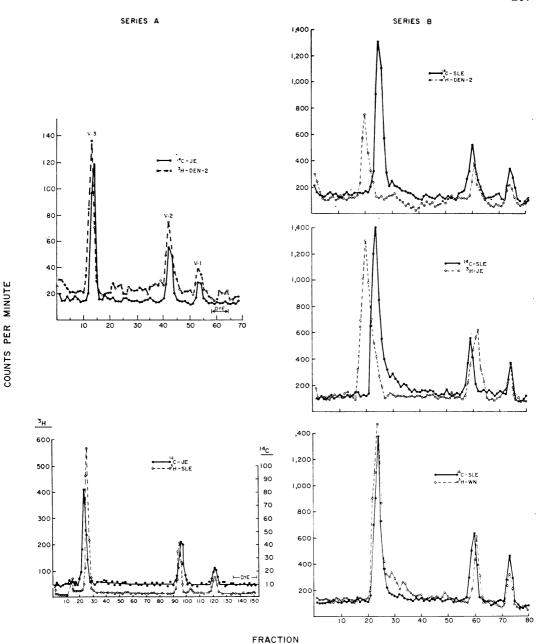


Fig. 1. Electrophoresis of subgroup I, mosquito-borne viruses. Series A: top, 40 µliters of \$\$^{14}\$C-amino acid-labeled Japanese encephalitis (JE) virions was mixed with 20 µliters of \$\$^{14}\$H-amino acid-labeled dengue-2 (DEN-2) virions, and the mixture was subjected to coelectrophoresis through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

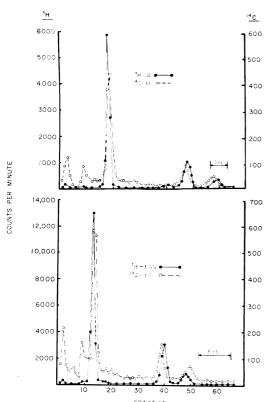


Fig. 2. Electrophoresis of yellow fever virus (YF). Series A (only): top, 40 µliters of <sup>3</sup>H-Japanese encephalitis virus (JE) was mixed with 20 µliters of <sup>14</sup>C-YF and subjected to coelectrophoresis through a 70-mm, 8% acrylamide gel; bottom, 20 µliters of <sup>14</sup>C-YF was mixed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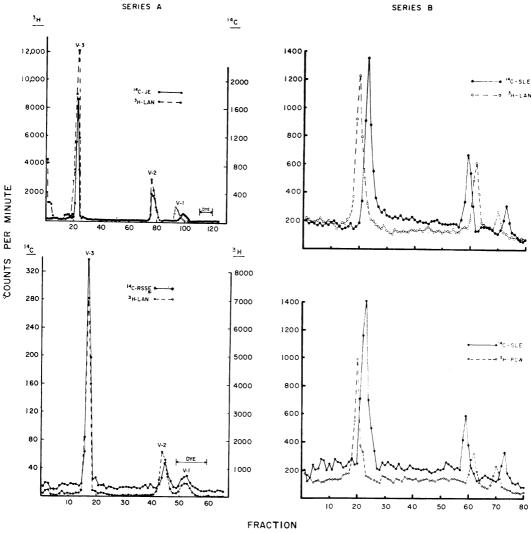


Fig. 3. Electrophoresis of subgroup II, tick-borne, viruses. Series A: top, 50 µliters of <sup>14</sup>C-Japanese encephalitis virus (JE) was mixed with 50 µliters of <sup>3</sup>H-Langat virus (LAN) and subjected to coelectrophoresis through a 180-mm, 10% acrylamide gel; bottom, 50 µliters of <sup>14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