Virginia Journal of Science
Volume 41, Number 3
Fall 1990

Ecology of Rocky Mountain Spotted Fever in Virginia and Maryland

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Rocky Mountain spotted fever is a severe, life threatening typhus-like rickettsial disease transmitted by ticks. It is endemic in the eastern United States, especially in the southeast. Approximately 700-800 cases are reported annually and probably represent a significant underestimate of the true incidence of this disease. RMSF is a zoonotic infection that circulates enzootically among ticks and wild mammals. The major tick vector in the eastern U.S. is the American dog tick, *Dermacentor variabilis*. Although most wild mammals are susceptible to infection, a very small number of species play a significant role as hosts for this tick and the disease. In the spring, larval ticks emerge from their winter diapause and infest small mammals, especially white footed mice (*Peromyscus leucopus*) and meadow voles (*Microtus pennsylvannicus*). Reproduction among these small mammals also occurs at this time, providing a rapidly expanding host population at the same time that the ticks commence their attack. Rickettsemic animals provide opportunities for rapid spread of the infection from infected to uninfected ticks sharing the same feeding pool, amplifying the infection within the tick population. Subsequent attacks by nymphal ticks molted from the fed larvae further amplifies the infection, and a high proportion of the mammal hosts have serum antibodies to RMSF. Man biting adult ticks emerge from this population in the late spring, reaching a peak in June or July. The seasonal incidence of RMSF reflects this pattern, with the peak in human illness following soon after the peak in adult tick numbers. Estimates of the incidence of RMSF infection in ticks in Virginia, based on inoculation of tick extracts into susceptible laboratory hosts, was approximately 5% over a three year period. In nearby southeastern states, estimates of the incidence of infection in ticks exceeded 10% in some areas. Dogs also play a significant role in the maintenance and spread of RMSF infected ticks as shown by serosurveys. The role of dogs in the spread of RMSF to man should be quantified. In Maryland, estimates of infection in ticks based on direct FA assay of tick hemolymph were as high as 19% in some populations. However, these higher estimates may include other rickettsial species which are not known to cause RMSF. Although ticks tend to be more abundant in the old field - forest ecotone and adjacent woodlands, most of the infected larvae were associated with the old field and ecotonal communities. Studies in northern Virginia (Fairfax County), a locality close to the highly urbanized Washington-Baltimore metropolitan complex, suggest that the highest risk of exposure to this disease is in the suburban and rural communities. Tick abundance was highest in the less populated southern and western parts of the country. Most cases of RMSF occurred in these same localities. Some residents of the more urbanized areas of the county are believed to have acquired their exposure in these same highly tick infested regions. Tests of ticks collected from representative regions throughout the county for infection with RMSF done by personnel of the Bureau of Biologics, U.S. Public Health Service, Bethesda, Maryland, revealed

infection in 8 of 69 pools assayed by inoculation of the pools into susceptible laboratory hosts (Bozeman, F.M., pers. comm.). New methods using monoclonal antibodies and other advanced microbiological techniques may facilitate ecological and epidemiological studies in the future and provide more accurate estimates of the risk of infection to man.