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ASSOCIATION OF VERTEBRATE PATHOGENS WITH
ECOLOGICAL PERTURBATION OF TROPICAL
FORESTS

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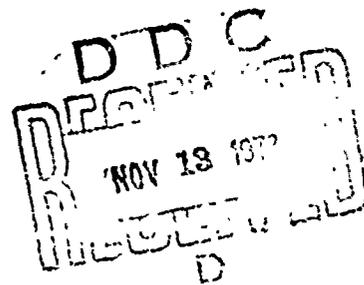
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13. ABSTRACT

A sera bank from wild vertebrates captured in Providencia, Colombia, and from human and domesticated animals from lowland, intermediate, and highland areas has been established. Serological testing has begun and tentative conclusions may be drawn. Neutralizing antibodies to five zoonotic diseases and to the sandfly isolates have been detected in the Providencia area. There is evidence for Venezuelan equine encephalitis virus infection in wild mammals, cattle, swine and horses, but not in wild birds. Antibody prevalence in New Jersey and Indiana serotypes of vesicular stomatitis virus are surprisingly high in wild and domesticated mammals (but not in birds), suggesting a sylvan maintenance cycle, since domesticated animal populations in the area are very low. Eastern equine encephalitis is moderate.

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The objective of the study was to document the ecological effects of perturbation of tropical forests. Accordingly, we assembled an interdisciplinary team of faculty and graduate students to carry out the study. Although ultimately concerned with the epizootiology of vertebrate pathogens, an understanding of the ecology of these pathogens must rest firmly on a base of understanding of the ecology of plant and animal communities.

ENTOMOLOGY

Studies of spatial and temporal distribution of hematophagous insects in primary and secondary forests and in associated clearings were done. The studies have also provided material for the virus laboratory, to relate insects to virus transmission.

Forest collecting platform sites were established in primary and secondary forests for simultaneous vertical collections at various levels. Horizontal simultaneous collections were made in clearings. Man-biting collections were made during daylight and at night. Supplemental material was gathered by means of horse bait collections and by larval collections for taxonomic purposes.

The most abundant biting group in the clearings were the simuliidae represented by four species, followed by Culicoides and Lutzomyia (sand flies). There was marked temporal distribution of certain mosquitoes including some important vector species. Anopheles, Culex and Aedes were active at night and Wyeomyia, Psorophora and Haemagogus were diurnal. Seasonal differences in populations in clearings were also observed and were correlated with rainfall. In addition to similar temporal differences observed in the forest, striking vertical differences in species were also

measured. Haemagogus and Sabethes, both vectors of sylvan yellow fever had marked preference for the forest canopy. Psorophora albipes occurred on the forest floor. Similar distributional patterns were also seen in tabanids, black flies and sand flies.

While a variety of mosquitoes were collected at the Providencia forest and clearing sites, absolute numbers were relatively small. As a result, a second study site was established in an area of greater ecological disturbance, Caucasia, where most of the tropical rain forest has been cleared and converted to pasture land and where populations of domesticated animals, especially cattle, were larger. Mosquitoes are numerous in Caucasia and determination of their potential roles as vectors of disease is currently underway.

ORNITHOLOGY

An influx of migrants caused seasonal variation in species composition. Spatial differences were also observed. Cleared areas had larger populations and more species than did forested areas. Higher recapture rates in the forest, however, indicated that these populations were more stable. Several species were found in all areas including humming birds, vultures, eagles and hawks, oil birds, swifts, swallows, ant birds, wrens, honey creepers and tanagers. Of these, the tanagers appeared to be colonizers of newly cleared areas. Some species, as the parrots and toucans, made regular long-range movements and may contribute to interarea dispersal of pathogens.

MAMMALOLOGY

A comparative study of the mammals of primary and secondary rain forests and associated agricultural clearings was made. Mammals were trapped or netted (bats). A total of 59 mammal species were collected.

Bats were the most abundant mammals of the area. A general unexplained year-long decline in rodent populations occurred in 1971. Spatial distribution within the three habitat types was variable. Three rodent species, Heteromys sp., Orizomyes, Caliginosis and Proechimys sp., were collected in all habitat types. Others including O. capito, Meacomys spinosus, Nectomys alfari, and Tylomys mirae, were captured in both secondary forests and agricultural clearings and probably occurred in primary forests as well. Hopiomys gymnurus appears to be confined to other courses and Rattus rattus to farm buildings. Thus it would appear that most mammals colonizing the clearings are forest mammals but introduction of exotic species from outside zones, as Rattus rattus, into cleared areas does occur.

MICROBIOLOGY

During the course of the study a home laboratory (Madison campus), two base laboratories (virus identification in Medellin and virus isolation in El Hatillo) and a mouse colony were established to support field operations.

Several thousand insect pools and organs from birds and mammals have been tested for viruses. To date, viruses have been isolated from Lutzomyia sandflies from engorged Simulium exiguum, from tabanids (Dichlocera sp.) and an organ pool from Rattus rattus. All are smaller than 220 nanometers in size and all except for the S. exiguum pool, are highly chloroform sensitive. The sand fly isolate is an RNA virus and the others await further characterization and identification. A complete set of reference South and Central American arboviruses and their antisera has been prepared and tested in the base and home laboratories, which will facilitate identification of the isolated agents.

A bank containing sera from wild vertebrates captured in Providencia and from human and domesticated animals from lowland, intermediate, and highland areas has been established. Serological testing has just begun but permits tentative conclusions to be drawn. Neutralizing antibodies to five zoonotic diseases and to the sandfly isolates have been detected in the Providencia area. There is evidence for Venezuelan equine encephalitis virus infection in wild mammals, cattle, swine and horses, but not in wild birds. Antibody prevalence to New Jersey and Indiana serotypes of vesicular stomatitis virus are surprisingly high in wild and domesticated mammals (but not in birds), suggesting a sylvan maintenance cycle, since domesticated animal populations in the area are very low. Eastern equine encephalitis appears to be nearly absent but antibody prevalence to Western equine encephalitis is moderate.