has been controlled effectively while fox rabies is still rampant.

In those areas where wildlife rabies exists, there is also a correspondingly great loss from cattle rabies. New York State is such an example.

In South and Central America, an epidemiologic analysis of deaths of cattle dying with a paralytic disease led to the discovery of the most unusual case of wildlife rabies yet discovered. Vampire bats were found to be transmitting rabies to cattle and humans. In studying this disease in bats, it was found that some of these animals could transmit the virus by biting and yet not show symptoms of rabies themselves. Because the most complete study of rabies in vampire bats was done on the West Indian island of Trinidad, the disease has been named "Trinidad rabies" and the little mammal has been called euphemistically the "Trinidad bat."

As far as control of rabies is concerned, there are two distinct cycles: (1) the natural disease as it occurs in wild animals, and (2) the urban type which is maintained in the domestic dog. For each type, the methods for control and eradication are known and there is no reason to assume a defeatist attitude toward the eradication of rabies just because it has found its way into wildlife. There are areas in which wildlife rabies has been eradicated, notably States of the Rocky Mountain region of the United States, and in England and Scandinavia, where rabies has been eradicated even though it had invaded wildlife.

## The Comparative Regional Prevalence of Dog Rabies in the United States, 1949

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This is a preliminary review of the study of rabies in recent years in the United States. Acknowledgment is made to the State health departments which have cooperated in this review by preparing special tabulations of reported animal rabies data by county, month, and type of animal for 1949. The Public Health Service Regional Offices have facilitated the project by collecting and forwarding data as it was available.

The reporting of rabies in animals varies not only with prevalence of the disease from area to area, but also with the effort applied in discovering it. The present portion of the study has been limited to the disease in dogs, since it is probable that the close association of dogs to humans leads to less variation in reporting than for wild animals.

This close association indicates, further, that

in the absence of a better measure, it is possible to devise a crude index for the comparison of the prevalence of the disease from one area to another in the United States. Presentation of the distribution of rabies in terms of reported cases per State does not provide an adequate basis for the epidemiological analysis of the disease.

Such an approach falsely stresses the political boundary of a State as the limitation of the infection in that area and does not include a measure of such important related factors as human and animal population concentrations in the region under consideration.

In an attempt to avoid these shortcomings, use has been made of an index given by the number of reported dog cases divided by the human population, by county. Such a ratio, in a given area, is a rough measure of the probability of human

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exposure. In this evaluation, however, the index is used for comparison between rural areas and between urban areas with respect to the prevalence in the dog population. It will be noted that the rabies picture in the counties of the index map (figure 1) differs considerably from that of the incidence map (figure 2).

The assumption is made that the ratio of dogs to humans varies little from one area to another in the region with which the study primarily is concerned. It is characteristic of the index to magnify the rabies situation where the ratio of dogs to humans is comparatively higher and to diminish the situation where the ratio is comparatively lower. Thus there is some magnification of the rural and diminution of the urban, with quite obvious effects at the extremes of human population densities. Consequently, in making comparisons, attention should be given to relative human population densities.

In 1949 there existed several apparently separated areas of enzootic-epizootic dog rabies (figure 3). The largest of these has its center along the Ohio River in the Kentucky-Indiana-Ohio sector. It extends north to Lake Michigan, east into West Virginia and Virginia, and south including Tennessee, northern Alabama, and northern Georgia.

At the periphery of this general region lie other areas of relatively high endemicity when measured by the described index. The largest and most outlying of these is that in south and east Texas, Oklahoma, and western Arkansas.

A second peripheral area lies in South Carolina, central North Carolina, and southem Virginia. A third is in central and south Georgia, with some evidence of involvement in eastern Alabama. Another somewhat more vague area extends through south and east Louisiana, western Mississippi, and eastern Arkansas.

Other lesser areas are in evidence. One is in Iowa. Another extends through central New York, northeastern Pennsylvania, and northern New Jersey. It may be that one exists in Michigan and another in eastern Virginia.

There are local situations where one or two counties are high in index rank but are isolated by distance or natural barriers from the primary and secondary centers mentioned above.

With regard to the scale being used in applying the index, it should be understood that the breakdown as noted in figure 1 and as modified in figure 3 was devised to cover the range of possible values with arbitrarily chosen values of demarkation between levels.

Certain criteria may be put forward for the purpose of interpreting the index levels. The principal epidemiological factors of dog rabies are size of the dog population in a given area, the amount of contact between dogs, the immunity level within the population, the presence of rabies in cohabitative animal populations, and the importation of rabid animals.

To interpret an index of zero as indicating that the disease is not enzootic in the dog population of that area, one should presuppose reporting to be incomplete and judge on the basis of the length of time that the county has been free of dog rabies, the distance from the area perimeter (e.g. county line) to the nearest reported case, and the presence or absence of rabies in cohabitative animals.

The interpretation of indices other than zero depends on variations of the same factors. The presence and intensity of rabies in adjoining counties, the level of rabies in cohabitative animals, the concentration of the dog population, and the results of epidemiological investigation of previous cases of dog rabies will help in making the decision of whether an enzootic situation exists in the local dog population.

General similarities may be noted which are to be found in varying degree among these areas. First, and in agreement with the epizoology of dog rabies, it will be noted that sparsely settled areas (for example, ranch land, arid land, and depleted land) generally are not involved. Second, there seems to be evidence that the distribution of critical areas may be associated with waterways and drainage areas.

In order to explain the discrete-area phenomena evident in figure 3, much more must be done. It is desirable to know whether these areas are in reality one; if not, whether a given area is likely to disappear or merely to fluctuate about the perimeter with established permanent foci remaining over long periods.

It is not the purpose of this review to draw conclusions pertaining to the prevalence of rabies in specific areas. The study is presented as a possible guide for local and regional comparative evaluation. Subsequent reports will utilize available information on incidence of the disease in other animals, animal vaccinations, and human postexposure vaccine treatments, in order to provide a more complete and comprehensive description of the rabies situation in the United States as it has developed in recent years.



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