Three Studies on Domestic Rats and Murine Typhus Control

Studies on rats and their ectoparasites in relation to murine typhus control are reported in detail in three papers published as Public Health Monograph No. 5 under the general title, "Domestic Rats, Rat Ectoparasites, and Typhus Control."

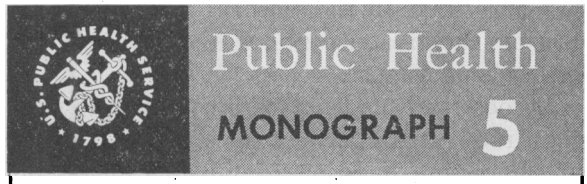
Part I. Domestic Rats in Relation to Typhus Control. By Harvey B. Morlan, M.S., Bernice C. Utterback, and Jack E. Dent.

This paper reports the composition of rat samples and the prevalence of typhus antibodies in rats by species, sex, and age, together with observations on rat behavior and reproduction. It includes information for students of rat ecology, and strengthens conclusions indicated by the gross data in previous articles.

The rat samples were divided into groups based on body length, weight, species, sex, and age. Roof rats (*Rattus rattus*) and brown rats (*Rattus norvegicus*) collected from one untreated and two DDT-dusted Georgia counties were studied, in both field and colony situations. A shake-down method of hand-catching rats proved to be a valuable supplement to usual trapping methods. Questioning occupants of premises being surveyed and using records of captures in relation to the number of traps set proved to be unreliable methods for estimating relative abundance of rats.

Sex ratios in the two rat species and the average body length of sexes within each species were similar. Samples were slightly biased in favor of large rats.

During three full operational years, complement fixation tests for murine typhus were completed for 18,959 rat serums. The average titer



This summary covers the principal findings presented in Public Health Monograph No. 5, published concurrently with this issue of *Public Health Reports*. The authors are members of the staffs of the Public Health Service, Communicable Disease Center, Atlanta, Ga., the Center activities at the Oklahoma State Department of Health at Oklahoma City, and the department of zoological sciences, University of Oklahoma, Norman, Okla.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch, Public Health Service. Copies will be found also in the libraries of professional schools and the major universities, and in selected public libraries.

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Morlan, Harvey B., Utterback, Bernice C., Dent, Jack E., Wilcomb, Maxwell J., Jr., Griffith, Melvin E., and Ellis, Leslie L.: Domestic rats, rat ectoparasites, and typhus control. Public Health Monograph No. 5 (Public Health Service Publication No. 209). U. S. Government Printing Office, Washington, D. C., 1952. Price 25 cents.

level of positive serums from brown rats was consistently higher than that for serums from roof rats when species from two of the counties were compared. There were no regular differences between prevalence of antibodies between rat species; prevalence was similar in male and female rats; antibodies were more prevalent in adult rats than in young rats and in larger than smaller body length or weight groups.

Reproductive capacity in both species tended to be proportional to body length. Data suggest two peaks in the seasonal level of reproduction, the greater centered about March, the lesser about August.

An observed tendency of brown rats to supplant roof rats in parts of the study area raises an interesting question of possible effects on typhus epidemiology.

Part II. Ectoparasites of Domestic Rats in Relation to Typhus Control. By Harvey B. Morlan, M.S., and Bernice C. Utterback.

The extensive ectoparasite data collected during a study of murine typhus in southwestern Georgia are summarized in this paper. Observations on rats provided material for the preceding paper.

Four common species of ectoparasites, *Xenopsylla cheopis*, *Leptopsylla segnis*, *Bdellonyssus bacoti*, and *Polyplax spinulosa* made up 95 percent of the ectoparasites recovered from over 20,000 rats. Although *X. cheopis* is recognized as the principal vector of murine typhus, it appears desirable to investigate further the possible role of *P. spinulosa* as a supplementary vector of typhus among rats.

X. cheopis, *L. segnis*, and *P. spinulosa* infested higher percentages of brown than of roof rats, while the reverse was true of *B. bacoti*. Rats which were positive to the murine typhus complement fixation test were more frequently infested with *X. cheopis* and *L. segnis* than were negative rats. *X. cheopis* and *B. bacoti* normally infested young rats more frequently than adult rats. Percentages of rats infested with *P. spinulosa* were higher for male than for female rats.

In the untreated county, infestation of all rats with *X. cheopis* occurred in only 29 percent of 705 instances of multiple catches from the same building on the same day.

During and subsequent to DDT dusting, rats infested with *X. cheopis* were found on 11 to 76 percent of the treated premises compared to 81 to 90 percent infestation of untreated premises. Apparently, DDT dusting was less effective for female than for male ectoparasites. Higher percentages of females of both *X. cheopis* and *L. segnis* were found on roof rats than on brown rats. In the untreated county, the proportion of females of *X. cheopis* increased in months with a lower mean temperature and decreased in months with a higher mean temperature.

Part III. Commensal Rat Ectoparasite Collections in Oklahoma. By Maxwell J. Wilcomb, Jr., M.S., Melvin E. Griffith, Ph.D., and Leslie L. Ellis, M.S.

The ectoparasite and typhus records from commensal rat collections in 33 Oklahoma counties from November 1949 through June 1951 are presented in this paper.

During the study 1,051 rats were collected. Fifty of these were roof rats; the remainder were brown rats. The roof rats were free of ectoparasites; 758 of the brown rats which were collected alive yielded most of the ectoparasites. Mites, lice, and fleas were identified. Of the mites, *Laelaps echidninus* was the most abundant species. *Xenopsylla cheopis* infested 11 percent of live Norway rats. Most oriental rat fleas were taken from food, feed, seed, or grain-handling establishments in industrial districts.

Twenty of the blood specimens from 675 rats were positive for murine typhus. Four *X. cheopis* were found on an infected rat from one county and an average of 6.1 *X. cheopis* from 19 typhus positive rats collected in another county.