

Plague Investigations and Control Activities

by Sanitary Engineer
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As a result of the discovery of plague in California field rodents in 1908, the Office of Plague Suppressive Measures, USPHS, San Francisco, and several state health departments in the West, began conducting plague surveys. Teams operating from mobile field laboratories collected field rodents, rats, hares and some predators. These were combed to remove all ectoparasites, consisting principally of fleas, which were sent to the laboratory for determination of the presence of plague organisms. Tissues from some of these animals were also submitted for similar determinations. Positive findings have been reported in weekly *Public Health Reports*. Survey teams have operated at greatly increasing distances from the West Coast as plague in field rodents has been found farther and farther east. Since 1939, plague infection has been reported in 116 counties of 15 Western and Pacific Coast States. The easternmost areas in which plague has been found are:

| STATE | COUNTY |
|--------------|----------|
| North Dakota | Divide |
| Kansas | Scott |
| Kansas | Logan |
| Kansas | Cheyenne |
| Kansas | Morton |
| Oklahoma | Cimarron |
| Texas | Cochran |
| Texas | Dawson |

Future survey work may discover plague infection farther east than is known at present, suggesting greater potentialities for human infection than exist in the sparsely settled plains states. The eastward extension of plague may be slowed down as it encounters extensive cultivated areas in place of western grazing areas which support relatively large populations of field rodents. But it seems desirable and economical to apply limited control measures in the near future, rather than to wait until plague has reached the Mississippi Valley. Intensive field study will be necessary, possibly requiring several years, before suitable measures are developed to prevent the spread of plague in field rodents. There are certain measures, however, which will protect cities against such outbreaks as have occurred in San Francisco and New Orleans. These are the procedures now utilized in murine typhus control in cities in the South and Southeast. They are:

- (1) Ratproofing and rat eradication in existing business buildings.
- (2) General sanitation.

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(Upper) Setting a baited wooden trap for pack rats. (Lower left) Pack rat (*Neotoma*) nest.

(3) Rat poisoning.

(4) Ratproof construction of new buildings.

If the above rat control measures are conducted with continued maintenance in a permanent program, there is no reason to fear outbreaks of plague, typhus or other rat-borne diseases. Such programs also are usually popular and, to a large extent, self-supporting because of the savings resulting from the elimination of rat damage.

PRESENT PLAGUE INVESTIGATIONS AND CONTROL ACTIVITIES

Plague-positive findings in fleas of field rodents from four ranches in Cochran County, Texas were reported in the spring of 1946. Since typhus existed in the same section of the Texas Panhandle, a combined plague-typhus control project was established in an eight-county area during the

fall of 1946. Headquarters were originally at Lubbock but are now at Brownfield, Texas. Because plague bacilli were recovered from fleas of prairie dogs on a ranch in Dawson County in the spring of 1947, this county was added to the original eight counties. The project is operated, like other CDC programs, by the State Department of Health and local health departments.

The Plague-Typhus Project has a two-fold operational plan. The first is typhus control and plague prevention by rat and rat-ectoparasite control, both urban and rural, in the nine-county area. This involves the four measures mentioned above plus DDT dusting. The following progress has been made to date:

- (a) Six counties have hired permanent rodent control men and furnished their transportation and poisoned baits.
- (b) Mobile typhus control units have inaugurated DDT dusting and rat poisoning in eight counties. These units trained personnel mentioned above in these activities.
- (c) Complete county-wide cycles of dusting and poisoning have been accomplished at least once in six counties.
- (d) Dusting has been evaluated by means of rat ectoparasite prevalence studies and murine typhus complement-fixation tests on rats as in regular typhus control projects.
- (e) Ratproofing and rat eradication in the existing business buildings of Morton, Seminole, and Brownfield are essentially completed. A dozen other cities and towns have officially committed themselves to undertake ratproofing programs as soon as trained health department personnel are available.

The six counties mentioned under (a) are Hockley, Gaines, Terry, Lubbock, Yoakum and Dawson. These counties deserve special mention because they contribute everything except DDT dust and very limited super-

vision, pay travel expenses of mobile units while present, and conduct their own evaluation trapping. This is remarkable because all except Lubbock County are small and several of the counties had no local health service whatever until the Plague-Typhus Project began.

The second phase of the plan consists of plague investigations. These involve studies and collections of field rodents, rats, hares, predatory mammals and birds. A panel-body truck equipped as a special field laboratory, is manned by two or three men who hunt and trap these animals, remove their ectoparasites, autopsy them and obtain tissue specimens. Pools of ectoparasites and of tissues are forwarded to the Texas State Health Department Laboratory in Austin where they are examined for the presence of the plague bacillus. Also, ectoparasites are identified, counted, and examined bacteriologically. The Officer in Charge at Brownfield, Entomologist Virgil I. Miles, directs the studies and the sampling. The studies involve the distribution and abundance of the various hosts (rodents) and vectors (ectoparasites) as well as the interrelations of host and

Fleas in the mouth of prairie dog burrows are collected on a moving cloth, placed in vials, and examined for plague in the laboratory.



vectorial species. This is a large task presenting many problems. A major problem is the enormous numbers of specimens required by present laboratory procedures to produce one positive plague finding.

The Texas State Health Officer announced that on December 23, 1947 plague organisms were found in a pool of 141 fleas from pack rats (*Neotoma microphus*) collected on October 2 and 3, 1947, eight miles west of Lamesa in Dawson County. This is the first report of a positive plague finding by the Plague-Typhus Project in Texas. The previous report of plague in this county was by the Office of Plague Suppressive Measures, plague having been proved in a pool of 50 fleas from six prairie dogs on May 28, 1947. The two positive areas are only approximately nine miles apart in Dawson County.

PROPOSED RAT CONTROL AND PLAGUE INVESTIGATIONS PROJECTS

Plague is or has been present in scattered areas from the West Coast to the western North Dakota — Kansas — Oklahoma — Texas line. Some of the areas contain



cities and towns having appreciable rat problems. It is apparent that plague is occasionally transferred from field to domestic rats resulting in a human plague outbreak. Control of field rodents or even of field rodent plague over nearly an entire third of the United States obviously is impractical. It is feasible, however, to prevent plague outbreaks in cities and towns by rat control and, possibly, by developing and conducting limited field rodent or ectoparasite control either surrounding the cities or surrounding any nearby plague foci. The latter must be carefully studied from biological and entomological aspects in each specific area before control procedures can be formulated.

It is proposed in fiscal year 1949 to continue the Brownfield Plague-Typhus Project and to develop and utilize all findings to the greatest extent possible. As an extension of the Brownfield studies, it is proposed that about four rat control-plague investigations projects be established in other states in the 1949 fiscal year. Six areas with both a domestic rat problem and the hazard of sylvatic plague nearby have been tentatively selected. One of these areas is located in each of the following states: Wyoming, Colorado, New Mexico, Utah, Washington and California. Although each area will present different problems, preliminary plans include: (1) permanent rat control consisting of the four previously enumerated measures and (2) the sampling and ecological studying of field rodents and their ectoparasites together with laboratory determinations of plague.

The plague survey units of the Office of Plague Suppressive Measures will continue to operate in order that public health officials may be kept informed, as accurately as possible, of the areas in which plague can be demonstrated in field rodents or their ectoparasites throughout the United States.

Mobile laboratory unit for plague investigations work.