

RECENT DATA FROM THE THOMASVILLE, GEORGIA, TYPHUS INVESTIGATION PROJECT

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Statistician

A review of recent data from the Thomasville Project shows that the incidence of human typhus has continued at a low level for more than 2 years after the last DDT dusting.

The present summary supplements findings previously reported by Hill and Morlan (1), Dent, Morlan, and Hill (2), and Morlan, Hill, and Schubert (3). The study has been carried on in cooperation with the Georgia State Department of Health through C. D. Bowdoin, M.D., Director, Division of Preventable Diseases, and Roy J. Boston, Director, Typhus Control Services.

The Thomasville Project was established in 1945 to determine the effectiveness of DDT dusting as a murine typhus fever control method. Three counties in southwest Georgia were included. Populations in 1940 were: Thomas, 31,256; Brooks, 20,476; and Grady, 19,665. Rat runs in and near buildings in Brooks and Thomas Counties were dusted with five applications of 10 percent DDT in pyrophyllite during the period April 1946 through September 1947; Grady County was not treated.

Records of human typhus cases were obtained through reports from State and local health departments, hospital records, laboratory records, contact with physicians, and supplementary information which the project personnel obtained informally from families in the study area. It should be pointed out that these data on incidence of typhus include many cases which would not be reported through routine channels. A complement fixation test yielding a titer of 1:4 or higher was considered evidence of the presence of typhus antibodies.

It has been shown in earlier reports (1) that incidence of typhus was lower in the year following DDT dusting operations in Thomas and Brooks Counties than in the year preceding dusting. No significant change occurred in untreated Grady County. Figure 1 shows that in the 2 years subse-

quent to cessation of dusting, the incidence of typhus was minimal (four cases in each of the two dusted counties); while during the same period, a total of 53 confirmed cases was recorded for the undusted county.

During the year after dusting, murine typhus antibody prevalence reached a low level of 3-7 percent in rats examined from dusted counties and remained at this level for nearly 2 years (table 1). Current data (fig. 2) show a slight rise in 1949.

An average of 175-200 rats per month was trapped in each county during the period of study (table 2). As previously reported (1, 3), a change in the rat population occurred during the course of the project. Initially, *Rattus rattus* appears to have been the predominant domestic rat species in the three counties; but by the third year, *Rattus norvegicus* had increased in number so that the ratio of *R. rattus* to *R. norvegicus* was 2:1 or less in Thomas and Grady Counties. In Brooks, there was a noticeable absence of *R. norvegicus* until November 1947 and relatively few were trapped subsequently.

More than 96 percent of the total number of ectoparasites collected in the three counties were among four species: *Xenopsylla cheopis*, the oriental rat flea; *Leptopsylla segnis*, a second rat flea; *Liponyssus bacoti*, the tropical rat mite; and *Polyplox spinulosa*, a rat louse.

The percentage of rats infested with *X. cheopis* is shown in table 3. Hill and Morlan (1) reported that a greater reduction in flea infestation occurred in the dusted counties than in the undusted. Recent data indicate that this reduction was maintained for approximately 1 year after dusting was completed. The infestation rate also declined in untreated Grady County during the same period, but the relative decrease was small in comparison with that observed in the treated counties. During

Figure 1
 INCIDENCE OF HUMAN TYPHUS FEVER BY MONTH OF ONSET IN THE UNDUSTED AREA, GRADY COUNTY, AND IN THE DUSTED AREA, THOMAS AND BROOKS COUNTIES

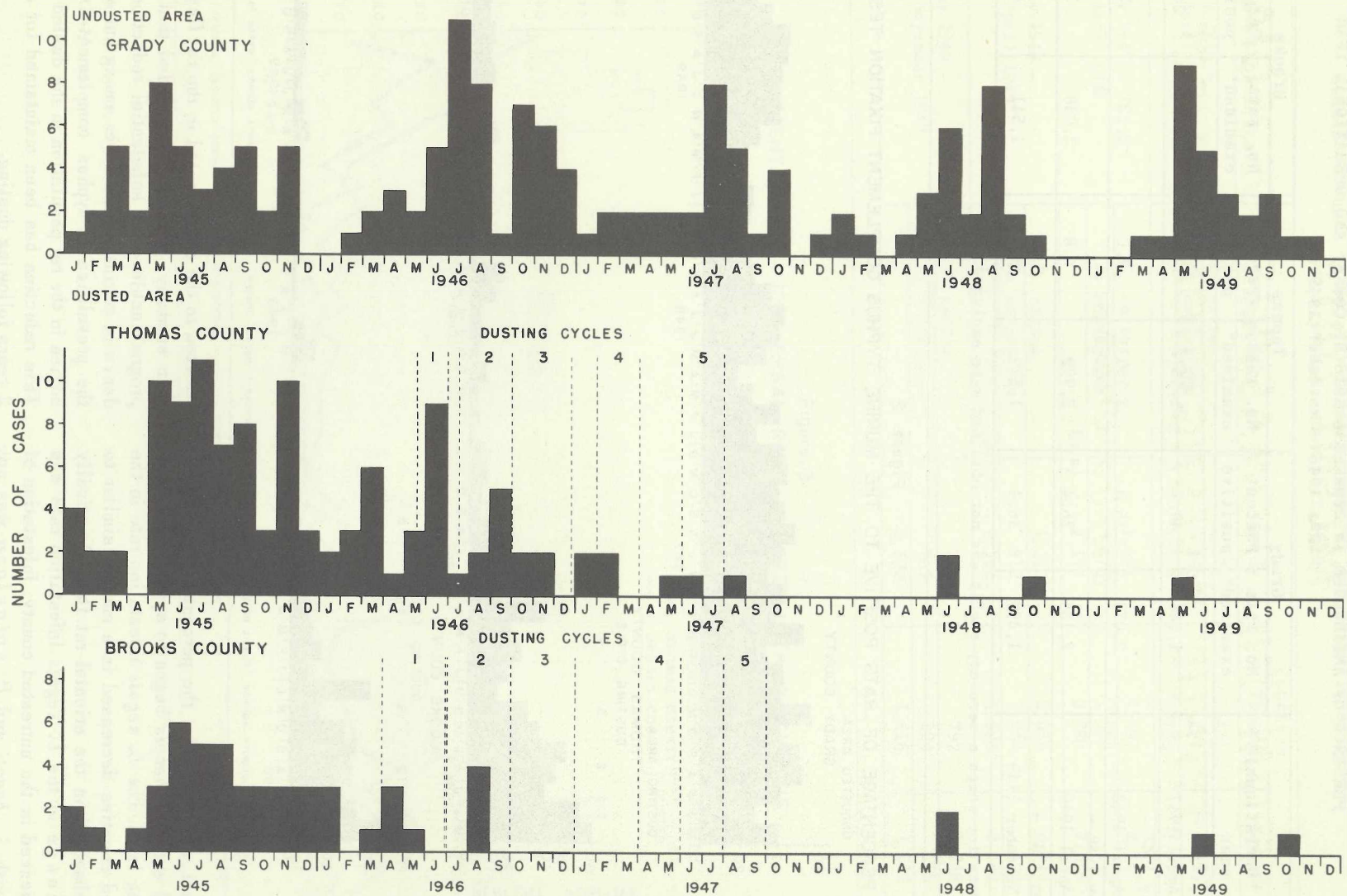
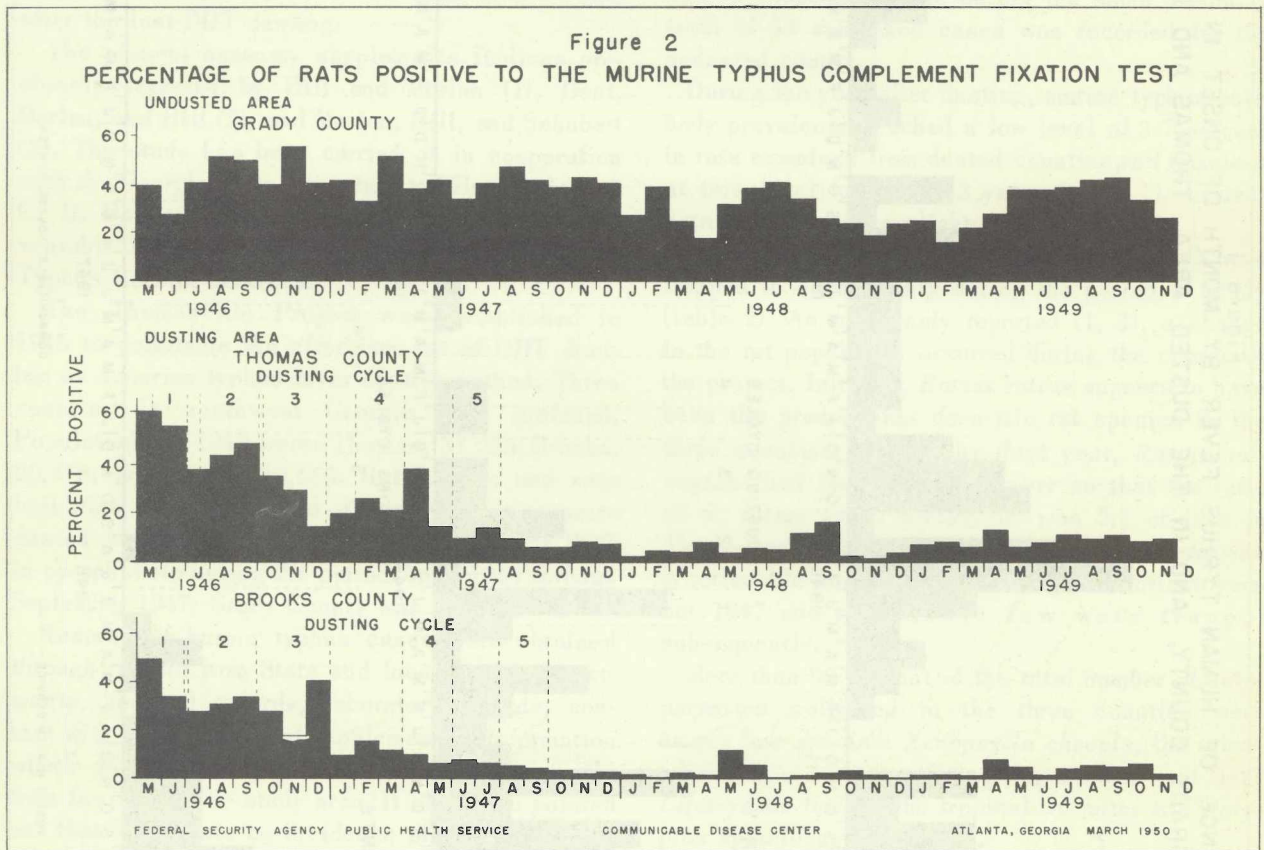


Table 1
PRESENCE OF ANTIBODIES IN COMMENSAL RATS BY COUNTY AND OPERATIONAL YEAR
 May 1946 - November 1949

Operational year	Grady		Thomas		Brooks	
	No. rats examined*	Percent positive	No. rats examined*	Percent positive	No. rats examined*	Percent positive
May 1946 - April 1947	1,240	40.7	1,537	39.7	1,483	24.7
May 1947 - April 1948	2,073	36.0	2,190	7.0	2,220	3.3
May 1948 - April 1949	2,136	26.4	2,992	6.8	3,088	3.0
May 1949 - November 1949	1,499	36.4	1,579	8.9	1,541	4.0

*Rats for which a serology result was not obtained were excluded.



the last year of study, the percentage of rats infested with *X. cheopis* began to approach the pre-dusting level. The *L. segnis* infestation rate in the treated counties decreased in a manner similar to that observed in the oriental rat flea. Practically no change in the *L. segnis* infestation rate was experienced in the untreated county. Infestation of rats with *L. bacoti* and *P. spinulosa* was not

affected to the extent noted in the rat fleas.

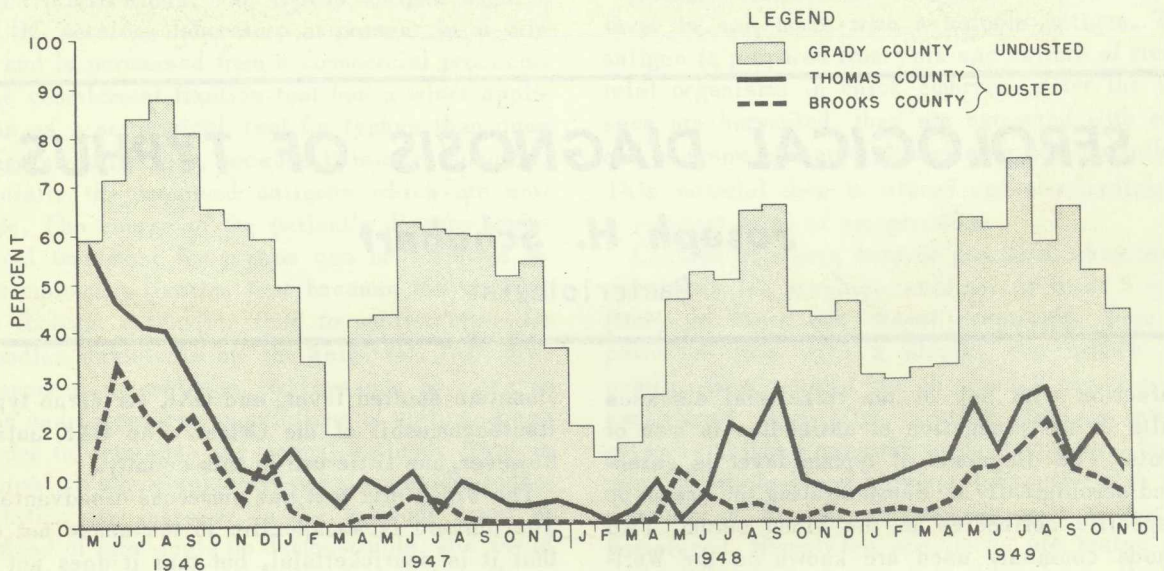
In summary, it may be concluded that the DDT program achieved a substantial reduction in incidence of murine typhus fever among humans and in the prevalence of typhus complement-fixing antibodies in the rat population in the dusted counties. This reduction has been maintained for more than 2 years following dusting.

Table 2

SUMMARY OF RATS TRAPPED BY SPECIES, COUNTY, AND OPERATIONAL YEAR
May 1946 - November 1949

Operational year	Species	Counties		
		Grady	Thomas	Brooks
May 1946 - April 1947	<i>R. rattus</i>	1,178	1,441	1,919
	<i>R. norvegicus</i>	352	327	0
	Total	1,530	1,768	1,919
May 1947 - April 1948	<i>R. rattus</i>	1,494	1,697	2,267
	<i>R. norvegicus</i>	676	583	49
	Total	2,170	2,280	2,316
May 1948 - April 1949	<i>R. rattus</i>	1,312	2,036	3,018
	<i>R. norvegicus</i>	912	1,060	164
	Total	2,224	3,096	3,182
May 1949 - November 1949	<i>R. rattus</i>	762	792	1,318
	<i>R. norvegicus</i>	761	824	255
	Total	1,523	1,616	1,573

Figure 3
PERCENTAGE OF COMMENSAL RATS INFESTED WITH X. CHEOPIS

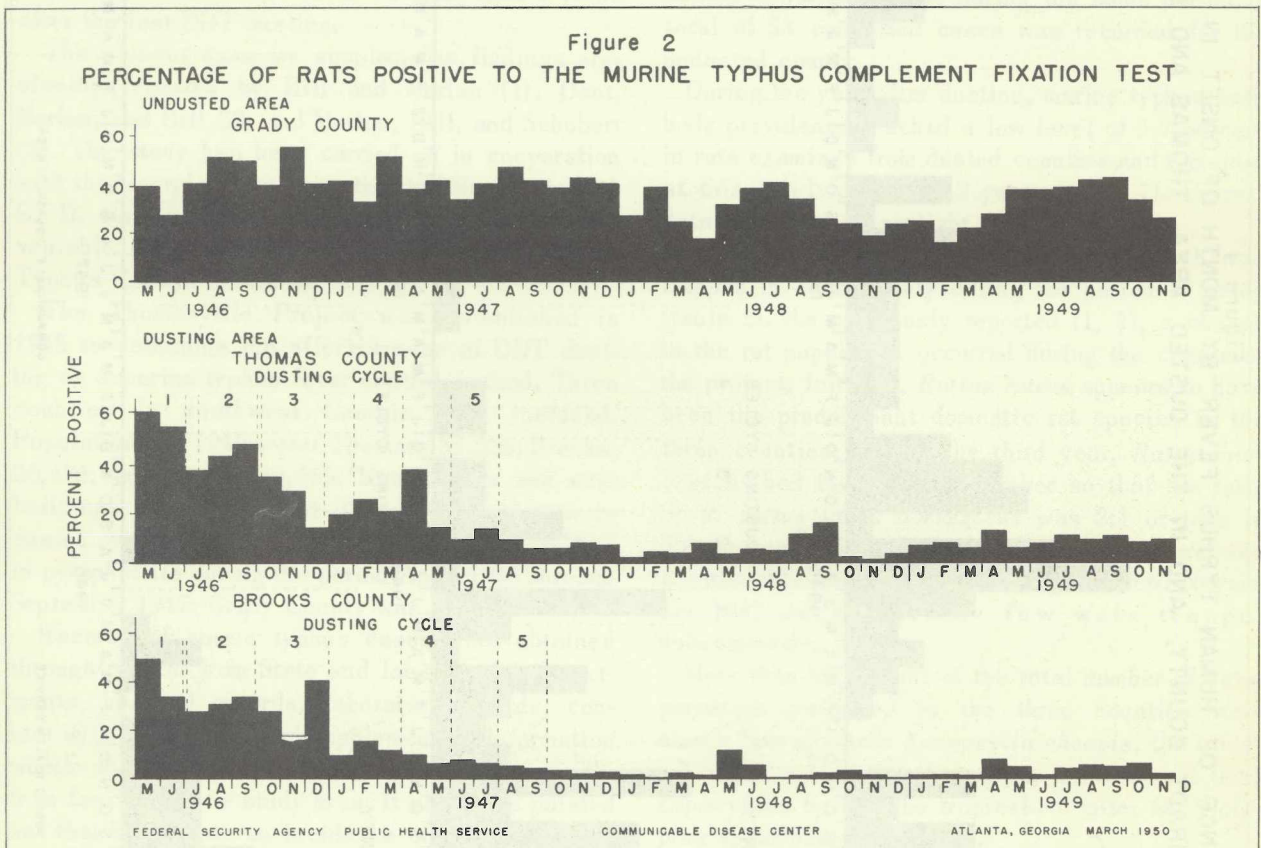


FEDERAL SECURITY AGENCY PUBLIC HEALTH SERVICE COMMUNICABLE DISEASE CENTER ATLANTA, GA. MARCH 1950

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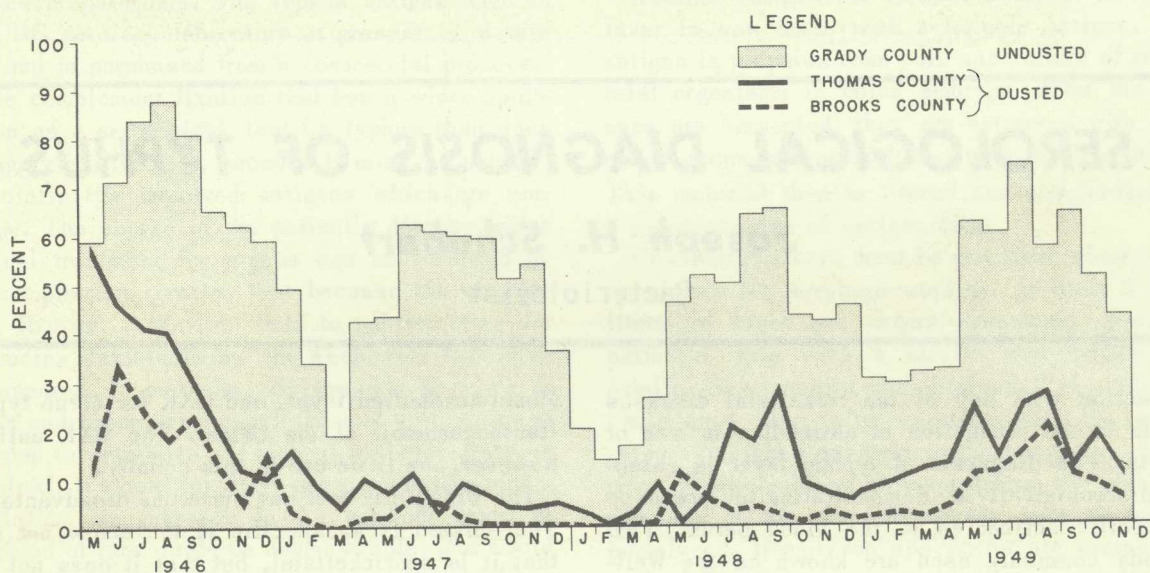
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Table 3

"XENOPSYLLA CHEOPIS" INFESTATION OF COMMENSAL RATS BY COUNTY AND OPERATIONAL YEAR
May 1946 - November 1949

Operational year	Grady	Thomas	Brooks
	Percent infested	Percent infested	Percent infested
May 1946 - April 1947	60.7	28.4	13.2
May 1947 - April 1948	41.4	5.2	1.8
May 1948 - April 1949	42.1	11.2	3.6
May 1949 - November 1949	59.0	19.1	11.6

REFERENCES

- Hill, Elmer L. and Morlan, Harvey B.: Evaluation of county-wide DDT dusting operations in murine typhus control. Pub. Health Rep. 63:1635-1653 (1948).
- Dent, Jack E., Morlan, Harvey B., and Hill, Elmer L.: Effects of DDT dusting on domestic rats under colony and field conditions. Pub. Health Rep. 64:666-671 (1949).
- Morlan, Harvey B., Hill, Elmer L., and Schubert, Joseph H.: Serological survey for murine typhus infection in southwest Georgia animals. Pub. Health Rep. 65:57-63 (1950).

SEROLOGICAL DIAGNOSIS OF TYPHUS

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Bacteriologist

Infection with any of the rickettsial diseases results in the production of antibodies in man or rodents. The diagnosis of typhus fever is established serologically by demonstrating the presence of specific antibodies in the blood serum. Two methods commonly used are known as the Weil-Felix agglutination test and the complement fixation test.

The use of *Proteus* OX19 in an agglutination test for typhus stems back to 1915 when Weil and Felix observed that serum from typhus fever patients would agglutinate in certain strain (OX19) of *Proteus* bacilli. Since that time other *Proteus* antigens, OX2 and OXK, have been found useful for the agglutination test in rickettsial diseases. The OX2 strain was reported as specific for Rocky

Mountain spotted fever, and OXK for scrub typhus (tsutsugamushi) of the Orient. The OXK antigen, however, has little use in this country.

The Weil-Felix test has numerous disadvantages. The antigen is nonspecific in the sense not only that it is nonrickettsial, but that it does not differentiate clearly between certain rickettsial diseases. For example, it was found that 70 percent of the sera from cases of Rocky Mountain spotted fever agglutinated the OX19 antigen which is used primarily for typhus, although usually not in very high dilutions. The OXK antigen, useful for diagnosing scrub typhus, agglutinates to high titers in serum from patients with louse-borne relapsing fever. Q fever and rickettsialpox infections fail to develop agglutinins in significant amounts to