

Endemic Typhus

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THE world-wide distribution of the various forms of typhus fever with its increasing incidence in various countries is causing more and more attention to be directed toward this disease. During 1933 large numbers of cases were reported from Asia, Africa, the United States, Peru, Mexico, the Balkan States, Portugal, Poland,

fatality rate is of negligible importance in the United States. Occasionally it appears among immigrants, but it has never gained a permanent foothold here. On the other hand, Brill's disease or endemic typhus has shown a marked increase in our Southern States during the past 2 years.

From Table I it will be seen that the

TABLE I
TYPHUS FEVER INCIDENCE IN SOUTHERN STATES
1928-1933

	1928	1929	1930	1931	1932	1933
Florida	0	48	39	28	42	54
Georgia	48	57	134	127	308	625
Alabama	59	72	67	80	237	823
Louisiana	0	1	0	1	17	11
Texas	5	8	13	43	227	398

and Lithuania. According to the *Medical Officer*,¹ Great Britain, France, Germany, and New Zealand are the only countries which escaped typhus during the early months of 1933.

Old-world typhus with its high

morbidity rates for Alabama, Georgia, and Texas have been especially high in 1932 and 1933. The number of cases in Louisiana and Florida has been small, and in Mississippi very few have been reported. For 1932 and 1933 Egypt

TABLE II
INCIDENCE OF TYPHUS FEVER

	1928	1929	1930	1931	1932	1933
Egypt	599	1,141	288	265	2,298	7,839
Union of South Africa	1,436	1,778	1,347	1,663	1,664	2,288 (To Nov. 25)
Mexico *	516	741	894	1,684	1,246	989 (6 months)
United States	196	239	510	374	892	1,668
Poland	2,401	1,988	1,640	2,154	2,283	2,842
Rumania	983	1,456	1,857	1,419	1,788	1,871

From the *Epidemiological Report*, Health Section League of Nations

* Deaths.

had more than its normal number of cases, and in Poland and in the Balkan States typhus has been rapidly increasing since 1931. Table II gives some idea of the incidence of this disease for the past 6 years in various countries.

EPIDEMIOLOGY

From earliest times epidemic typhus has been closely connected with filth and human misery. It has been called jail fever, ship fever, and famine fever. Wherever the standard of living has been materially lowered, typhus has almost invariably made its appearance, and this obvious connection had caused many speculations concerning its etiology and method of conveyance.

Otto² (1909) from observations made among army troops believed that vermin acted as vectors. Nicolle, Comte, and Conseil³ (1909) proved that the body louse could transmit epidemic typhus among experimental animals. Soon their work was confirmed by Ricketts and Wilder⁴ (1910), Anderson and Goldberger⁵ (1912), da Rocha Lima⁶ (1916), and others. Since then it has been demonstrated that the spread of epidemic typhus may be prevented if the louse is destroyed. Epidemiological data show that outbreaks are most common in the late winter and early spring when louse infestation is the highest.

In 1898 Brill⁷ recognized in the United States a type of fever which, resembling typhoid, gave a negative Widal reaction. He^{8,9} demonstrated its similarity to typhus, but showed that it was milder and less contagious, only one case as a rule being found in a household. He reported that it was most prevalent during the fall instead of late winter or spring. In 1912, Anderson and Goldberger¹⁰ proved that Brill's disease was immunologically identical with Mexican typhus or tabardillo. Naturally this led to the belief that it was louse-borne.

Maxcy¹¹ (1926) in an extensive epidemiological study of Brill's disease or endemic typhus was at a loss to explain its non-contagious character and its seasonal incidence if he assumed that the louse was the vector. Since he noticed that a larger number of cases appeared among persons handling food-stuffs, he was inclined to believe that rats and mice might be the reservoirs and that the disease was carried to man by fleas, mites or ticks. He emphasized the fact that Brill's disease shows no preference for the lower strata of society and bears no relation to lousiness. The next step was taken when Dyer, Rumreich, and Badger¹² (1931) were able to recover the virus of Brill's disease from rat fleas which had been found in typhus foci.

Rumreich¹³ (1933) has pointed out that until 1931 ". . . there was, in spite of Maxcy's fundamental work, much confusion in regard to the probable vector of endemic typhus, and a variety of insects and arachnids were suspected by different workers. Among these vectors were the tropical rat mite, common North American chigger, the body louse, the head louse, the Anopheles mosquito, the bed-bug and the tick. It is now obvious that much of this chaos was due to the fact that two distinct clinical entities were being confused, and for this reason Maxcy's observations were not more widely accepted." The work of Rumreich, Dyer, and Badger¹⁴ (1931) definitely proved that there are in Eastern and Southern United States 2 diseases which are related both etiologically and serologically. One of these is endemic typhus which is transmitted to man by the rat flea; the other is Rocky Mountain spotted fever which is carried by the tick. Although ticks may be infected by intrarectal injection of the typhus virus, the fact remains that, as Dyer¹⁵ (1933) states, "the isolation of spotted fever cases from the true typhus group

TABLE III
SEASONAL DISTRIBUTION OF CASES
Alabama, 1926-1933

	<i>Jan.</i>	<i>Feb.</i>	<i>March</i>	<i>April</i>	<i>May</i>	<i>June</i>	<i>July</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>
1926	4	1	1	2	3	3	1	5	7	7	4	10
1927	6	1	2	1	1	5	9	7	14	7	8	3
1928	1	2	1	0	0	7	9	12	13	2	4	3
1929	0	3	4	5	4	7	4	11	11	5	12	6
1930	1	2	1	0	6	5	3	11	19	10	6	3
1931	3	2	1	6	1	4	7	12	5	15	13	11
1932	6	3	5	12	9	29	17	26	51	48	17	14
1933	11	8	16	15	39	79	153	129	147	75	92	59
Total	32	22	31	41	63	139	203	213	267	169	156	119

removed all epidemiological evidence that the tick was acting as a vector of typhus fever in the country."

ENDEMIC TYPHUS IN ALABAMA

Typhus fever was first recognized in Alabama in 1922 when a series of cases giving a positive Weil-Felix Reaction were reported by Maxcy and Havens.¹⁶ From that time until 1932 cases continued to be reported—60 to 80 cases each year. The disease has been confined almost exclusively to South and Southeast Alabama, with certain localities showing cases year after year. In 1932 there was a very sharp increase in incidence—237 cases with 11 deaths as

compared to 80 cases and 4 deaths the preceding year. This increase continued during 1933 when the cases reached 823 and the deaths 35. From the urban centers the disease spread and much of the incidence is now in purely rural areas and among people who could not have obtained their infection except at home. Association with food establishments is still an important factor in urban cases.

The seasonal occurrence has remained constant during all this time with the summer and fall months accounting for most of the cases. This is contrary to the experience with the epidemic type of the disease.

TABLE IV
DISTRIBUTION OF 1,029 CASES OF TYPHUS FEVER BY RACE, SEX, AND AGE
Alabama, 1932-1933

<i>Age</i>	<i>White</i>		<i>Colored</i>		<i>Total</i>	
	<i>Male</i>	<i>Female</i>	<i>Male</i>	<i>Female</i>	<i>Male</i>	<i>Female</i>
0-4 years	4	10	0	0	4	10
5-9 "	20	15	1	1	21	16
10-14 "	43	31	2	2	45	33
15-19 "	67	24	3	0	70	24
20-24 "	46	26	1	4	47	30
25-34 "	105	51	10	11	115	62
35-44 "	117	52	7	3	124	55
45-54 "	74	46	8	4	82	50
55-64 "	42	20	4	2	46	22
65-74 "	21	11	0	1	21	12
75+ "	3	2	0	0	3	2
Not Stated	66	56	9	4	75	60
Total	608	344	45	32	653	376

Race, Sex, and Age—Maxcy¹¹ called attention to the relative freedom of the negro from the infection. This holds true, but not to the same extent, since there have been 77 cases reported among colored in the past 2 years. In the 21 counties most concerned the negro population is 45 per cent of the total so that the attack rate among them is only one-tenth that of the white. Males continue to predominate particularly among the whites, and adults are most affected. With the extension of the disease into rural areas, and with the infection being acquired at home, more women and children are being exposed. Table IV shows the distribution of 1,029 cases reported during 1932 and 1933 in which race, sex, and age were given.

Diagnosis—These cases were seen by a number of physicians, but the clinical appearance was sufficiently characteristic in most instances to be readily recognized. During 1933 the laboratories of the State Health Department examined 1,445 specimens of which 461 were positive for the Weil-Felix Reaction, while an additional 81 were classed as doubtful. This compares with 149 positive tests in 1932, 63 in 1931, and 61 in 1930.

Fatality—During 1932 and 1933 there were reported 46 deaths from typhus fever. Based on 1,060 cases re-

ported for these years, this is a case fatality rate of 4.3 per cent, an annual death rate of 0.84 per 100,000 population. This fatality was lower than that for cases reported prior to this period. In the 498 cases reported in 1922-1931, inclusive, there were 38 deaths, a fatality rate of 7.6 per cent. No doubt, the morbidity was reported more completely during the last 2 years and this is a partial explanation of the decrease in the fatality rate. It is apparent that there has been no increase in the fatality with the increased incidence.

Whereas, 73 per cent of the cases in Alabama during the last 2 years were under 45 years of age, only 35 per cent of the deaths occurred in this age period. As shown in Table V, the fatality rate varied greatly with age, being less than 2 per cent for cases under 45 years; 5 to 7 per cent between the ages of 45 and 64 years, and approximately 30 per cent for persons above 65 years of age.

These conclusions are based on the fatality rate for white cases, in so far as the number of colored cases, by age, was too small to warrant analysis. The fatality rate for the colored cases was 11.7 against 3.8 for whites. That the higher fatality rate for negroes may be due, to a considerable extent, to less complete recognition and registration of cases for this group is possible.

TABLE V
CASE FATALITY, TYPHUS FEVER, ALABAMA
(Based on 1,029 Cases)
1932-1933

	Cases *				Deaths				Deaths per 100 Cases			
	White		Colored		White		Colored		White		Colored	
	M	F	M	F	M	F	M	F	M	F	M	F
0-14 years	75	67	4	4	1	1	1	..	1.3	1.5	(a)	..
15-44 years	376	183	26	20	7	2	4	..	1.9	1.1	(a)	..
45-64 years	130	79	15	7	9	4	1	2	6.9	5.1	(a)	(a)
65 years and over	27	15	0	1	8	5	1	..	29.6	33.3	(a)	..
All ages	608	344	45	32	25	12	7	2	4.1	3.5	15.5	6.3

* Unspecified Ages Distributed

(a) Number of cases too small to make significant rates

It should be noted that when 2 or more causes are given on the death certificate typhus fever is preferred over all other causes except cholera, plague, yellow fever, and deaths from violence. A study of the death certificates for these deaths reveals that on only 11 was typhus fever the only cause given. The most frequent contributory cause was pneumonia, in 14 instances; nephritis in 9; myocarditis in 6; apoplexy in 4; and all other causes, 8. In some instances more than one of these conditions were also noted on the death certificate. A contributing factor to this higher fatality in the higher ages is the fact that these persons were already suffering from a chronic heart or nephritis condition which would have made them poor risks for any infectious disease. In uncomplicated cases the case fatality for endemic typhus is low.

Control—During the past 2 years the disease reached such proportions that it became a serious public health problem. The definite incrimination of rats and rat-fleas as sources of infection naturally pointed to rat destruction as the most feasible means of attack. The area of Alabama most seriously infected corresponds roughly to the peanut growing area so that the rat population was probably large. Nearly all homes visited reported manifest rat infestation. During 1933 many of the towns in the area concerned inaugurated rat control programs—combining poisoning and trapping in most instances. With the inauguration of the CWA work program a larger, widespread program superseded the local efforts and a serious attempt at rat destruction was undertaken in some 21 counties. It is estimated by the Biological Survey that almost 4,000,000 rats were destroyed in this project which closed with the discontinuance of the Civil Works Administration program.

It is too early to determine the effect this wholesale slaughter will have on the

typhus incidence during 1934, but the early months of the year have not shown the expected incidence.

At present studies are being conducted as to other possible reservoirs of infection in nature, but the rat is probably the greatest offender. Eradication is almost impossible, but continued effort will materially lessen his menace to the health of the people.

DISCUSSION

Endemic typhus fever, or Brill's disease, has during the past 2 years become a serious problem in Alabama and some other southern states. From foci in certain cities the disease has spread to rural areas and is now widespread.

The original observations of Maxcy as to race, sex, age, and seasonal distribution have been largely confirmed.

The case fatality rate for uncomplicated endemic typhus is low. Much of the mortality is in the older age groups. There has not been an increase in case mortality rates with the increasing morbidity.

The work of Maxcy¹¹ and of Dyer, Rumreich, and Badger¹² has shown that the reservoir of infection is in the rat and that transmission is by the rat-flea. The mild winter climate, plentiful food supply, and absence of rat-proofing in buildings are all conducive to heavy rat infestation.

An attempt at control of typhus in man through rat eradication was carried out during the early months of 1934 with the effects still to be determined.

Evidently typhus fever has secured a firm foothold in Alabama and is going to require a continuous control program.

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Hop-Picking

AS the occupation is healthy, and financially is reasonably recompensed, there is a holiday element in it which appeals to the city dwellers. If the summer is warm and comparatively dry, it is a real outing for the East End Londoners, but if it is wet the immigration is shorn of much of its attractiveness for, even under the most favorable weather conditions, the health authorities find it extremely difficult to house the invaders, notwithstanding the large number of permanent corrugated iron camps which are dotted all over the areas. In South West Kent alone, and here I borrow my figures from Dr. Galbraith's reports, there are 386 hop farms with 11,548 huts to accommodate the 67,000 pickers who arrive every summer. In many of the camps it is more or less a gipsy life which is led, but pure water is carried into all the camps both for drinking needs and hygienic

requirements; the cleaning of camps and the removal of litter have to be attended to, but, despite all efforts, overcrowding is a blot on the family and social life of the camps. . . . One consequence of handling the hops, or as the result of friction of the skin against the catkins and leaves of the plant is the occurrence of an inflammation of the skin. The dermatitis, or "hop rash" as it is called, and due to an irritant evolved from the plant, is mostly observed on the arms. The inflammation may affect the eyes, giving rise to "hoppers' eye," or there occurs what is called "hoppers' gout," an inflammation of joints or a synovitis mainly of the wrists, and probably caused by the repeated and fatiguing movements of the joints in picking.—Sir Thomas Oliver. Disease and Disaster Traceable to Vegetable Sources. *J. State Med.*, July, 1934, pp. 421-422.