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TYPHUS FEVER IN IRAN AND IRAQ, 1942-43.
A REPORT ON 2,859 CASES.

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PART I.

(A) Introductory Remarks.

(B) Epidemiological Aspects.
   (1) Topography.
   (2) Epidemiology.
   (3) Preventive Measures.
   (4) Prophylactic Inoculation.

(C) Clinical Aspects.
   (1) Signs and Symptoms of Prognostic Significance.
   (2) Variations in the Different Groups of Cases.
   (3) The Relation of Mortality to Age.

(A) Introductory Remarks.

The object of this paper is to place on record epidemiological, clinical and laboratory data obtained when investigating 2,859 cases of typhus fever treated in military hospitals in Iran (Persia) and Iraq. Certain aspects of the outbreak which occurred during the Mesopotamia campaign of 1914–18 and the subsequent epidemiology of the disease in Iraq are considered. The value of large-scale prophylactic inoculation, carried out under controlled conditions, is discussed. The information given is taken from the official report submitted to the War Office by permission of the Director-General of the Army Medical Services.

The possibility of an outbreak was envisaged when cases of imported typhus fever occurred among Polish soldiers evacuated from Russia during the spring of 1942. Owing to the conditions prevalent in the early winter of 1942–43, it became evident that an increased incidence
was to be expected among the poorer classes in Iran. The Director of Medical Services, Persia-Iraq Force, adopted precautions to check the spread of the disease to the military population, and made arrangements to have cases admitted to military hospitals as completely investigated as field conditions would permit. Major J. H. Bowie, I.M.S., was placed in charge of a research team which later carried out investigations in Mosul (Northern Iraq) and Teheran.

(B) Epidemiological Aspects.

(1) Topography.

In order to follow the spread of the disease it is useful to consider the routes into Iraq from east and north. These main routes carry the bulk of the traffic from Western Asia and Southern Europe into Iran and Iraq. They do not include the more southerly routes which connect Iran with India through Kerman and Yezd.

(1) The most easterly of these routes is that from Meshed carrying the trade from Afghanistan.

This is joined by the road from Gurgan which brings traffic from the East Caspian region and proceeds to Teheran, whence the main traffic line to the south is through barren hilly country to Qum where the road divides. One branch goes almost due south to Isfahan round Shiraz, and from there to the Persian Gulf ports. The other proceeds in a more southerly direction through Arak (Sultanabad), Malayer, Khurramabad, Dizful, Awaz, Khurramshah and Abadan. In addition there is now a railway which goes from Teheran eastward to Awaz to Khurramshah.

(2) The second main route is from Tabriz in North-West Iran. This, at first, follows the south-easterly direction to Kasvin. From there it goes south-west till it reaches Hamadan crossing the Aveh pass (7,500 feet). After leaving Hamadan the route crosses the Shah Pass when it descends on the way to Kermanshah, running between hills close to the north and the comparatively fertile valleys of the south. Kermanshah is the most westerly of the big towns in this stretch of the Iranian plateau. From here the road passes through rather barren country to the Iraq border where, after a gradual descent, it comes into the desert country around Khanaqin. The desert route runs from Khanaqin to Baghdad. This is probably the main traffic route from Iran into Iraq and is supplemented by a railway.

(3) The third route is one which carries trade from the western and southern shores of Lake Urmia and surrounding country, and brings it westward to Ryat, near which town it crosses into Iraq. The route continues through hilly country until it reaches the plains near Erbil. From here trade can be diverted either to Kirkuk and the south, or to Mosul and the west.

(4) The fourth route begins in the area south of Lake Urmia and traverses the hills to Penjwin and then proceeds to Kirkuk.

The remaining two routes are concerned only with Iraq and the countries of the north and west.

(5) The fifth route starts from Zakho near the Turkish Border almost due north of Mosul and leads direct to that town.

(6) The sixth and more important of the trade routes for this direction is that which starts from Nisibin on the Syria-Turkish border and continues south-east over flat arid country to the Iraq-Syrian border at Tel-Kotchet and thence on to Mosul.

Routes from Iraq to the West.—From Mosul in the north two routes pass into Syria. The first, as already referred to above, is from Mosul to Nisibin. The second and more southerly route traverses more desert-like country to Der-Ez-Zor via Telafar.

Further to the south, from Baghdad, starts the main route from Iraq into Trans-Jordan and Palestine. This is the desert road which passes through Rutba.
A. Sachs

(2) Epidemiology.

The epidemicity of typhus fever in Iran (Persia) is well known, but owing to the absence of any proper notification system of infectious diseases no reliable statistics are available.

Typhus is also endemic in Iraq, but less widespread than in Iran. It occurs frequently in the northern districts where the winter is severe and where frequent contact occurs in the course of trade between the inhabitants and those of the Iranian villages across the border. Iraq has an efficient health service and a system of notification of infectious diseases.

(a) Typhus Fever during the Mesopotamia Campaign, 1914–18.—The Official History of the War 1914–18, Medical Services, General History (1924), conveys the impression that typhus was not then considered a serious problem in the British and Indian Armies in Mesopotamia. It records two British and two Indian patients admitted to hospitals in the Basrah area between December, 1916, and September, 1917, and fifteen British and thirteen Indian in the 13th and 14th Divisions in Upper Mesopotamia between October 1, 1917, and December 31, 1918. In Iran the disease appears to have been more prevalent in the Army, but still not extensive. From October to December, 1918, fourteen cases of typhus were recorded among troops in North Iran. Elsewhere typhus reported on the Iranian line of communication in October, November and December, 1918, reached its peak on December 31, when there were fifteen cases. A fuller account is given by Willcox (1920).

Conditions were otherwise in the Turkish Army where the disease was very prevalent. This is referred to in the Official History (1924), in Willcox’s paper (1920), and is confirmed by doctors, now in the Iraq Health Service, who were then in the Turkish Army.

Among the civil population the incidence was not high in Basrah and Amara. The only source of danger to the British and Indian troops was infection from Turkish prisoners until the capture of Baghdad in March, 1917, when cases appeared but, after June, 1917, typhus practically died out. It broke out again in February, 1918, infection being due to contact with local labour corps mainly recruited from refugees from North Iran.

In Iran conditions were worse than in Iraq. Typhus was rampant among the population. Refugees streamed into Iraq from North Iran, and, in addition to being employed in labour corps, large numbers were sent to the refugee camp at Baqubah near Baghdad where a serious epidemic of typhus broke out.

Willcox (1920), dealing with the 1916–19 period, writes:—

“Northern Persia had been much affected by the War. In 1914 and 1915 the Turks were in occupation there and they retired before the advancing Russian troops who occupied Northern Persia in 1916 and 1917. The local population in consequence of the using up of the local food supplies by the invading armies suffered terribly from famine and many of their primitive dwellings were wantonly destroyed. They were indeed in a desperate state. The appalling conditions led to their clothing being of the filthiest and scantiest description and to an extreme degree of starvation. The famished inhabitants were crowded together in the rudest dwellings and under the most insanitary conditions; they thus became very heavily infested with lice and, in consequence of this, typhus and relapsing fever were rampant amongst them. Indeed during 1918, typhus and relapsing fever were extremely common amongst the inhabitants of Northern Persia, and several of our men who by their military duties were brought into contact with the local population contracted these diseases.

“In the latter half of 1918 some 70,000 refugees from the district round Lake Urmia and Lake Van were driven by the Turks to seek refuge in Mesopotamia and they travelled down this great distance (some 500 miles) with their families and household goods under conditions which it is difficult to describe but can perhaps be imagined. The remarks about the inhabitants of Northern Persia apply to some extent to refugees so that many of them were heavily louse infested and, as a consequence, typhus and relapsing fever occurred in considerable numbers.”

(b) Brief History of Typhus Fever in Iraq Subsequent to 19181.—The following general observations have been made from information available:

1The details given in this section were supplied by Professor C. P. Beattie, Professor of Bacteriology, Royal Faculty of Medicine, Baghdad.
(i) In the Baghdad area, and probably also south of Baghdad, typhus is endemic using the word in its true epidemiological sense with no implication as to whether it is louse-borne or murine, but both varieties are believed to be present. In those areas it is not, as a rule, a serious menace.

(ii) In the north of Iraq, and particularly in Kurdistan, typhus is always smouldering and frequently gives rise to epidemics in the spring. Here the disease is almost certainly the classical louse-borne type. These epidemics are a recurring danger to the health of the cities of Mosul, Arbil, Kirkuk and also Baghdad.

(iii) In Iran, classical louse-borne typhus is prevalent. The most serious menace to Iraq is from Iranians entering the country, either as refugees, as in the 1914–18 war, or in search of employment.

(iv) The months of maximum incidence are still as shown in Willcox's chart (1920): March, April, May and June.

Typhus fever continued to be prevalent in Baghdad till 1924 or 1925 when it died down. This disease was of a severe type with a marked rash. As far as information is available it would appear that the disease was most prevalent in winter, but continued into the spring and early summer.

Typhus is always present as is shown by the Civil Health Service records and supported by results of Weil-Felix reactions. Laboratory returns for the years 1939, 1940, 1941, and 1942, during which period the Weil-Felix reaction was done on all sera submitted for agglutination reactions, suggest that typhus has one-quarter the prevalence of enteric fever.

In April, 1940, an epidemic of typhus broke out in Baqubah prison and subsequent cases occurred in Baghdad prison. There is little doubt that the Iranians arrested for illicitly crossing the frontier, and sent to an overcrowded and insanitary prison at Baqubah, were responsible for this outbreak. The disease was severe, of classical type, and the percentage mortality was about twenty.

About the same time a severe type of typhus was reported in Kurdish villages near Kirkuk. In one village six out of twenty-six patients died. Again Iranian beggars were suspected of having introduced the infection, but with less certainty than in the case of the Baqubah outbreak.

In the spring of 1943 there were considerable epidemics in Northern Iraq and also in the Basrah area. Extension of the facilities to perform the Weil-Felix reaction to the laboratories in Mosul, Kirkuk and Basrah assisted diagnosis and probably resulted in more cases being notified. High prices of food, clothing, soap and fuel favoured these epidemics. Probably even more important were the movements of population, especially of the Iranians entering Iraq in search of employment.

(c) Typhus Fever in Iran and Iraq—1942–43.—It is reported that during the winter and spring of 1941–42 cases of typhus in Teheran were "more numerous" than usual. There are no figures to support this statement, which is the opinion of local medical men and can be regarded as reliable.

In the spring of 1942 some 28,000 Polish refugees and soldiers evacuated from Russia arrived in Iran via Pahlevi, a port on the Caspian coast. Typhus was stated to have been rife in the concentration camp from which they came. Malnutrition was marked. The strictest measures were taken to prevent the spread of disease. All refugees were disinfected on arrival at the port and again at Teheran where they were segregated from the local populace. Cases of typhus occurred shortly after disembarkation. It is improbable that any cases contracted the disease after leaving the port of arrival. In view of the strict measures adopted, and the early cessation of new cases, it is unlikely that this imported typhus had any bearing on the outbreak that occurred among the civil population of Iran during the ensuing winter.

In the winter of 1942–43 it was merely history repeating itself. Conditions in Iran were especially favourable for an epidemic of typhus. The economic state of the poorer class was deplorable. The wheat crop was inadequate for the needs of the country and the price
bread, the staple article of food, soared to unprecedented heights. The starving population, ill-clad and verminous, wandered from town to town and across the frontier into Iraq in search of work and food. The winter in North Iran was unusually severe.

The present outbreak started in December, 1943, when cases of typhus were reported to be occurring in the civil population at Teheran and Kermanshah in Iran, and Mosul in North Iraq, and rapidly increased in intensity. In February, 1944, it was reported that there were over a thousand cases in the relatively small town of Kermanshah. Towards the end of March the epidemic had reached such proportions in Teheran that the Iranian Government appealed to the British Army for assistance, and a complete hospital was placed at its disposal.

At Abadan the Anglo-Iranian Oil Company admitted over a thousand cases to their coolie hospital.

In Iraq the disease was widespread, but assumed less serious proportions. It is worthy of note that of the 1,300 cases reported, the majority occurred at the three main points of entry from Iran, viz. Basrah, Suleimaniya and Mosul.

From a labour force of 10,000 coolies, employed by the British Army at Basrah, cases of typhus were treated in a military hospital set apart for this purpose.

It was hardly to be expected that the many thousands of British and Indian troops scattered throughout Iran and Iraq could escape unscathed, particularly when it is remembered that many of them were, in the course of their duties, constantly in close contact with local labourers.

The first military cases occurred in January, 1943, when 11 were diagnosed. The peak months were April and May when 50-7 per cent of the total cases occurred. These observations are very similar to those made by Willcox (1920).

Military cases were sporadic, being reported from all parts of the Command. In no instance could case-to-case infection be established. Only three were louse infested on admission to hospital. All gave a history of close association with the civilian population.

(d) Incidence and Mortality Rates.—Relevant statistical data is given in the following tables:

**Table I.—Mesopotamia Campaign 1917 and 1918.**

<table>
<thead>
<tr>
<th></th>
<th>Admissions</th>
<th>Ratio per 1,000</th>
<th>Deaths</th>
<th>Per cent mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>British troops</td>
<td>150</td>
<td>0.58</td>
<td>34</td>
<td>22.7</td>
</tr>
<tr>
<td>Indian troops</td>
<td>386</td>
<td>0.56</td>
<td>89</td>
<td>23.0</td>
</tr>
<tr>
<td>Totals</td>
<td>536</td>
<td>0.56</td>
<td>123</td>
<td>22.75</td>
</tr>
</tbody>
</table>

**Table II.—Military Cases 1942-43.**

<table>
<thead>
<tr>
<th></th>
<th>Admissions</th>
<th>Ratio per 1,000</th>
<th>Deaths</th>
<th>Per cent mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polish troops</td>
<td>420</td>
<td>28.0 (approx.)</td>
<td>48</td>
<td>11.4</td>
</tr>
</tbody>
</table>

1943 January 1 to July 31.

<table>
<thead>
<tr>
<th></th>
<th>Admissions</th>
<th>Ratio per 1,000</th>
<th>Deaths</th>
<th>Per cent mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>British troops</td>
<td>42</td>
<td>0.64</td>
<td>10</td>
<td>23.8</td>
</tr>
<tr>
<td>Indian troops</td>
<td>118</td>
<td>0.84</td>
<td>25</td>
<td>21.2</td>
</tr>
<tr>
<td>Totals</td>
<td>160</td>
<td>0.78</td>
<td>35</td>
<td>21.9</td>
</tr>
</tbody>
</table>

**Table III.—Records of Iraq Civil Health Service 1932-43.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Admissions</th>
<th>Deaths</th>
<th>Per cent mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1932</td>
<td>4</td>
<td>1935</td>
<td>76</td>
</tr>
<tr>
<td>1933</td>
<td>24*</td>
<td>1936</td>
<td>2</td>
</tr>
<tr>
<td>1934</td>
<td>207*</td>
<td>1937</td>
<td>44</td>
</tr>
</tbody>
</table>

*The large number of cases recorded for 1934 was due to a considerable epidemic in Kurdistan.

<table>
<thead>
<tr>
<th>Year</th>
<th>Admissions</th>
<th>Deaths</th>
<th>Per cent mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1941</td>
<td></td>
<td>129</td>
<td>3</td>
</tr>
<tr>
<td>1942</td>
<td></td>
<td>172</td>
<td>2</td>
</tr>
<tr>
<td>1943 (Jan. to July)</td>
<td>1,302</td>
<td>128</td>
<td>9.8</td>
</tr>
</tbody>
</table>
Typhus Fever in Iran and Iraq, 1942-43

TABLE IV.—CIVILIAN CASES TREATED IN MILITARY HOSPITAL 1943.

<table>
<thead>
<tr>
<th></th>
<th>Admissions</th>
<th>Deaths</th>
<th>Per cent mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iranian civilians (a)</td>
<td>2,036</td>
<td>244</td>
<td>12·0</td>
</tr>
<tr>
<td>Coolie labourers (b)</td>
<td>243</td>
<td>92</td>
<td>37·9</td>
</tr>
</tbody>
</table>

(a) Not even approximate figures are available for this outbreak as no satisfactory records were maintained by Civil Health Authorities. It is possible that some 50,000 cases occurred in Iran. The 2,036 cases were admitted to the military typhus hospital at Teheran during the period April 11 to July 10, 1943.

(b) This group consists of some 10,000 Iranian and Iraqi Coolies employed by the Military Command in various Supply Depots. Iranians were chiefly old men and young boys who were physically poor under-nourished specimens. All were probably infested with body lice. The cases were admitted to a 100-bedded section of a military hospital at the Base during the period April 20 to July 13, 1943. Ratio per 1,000 is approximately 27·0.

COMMENTS.

Case mortality is relatively high and varies very little between British Troops, Indian Troops and Coolies in South Iraq, but it is considerably lower among civilians in Northern Iran. It is also evident that the percentage mortality for troops in the two campaigns is very similar.

The lower mortality among Polish troops and Iranian civilians may be due to some degree of acquired immunity, as typhus fever has been endemic in Poland and Northern Iran. The difference in mortality between the Iranian and Iraqi civilians, and the Coolies, the majority of whom were Iranians—is more difficult to explain.

One important reason for this difference may be the movement of individuals from localities, where they had acquired some degree of immunity to a particular strain, to another where a different strain was prevalent.

Both groups were almost equally exposed to the other factors associated with outbreaks of typhus, i.e. under-nourishment, lousiness, infrequent washing, overcrowding, etc.

Another point for consideration is how far those figures were really comparable. Cases and deaths among military personnel and South Iraq Coolies were recorded, but Northern Iran figures relate only to individuals who happened to be treated in a military hospital. No information is available as to the number of cases and deaths which occurred apart from these recorded cases. It is therefore uncertain which way this may influence case mortality, but the figures do afford a basis for comparison.

Preventive Measures.

As soon as it became apparent that an epidemic of typhus was probable, all possible steps were taken to protect military personnel from infection.

To facilitate control Administrative Districts in Iraq and Iran were subdivided into a number of small areas. On the occurrence of cases of typhus a notification was issued by G.H.Q., Paiforce, proclaiming the particular area a "typhus area." Movement within and without was restricted. Villages and Bazaars were placed out of bounds for troops. This occasionally led to difficulties for a time in obtaining supplies of fresh milk, vegetables and fruit for the troops in some areas, but these difficulties were more apparent than real. Troops arriving from these areas were segregated until they were found to be free from infestation.

The prevention and control of louse infestation was made a unit commander's responsibility. Weekly inspection of all troops was ordered and arrangements were made for disinfestation of those found to be verminous. Louse infestation was found to be more prevalent among personnel in transport units who, by the nature of their duties, did not always have the same opportunities as others for obtaining facilities for bathing and washing their clothing. Arrangements were overhauled and improved where necessary. Mobile bath and laundry units were located in "danger areas," where the numbers of troops warranted these special units.
Special "typhus teams" were organized and trained for field disinfection of personnel and their effects. These teams were provided with protective clothing, and were equipped with portable shower-bath apparatus and disinfectors. Training was undertaken by field hygiene sections and was under the control of the Deputy Assistant Directors of Hygiene. Static disinfection stations were constructed at all the larger military centres.

Protective inoculation of all personnel of medical units, e.g. hospitals and field hygiene sections, and of all troops most closely associated with native labour, was carried out (vide Section (4)).

A major problem was presented by the large number of labourers employed by civilian contractors on behalf of the military authorities and not under direct military control. At Basrah this problem was solved, in part, by establishing a coolie camp for those whose homes were not in the vicinity of their work. A medical officer was appointed to the camp and all coolies were inspected and disinfested weekly. In the case, however, of the large number of labourers who returned to their homes nightly, such measures were valueless; the men became reinfested in their homes. For these the Army Anti-Louse Powder (A.L.63) was supplied, and its use enforced with satisfactory results. A supply of lethane-impregnated belts arrived too late in the season to be of value.

It seems not unreasonable to claim that the low incidence of typhus among military personnel, living under unfavourable conditions, is proof of the efficacy of the measures adopted for their protection.

(4) Prophylactic Inoculation.

Early in January, 1943, 400,000 c.c. of Cox's type typhus vaccine were received. This vaccine is prepared from cultures of rickettsia in the yolk sac of developing chick embryos. The type used was the epidemic strain of rickettsia. Three injections of 1 c.c. were given subcutaneously at weekly intervals. From information available and from our own experience it would appear that immunity takes six weeks to develop after the third injection. During the occurrence of cases of typhus immunity was regarded as only lasting for three months. A boost dose of 1 c.c. was therefore given at three monthly intervals as long as cases of typhus were occurring.

As there was an increased incidence of typhus among the civilian population, and as cases occurred in the Army, the D.M.S., Paiforce, issued instructions on January 15 that certain categories of personnel were to be protected, viz.:

(i) Staff of hospitals nursing cases.
(ii) Personnel of field hygiene sections, mobile bath and laundry units.
(iii) Engineer, supply and transport, and ordnance personnel in contact with civilian employees.

It must be emphasized that although prophylactic inoculation was instituted, orders were issued to ensure that the prevention of infestation was to be regarded as of paramount importance.

During the period under review, approximately a quarter of the Force was protected. In considering the incidence of typhus fever, anyone who had received one or more doses of vaccine is included in the group of protected personnel.

(a) Incidence of Typhus Fever.

\[ \text{Protected Personnel.} \]
\[ \text{No. protected (approx.) 51,000} \]
\[ \text{No. of cases} \quad 19 \quad \text{Ratio per 1,000 for 7 months} \quad 0.37. \]
\[ \text{No. of deaths} \quad 2 \]

\[ \text{Unprotected Personnel.} \]
\[ \text{No. unprotected (approx.) 155,000} \]
\[ \text{No. of cases} \quad 141 \quad \text{Ratio per 1,000 for 7 months} \quad 0.91. \]
\[ \text{No. of deaths} \quad 33 \]
It is impossible to be dogmatic about the value of any prophylactic inoculation during the course of an epidemic. These figures, however, show that there was a lower incidence of typhus in the inoculated group than in the uninoculated. It must be emphasized that the former group were far more exposed to infestation than the latter and, with the exception of certain medical and hygiene personnel who were issued with special protective clothing, had only the additional protection of prophylactic inoculation.

The best presumptive evidence available to assess the value of the vaccine is from West Central Iran which includes Kermanshah and Sultanabad. It was in these areas that typhus fever first occurred among military personnel in January and February. Prophylactic inoculation was therefore instituted early and the majority of those requiring protection were fully immunized by the middle of March, i.e. six weeks after receiving their third dose of vaccine. Here, as elsewhere in Iran and Iraq, typhus fever was on the increase among the civilian population, reaching a maximum intensity in April and May.

The table below gives a comparison between the incidence of typhus fever in the troops in West Central Iran and those in the adjacent area of Southern Iran where prophylactic inoculation was instituted too late for protection to be obtained before the peak of the outbreak was passed. The number of troops located in each area was approximately the same.

In addition to typhus occurring in the surrounding towns and villages, personnel stationed in West Central Iran were exposed to an additional risk from the stream of road traffic along the Sultanabad, Kermanshah, Khanaqin route to and from Iran and Iraq.

<table>
<thead>
<tr>
<th>WEST CENTRAL IRAN</th>
<th>SOUTHERN IRAN</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cases</strong></td>
<td><strong>Deaths</strong></td>
</tr>
<tr>
<td>January</td>
<td>4</td>
</tr>
<tr>
<td>February</td>
<td>3</td>
</tr>
<tr>
<td>March</td>
<td>4</td>
</tr>
<tr>
<td>April</td>
<td>1</td>
</tr>
<tr>
<td>May</td>
<td>-</td>
</tr>
<tr>
<td>June</td>
<td>1</td>
</tr>
<tr>
<td>July</td>
<td>1</td>
</tr>
<tr>
<td>Totals</td>
<td>14</td>
</tr>
</tbody>
</table>

The above figures show that there was a lower incidence of typhus fever in March, April, and May among the troops in West Central Iran than in Southern Iran.

During the seven months under review, 15 cases occurred among personnel of the R.A.M.C. and I.A.M.C., with two deaths. Only four cases had received prophylactic inoculation prior to infection. In the Teheran typhus hospital, out of a staff of five hundred inoculated personnel employed in handling and treating cases, two mild cases occurred.

(b) Relationship between Dates of Onset and Inoculation.—Approximately one-third of the cases developed typhus between the first and third doses of vaccine and the remaining two-thirds within six weeks after the third inoculation. It is of interest to note that no case of typhus occurred in individuals who were fully immunized, i.e. six weeks after the third dose.

(c) Type of Disease in Protected Personnel.—In 16 of the cases the type of disease has been recorded:
- Mild, 9
- Moderately severe, 3
- Severe, 2
- Fatal, 2.

The type of disease in cases who had received any prophylactic inoculation was generally described as less severe than in the non-inoculated.

(C) CLINICAL ASPECTS.

No striking new facts were brought to light. The clinical features of the epidemic in Iran and Iraq in 1943 and the outbreak among the Polish Forces during their evacuation from Russia to Iran in 1942 conform in the main with the published description of the disease.
Therapeutic treatment has in reality made little progress, if any, since the previous Meso­
opotamia campaign. Willcox (1920) stressed the value of subcutaneous and intravenous saline in severe cases. He also refers to the liability to sudden collapse and advocates the
continuance of stimulants for some days after the temperature has become normal.

Sulphapyridine was given early in a total of 336 cases, of whom the majority had signs of pulmonary involvement. The following observations were made:

(a) Sulphapyridine is shown to be of no benefit in treatment of typhus as such, but it
may possibly have some effect where there is a complicating pneumonia.

(b) The use of the drug is justified in cases with pulmonary involvement, although no striking results are to be expected.

(c) Administration of sulphapyridine on or before the fifth day did not reduce the incidence of bronchopneumonia or have any significant effect on mortality.

Atebrin was used without any beneficial or detrimental effect in six cases.

A general description of typical cases of typhus fever is unnecessary in a paper of this
type. The relative frequency of various features analysed stresses the prognostic importance
of certain signs and symptoms, some of which although generally considered to be of prog­
nostic importance have not been shown to be so in this statistical series, and are discussed
below. Facts were obtained from a special case sheet which was completed in all typhus
fever cases. In assessing the reliability of information, considerable reserve is necessary
in accepting figures for less clear-cut features and histories. Under epidemic conditions
standards of diagnosis vary and the clinical picture is often confused by associated disease,
e.g. malaria and syphilis among coolies. Subjective symptoms are difficult to evaluate
owing to language difficulties and the variable mental capacity of patients.

(1) Signs and Symptoms of Prognostic Significance.

Clinical features which were relatively uncommon in the non-fatal cases and significantly
more common in the fatal cases are valuable prognostic guides.

(a) Presence of any of the undermentioned features indicates a bad prognosis. The
relative frequency of their occurrence in fatal and non-fatal cases is given.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Non-fatal Per cent</th>
<th>Fatal Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Coma vigil</td>
<td>1</td>
<td>34</td>
</tr>
<tr>
<td>(ii) Black or brown dry fur on tongue</td>
<td>3.8</td>
<td>31</td>
</tr>
<tr>
<td>(iii) Jaundice</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>(iv) Urinary incontinence or retention</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>(v) Diarrhoea</td>
<td>6</td>
<td>28</td>
</tr>
<tr>
<td>(vi) Typhoid state</td>
<td>13</td>
<td>43</td>
</tr>
<tr>
<td>(vii) Delirium</td>
<td>21</td>
<td>52</td>
</tr>
</tbody>
</table>

(The percentages given were obtained from an analysis of 226
unselected cases among British and Indian troops and coolies; of
these 68 terminated fatally.)

The features shown to be of serious prognostic significance are in general those of severe
toxaemia. The serious prognostic significance of jaundice was not previously realized and
was present in two children who died in Teheran.

(b) Rash.—Some type of rash was present in almost all patients, and was equally common
in fatal and non-fatal cases. The rash commenced with a macular eruption. The first
macules were sparse and constantly appeared on the anterior axillary folds. Subcuticular
mottling was rare and when present usually associated with peripheral circulatory failure.
The face, palms or soles were not involved in a single Iranian case treated in Teheran. The
rash cannot be detected on very dark-skinned people. A hemorrhagic rash with superficial
purpura was frequently present in severe toxic cases. In one fulminating fatal case both a haemorrhagic rash and multiple haemorrhages were noted. The presence of a petechial rash (present in 59 per cent of non-fatal and 68 per cent of fatal cases) with or without purpura (present in 3 per cent of non-fatal and 3 per cent of fatal cases) was not found to be of any prognostic value as this was equally common among fatal and non-fatal cases. These findings are at variance with the usual views.

(c) Respiratory Involvement.—Some degree of respiratory involvement was always present except in the mildest cases, but there is some divergence of findings as to the nature of the lesion present. Bronchial catarrh, acute bronchitis, acute bronchitis with hypostatic congestion, hypostatic pneumonia, bronchopneumonia and massive lobar pneumonia have been recorded in roughly equal proportions. Variation appears to occur in different localities, but this may be possibly due to the personal idiosyncrasy of different medical officers.

Extensive consolidation occurred more frequently in non-fatal (13 per cent) than in fatal cases (3 per cent). An explanation may be that fatal cases die before they have had time to develop consolidation. It would therefore appear that if a patient survives long enough to develop consolidation, his chances of survival are better. No information is available as to the date on which consolidation was detected.

(2) Variations in the Different Groups of Cases.

Although the disease in the different groups was basically the same, there were some significant differences.

(a) The most striking of all features is that 55 per cent of the North Iran cases died of circulatory failure or pulmonary oedema whereas no case in South Iraq was noted as having either of these symptoms. The incidence of hypostatic congestion was also much higher in North Iran (21 per cent) than in Iraq (2 per cent). This strain in North Iran would therefore appear to have some special affinity for the peripheral circulatory system.

(b) Cyanosis of fingers and toes was more common in South Iran than in other localities in Iran and Iraq. Thrombophlebitis, cancrum oris, gangrene of the buttock and ears have also been recorded in cases from this area.

(c) In South Iraq there was a very much higher incidence of mental symptoms suggesting a neurotropic type. Bronchopneumonia was also more frequently found in the South Iraq cases.

(d) Enlargement of spleen—South Iraq: A high rate among coolies (64·2 per cent) is not surprising because many of them come from malarious areas where the spleen-rate in children approaches 80 per cent. The rate (about 45 per cent) for troops and that (about 60 per cent) for civilians in Teheran, where malaria incidence is low and later in the season than typhus, are more reliable. They show that splenic enlargement is more common than most textbook descriptions indicate.

(e) Mental-Symptoms:

<table>
<thead>
<tr>
<th></th>
<th>Coma vigil</th>
<th>Typhoid state</th>
<th>Stupor</th>
<th>Delirium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-fatal</td>
<td>Fatal</td>
<td>Non-fatal</td>
<td>Fatal</td>
<td>Non-fatal</td>
</tr>
<tr>
<td>British troops</td>
<td>0</td>
<td>58</td>
<td>26</td>
<td>72</td>
</tr>
<tr>
<td>Indian troops</td>
<td>0</td>
<td>31</td>
<td>47</td>
<td>63</td>
</tr>
<tr>
<td>Iranian civilians</td>
<td>0</td>
<td>9</td>
<td>0</td>
<td>32</td>
</tr>
<tr>
<td>Coolies</td>
<td>1</td>
<td>32</td>
<td>0</td>
<td>32</td>
</tr>
</tbody>
</table>

(Figures above represent percentages.)

Although there is little difference in the occurrence of coma vigil and stupor among troops and coolies, delirium and typhoid state were less common in the latter. Mental symptoms were markedly less frequent among Iranian civilians. A possible explanation for this variation is that the Iranian civilians and coolies had acquired some degree of immunity in the past and consequently were less liable to toxic manifestations.
A. Sachs

(3) The Relation of Mortality to Age.

(1) British Troops, Indian Troops and Coolies (an analysis of 226 unselected cases).

<table>
<thead>
<tr>
<th>Mortality in Age-groups</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 19</td>
<td>16.7</td>
</tr>
<tr>
<td>20—29</td>
<td>20.0</td>
</tr>
<tr>
<td>30—39</td>
<td>27.1</td>
</tr>
<tr>
<td>40—49</td>
<td>63.2</td>
</tr>
<tr>
<td>Over 50</td>
<td>58.3</td>
</tr>
</tbody>
</table>

(2) Iranian Civilians.—Among the cases treated in Teheran there were 100 cases under 12 years old, with only two deaths.

It was the consensus of opinion that after the age of 50 the prognosis of a case of average severity is always in doubt and after 70 invariably fatal.

It is important to remember the high mortality rate over the age of 40 when selecting personnel for employment in the control, treatment and investigation of typhus fever.

(To be continued.)