

acid are the best disinfectants. Formalin is easy to use, efficacious, not very expensive, and the odor is not lasting. Fæcal discharges should be received into a vessel containing about a pint of dilute formalin (ten per cent.). After defecation the stools should be covered with the solution, then mixed thoroughly, best with a stick that can be burned, and after standing for some time they may with safety be emptied. Urine should always be disinfected. This may be done with corrosive sublimate, five per cent. carbolic acid, or chlorinated lime, but best by adding one-fortieth of its volume of formalin.

To disinfect urine in the bladder of patients *wrotropin* is given in doses of from eight to ten grains three times a day for two days each week until convalescence is completed. Soiled bed linen and other articles which may be infected should be soaked in disinfectant (five per cent. carbolic-acid solution), and then when possible boiled, or exposed to dry heat in a disinfecting chamber. The sputum should be disinfected and may usually be burned. The nurses and attendants, after coming in touch with the patient, should also disinfect their hands carefully, both for their own protection and for the protection of others. The disinfection of thermometers and other utensils should not be overlooked.

In the country disinfection is exceedingly important. Any patient may be the source of a serious epidemic. Here the stools may be disinfected by mixing with an equal quantity or more of "milk of lime," which is slaked lime with four volumes of water, and after standing for two hours, they may be put in the privy vault or burned. Milk of lime should also be thrown liberally into the privy. The urine may be disinfected by chlorinated lime (1 to 32) or corrosive sublimate. The sputum should be burned, and linen, etc., all carefully disinfected. If any of those attending the sick also do farm or dairy work, especial care and diligence should be observed in preventing them from spreading the disease.

**CONVALESCENCE.**—Convalescence from typhoid fever is always slow, and may be very prolonged. It is always a matter of weeks, and may be a matter of many months. During this period a general supervision of the patient is desirable—care as to food, clothing, exercise, occupation, rest.

Notwithstanding the changes in our views incident to the development of bacteriology and minute histology, a better summing up of the disease process in its relation to the process of convalescence cannot be given than in the closing words of Hoffmann's volume on the pathological-anatomical changes in the organs in typhoid fever: The poisonous materials are, as a rule, taken into the body with the food, and carried into the blood from the lower portion of the ileum, as the place where the food tarries the longest, and where particularly favorable conditions for absorption are found. With this absorption, tissue changes take place in these parts which cause the onset of a severe febrile movement, and this in turn entails a parenchymatous degeneration of the various organs. Under an extreme development of these phenomena, attended by a number of unfavorable complications, the patient succumbs. But in most cases the fever declines with the return of the intestine toward health. Nutrition regulates itself, and the degenerated organs are gradually renovated.

When one therefore reflects how in all parts of the body large portions of important organs are destroyed during the typhoid process, one easily understands why typhoid patients in general experience such pronounced weakness for such a long time, and why typhoid fever is followed by so much longer convalescence than so many other less generally destructive diseases. The restoration of such a large portion of the most important portions of the system as are destroyed during the disease taxes to the utmost the ability of those which are left, and is rendered laborious precisely by the fact that the very delivery of new material for rebuilding is greatly impeded by the destruction of large areas of the lymph glands in the intestine.

Reflecting on these points, instead of being surprised

at the slowness of convalescence, one is led to wonder at the recreative force which, undaunted by such impediments, builds up afresh in a comparatively short period a large part of the whole body; and, at the same time, one understands why it is that the convalescent, after passing safely through an attack of typhoid fever, feels rejuvenated and as if he were born anew.

*George B. Shattuck.*

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**TYPHOID FEVER: BACTERIOLOGY.** See THE APPENDIX.

**TYPHO-MALARIAL FEVER.**—This term, which was suggested by Woodward in 1862, and has since been widely adopted, cannot be justified upon scientific grounds; for, as conceded by Woodward himself, and generally admitted by recent authorities, "it does not designate a distinct type of disease, but is simply a term which is conveniently applied to the compound forms of fever which result from the combined influence of the causes of malarious fevers and of typhoid fever."

If we accept this definition of the term upon the authority of its author, we shall be obliged to admit that typho-malarial fever is simply a clinical variety of typhoid fever in which the symptoms are more or less modified by the fact that the patient has also been subjected to the influence of the malarial poison, and the propriety of making a separate heading for such cases in our nosological tables may be questioned.

If, in accordance with this definition, the sole difference between typhoid fever and typho-malarial fever consists in the presence or absence of a malarial complication, it would be reasonable to expect that the mortality from the complicated cases—typho-malarial—would at least equal that from the uncomplicated cases. But if we refer to the statistical tables published in the first medical volume of "The Medical and Surgical History of the War of the Rebellion," we shall find that this is not true of the cases included under this heading by the medical officers of our armies during the war. On the contrary, *the mortality from typho-malarial fever is very much less than from typhoid fever.* This is shown by the accompanying table, taken from the writer's work (1884) on "Malaria and Malarial Diseases," page 83.

We find by referring to the third column in this table that the percentage of mortality in the cases designated simply "typhoid" was, in the case of the white troops, more than five times as great, and in the case of the colored troops more than three times as great, as in the class of cases designated "typho-malarial." It will scarcely be maintained that a complication can exercise a favorable influence upon the severity and fatality of a specific disease. We are, therefore, obliged to suppose

ANNUAL RATE PER 100 OF SICKNESS AND MORTALITY FROM CONTINUED AND MALARIAL FEVERS IN THE ARMIES OF THE UNITED STATES DURING THE CIVIL WAR.

	RATIO OF CASES TO MEAN STRENGTH.		RATIO OF DEATHS TO MEAN STRENGTH.		RATIO OF DEATHS TO CASES.	
	White.	Colored.	White.	Colored.	White.	Colored.
Typhoid .....	2.62	2.14	1.05	1.19	39.89	53.24
Typho-malarial..	2.43	3.94	.19	1.01	7.08	17.28
Remittent .....	11.62	16.05	.16	.62	1.39	3.27
Intermittent....	36.54	62.77	.04	.06	.18	.10
Congestive intermittent.....	.53	1.32	.14	.36	26.23	31.30

either that this malarial complication only manifests itself in the milder forms of typhoid; or that a large share of the cases diagnosed "typho-malarial" are simply uncomplicated typhoid of a mild form; or that under this heading a large number of cases are included which are not typhoid at all, but belong to a distinct species of fever of much milder type. In the latter case, it is evident that it will be necessary for those who maintain the existence of a distinct form of continued fever to define its characters, and to give it a specific name, inasmuch as typho-

The disease runs its course in two or three weeks, sometimes even in less time, and then subsides spontaneously, leaving no unpleasant effects. *Such cases are often mistaken for miasmatic remittent, especially as they not infrequently have a daily remission and exacerbation of the febrile symptoms.*

Since the introduction of the term "typho-malarial fever," such cases are very commonly classed under this heading, and it is certainly a decided gain to have them rescued from the group of malarial fevers to which they were formerly so often relegated, under the convenient heading "remittent fever," a term which in this country, in Europe, and especially in India, has been made to serve as a catch-all for a variety of febrile complaints differing widely in their etiology and having nothing in common except a more or less remittent character of the pyretic movement.

The supposition that a large share, at least, of the cases which appear in our statistical tables under the heading "typho-malarial fever" are identical as regards etiology with the cases included under the heading "typhoid fever" is supported by a consideration of the data contained in the first medical volume of "The Medical and Surgical History of the War of the Rebellion."

This is shown by the following table, and remarks taken from the writer's work on "Malaria and Malarial Diseases," heretofore referred to (page 21):

WHITE TROOPS IN FIELD, GARRISON, AND HOSPITAL.—GENERAL SUMMARY.

	1862.		1863.		1864.		1865.	
	Number of cases.	Ratio per cent. of cases to mean strength.	Number of cases.	Ratio per cent. of cases to mean strength.	Number of cases.	Ratio per cent. of cases to mean strength.	Number of cases.	Ratio per cent. of cases to mean strength.
Typhoid fever.....	21,965	7.60	32,166	4.87	10,116	1.49	9,739	1.50
Common continued fever.....	11,769	4.06	.....	.....	.....	.....	.....	.....
Typho-malarial fever.....	.....	.....	23,346	3.53	11,729	1.73	13,149	2.03
Malarial fevers (including intermittent and remittent).....	112,876	39.07	282,675	42.83	361,968	53.58	320,559	49.64
Mean strength.....	288,919		659,955		675,413		645,506	

malarial fever is now generally recognized as being simply a clinical variety of typhoid.

There can be no doubt that a large proportion of the cases which in our army statistical tables appear under the heading "typho-malarial fever" are in truth mild cases of typhoid. And it may be that under the influence of a malarial complication the pyrexia in such cases has a more decidedly remittent character than in similar cases without complication. But it must be remembered that uncomplicated typhoid often presents a decidedly remittent character at the outset of the attack, and that in infants the pyrexia of enteric fever commonly presents this character in so marked a manner as to have led to the designation "infantile remittent." There is reason to believe that the non-recognition of this fact leads to frequent mistakes in diagnosis, and that many cases of simple enteric fever, and especially the mild cases, are improperly classified under the headings "malarial," "typho-malarial," and "remittent fever." This results largely from the fact that the diagnosis has been made at an early period in the progress of the disease, before the distinctive characters of typhoid fever have been developed, and at a time when the pyrexia is, as stated, very often remittent in its character. In speaking of mild cases of enteric fever, Dr. George B. Wood, in his "Practice of Medicine" (ninth edition), says: "In some instances the disease presents no other symptoms than those of moderate fever, with the characteristic phenomena of a slight diarrhoea or tendency toward it, some meteorism of the abdomen, and perhaps a few rose-colored spots. The tongue remains soft, moist, and whitish throughout; there is no vomiting, no considerable nervous disorder, no great prostration; in fine, none of these peculiar symptoms commonly denominated typhus.

"The figures in the tables from which our general summary has been made relate to the fiscal year, which includes the period from June 30th of one year to July 1st of the following year; the data, therefore, under the heading 1862, for example, relate to the last six months of 1861 and the first six months of 1862. The change in nomenclature, made in accordance with the recommendation of a board of medical officers, of which Dr. Woodward was a member, took effect soon after the commencement of the fiscal year 1863, and it is quite apparent from an inspection of the table that the class of fevers previously known as 'common continued fevers' subsequently fell into the group denominated typho-malarial.

"The broad fact which our table shows, is that the relative proportion of cases of typhoid fever diminished, and the relative number of cases of malarial fever increased, as the war progressed. Thus, upon comparing the first two years with the last two years, we find that the sum of the annual ratios is as follows: Typhoid fever, first two years, 12.47; last two years, 2.99; malarial fevers, first two years, 81.90; last two years, 103.22. This affords us a criterion for determining whether the group of fevers called, prior to 1863, 'common continued fever,' and subsequently 'typho-malarial fever,' is more nearly allied, etiologically, with true typhoid or with the malarial fevers. Taking, as above, the sum of the ratios for the first and last two years of the war, we obtain the following: Typho-malarial fever, first two years, 7.59; last two years, 3.76. Evidently the causes which produced this group of fevers diminished as the war progressed, as did those which produced the fevers recognized as typhoid, while the relative proportion of cases of malarial fevers increased.

"The etiological deduction is apparent, and the reasons for this increase of one class of fevers and decrease of another are not difficult of comprehension. In the first place, our armies moved southward as the war progressed, and came more within the influence of the malarial poison. And, perhaps, this general movement southward, in which, however, the Army of the Potomac did not to any considerable extent participate, carried our troops, to some extent, outside of the endemic prevalence of enteric fevers. This, however, is open to question. In the second place, it is a generally recognized fact that exposure to malaria, and attacks of malarial fevers, not only do not confer immunity, but predispose to further attacks. The increased number of cases of malarial fevers is, therefore, accounted for.

"On the other hand, attacks, however mild, of the specific fevers protect those attacked, to a greater or less extent, from future attacks. That this immunity applies to typhoid, as well as to yellow fever and the eruptive fevers, there can be no doubt. . . .

"The history of armies in all parts of the world shows that new levies are especially subject to typhoid fever, and to the mild continued fever so often called by some other name, while seasoned troops are, to a great extent, exempt from it" (*op. cit.*, page 22).

In further support of the view that the etiological conditions which produce the cases denominated typho-malarial correspond with those which produce typical cases of enteric fever, we may call attention to the fact that the so-called typho-malarial fever frequently occurs in localities where intermittents and remittents are unknown; that it may prevail during the winter months, and in cities which are far removed from malarial influences; that its prevalence is often traced to insanitary conditions of the same nature as those which are concerned—as predisposing causes, at least—in the production of epidemics of typhoid; and, finally, to the fact that in fatal cases, which have been diagnosed as typho-malarial at the outset of the attack, the lesions of enteric fever are commonly found at the autopsy.

If, as some claim, there is a form of continued fever widely prevalent in the United States, which, although influenced by the same predisposing causes, is specifically distinct from true enteric fever, and also from the malarial fevers, properly so-called, then we must protest against the use of the name typho-malarial fever as applied to such cases, inasmuch as, in accordance with the definition given, by the originator of the name, this term is generally understood to designate a clinical variety of typhoid fever.

George M. Sternberg.

<sup>1</sup> Transactions of the International Medical Congress held in Philadelphia in 1876, article Typho-Malarial Fever.

**TYPHUS FEVER.**—Synonyms: German, *Fleck-typhus*, *Fleck-feber*, *typhus exanthematicus*; French, *typhus exanthématique*; Italian, *Dermo-tifo*, *typho esantematico*; Spanish, *Tifus El "Tabardillo"*, or *tifo tabardilla*; Dutch, *Vellekoorts Kwaadardigekeorts*; Swedish, *Fläck-tyfus*; Norwegian or Danish, *Nerve feber*, *Exanthematisk typhus*. The disease has also been known by various other names as Spotted fever, Camp, Jail, Ship and Hospital fever, Typhus Contagiosus, Typhus Petechialis, Febris Puerpera Epidemica, Morbus Pulcaris, Febris Peticularis, Catarrhal Typhus, Ochlotic Fever, Adynamic or Ataxic fever, Cerebral Typhus, Putrid or Malignant Fever, Irish Ague, Febris Hungarica.

**DEFINITION.**—Typhus fever is an acute, infectious disease of unknown origin, highly contagious, so far as we know spread only by actual contact, and maintained by overcrowded conditions of population. It occurs in epidemics but may become endemic. It is characterized clinically by severe onset, early and pronounced nervous manifestations, such as prostration and tendency to mental derangement, a rapidly developing macular eruption, which is at first hyperemic but later becomes hemorrhagic, and a fever which terminates by crisis. It presents no specific anatomical lesions, and is in no way

related to typhoid fever. It belongs, in all probability, to the group of diseases known as the acute exanthemata.

**HISTORY.**—Typhus fever, since the conditions which favor its development have always been present in the world, has probably followed upon great wars and famines since the beginning of civilization, and fevers are described by ancient writers which are thought to be typhus. In 1083 Carradi<sup>1</sup> and in 1463 Jacobus de Partibus<sup>2</sup> describe epidemics which many writers believe are the first unmistakable reports of the disease; but the great bulk of evidence points to the epidemics recorded by Fracastorius,<sup>3</sup> a Veronese physician, as the first which we can with a degree of certainty pronounce typhus fever. Fracastorius in 1546 published his work entitled "Contagionibus et Morbis Contagiosis," in which he describes an epidemic in Italy in 1505 and 1508, and a second epidemic which he witnessed twenty years later under the name of morbus lenticularis. This disease, though new in Italy, appears to have been well known by the physicians of Cyprus, where the disease was probably epidemic, and whence it may have come to Verona. The second epidemic in Italy, from 1524 to about 1530, spread to France and Spain, over the whole of the German Empire and even to Sweden, returning to Italy toward the end of the century.

Epidemics of typhus fever with dysentery and scurvy recurred in the seventeenth century among the train of evils entailed upon the unhappy empire by the Thirty Years' War. The disease continued to break out both in England and upon the continent during this and the succeeding century. In the eighteenth century it was endemic on the continent and became epidemic wherever want pressed more sorely than usual. In England the so-called Black Assizes became centres of contagion, when at judicial sessions prisoners communicated the disease to judges on the bench and to others in proximity. The cause of the disease was pointed out in 1735 by Browne Langrish<sup>4</sup> to be overcrowding and want of ventilation, so that "people are made to live in their own steams." The disease had been known by various names, chiefly as spotted fever. The name typhus was applied to it about this time (in 1760) by Sauvages.<sup>5</sup> The term is from the Greek, *τιφος*, a smoke or fog, which was used by Hippocrates to designate a condition of stupor, and well describes the characteristic intellectual sluggishness of the sufferer from this form of fever. The extensive epidemics of the so-called "Faulfeber" in Austria (Vienna, 1757 and 1759) and Germany (1771 and 1772) were very probably typhus.

The early years of the nineteenth century saw a general epidemic of typhus on the continent. The armies of the French Republic and the First Empire carried the contagion everywhere. Napoleon lost more men by this pestilence than by the armies of the allies. When the tide of war receded the larger towns were left as centres from which epidemics spread from time to time. Great devastation was wrought by typhus among the armies of the Crimean War (1854-56), and in the war between Russia and Turkey in 1877-78 the pestilence visited the Russian camp, prostrating one hundred thousand men, half of whom died. The United Kingdom meanwhile has suffered much. Ireland has been a focus from which, during the last century, five epidemics have radiated. The most severe of these was in 1846. The mortality was very high and the disease spread to England, where it reached its height in the almost incredible number of one million cases (Murchison), and thence to the continent. In the century just closed the epidemics have shown a tendency to confine themselves to the vicinity of the place of origin, a result no doubt traceable to improved sanitation. The ravages of the disease among the Russian forces in the Crimean and Turkish wars were due directly to the horrible sanitary condition of the camps. In the Crimean War the English, whose camp was better managed, suffered less from the pestilence.

In the New World the disease is pandemic in Mexico, where it has existed since the advent of the Spaniards; if it was not known before the conquest under the name of

"cocoliste." It is thought by some that the disease in Mexico has been confused with malaria and typhoid fever, and that typhus is exceedingly rare. In the United States there have been several local epidemics during the last century. The first was in New England in 1807. The disease broke out in Philadelphia in 1812, and lurked in the city "in lanes and alleys" until 1821 when Wood, then a student of medicine, studied and reported the disease. Philadelphia suffered another visitation in 1836, the history of which was written by Gerhard<sup>6</sup> who was the first, in this country at least, to establish the difference between typhus and typhoid. Since that time epidemics have visited sundry American cities and have been described by Flint, Da Costa, and Loomis. Typhus was not epidemic on either side during the Civil War. It is true that seventeen hundred and twenty-three cases were reported to Washington, but these, as Hutchinson maintains, were typhoid accompanied by conditions which misled the army surgeons in diagnosis.

Few and mild have been the epidemics during the latter part of the century just closed. As Osler has remarked: "The gradual disappearance of typhus fever is one of the great triumphs of modern medicine."

**ETIOLOGY.**—*Geographic Distribution.*—If the history of typhus fever is reviewed, it will be found that no country of Europe has been exempt from the disease. England and Ireland, Italy and Russia are known as the classic homes of typhus fever, places in which the disease lurks, and from time to time epidemics, whose origin is traceable to these places, occur in neighboring and distant countries, whither they have been brought by means of merchant ships. Immunity from typhus has been claimed for France, but this claim, according to Hirsch, is not warranted, as recorded cases will show. The disease is not unknown in Iceland. In Africa and in Asia, outside India, the disease is, according to Murchison, unknown, but here again Hirsch found trustworthy evidence of occasional cases of the malady in Asia Minor, Syria, Persia, Egypt, Nubia, Tunis, and Algeria. New Zealand and Australia, the Mississippi valley, and the Pacific maritime states have remained free. In Mexico and Central and South America again Hirsch affirms, while Murchison denies, the existence of typhus.

**MODES OF CONVEYANCE.**—*Contagium.*—The contagium develops and reproduces itself in the body of the typhus-fever patient. The manner in which it is given off from the body is as yet only a matter of speculation. It is thought that the contagium exists in the secretions and excretions of the body and in the exhalations from the lungs and skin. There can be no question on the other hand that the disease is transmitted by so-called common carriers or fomites. The contagium clings to particles of dust, articles of clothing, furniture, and conveyances of various kinds, and retains its pathogenic properties for months. The literature abounds in instances where the disease has been conveyed to hitherto uninfected localities in articles of clothing, etc. The contagium has been carried by dead bodies.

Typhus fever may be transmitted through the air, but not for great distances. It has been demonstrated that in well-ventilated and uncrowded wards, where three or four typhus-fever cases are being cared for, the other patients remain uninfected, while those who have the immediate care of the cases are very frequently affected. On the other hand, in crowded wards or buildings with poor ventilation all are affected who are exposed.

That the disease is of a specific nature and does not occur spontaneously is shown by the fact that articles of clothing containing the contagium cannot infect after they have been subjected to a temperature of 100° to 120° C.

The contagium may be transmitted at all stages of the disease, including the stage of incubation. The period of greatest danger is during the beginning and at the acme of the febrile stage. Upon this point most writers are now agreed, while many of the older writers maintain that the contagium is more often transmitted during the stage of convalescence.

*Bacteriology.*—We still remain in the dark as to the

true nature of the contagium. Whether it is a bacterium or a parasite of some other order is a question yet to be solved. In this disease as in the acute exanthemata many researches have been made, the purpose of which has been to demonstrate the specific cause, but little if anything has been accomplished. It will be unnecessary to more than mention the work of those whose efforts thus far have apparently no other than an historic value.

As early as 1868 E. Hallier, of Jena, described an organism which he called typhus fungus (rhizoporus), and fifteen years later, in 1883, Mott<sup>7</sup> reported the finding of motile spirilla in the blood of a typhus-fever patient. Little importance, however, was attached to these reports at that time or since. In 1888 Moreau and Cochet<sup>8</sup> isolated, from the blood and urine of typhus-fever patients, bacilli which they describe as resembling the bacillus typhosus. A year later, in 1899, Hlava, of Prague, made observations on forty-five typhus-fever cadavers. In twenty of these and also in one living subject he found a streptobacillus in the blood, but was unable to demonstrate its presence in any of the organs. Cornil and Babes were unable to confirm Hlava's conclusions. In 1892 Lewaschew<sup>10</sup> described coccus-like bodies in the spleen blood which, when stained, were seen to possess long cilia. He also observed free flagella, to which he gave the name spirochaete exanthematicum, and these, he thought, represented a different stage in the life history of the organism. He succeeded in growing the organism on ascitic fluid. In the same year Thoinot and Calmette<sup>11</sup> described a flagellate and amoeboid organism in the spleen blood of five living patients and from the pulmonary blood of one after death. In 1893 Cheesman<sup>12</sup> described his bacillus sanguinis exanthematicus. In 1894 Dubief and Brühl<sup>13</sup> described their capsulated diplococcus exanthematicus which they found much more commonly in the air passages and sputum than in the blood. When planted on agar a luxuriant orange-yellow growth was obtained. Animal inoculations, in their opinion, were successful in producing a condition which resembled typhus fever. Porter<sup>14</sup> in 1899 isolated a diplococcus in eighty-eight per cent. of one hundred and forty-three cases of typhus, but was also able to demonstrate the same organism in typhoid patients. Obermeyer<sup>15</sup> has reported the finding of a spirillum in the blood, but in his case as well as in similar cases reported by others it is highly probable that relapsing fever was associated with typhus. A field as yet unexplored, and which may prove a source of knowledge, is a systematic bacteriological examination of the eruption itself.

*The Influence of Age.*—No definite periods of life can be absolutely settled upon at which typhus fever is especially liable to occur. Many statistics have been gathered, and if we were to base our conclusions upon them we should say that in adult life, between the ages of twenty and forty, the disease is most common. However, all things being equal, social and physical conditions, occupation, environment, etc., the first statement must be accepted as the correct one. The disease occurs at the extremes of life. Wiess<sup>16</sup> (1862) reported a case in which a fetus of five to six months showed irregular black petechiae with vesicles the size of a pea scattered over the body. The spleen was enlarged, and measured 1.5 by 3 cm. Peyer's patches and the mesenteric glands were swollen. The epidemic from which the mother suffered was true typhus exanthematicus, and in this form of typhus the tendency toward abortion is slight. So far as I am able to ascertain, this is the only case of typhus in the fetus reported. Buchanan<sup>17</sup> reports a case of typhus in an infant two weeks old. Older children, however, are more frequently affected than younger ones. The disease is not uncommon in the aged, in which respect typhus differs from typhoid. Buchanan reports a case in a man of eighty.

*Influence of Sex.*—It has been demonstrated that if males and females are equally exposed to infection they are equally affected. Men are more frequently affected because they are more frequently exposed. Sex therefore plays a subordinate part in the etiology of the disease.

*Influence of Race.*—No significance appears to be attached by the majority of authors to race influence. But in the Philadelphia epidemic of 1836 "negroes and mulattos suffered from it more severely than others."

*Influence of Occupation and Social Conditions.*—Only in so far as occupation and social conditions may bring the individual into actual contact with the disease, as in the case of physicians and nurses, can they be regarded of any etiological importance; that is to say, no particular trade either predisposes to or protects against infection. The contrary view, however, is held by many English physicians, who maintain that butchers and workers in fats, such as candle-makers, are relatively immune. Curschmann,<sup>18</sup> however, does not incline to this opinion, as he has seen as many cases in butchers as in other workmen.

*Influence of Season and Meteorological Conditions.*—The disease is rare in tropical climates, and flourishes chiefly in colder countries, during the winter and spring months, where imperfect ventilation and crowding of population among the poorer classes supply the conditions favorable to its development. Some large epidemics have occurred, however, during the warmer months, notably the one described by Gerhard. Very low altitudes and damp places, as seaport towns, are thought by Hirsch to be important predisposing factors.

*Individual Predisposition.*—It is generally conceded that influences that tend to lower the bodily tone of an individual, such as illness, poverty, and worry, are powerful predisposing factors. In this respect a striking contrast is offered to typhoid fever which so commonly attacks young, robust individuals. Even among the classes in better circumstances, where hygienic conditions are more perfect, if any be affected it is almost invariably one whose physical strength is at a low ebb. Convalescents from long-continued or acute diseases are unquestionably predisposed to the disease. It was thought by Hildebrand and his followers that tuberculosis gave a relative immunity to typhus-fever patients. Murchison and Curschmann, on the other hand, do not incline to this opinion, as they not uncommonly found the two diseases together. Littlejohn and Ker<sup>19</sup> in their description of the Edinburgh epidemic (1899) inform us that most of the fatal cases occurred in large, muscular men. They are of the opinion—contrary to the observation of others—that a good physique is a disadvantage in typhus.

*Immunity.*—Typhus fever resembles the acute exanthematous diseases, in that one attack usually protects for many years and often for life. Murchison was attacked twice, and there are other instances of second attacks that might be mentioned. The disease does not, however, recur with the same frequency as does measles. Hildebrand believed that a certain immunity was obtained by physicians and nurses and those who, by constant attendance upon the disease, became accustomed to the poison. Loomis, who in all his well-known experience in typhus fever never contracted the disease, thought that his immunity was due to some personal idiosyncrasy.

*MORBID ANATOMY.*—There are no characteristic post-mortem changes in typhus fever. The external findings are those which accompany all of the acute exanthematous diseases. Traces of the rash are seldom present. The organic changes that occur are those resulting from the pyrexia. Certain phenomena, nevertheless, occur with such frequency as to demand attention. The most important of these are the following:

*Changes in the Respiratory Organs.*—To a certain extent in almost all cases the respiratory tract is affected. Tracheal and bronchial catarrh and hypostatic congestion are among the more constant conditions met with, and cases presenting these characters have been designated by Rokitsky bronchotyphus and pneumotyphus respectively. In Ireland they are commonly called catarrhal typhus. In some epidemics laryngeal disease is very common. There may be simply reddening and swelling of the mucous membrane or suppuration may supervene. Not infrequently a unilateral peri-

chondritis, which at times resulted in necrosis, was noted by Curschmann, and in fifteen per cent. of his Berlin cases lobar pneumonia was the immediate cause of death. This, however, is an inconstant factor, as is shown by the fact that Murchison rarely encountered it in England, and Thoinot and Netter make no mention of its occurrence in France.

*Changes in the Circulatory Organs.*—The chief changes in the circulatory organs are those on the part of the heart. Changes in the blood-vessels have been seldom observed. During the course of the disease unilateral dilatation and infectious myocarditis may be said to be of fairly constant occurrence, but other changes that have been noted in the appearance of the heart are unquestionably due to post-mortem influences.

*Changes in the Muscles.*—The muscles in general have a brownish-red and dry appearance. They show little sign of wasting. Small ulcerations have been frequently observed in the recti and thigh muscles, and the changes described by Zenker—atrophy of the fasciculi and granular and fatty degeneration—also obtain here, but to a less extent than in typhoid fever. Sometimes hemorrhages take place into the muscles.

*Changes in the Liver and Spleen.*—The liver is usually enlarged and soft. When death occurs after the ninth or tenth day the spleen is almost invariably found enlarged, if before this time it remains normal in size.

*Changes in the Kidneys.*—In severe cases the cortex is swollen, opaque, and has undergone more or less fatty change. Cloudy swelling of the epithelial cells of the convoluted tubules may also be seen.

*Changes in the Gastro-Intestinal Tract.*—Affections of the stomach and intestines are not frequent. Peyer's patches and the mesenteric glands are likewise rarely involved, and infiltration and degeneration are never found.

**SYMPTOMATOLOGY.**

*GENERAL DESCRIPTION.—Incubation.*—The stage of incubation lasts for from one to fourteen days, oftenest eight to twelve. Reliable records inform us that its duration may be only a few hours, and that it is very rarely prolonged more than fourteen days. During this stage symptoms seldom manifest themselves. Occasionally a history of headache, loss of appetite, depression, and general inaptitude for work is given.

*Invasion.*—The outset is, as a rule, sudden. Repeated chills within the first twenty-four hours are common. The temperature rises quickly and may, on the first day, reach 104° F. Headache, pain in the back, and along the course of the larger nerve trunks are quite constant features. Prostration soon sets in, and even the most robust individual takes early to bed. The chills may recur for a few days, and are not infrequently accompanied by nausea and vomiting. The mind, which is at first clear, soon becomes clouded; the patient is uninterested in things about him, his talking is fragmentary, and his expression is dull and stupid. Mild delirium may set in, and in severe cases may develop into maniacal storms. The pulse is rapid, but full in volume; diastolic is rare. The face soon shows a reddish flush, often a peculiar oedematous appearance, and the conjunctivæ are injected. The intensity of the color in the face is said to be an index of the severity of the disease. The tongue is dry, tremulous, and covered with a yellowish-brown coat.

On the third, fourth, or fifth day the rash appears on the skin of the abdomen. With its occurrence the temperature remains high and the symptoms in no way abate. In severe cases the heart may become enfeebled, respiration accelerated, and death may ensue from exhaustion. In more favorable cases the crisis occurs about the end of the second week, the patient often falls into a refreshing sleep and awakens with a clear mind.

*SPECIAL FEATURES AND SYMPTOMS.—The Temperature.*—The fever rises steadily and may be 104° F. the evening of the first day. It continues to rise with but slight morning remissions for four or five days and

reaches its maximum, 106° to 107° F., about the end of the seventh day. Having reached its height it continues with remarkable constance between 104° and 105° F. until the thirteenth or fourteenth day, when it falls by

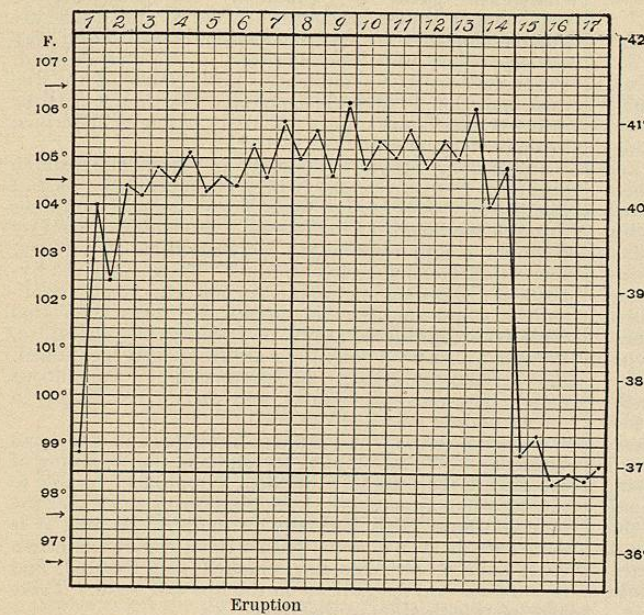


FIG. 4821.—Typical Fever Curve of a Moderately Severe Uncomplicated Case of Typhus Fever, Diagrammatic.

crisis. The crisis is one of the most characteristic features of typhus fever. The temperature may fall in a few hours from 105° or 106° F. to normal or slightly below. A longer time, however, is usually required, and there is frequently a rise of a degree or more before the normal point is reached.

Variations from the typical temperature curve occur, but not as frequently as in typhoid fever. In mild cases the temperature rarely rises higher than 103° F. Much importance has been attached by Wunderlich and his followers to a so-called characteristic drop in the fever on the seventh day, but it has been repeatedly shown that this symptom is the exception rather than the rule. The fever may reach its height within the first twenty-four or thirty-six hours. In many cases defervescence is protracted. This is more noticeable in mild than in severe cases. There are abortive cases in which the onset is severe and the crisis occurs on the fifth or sixth day. A rather remarkable feature, just before death, is the so-called pre-agonic rise to 109° or 110° F.

*The Eruption.*—Between the second and the eighth days, more frequently on the fourth or fifth day of the disease, the eruption first appears. Salomon<sup>20</sup> reports a case in which the eruption was delayed until the eleventh day. The spots come out first upon the abdomen, chest, and back, then upon the extremities and face. The sequence of the eruption, however, is by no means definite. It develops quite rapidly, so that by the end of the second or the beginning of the third day after its appearance it is all out. It does not come out in successive crops. The eruption is marked on the extremities. The flexor surfaces of the forearm are first involved. In many cases the spots are quite noticeable on the dorsum of the feet. The face is generally exempt, although in some epidemics the eruption on the face has been marked.

In the *stage of hyperæmia* there is at first a fine dusky red mottling just beneath the cutis. The spots soon appear as irregular rose-pink maculæ. They range in size from that of a pinhead to that of a lentil, and may be slightly elevated above the skin. At first they disap-

pear completely when pressed beneath a glass slide; later they become a dirty-red color, begin to undergo hemorrhagic change, and give up their color sluggishly when pressed upon. During the early part of this stage, particularly in dark-complexioned people, the eruption even in the best light may be difficult to see. In children the rash quite frequently resembles that of measles, and because of its peculiar mottled appearance has been called mulberry rash.

In the *hemorrhagic stage* "there is an infiltration of dissolved hæmatin into the tissues of the cutis." This change begins in the centre of the spot and extends to the periphery. The spots soon cease to be hyperæmic; the color only partially disappears on pressure. At first they are bluish-red and as the hemorrhagic change goes on they become a dark livid color. They are more numerous in the inguinal regions, or where the skin is loose. Sometimes the spots appear to be undergoing a true petechial transformation. Indeed, Murchison, Moor,<sup>21</sup> and many others describe the petechiæ as dark purple points in the centre of the spot, or speak of the maculæ being converted into petechiæ. Strictly speaking, these statements are not correct. Hemorrhagic changes that ordinarily occur in the spots must be distinguished from the true petechiæ.

The *petechial stage* is characterized by the occurrence of *direct* hemorrhages into the skin. These little bluish-red spots do not disappear on pressure, and are not preceded by a stage of hyperæmia. They occur usually at the height of the disease, and are more common in some epidemics than in others. When they are present in small numbers no importance is attached to them; but when they are abundant and combined with extensive hemorrhages into the skin, they are of bad omen. Hemorrhages into the conjunctivæ are common during this stage. All these, together with the livid spotted body, present a most horrible picture.

The stage of eruption lasts for from seven to ten days, and traces may remain for several days longer. If hemorrhagic changes do not occur the primary rose spots remain but a short time. They may have all disappeared by the end of the first or the beginning of the second day.

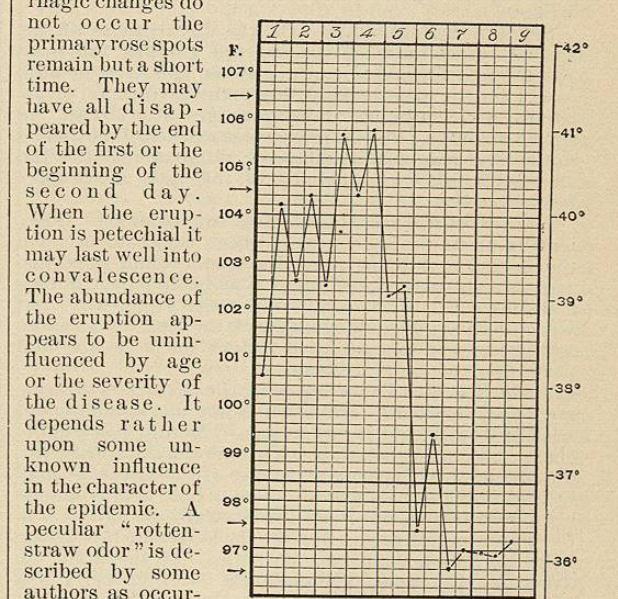


FIG. 4822.—Abortive Case of Typhus Fever with Severe Onset. (Adapted from Curschmann.)

When the eruption is petechial it may last well into convalescence. The abundance of the eruption appears to be uninfluenced by age or the severity of the disease. It depends rather upon some unknown influence in the character of the epidemic. A peculiar "rotten-straw odor" is described by some authors as occurring during the stage of eruption. Littlejohn and Ker<sup>19</sup> noted it in the somewhat recent Edinburgh epidemic, and assert that it was of great help to them in diagnosis. Gerhard