

week. In the presence of a dry brown tongue, of unusual tremor, suggesting deep sloughs of the intestine, of active delirium, or in almost any case with a rising pulse of 120, alcohol should be given, and the dose regulated according to the effects, as shown by pulse, tongue, and countenance. From four to twelve ounces of brandy in divided doses will usually be sufficient in the twenty-four hours, but in advanced cases manifesting much exhaustion, sixteen and even twenty ounces may be required, and will sometimes turn the scale between death and life. The addition of five grains of carbonate of ammonia, every two or three hours, or of a drachm of aromatic spirits of ammonia, is useful and will limit the amount of alcohol required.

**Digitalis.**—Digitalis was recommended by Murchison in typhoid to control the febrile movement. It is supposed to equalize the circulation by its action on the peripheral terminations of the vaso-motor nerves, to which the arteries of the mesenteric system respond more than the superficial vessels; at the same time the primary effect upon the heart is to slow and steady its action by stimulating the vagus. Too small a dose will not produce the first effect; too large a one will accelerate and then paralyze the weakened heart, and a fall in temperature will follow, as it would the exhibition of any depressing poison.

**Quinine.**—Many practitioners are in the habit of giving eight grains of quinine during the twenty-four hours as a tonic and stimulant to the heart's action; but to get the antipyretic action, much larger amounts in concentrated doses must usually be given. If the quinine is given in the evening, the fall of temperature coinciding with the usual morning remission will be greater; if it is given in the morning, the evening maximum will be modified. Less than fifteen grains given in a single dose, or within the space of an hour, will usually prove disappointing in lowering appreciably a high temperature; more than thirty grains so given is liable to cause cerebral and gastric disturbances. When quinine is effective, the temperature begins to fall in a few hours, reaches its lowest point in six to ten hours, and remains below the previous maximum for twenty-four hours or longer. In some cases quinine is not well borne, and in not a few it produces an inappreciable antipyretic effect or none at all. Liebermeister advocated the use of quinine, and Nothnagel still does so, regarding it as the least dangerous of all the antipyretic drugs, even when the heart is in an unstable condition.

**The Coal-Tar Derivatives.**—The number of these is now very considerable, and their action is better understood than formerly. Some are more effective and less depressing than others. If used at all, they should be used sparingly with caution, and as adjuvants to other measures. With regard to these, as with cold baths, the general ends to be gained should be borne in mind and not the mere temporary effect upon the temperature alone.

**Antityphoid Inoculation.**—Such inoculations have been practised on a considerable scale upon British troops in India and South Africa. The reports of Prof. A. E. Wright, of the Army Medical School at Netley, as to the degree of protection obtained, seem promising, but they lack precision, and the actual value of the process is still to be determined. (See Addendum on p. 951.)

**Serum Therapy.**—Several different experimenters have prepared typhoid antitoxins by injecting horses with cultures of the typhoid bacillus, and subsequently patients have been injected with these sera. The reports of the results are conflicting and unsatisfactory. The blood serum of patients convalescent from typhoid fever has also been used, with equally indefinite results. This question is still in an undeveloped stage.

**COMPLICATIONS AND SEQUELÆ.**—Although, for the sake of brevity, I have avoided describing minutely the various pathological changes and clinical complications, other than those connected with the bowels and especially characteristic of the disease, which are incident to typhoid fever, some of these are encountered in so large a num-

ber of cases, or are of such importance, that they merit separate mention.

**Recrudescence and Relapse.**—These are both common phases of typhoid fever, and it is not always easy to classify each return of pyrexia under the one or the other term. In general, a sudden temporary elevation of temperature would be called a recrudescence, and a more gradual and prolonged elevation a relapse. A typical simple relapse, as exhibited on a chart, shows a rising temperature following some days of normal temperature after the primary attack has run its course. According to Irvine, "the temperature begins to rise, and continues to rise, with little intermission, until it reaches its height on the fifth day of relapse; from the fifth day to the eighth or ninth day it is steady, but shows a slight inclination downward; on the eighth or ninth day it falls suddenly several degrees, possibly to subnormal levels; from such levels it ascends even to former heights, but this rise in simple cases is, so to speak, ephemeral. Fever persists to the fifteenth day, when in the simple cases a rapid, though intermittent, fall continues to the twenty-first day of the disease, at which time convalescence commences, and goes on with remarkable rapidity in many cases."

This is a very idealized picture, even of the simple relapse. Relapse indulges in quite as many freaks as the primary typhoid may indulge in. To appreciate this, it is only necessary to remember that the same case may experience several (two, three, or even four) relapses. The relapse may be engrafted immediately upon the primary attack; it may complicate or be complicated by recrudescence; one relapse may be intercurrent with another, etc. Relapse is generally accompanied by a return of the characteristic symptoms, such as diarrhoea, rose spots, enlargement of the spleen; and it is liable to any of the complications attendant upon primary typhoid. But the duration is generally shorter, and, notwithstanding the debilitated state of the patient, a fatal termination is less common than in primary typhoid.

Recrudescence is generally due to some indiscretion; true relapse is probably the result of a secondary auto-infection with the typhoid poison, and will be frequently observed where there has been no imprudence whatever, either of diet or otherwise. On the other hand, instances of various indiscretions unattended by any evil consequences, and of an early return to solid food against orders without paying the threatened penalty, are almost equally common.

**Perforation.**—Perforation is the most fatal complication of typhoid fever. It occurs in from one to two per cent. of all cases, and is responsible for about ten per cent. of the deaths. It occurs most often in the third week, but may be as early as the fourth day, or as late as in the fourth month during a relapse. There have been more cases in men than in women. The perforation occurs in the last two feet of the ileum in over eighty per cent. of the cases. In very many it is in the last foot. Perforation may not always be fatal. It may occur between two coils of intestine which are adherent, or probably more often it is immediately walled off by fibrin and may heal. It is unwarrantable, however, to expect a perforation to heal under medical treatment, and as soon as the diagnosis is made, surgery offers the real hope of recovery. It is of the utmost importance to make the diagnosis early, but the subject presents great difficulty.

There are causes of peritonitis other than perforation, and these may be of mild grade and recover without surgical interference. There is no pathognomonic sign of perforation in typhoid fever. The most characteristic symptom is sudden, severe, abdominal pain, persisting and increasing for some time, accompanied perhaps by collapse, a fall of temperature, a rise of pulse, nausea and vomiting, with sometimes abdominal spasm which persists, and sometimes hemorrhage. It was hoped at one time that the leucocyte count would be useful, but though in some cases it was found to rise rapidly after perforation, in others there was a diminished leucocytosis. On the other hand, there might be a leucocytosis of

28,000-70,000 in obstruction without perforation. There is then no sure diagnostic sign of perforation, but the diagnosis must be made from the group of symptoms present in a given case. However, as the benefit to be derived from operation is offered only when the diagnosis is made early, the physician should secure a consultation just as soon as the condition is suspected. Some authorities advise a small abdominal incision under cocaine to allow taking a culture from the peritoneal cavity, and to finish the operation if pus is found, but it is hardly reasonable to suppose that such a procedure would do no harm to a patient who is already very sick with an acute disease.

**Hemorrhage.**—Hemorrhage is a more frequent complication than perforation, but fortunately is not so fatal. It occurs in from four to six per cent. of all cases, and is probably responsible for death in about fifteen per cent. of cases. The exciting cause of hemorrhage may be an error in diet, or restlessness or distention, but it may occur in spite of the utmost care. It is most frequent in the second and third weeks, but like perforation it may be the first noticed symptom in an ambulatory case, or it may occur in the eighth week during a relapse. It is less common in children, and according to statistics less serious in women. Pain may accompany or precede hemorrhage, and sometimes hemorrhage occurs with perforation, obscuring the diagnosis. The amount of blood lost may be an inconsiderable streaking of the fecal discharges due probably to an intense hyperemia of the lymphoid tissue of the intestine, or it may be very copious—more than a quart—and clotted, and is then probably due to the erosion of a larger vessel.

The effect of the hemorrhage depends on the amount of blood lost. Some authorities maintain that a moderate loss of blood in a robust patient with high fever may even be beneficial. Certainly sometimes the effect of hemorrhage is inappreciable. In more severe cases there are the signs of acute anemia, pallor, coldness, small, feeble, more rapid pulse, and there may be a marked drop in temperature. Sometimes these signs are present before the blood has appeared. The patient may even have fatal collapse and die within a few hours, before the blood appears in the stools. More commonly the hemorrhages are repeated at intervals and the patient may succumb within a few days. The treatment of hemorrhage depends on the effect. Styptics cannot be expected to check it. Opium may produce quiet, depress the heart's action, and reduce peristalsis. The diet should be restricted for a time and the baths withheld temporarily. Stimulation is not usually given, but if the patient's condition requires it, subcutaneous stimulation may be of some benefit, and subpectoral infusion of salt solution, though irrational, may possibly tide the patient over a severe acute anemia. The local application of cold externally is resorted to, but is not to be recommended.

**Epistaxis.**—Nose-bleed, in the period of invasion, is so common an occurrence as to be considered almost a diagnostic detail. At this period it is usually slight, requires no treatment, and is even a source of relief to the headache and dulness. Later in the disease nose-bleed is less usual, but is apt to be more profuse, and may necessitate plugging of the posterior nares. Exceptionally life may be endangered, and an enfeebled patient may not rally from a severe epistaxis in the later stages.

**Bronchitis** occurs undoubtedly more often in cases in which early and suitable care has not been given to the patient, but is quite common in other cases as well. It is often due to weakness and the dryness of the buccal and pharyngeal mucous membranes, and to the consequent inability to raise and expel the bronchial secretions. The râles may be so loud as to be audible at a distance from the chest. Bronchitis is sometimes associated with a lobular pneumonia, and in the later stages with hypostatic congestion of the lungs. All these conditions disappear with the pyrexia, and their best treatment is that directed to supporting the strength of the patient and controlling the toxins.

A genuine croupous pneumonia sometimes compli-

cates the disease; and, when appearing early, may be regarded as a direct manifestation of the typhoid poison, to which the term typhoid-pneumonia is applied.

**Thrombosis.**—Venous thrombosis is frequent both as a complication and as a sequel. It occurs generally in cases which have run a prolonged and exhausting course. The femoral veins and their branches are those most often affected, and of these the left more frequently than the right. An elevation of temperature, a hardness of the vein, and swelling of the leg announce and accompany the condition. Complete rest, elevation of the leg, flannel bandaging, and, later, possibly some small blisters, are indicated as treatment.

Either as a complication or as a sequel, thrombosis is sometimes painful and tedious, but fortunately only in exceptional instances does it give rise to embolism of the pulmonary artery and death.

**Acute Otitis Media.**—This is a by no means infrequent complication, developing usually from the second to the fourth week, and occurring in from two to three per cent. of the cases. It is generally of infectious origin by way of the Eustachian tube, and is associated with the patient's prostration and altered and accumulating buccal and pharyngeal secretions. It often complicates the temperature chart and leucocyte count, and may require special treatment.

**Typhoid Psychoses.**—Various psychoses may accompany or follow typhoid fever. Of all the acute diseases it is the one most often accompanied by mental symptoms. In all such cases the family history should be inquired into, especially with reference to the prognosis.

Kraepelin groups the conditions which present themselves as follows: (1) Initial delirium; (2) febrile psychoses; (3) asthenic psychoses.

Initial delirium is said to be the rarest form, to exhibit the most rapid course, and to offer the worst prognosis, over fifty per cent. ending fatally. Unsound heredity is a predisposing cause.

Febrile psychoses embrace the great majority of mental cases developing in typhoid fever, and offer a relatively good prognosis.

Asthenic psychoses are associated with the period of convalescence, and are apt to present long, weary courses and a doubtful outlook.

**Neuritis.**—Various forms of neuritis, local and general, accompany and follow typhoid fever. Among others, "tender toes" is mentioned by Osler, making the weight of the bed covering insupportable. The "typhoid spine" is a sequel to which Gibney called attention, and which he regarded as a perispondylitis, but which others consider to be dependent rather upon a general neurasthenic condition.

**Necrosis and Periostitis.**—When these occur it is usually as sequels, and such cases should be referred to the surgeon.

**DISINFECTION.**—In discussing the etiology and the pathology of typhoid fever, the occurrence of typhoid bacilli in the body and their resistance and tenacity of existence under different conditions were considered. Careful thought with regard to these matters indicates what a grave responsibility rests upon those associated with typhoid-fever patients, and what great care should be used in disposing of all excreta and in guarding in other ways against the dissemination of the germs of the disease.

In private practice, where possible, a room should be chosen which will combine good ventilation and sunshine with partial isolation and easy means of disposing of excreta and soiled linen without contaminating any more of the house than is necessary. Just as soon as the diagnosis is suspected, rigid rules should be made and enforced regarding the disposal of excreta and the disinfection of all articles which come in contact with the patient. Of course, different circumstances will require varied arrangements, but if the principles are understood and the objects to be attained are considered, the manner of their achievement is indifferent. In the city, where injury to plumbing is to be avoided, formalin and carbolic



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	.52	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.