

E N T E R I C F E V E R .

with

Some suggestions for its avoidance in war-

fare

- by -

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E N T E R I C F E V E R

No great originality is claimed for the subject matter contained in the following pages, but I have attempted to embody therein, the opinions at which I have arrived from a study of over three hundred cases of Enteric Fever, some in this country, some in Siam, but the greater number seen whilst serving as a medical officer, in the South African War.

I have described the course of the disease, and such symptoms as have come under my own observation, with the opinions I have arrived at with regard to treatment; and attempted to discuss some of the circumstances which, I think, contribute to the great prevalence of this disease amongst troops during active Warfare, and to make some suggestions for their avoidance.

As I have here reviewed the disease more from a Clinical and Aetiological point of view, the Historical and Pathological features have been only very lightly touched upon.

HISTORICAL:- Until a comparatively recent period, Enteric Fever was confounded with Typhus, both diseases being described under the one term "Continued Fever"; and these symptoms and conditions, which are now recognised as constituting the distinctions between the two diseases, were merely considered as accidental modifications, the intestinal lesions of the former being looked upon as fortuitous peculiarities, which were sometimes absent and sometimes present in this, so called, "Continued Fever."

As far as I have been able to ascertain, Enteric Fever was first distinguished as a separate disease by a French physician, Pierre Bretonneau, in 1813. He gave to it the name

"Dothiésentérite", a term which is still used in French nomenclature.

The word "Typhoid" was first employed in connection with this disease by Louis in 1829, and it is to one of his pupils, Gerhard of Philadelphia, that the credit is due of having, in 1837, first clearly distinguished between Typhoid and Typhus Fevers.

The fact, that "Continued Fever" really consisted of two separate and distinct diseases, was not recognised, in this country until a much later period than this, and it is to a Glasgow physician, Dr. A. P. Stewart, that the honour of bringing about this recognition must be very largely ascribed.

Traces of the confusion formerly existing between Enteric and typhus fevers are still to be found in the nomenclature of the former as in the English "Typhoid" and the German "Ileotyphus" and "Abdominaltyphus" by which terms the disease is yet described.

As a result of this confusion, no great advance in our understanding of these diseases was made until comparatively recently.

Since, however, the difference between Enteric and Typhus Fevers has been recognised, great progress has been made in our knowledge regarding them, though much has yet to be learned.

NOMENCLATURE.- This disease is known in this country as "Enteric Fever" or "Typhoid Fever", in France as "Fièvre typhoïde" or "Dothiésentérite" and in Germany as "Ileotyphus" or "Abdominaltyphus". In children the terms "Gastric Fever," "Infantile Remittent Fever" etc. are often loosely employed in describing this disease, which is also sometimes called "Autumnal Fever" from its prevalence, in this country, in the Autumn.

DEFINITION:- Enteric fever may be defined as a specific fever characterized by inflammation and ulceration of Peyer's patches in the small intestine, and accompanied by gastro-intestinal

disturbance, and an eruption of characteristic "pink spots".

MORBID ANATOMY:- The most characteristic lesions are intestinal, affecting principally the ileum and being most marked in the neighbourhood of the ileo-caecal valve becoming less so as we proceed upwards from this point.

Inflammation and infiltration of Peyer's patches with congestion and swelling of the surrounding mucous membrane are, in the early stages, the conditions met with.

The inflammation of Peyer's patches usually goes on to necrosis and the formation of a slough.

This slough which is of a brownish-yellow colour, from staining with bile, finally separates leaving an ulcer.

The distinction between the ulcers occurring in Enteric Fever and those of a tubercular origin consists principally in that, in the former disease, the length of the ulcer is parallel to the intestine and the edges are thin and undermined, whereas, in the latter, the length of the ulcer lies across the intestine and the edges are thick and indurated.

After the separation of the slough, the resulting ulcer under favourable conditions progresses towards cicatrization but if, before this has been completed, any undue strain be thrown on the weakened intestinal walls, the floor of the ulcer may give way, leading to perforation, an accident which may also result from the gradual erosion of the intestinal coats by the extension of the ulcerative process.

A more infrequent factor in the production of perforation is a severity of the necrotic processes, leading to the inclusion in the slough of the whole thickness of the intestinal wall.

In whatever way, however, this solution of intestinal continuity is brought about, the invariable result is the production of peritonitis from the escape of the bowel contents.

This peritonitis is as a rule general, but under favourable circumstances a previous local conservative peritonitis is set up and, by binding the neighbouring parts together, localizes the inflammation by preventing a general infection of the peritoneal cavity.

Peritonitis is said to sometimes result from the extension of the inflammatory process through the intestinal wall without there being any perforation.

In my own experience, however, I have never seen a case of general peritonitis in Enteric Fever where there had not been some perforation.

Sometimes this has been very small and has required careful looking for, but I have always been able to find some indications of its presence. Localized peritonitis undoubtedly frequently occurs from extension of inflammation from the gut without there being any perforation.

Severe Haemorrhage may occur from the erosion of some vessel in the floor of the ulcer.

The slight haemorrhage which sometimes occurs in the early stages is usually due to the extreme congestion of the intestinal mucous membrane.

Enlargement of the Spleen with swelling and softening of the mesenteric glands are conditions which are usually present in this disease.

AETIOLOGY.

(1) General Considerations:- The opinion commonly accepted at the present day is that enteric Fever is caused by a bacillus which having been first described by Eberth is now known by his name.

This bacillus has not yet been proved to conform with all the requirements of Koch's law.

It is certainly always present in this disease and it has been cultivated outside the body, but it has yet to be clearly demonstrated that the disease can be experimentally produced in a healthy animal by inoculation from such cultures and the bacillus again found in the diseased tissues of the animal thus inoculated.

However, in spite of this incompleteness in the evidential chain, there can be very little doubt but that Eberth's bacillus is the actual causal agent in the production of Enteric Fever.

The bacillus grows and multiplies in the intestinal walls. Spleen, and mesenteric glands, and is found in both the faeces and urine.

The fact that it occurs in the urine is a point to be remembered, and the disinfection of the urine is as important as that of the faeces in preventing the spread of the disease.

The mode of entrance of the bacillus into the body seems to be only by the intestinal tract.

(2) Agents in the transmission of the disease.

(a) Water is probably the most common source of infection and outbreaks of Enteric Fever frequently have their origin in a contaminated drinking water.

When a water supply is received and stored in reservoirs and distributed in pipes, contamination may take place, during its storage in the reservoirs, by drainage into them of tainted surface water or by percolation from some neighbouring collection of infected sewage; or the supply may become polluted during its distribution, when imperfections in the water pipes co-exist with their embedment in a porous soil defiled by the percolation of improperly confined sewage, either from a cess-pool or from some neighbouring defective sewer pipe.

Thus a proximity of the sewer and water systems in a town is a constant source of danger and constitutes a not uncommon

cause of the spread of Enteric Fever.

When the water supply is derived from a well or spring, this may be similarly contaminated. Taylor in his "Practice of Medicine" speaks of an outbreak which was traced to a well near a laundry.

Some soiled linen from an Enteric Fever patient had been washed in the laundry and shortly afterwards several people who had been drinking the water from the well contracted the disease. In this case the slops from the laundry had contaminated the well.

I shall refer to the danger of this contamination of water when speaking of the disposal of typhoid excreta.

The following slight outbreak of Enteric Fever, I think, was almost undoubtedly due to drinking impure water from a contaminated well:-

During the latter half of March 1901, the regiment, to which I was attached, was stationed at various points along the railway between Stormberg Junction and Aliwal North.

One of these stations was at Albert Junction and here the garrison occupied two camps situated about half a mile apart, one on the West Side of the railway and the other on the East Side.

A well situated just outside the West Camp constituted the only water supply in the neighbourhood but, as it was rather low-lying and as all the surface water from the higher ground - on which there had already been incampments - drained into it, this supply was condemned and 'approved' water was brought to the camp, as required, in Railway water trucks, from Burghersdrop the nearest town.

These trucks were shunted into a siding about midway between the two camps and constituted the nearest water supply for the Camp on the East Side.

The trucks however were so much further than the well from the West camp that great difficulty was found in preventing the men in this camp from using the well water.

During the fortnight the regiment was guarding this line of railway, numerous changes took place in the details of the several garrisons and "A". "E." "F." "G". & "H". Companies at various times were stationed at Albert Junction, "F" "G" and "H" Companies having always occupied the West Camp and "A" and "E" the East Camp.

The regiment left about the beginning of April and between the 6th and 16th of April several cases of Enteric Fever occurred in "F" "G" and "H" Companies but none in "E" and "A".

The general conditions of both the East and West camps were exactly similar and their food was drawn from a common source.

Thus the only reason I can assign for the occurrence of the disease amongst the men who had occupied the West Camp, whilst the rest of the garrison was unaffected, is contained in the fact that, in the former case, the water from the well was, I am convinced, frequently used, owing to its proximity, and nearly all the men attacked acknowledged having drunk this water at some time or other.

(b) Food:- Uncooked foods are more likely to be transmitting agents than foods which have been cooked owing to the fact that, in the latter case, if any infection be originally present it will be destroyed in the process of cooking.

Thus foods, which have been cooked, unless subsequently infected, may be excluded as sources of this disease.

Amongst uncooked foods, vegetables contaminated by being grown on infected manure are not uncommon causes of infection, whilst oysters and other shell fish laid down in water polluted by sewage are frequent transmitting agents.

The disease is also frequently conveyed by milk, which has been contaminated either by being mixed with infected water or contained in vessels washed by such water, or to which infection may have been carried by flies, etc.

(c) Drinking and eating Utensils may be contaminated by washing in infected water and anything eaten or drunk out of them may cause infection.

(d) Flies undoubtedly are a common cause of the spread of this disease in some cases.

This I am convinced was frequently the case in South Africa. Anyone who has seen how these pests used to swarm about the latrines from which they would pass to any uncovered food cannot help being of the opinion that they, in a great number of cases, by contaminating the food, were the indirect means of spreading this disease.

(e) Dust:- Though the typhoid bacillus is said to die if completely dessicated, yet, I think that infected matter may, short of this, be sufficiently dried, to allow of its being blown about in the form of dust, without the vitality of the contained bacilli being destroyed and, in my opinion such infected dust by settling on and contaminating the food and water is a frequent agent in the transmission of this disease.

That this is so, I am convinced, from an experience of several cases in which dust seemed to have been the only possible means of transmission, the food and water supplies having been above suspicion.

As an example of this the following history is instructive.

An outbreak of Enteric Fever occurred in a small garrison guarding the railway at a place where for miles around there was nothing but dry sandy desert, and with no water anywhere near except what was brought to the place in Railway Water Trucks.

This water was supplied from an approved source, it being the ordinary drinking water from a large town in which there was no Epidemic of Enteric Fever.

The food consisted of the ordinary tinned army rations and biscuits; and there were no farms in the neighbourhood from which the men could have got milk or other possibly infected food.

The water and food supplies might therefore be considered as absolutely free from contamination

A man joined the garrison from another station and shortly afterwards developed Enteric Fever and was sent off to the nearest hospital.

This case was followed by several others though the camp had been hitherto free from the disease.

Undoubtedly, here, the new arrival had been infected before leaving his last station and, subsequently developing the disease, led to a contamination of the camp.

As this outbreak occurred at a period of the year when flies were uncommon and as the food and water, at least when issued, were above suspicion, a reasonable explanation of the method of transmission in the secondary cases can only be made on the supposition that either the infection had been indirectly caused by a subsequent contamination of the food and water, by infected dust; or had been conveyed directly to each patient through the contaminated dust getting into his mouth and being subsequently swallowed.

I think that probably the history in a great number of these outbreaks is that a man, from some infected area, joins the garrison. After a certain incubation period he begins to have diarrhoea; and, for some days, not feeling very sick, he goes about the camp. He is finally, however, sent to hospital and is found to be suffering from Enteric Fever.

His diarrhoeic stools, in the meantime, have become dried and, being blown about as dust, spread the infection in this way.

Another case, occurring in a militia officer, in charge of one of these small railway garrisons, is I think very interesting.

This officer had always somewhat dreaded the disease and had taken particular care to avoid infection.

His food at this place consisted of ordinary army rations and biscuits both of which are issued in hermetically sealed tins.

The water supply of the camp was brought by rail and as an additional precaution he used it only in the form of tea or after filtering it through a Berkefeld filter which he always carried with him.

He never used milk in any form.

After being six weeks at this camp he contracted Enteric Fever.

This occurred at a time of the year when there were no flies, but the place was very dusty, dust storms occurring nearly every day.

In addition to the officer, several of the men contracted the disease about the same time.

The origin of this outbreak was at the time rather obscure; but shortly before it occurred a man recently convalescent from Enteric Fever joined the garrison and was supposed to have conveyed the disease in some way or other.

Since reading however a description of some investigations of Büsing (Deut. med. Woch. June 19th 1902) which are described further on I have come to the conclusion that in all probability the urine of this convalescent still contained infective properties and that becoming dried was blown about with the dust

and in this way transmitted the infection.

Excluding cases in which, though every probability pointed to dust having been the agent by which the disease had been conveyed, yet, in which it had to be acknowledged that there had been a possibility of infection by other means, I think there is sufficient evidence to show that dust is a frequent source of infection and taking everything into consideration, I am convinced, that it is a more important factor in the spread of the disease than is generally recognised.

This, I think, was particularly the case during the late war in South Africa.

There, meals had to be taken in the open and during the high winds so prevalent in that country it was impossible to prevent the food from becoming covered with dust, which seemed to penetrate everywhere.

Taking into consideration the invariably polluted condition of the soil in a standing camp, the dust, under these circumstances, must have frequently been derived from, or in previous contact with, infected material; and it is not an unreasonable supposition that disease was frequently caused by it, either, directly, by being swallowed, or, indirectly, by infecting the food and water.

(F) Direct Infection from one person to another is said to occur. This, however, I think is very doubtful.

In cases, where it seems to have taken place, a careful investigation will show, in the great majority of instances, other more likely means by which the disease might have been conveyed.

In 1898, owing to the great prevalence of Enteric Fever in the camps of the United States Volunteers, a board of medical Officers, consisting of Majors Reed, Vaughan, and Shakespeare, was appointed to enquire into the cause of this.

The results of their investigations were embodied in a report of which an abstract was printed and published for general circulation in 1900.

Though, in the abstract of this report, the matter is so condensed and the facts and the arguments deduced therefrom so commingled, that it is in some parts difficult to follow the line of reasoning, the whole work bears evidence of the great care and diligence taken in its compilation and it is a matter for regret that the original complete report was not published "in extenso".

The most notable conclusions at which the Commission arrived, after a careful investigation of the various circumstances in each case, were that infected water was not an important factor in the spread of the typhoid fever but that a direct infection from man to man was common.

The former of these conclusions was based on the fact that, in those cases in which a suspicious water supply had been used, no diminution in the severity of the epidemic but sometimes an actual increase, followed the substitution of a drinking water of known purity for the previously used suspicious water.

For example, two divisions of the second Army Corps, stationed at Camp Alger, for the first seven or eight weeks, were drinking water from shallow wells and springs which were 'liable to pollution.'

At the end of the seventh week the shallow water supplies were being rapidly replaced by deep-driven artesian wells.

Whilst the troops were drinking the water of doubtful purity, the disease made but slow progress, but, about a fortnight after a better, purer, and more abundant supply had been obtained through the sinking of a 'bored well', for each regiment, the epidemic spread and rapidly attained large dimensions.

I think that in the above case a sufficient distinction has not been drawn between "water liable to pollution" and "polluted water."

Water from shallow wells, such as was used at first, always contains swarms of saprophytic bacteria and the inimical influence exerted by the chemical products of these would prevent the existence of the more highly specialized typhoid bacillus for any length of time.

In all likelihood, therefore, the water supply from these shallow wells and springs was, when the camp was first formed, pure as far as typhoid infection was concerned and its use free from danger.

Whether a persistence in its use, after the camp had been established for some time, would have been quite as free from risk is another question.

In my experience, an increase in the severity of a typhoid epidemic, such as occurred in the above case, is to be expected in any standing military camp after about eight weeks, independently of the purity or impurity of the water supply.

The soil, of such a camp of necessity becomes polluted after a time and even in cases where from the first the water and food supplies have been above suspicion an increase in the number of Enteric Fever Cases invariably occurs.

It is erroneous to conclude therefore that the increase in the epidemic at Camp Alger, in spite of a purer water supply, proved that infected water played only a small part in the spread of the disease, for in all probability if the troops had continued to drink the well water, the epidemic would have assumed even greater dimensions than it did.

Again, a division, 11,344 strong, removed from Chickamauga Park to Knoxville and another 10,302 strong to Lexington.

At both these places the water used by the inhabitants

was found to be pure and they themselves free from the disease.

Amongst the already infected troops, however, typhoid fever continued to spread.

In another case, the seventh Army Corps was encamped partly around, and partly in Jacksonville.

The water supply. here, came from Artesian wells more than a 1000 feet deep and was distributed through the camps by means of pipes.

In August and September of 1898, there were in Jacksonville roughly about 30,000 civilians and about the same number of soldiers encamped near by.

Both civilians and soldiers drank water from the same source and yet there were only a few sporadic cases of enteric Fever amongst the civilians whilst each of the three division hospitals was receiving a score or more of patients, with this disease, each day.

There is sufficient evidence, then, to show that the water supplies of the camps at Knoxville, Lexonville and Jacksonville were derived from a pure source but, before we can altogether exclude the water as a possible agent in the transmission of the disease in any of these cases, it is necessary to show that there has been no possibility of a contamination during its distribution which might account for the occurrence of the disease amongst the troops whilst the civilians escaped.

As no sufficient proof of this is advanced in the report, I do not consider that the sweeping assertion, however true it might be, that water played no important part in the spread of the disease has been sufficiently proved to allow of no dispute since a contamination of water during its distribution is not only a possibility but a great probability.

As an example of this, in a previously infected camp when

the water is distributed in pipes, the water taps may be the means of contaminating the water as soldiers will nearly always prefer to drink by putting their lips to these taps rather than use any drinking vessel and if a man, already infected and in the process of developing the disease, uses a tap in this way there is every probability that he will leave some infection about the tap.

In some of the camps the commission found that, whilst in certain companies the number of men attacked by Enteric Fever was very large, others were almost free from the disease, and, in some cases, there were such constant dissimilarities in the times of beginning and ending, as well as in the course of the epidemics, in the different companies, that the commission was forced to the conclusion that in such cases no common, simultaneous and more or less continuously - acting agent affecting the whole camp such as an infected water supply, existed, as the chief means of propagation of the epidemics.

When large bodies of men, living under almost exactly similar conditions, are supplied with the same water, distributed in the same way, an infectious disease conveyed by that water must be more or less evenly distributed amongst those who are drinking it, day after day, even allowing for wide differences of susceptibility.

Such company epidemics therefore under these conditions of water supply, tend to show that water is not the only important agent in the transmission of Enteric Fever in these cases, and that we must look elsewhere for an explanation of the prevalence of the disease in certain companies.

This explanation the commission has found in direct infection from man to man.

They have not however advanced any sufficient proof of the occurrence of this and I think the more probable cause, in these

cases, will be found in an indirect transmission of the disease through infected eating and drinking utensils, clothing bedding &c.

Similar outbreaks, localized to a Company or even to a tent, were not uncommon in South Africa and want of cleanliness, either in the Company or the tent, was usually found to coexist with such outbreaks.

Again, men occupying the same tent are constantly using each others eating and drinking utensils and, if one man contracts the disease, he may easily infect others when such common use of these utensils obtains.

(3) Conditions affecting the occurrence of the disease.

(a) Age. Enteric Fever is a disease principally of youth and early adult life, the greatest liability to the disease being between the ages of fifteen to thirty years.

(b) Season. This disease is most prevalent in hot and dry seasons which probably is to some extent due to the amount of dust and the number of flies in such seasons.

In this country Enteric Fever occurs most frequently in the Autumn from which circumstance it derives the name "Autumnal Fever."

In South Africa the period between November and March was that of the greatest incidence of the disease.

(c) Immunity.

(a) Natural: Certain persons seem naturally to possess an insusceptibility to attacks of Enteric Fever whilst others are extremely prone to contract the disease.

(b) Acquired: As far as my experience goes, I find that, though one attack of the disease confers a certain amount of immunity, second attacks within a comparatively short time of the first are not uncommon.

The immunity conferred by one attack probably does not last longer than two years. In four cases at least, in which I have tried the agglutination test, the reaction was absent at the end of this time.

An attempt has been made to confer immunity by inoculations of dead typhoid culture. This I shall refer to when speaking of the prevention of the disease.

In South Africa the incidence of the disease was much greater amongst troops freshly arrived in the country than amongst those who had been there for some time.

This was particularly noticeable whenever a fresh draft from home joined a regiment. Out of each of these drafts, there was always a certain proportion of men who, almost at once, contracted the disease and other cases constantly cropped up amongst the fresh arrivals for the first month or two.

After this, the proportion of cases from the fresh draft was not greater than that from amongst the more seasoned soldiers.

Whether this was due to the fact that residence in the country, in a short time, gave a certain amount of insusceptibility; or that those who had a natural predisposition to the disease were, at first, weeded out leaving those who had no great susceptibility.

At various times, during the war, I have been struck by the fairly large number of cases of Enteric Fever which developed in hospital amongst patients admitted for other diseases, principally dysentery.

If direct infection were common, the occurrence of these cases might be explained in this way but a more probable and reasonable explanation of such occurrence may be found in the contamination of the food by flies which had been in contact

with the excreta of typhoid fever patients.

Before leaving the subject of Aetiology, I should like to mention a possible source of infection which is rather difficult of classification.

I refer to the transmission of the disease by paper, from the latrines, being blown about and coming in contact with food.

This under ordinary conditions of life is, of course, not a likely source of infection but I quite believe that in South Africa, during the war, the disease was sometimes transmitted in this way.

It was no infrequent thing on a windy day to see papers from the latrines blown about by the wind often in unpleasant proximity to ones food.

PREVENTION

(1) General considerations. When once a case of Enteric fever has occurred our efforts should be directed to the prevention of its transmission by any of the means previously discussed.

The urine and faeces should be disposed of in ways to be hereafter mentioned.

All bedding, blankets, bed linen, dishes, thermometers, bed pans, urinals or anything else, which has come into contact either with the patient or with his excreta, should be isolated and thoroughly disinfected. The attendants should be instructed to wash and disinfect their hands immediately after doing anything for the patient, and all bedding soiled by either the Urine or faeces should be at once removed and thoroughly disinfected.

(2) Prophylactic Inoculation. It has been found that inoculations with dead cultures of typhoid bacilli are followed

by precisely the same blood changes as are induced by an actual attack of Enteric Fever and if, as is almost certain, the immunity or, at least, insusceptibility, which is conferred by the latter, depends on such blood changes it is reasonable to expect that the induction of these changes in the former way is also likely to be followed by a similar insusceptibility.

Moreover, it has been shown experimentally that animals inoculated with such dead cultures acquire an increased resistance to typhoid infection.

Taking these facts as a working basis, we have rational grounds for the inference that an insusceptibility to the disease may be expected to follow the inoculation of dead typhoid cultures.

The main credit of the practical application of these principles is due to Professor Wright of Netley whose anti-typhoid vaccine has been largely used during the late South African War.

This vaccine consists of sterilized cultures of typhoid bacilli which have been grown for the most part in nutrient broth for from three to four weeks, and is issued by the Army Medical Department, either in sealed glass capsules containing sufficient for one or two inoculations, or in small glass bottles, covered by paraffined india rubber caps, to be used when a larger number of inoculations are to be undertaken.

Method of using the vaccine. The vaccine contained in these capsules or bottles, before being drawn off into the syringe, should be well shaken up so as to bring into suspension any of the bacterial deposit which may be adhering to the sides of the vessel.

In drawing off the contents of the glass capsules, the tips of the capsules should be sterilised in a flame and then

cut off with a pair of sterilized scissors. The capsule is then inverted over the needle of the syringe and the contents drawn into the syringe.

When the vaccine in the rubber capped bottles is to be employed, the paraffin should be first melted off the rubber cap which should then be sterilized by dipping it into a boiling 5% solution of carbolic acid.

The bottle should then be fixed mouth downwards in a clamp, or held in this position by an assistant and the desired quantity of vaccine drawn off by passing the needle of the syringe through the indiarubber cap.

In order that the contents of the bottle may flow freely into the syringe it may be necessary to make a second puncture in the cap to act as an air hole.

After each inoculation, it is necessary to sterilize the needle before drawing off a further quantity of vaccine.

If, on completion of the series of inoculations, there should be some vaccine left in the bottle, this may be sealed up again by flushing the rubber cap with spirit and, after allowing this to evaporate, closing the punctures by dipping the cap in very hot melted paraffin or by coating it with rubber solution.

In making the inoculations, owing to the large amount of serous effusion which is apt to follow, particularly in lymphatic subjects, it is necessary to choose some spot for injection where the subcutaneous tissue is loose.

For this reason the flank is the site usually chosen.

A thick fold of skin should be picked up between the finger and thumb and the needle passed into the subcutaneous tissue in the middle of the fold.

The quantity of the vaccine which should be injected is stated on the capsule or bottle containing it and varies from

$\frac{1}{2}$ to 1 c.c.

The dose specified is that for a healthy man and must be reduced in the case of women, children or those of feeble physique.

If a second inoculation be made, it should be given in the other flank about a fortnight after the first and the quantity of Vaccine used should be increased 50 to 100 per cent according to the effect of the first inoculation.

In making these injections, it is necessary that every antiseptic precaution should be employed.

The needle and syringe must be sterilised and the method of doing this recommended by Professor Wright is an excellent one.

In this sterilization is effected by filling the syringe with sweet oil, heated to a temperature of 140° - 160° C. If any of the fittings of the syringe should be made of india-rubber, care must be taken that the temperature does not rise above this.

The oil may be heated in a spoon, or other shallow vessel over a spirit lamp and, if a piece of ordinary bread crumb be placed in the spoon, the point at which it begins to turn brown may be taken as an efficient indication of the required temperature having been attained.

This heated oil should now be drawn into the syringe and brought into contact with the whole interior of the barrel. The needle should be sterilized in the same way.

The skin at the site of inoculation must also be thoroughly disinfected by first washing it with soap and water and then scrubbing it with some antiseptic solution.

Value of Inoculations. During the late war, all transports conveying troops to South Africa were provided with the materials necessary for these inoculations, the advantages of

which were explained to the troops and all those, who desired, were inoculated.

There have not yet been published, the complete statistics from which conclusions could be drawn as to the preventive powers of these inoculations, but from my own experience I am of the opinion that, though the disease is not by this means absolutely prevented, when it does occur in inoculated patients, its course is greatly modified and that the general "average of severity" in such inoculated cases is very much less than in the non-inoculated.

This conclusion I have arrived at from watching the course of the disease in numerous inoculated cases and comparing it with that occurring in cases where there had been no preventative inoculation.

In all the cases of Enteric Fever amongst inoculated patients which I have come across, I have, invariably found that only one injection had been given.

I have never seen any cases of the disease amongst patients who had been inoculated twice and though this might possibly be due to the very small proportion of cases in which second inoculations were carried out, I am of the opinion that it is an important point for consideration whether one inoculation confers all the immunity that this method is capable of.

A second inoculation is almost invariably followed by some reaction and, though this is much less marked than that following the first, I consider that, as long as any reaction, however slight, occurs, it indicates that the full possible amount of insusceptibility had not been conferred.

In two cases in which I saw third inoculations given, there was absolutely no reaction, though after both the first and second injections, this had been present.

In these two cases the full insusceptibility had been conferred by the second injection, as shown by the absence of reaction after the third.

To give this treatment then, a fair trial as a preventative, I think the injections should be repeated until they give no reaction, though a second injection would suffice, I believe, in the great majority of cases, to confer the full insusceptibility of which this method is capable.

Clinical symptoms following Inoculation.- The reaction, which occurs after inoculation with antityphoid Vaccine, manifests itself by the occurrence of symptoms, both constitutional and local. These symptoms may be expected to appear in from one to six hours after the inoculation and, if the reaction is at all severe, will almost certainly appear during the first three hours.

The Constitutional Symptoms are ushered in by a feeling of malaise and tendency to faintness. In some cases distinct rigors occur. More rarely, the tendency to faintness passes into a condition of slight collapse. A certain amount of fever is nearly always present, but the temperature rarely rises above 101° F. though in exceptional cases it may attain a height of 103° F.

Local symptoms appear in about five or six hours after the inoculation in the form of tenderness and redness of the skin, at the site of inoculation.

About twelve hours after its first appearance, the local condition will have reached its maximum.

Tenderness will now be very marked and the skin, for two or three inches around the inoculation puncture, will be found inflamed and often with injected lymphatics leading from this point upwards to the axilla and downwards to the groin, in both

of which regions there may be some tenderness of the glands.

The local symptoms have usually all disappeared in about a couple of days and the general symptoms even before this, usually in about twenty four hours, though they may last as long as forty eight hours.

Care of the patient after inoculation. Owing to the tendency to faintness produced by the injections, the patient should be kept as quiet as possible after the inoculation and instructed to lie down as soon as a feeling of illness sets in. Exposure to the sun and violent exercise are to be avoided.

In the great majority of cases, no other treatment is required.

If the local tenderness and pain should be very severe, it may be relieved by hot fomentations.

To check the serous effusion and thus diminish tenderness and swelling Calcium chloride (cryst) has been recommended and should be given in a dose of 30 grains at the time of inoculation and repeated in about six hours.

(3) Special Preventive Measures. As the conditions present in a hospital are somewhat different to those existing in a standing camp, and as both of these vary widely from those which obtain in the Field, I shall discuss, separately, the preventive measures to be taken in each of these cases.

(a) In Hospitals, all the precautions previously mentioned, under the general considerations for prevention, should be adopted.

Cases of Enteric Fever should be isolated in a separate ward or, preferably, if possible, in a separate building, and attendants should be told off to attend to them and to them only.

All dishes, Thermometers etc. used by such patients, should be isolated and disinfected, after each time of using.

Dishes should be boiled and thermometers carefully washed in perchloride of Mercury solution (1 in 500), in which they may be allowed to stand when not in use.

Urinals and bed pans should be carefully rinsed out with solutions of perchloride (1 in 500) or Carbolie Acid (1 in 20) and scalded with boiling water.

Soiled linen and Blankets should be at once removed, soaked in Carbolie Acid (1 in 20), and then boiled.

Soiled mattresses and pillows may be sterilized in a steam sterilizer, if available, but if at all badly soiled, I think it is better to soak them with paraffin and set fire to them.

The attendants, after handling the patients or anything used by them, should at once wash their hands, using a scrubbing brush and plenty of hot water and soap, afterwards rinsing them in Perchloride solution (1 in 1000)

These precautions, however, being more directed towards the safeguarding from infection of the individual, are of only minor importance, compared with that which attaches to the disposal of the faeces and urine of infected patients as it is from these sources that contamination of water and food, leading to extensive outbreaks, is likely to take place.

The methods I have seen adopted for the disposal of such excreta has consisted in a primary disinfection either by treating with perchloride of Mercury or by boiling with Carbolie Acid followed by subsequent deep burying. A third method of disposal by burning has been described by Surgeon Lieut. Col. Giles.

In the first method, the faeces and urine are immediately emptied into a tank, containing an acid solution of perchloride of Mercury (1 in 500) and the bed pan or urinal rinsed out with a similar solution and the rinsings also emptied into the tank.

Once a day or oftener, the contents of this receptacle are emptied into a deep trench, which is at once filled in. Great care must be taken not to splash the matter over the sides of the trench or ground round about.

This method of disposal, I do not consider as particularly satisfactory or safe, as complete disinfection before burying may not have occurred from the last stools not having been a sufficient length of time in contact with the disinfectant, and one can easily see the possibility of contamination of some neighbouring water supply, in the ways already described, by percolation from the trench, if disinfection had not been complete.

A much safer procedure, is where the disinfection is carried out by boiling with carbolic acid. In this the stools and rinsings from the bedpans and urinals are emptied into a '1 in 20' solution of Carbolic Acid which is contained in a receptacle, raised above the ground so that a fire may be lit underneath. At the end of each day the contents of these receptacles are boiled for an hour and then buried, as in the former case.

This method is undoubtedly efficacious but the mere idea of boiling excreta seems repulsive, not to mention the disagreeableness of the smell given off during the process.

A much better way, to my mind, though I have never seen it used, is that described by Surgeon-Lieut. Col. Giles. His method is as follows :-

The faeces and urine are received into a bedpan, lined with pine sawdust, saturated with Mercury perchloride and vinegar. Directly the pan is removed, the contents are covered with an inch of similarly saturated sawdust, the whole being then emptied into an iron pan, raised either on bricks, or on one of the open fire buckets used at railway stations to thaw the

water mains, and a fire lit underneath; the bedpan is rinsed out with paraffin which is then poured over the sawdust and excreta in the iron-pan, and set fire to and the contents of the iron pan, thus, reduced to ashes.

The bedpans are afterwards washed out with perchloride of Mercury solution and the washings poured into an iron bucket filled with sawdust which is from time to time burned in the destructor.

A case reported by Büsing (Deut. Med. Woch. June 19th 1902) in which the typhoid bacillus was found in the urine long after the patient had recovered from Enteric Fever, is of great importance as showing that it might be wise to continue the above precautions for some time after recovery from the disease

Büsing, on April 6th, 1902, bacteriologically examined the urine of sixteen soldiers who had contracted Enteric Fever in China. Of these sixteen specimens of urine, fifteen were found to be free from the typhoid bacillus but, in one of the cases, bacilli were found which, both morphologically and biologically, were identical with the bacillus typhosus.

In this case the patient had been attacked by the disease on Oct. 10th 1901 and was discharged from hospital as cured on Dec. 24th, having at that time been convalescent for about two and a half weeks.

Specimens of urine from this man were found to contain bacilli on April 6th, 7th, 8th and 17th and it was only on April 19th that an examination failed to discover them; that is to say, almost four months after his discharge from hospital as completely recovered.

The possibility of the urine thus retaining its infective properties for some time after complete recovery from the disease requires further investigation and, if this should be found to be the case, the isolation of these patients with disinfection of their urine will have to be continued for some

time after convalescence.

It is interesting to note that on April 18th the patient commenced to take urotropin and that, on the following day, the bacilli were absent for the first time, a fact which might serve as an indication for the treatment of this condition.

Flies in a hospital, I am convinced, besides being a source of worry to the patients, are frequently the means of conveying infection and I think every effort should be made to keep down the numbers of these pests. Much can be done in this direction, by the judicious exposure of plenty of fly papers about the wards, and the removal of everything which might encourage flies to swarm to the place. Thus, all refuse should be emptied into some receptacle provided with a cover which should only be removed when necessary, and at the end of the day the contents burned or buried. To lessen the risk of contamination, all food should be kept covered and, in removing bedpans and urinals from patients, the access of flies to their contents should be prevented by, at once, covering them with a cloth moistened with perchloride of mercury solution.

The receptacles, into which the bed-pans are emptied, should also be provided with covers, which should never be removed except to receive the contents of the bed-pans. Attention should also be paid to the cleanliness of the surroundings of the hospital.

In this way, by attention to the cleanliness of the Hospital and its environment, together with the liberal use of fly papers, the most gratifying results can be obtained.

An example of this, I observed, when the Hospital Staff, to which I was attached during part of my service in South Africa, was transferred to a new hospital. This place contained an almost incredible multitude of flies, and an attempt was at once made to reduce their numbers. In less than a month, by

attention to the above details, their abundance had been reduced to an astonishing degree, and they no longer constituted the 'plague' that they were at first.

The water supply of a stationary hospital usually presents no difficulties, this having been taken into consideration in choosing a site for the hospital. The source from which it is derived should, of course, be periodically inspected.

Milk should be boiled to obviate the risk of its having been previously contaminated.

(b) In Standing Camps. Here, also, there should be no great difficulty with regard to the water supply.

Should there not be any suitable source near the Camp, it is usually an easy matter to have water from some approved source conveyed there. Failing this, there can be no insuperable obstacles, in the case of a standing camp, to purifying whatever water may be available by boiling and subsequent filtration.

The food question also, should contain no real difficulties. I would, however, prevent the sale of milk to the soldiers in such a camp, except by those to whom a special permit had been granted, and such a permit should only be given after a most rigorous inquiry into the source.

Especially in South Africa, where the Sanitation of many of the farms was of the crudest description, I think it was a mistake to allow the sale of milk in Camps by any person, whatsoever, who had milk to sell, and, though I attach no credence whatever to the rumour that milk purposely contaminated by typhoid excreta used to be sold to the men by Boer farmers, in order to cause this disease, I think that in all probability milk which had been accidentally contaminated may have often been sold and the disease communicated in this way.

Given an uncontaminated condition of the food and water to start with, the chance of its subsequent infection by dust and

flies may to a large extent be obviated by frequently watering the ground in and around the camp to lay the dust, especially on windy days, and by discouraging flies as much as possible.

Thus, no refuse should be allowed to lie about the camp, but should at once be buried or burned. The horse lines should be frequently swept up, and the sweeping similarly disposed of. In suitable places, near the cook-houses, refuse pits should be dug, into which all the waste matter from the cooking could be thrown at once and covered with a little earth. Dead animals, playing, as they do, an important part in the breeding of flies, should never be allowed to lie uncovered anywhere near the camp but should be buried at once. Trenches, 3 to 4 feet deep should be dug for use as latrines at some distance from the camp, and the men compelled to use these trenches both for urination and defaecation. Men should be specially told off to go round these latrines frequently, and after having sprinkled some disinfectant over their contents, cover them with a layer of three or four inches of earth.

By thus frequently covering the contents of the trenches by fresh layers of earth, access of flies to them is largely prevented, and the chance of paper from these places being blown about the camp minimized.

These trenches should be covered in, when about half full, and fresh ones dug.

Every man should have orders to 'report sick' at once, if he should have any looseness of the bowels and such men should be kept under observation if the diarrhoea should be in any way suspicious. The men under observation should use a separate trench and their stools should be sprinkled with Sanitary powder and covered with earth at once.

In South Africa particular care had to be taken that rules of camp cleanliness were carried out by the native drivers and other camp followers.

If possible, it is well that the position of the Camp should be changed every two months.

(c) In the field. Of the numerous suggestions, which have, from time to time, been advanced for the prevention of Enteric fever amongst troops in the field, many bear evidence of having been conceived by those entirely ignorant of the conditions under which their suggestions would have to be carried out. Some acquaintance, therefore, with the special circumstances under which hygienic measures 'in the field' have to be effected is absolutely necessary before any practical suggestions can either be made or understood.

In the latter half of the late South African War, operations in the field were carried on mostly by small columns, and the conditions under which hygienic measures had to be carried out in these cases may be taken as an example of the requirements which have to be considered.

Whether such columns were working independently or by concerted movements, it was essential that they should be able to travel quickly and anything, therefore, interfering with their mobility was inapplicable.

Such columns would probably begin the day's march about 7 a.m. having breakfasted at daybreak, and, with the exception of a halt at mid-day for dinner, and to rest and feed the horses and mules, would not stop until late in the afternoon when they would encamp for the night.

All measures, therefore, for the prevention of disease had to be such as could be carried out without interfering with these movements.

As troops in the field, as a rule, are not remaining at any one place for any length of time, the importance of camp cleanliness would not seem to be so very great, but, when it is

taken into account that the military considerations governing the selection of a position in any particular locality, to some extent, limit the sites available for such camping grounds, it will be seen that a column may have frequently to occupy ground that has either been already used for this purpose or is in the neighbourhood of some former camp.

Unless, therefore, the cleanliness of these camping grounds is attended to, the soil becomes polluted and may constitute a source of danger on some future occasion.

The same rules, therefore, of camp cleanliness, in regard to the use of latrine trenches, disposal of refuse by burning or burying etc. as have been described in the case of standing camps, should be applied in the field as far as is possible. The idea, that there is no time for this is an entirely erroneous one.

Though frequently using its old camping grounds, the regiment, to which I was attached, was comparatively free from Enteric fever and this, I attribute, to the great cleanliness of the camps in this case.

At the end of every day's march, latrine trenches and refuse pits were dug by the pioneers, and, the men having been trained to cleanliness, the surroundings of their camp never presented that filthy condition which I have often seen in other cases. In the morning, before marching off, these trenches were all covered in and the ground left in such a condition that it could be safely used again as an encampment.

Rations in the field are usually tinned and there is not much fear of typhoid infection from the food, unless contaminated after removal from the tins.

The question of the supply of pure water to troops in the field is a very important one, presenting great, though, I think, not insuperable difficulties.

I am convinced that the present system of water supply

could be very largely improved upon and I can see no reason why a supply of pure water should not at all times be available for use.

At present, each regiment is provided with three or four water carts, which, on the march, accompany the first line of transport. The water carts being thus massed together in one part of the column are out of reach of the great majority of the men who in consequence are compelled to fill their water bottles when empty, with water from any wayside pool or stream.

This, under the present system, does not matter much as the water carts, themselves, are replenished from similar sources, but if these carts could be filled with a supply of pure water, for this to be of any use, it would be necessary for these to be distributed along the line of march at such frequent intervals as would insure a supply of sound water being within easy reach of any part of the column.

This would, of course, necessitate an increase in the number of water carts, of which, I think, there should be at least one to every Company, distributed as nearly as possible at equal intervals along the line of march.

With regard to the provision of a pure water supply, this is one of the greatest difficulties we have to contend with in the field, since to obtain a naturally pure water is usually impossible, the supply being of necessity almost always drawn from some doubtful source.

Hitherto no attempt has been made to overcome this difficulty but I think much could be done, in this direction, by the adoption of some method of purification, which must be such as will insure a constant supply of pure water. Any method which entails waiting is absolutely useless since a man, if very thirsty, will always prefer 'dirty water at once' to 'pure water in half an hour's time'.

Purification of the water may be effected by chemical means; by filtration; or by boiling. Chemical purification, by

itself, is not of much use, since the employment of a sufficient quantity of a chemical agent to destroy infection would be inadmissable. In combination, however, with other methods it is of some utility.

If there be much organic matter in the water, the addition of a sufficiency of permanganate of potash to produce a persistent faint pink tint will destroy this by oxidation, but will have little effect on any living organisms.

Water, thick with suspended organic or mineral matter, may be cleared by the addition of about six grains of alum to the gallon of water. A precipitate of Aluminic Hydrate is formed and carries down all suspended matter. Should there be no lime present in the water perchloride of iron ($2\frac{1}{2}$ grains per gallon) ought to be added, previously.

Eight to ten hours should be allowed for this precipitation

Efficient filtration offers an excellent method of sterilizing water but the labour necessary for the purification, in this way, of large quantities of water are very great.

Most filters also are apt to go wrong or break, unless carefully handled.

In my experience, the filter, that gives the most satisfactory and useful results, is the Berkefeld Filter. The outflow is so great and the resulting purity of the water so certain, that no better means of sterilizing water could be employed. A previous clearing of the water with Alum will greatly facilitate filtration.

If some form of this filter could be devised capable of filtering a large quantity of pure water with a minimum of labour and which would at the same time be easily portable, it would be of inestimable service in the field.

A water cart, of which fig.I. is a diagram, has been designed by Mr. E. Bailey-Denton, with the object of reducing the

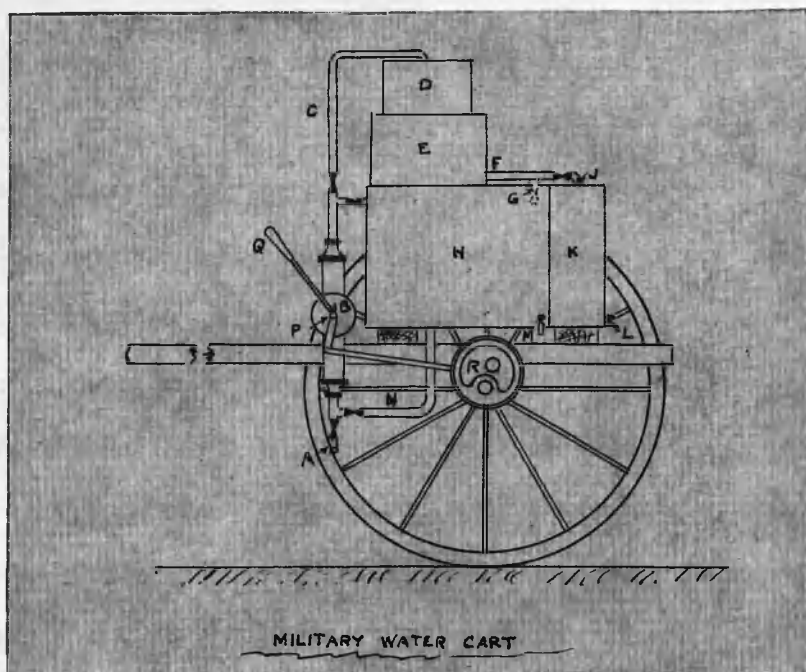


Figure I.

labour of filtration by utilizing the motion of the cart to pass the water through the filters.

'A' is the suction pipe which is to be connected to the source of supply. 'B' is a pump worked by the handle 'Q'. By it, the water can be pumped into the tank 'H' which contains Seventy-five gallons.

This operation takes some ten minutes.

By means of the pin, 'P', the pump can at once be disconnected from the handle, 'Q', and put into gear with the eccentric, 'R', on the boss of the cartwheel.

When the cart is on the march the revolution of the wheels causes the pump to raise the unfiltered water from the tank 'H', through the pipes 'N' and 'C', on to the top of the filter 'D'. Thence it percolates on to the surface of the filter 'E', whence it flows through the pipes 'F' and 'G', either back again into the tank 'H', - to be again pumped and filtered - or through 'J', into the filtered water reservoir 'K', which holds 25 gallons. The tank 'H' may be cleansed by means of the cock 'M', and the filtered water drawn off from 'K' by the tap 'L'.

The two tanks 'H' and 'K' together hold a hundred gallons

which represents the contents of the army water-cart now in use.

The handle 'Q' is equally suitable for pumping the water from the source of supply and for circulating the water when the cart is stationary and when this operation cannot be performed by the wheels.

When the cart is travelling at a rate of three miles per hour, it is claimed that the water is circulated at the rate of three gallons per minute, so that in a march of four hours the water could be passed through the filtering material nine times over.

The great objection in this cart to me seems to be the very small quantity of pure water (25 gallons) which is at any time available.

The most efficacious method of sterilizing water is undoubtedly by boiling. The main objection to this method is the length of time required for cooling before the water is fit to drink, but a constant supply of water sterilized in this way and ready for drinking might, I think, be attained by preparing the water supply for the next day at each camping place.

For this purpose the following water cart, which I have designed, would be useful.

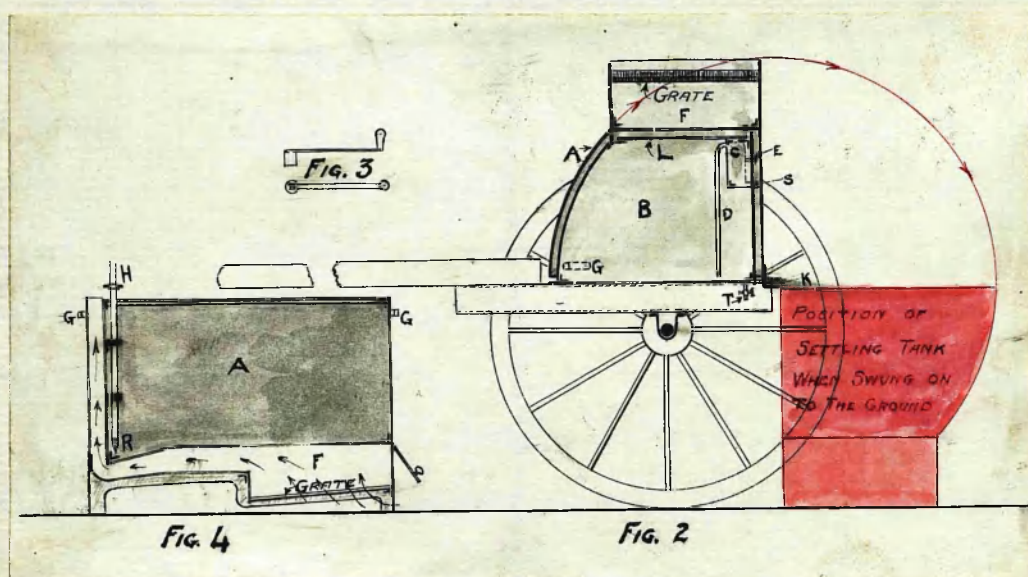
This consists (Fig 2) of an iron tank 'B' called the "Carrying tank" fixed on the body of the cart, provided with a tap 'T', and covered with a lid 'L' which should be bolted down, but, at the same time, easily removable for occasionally cleansing the tank.

Attached to the "Carrying tank" is a semi-rotary hand pump 'C' with a suction pipe 'S' and a discharge pipe 'D'. This is worked by a handle (Fig 3) which fits over the square head 'E'.

Outside and inverted over the "Carrying tank" is another tank 'A', called the "settling tank", provided with a furnace

"F" and hinged to the cart at "K" by an open hinge. Lugs "G" are attached to the "settling tank" on either side for lifting it.

In Fig. 4. is shown a cross section of the "Settling tank" and its attached furnace. In this "H" is a pipe for drawing off water from the tank and is fitted with a perforated 'rose' "R", covered with an asbestos filtering cloth.



The method of using this cart would be as follows :-

On arrival at the final halting for the night, the water carts would be driven up to the source from which it was proposed to draw the next day's supply of water, and the "Settling tanks" removed, by a man on either side of each cart catching hold by the lugs "G" and swinging it with its attached furnace over to the ground, using the hinge "K" as a fulcrum. When the tank is in position on the ground as shewn "in red" in the diagram, the hinge at "K" is open and the tank then loose from the cart.

The water carts, with their "carrying tanks" full of pure water previously prepared at the last night's halting place, would then drive to their allotted positions in the camp, and

from them the whole water supply for cooking and drinking would be drawn.

In the meantime the "settling tanks" would have been filled with water from the proposed source, fires lit in the furnaces, and the water in each boiled for half an hour, and sufficient alum then added to precipitate the mud if the water should require this.

Having completed these preparations, the water should be left standing in the tanks all night to allow of it cooling and settling.

In the morning by connecting the pipe "H" with the hand pump at "S" by means of a flexible hose, the supernatant clear water in the settling tanks could be drawn off into the water carts in a few minutes.

The "settling tanks" would then be cleaned out and placed again in position over the carrying tanks.

By thus preparing each night a quantity, sufficient for the next twenty four hours, a supply of pure water which would be available at any time during the march or at once on arrival at the final halting place might be obtained.

With "carrying tanks" of a capacity of 20 cubic feet, each water cart would carry 124 gallons or about 11 cwts. of water which ought to be sufficient to supply a company for twenty four hours.

As regards the amount of fuel required to boil this quantity, since 1 lb. of wood contains 6600 thermal units of heat, at a moderate computation, allowing for a loss of 65% of heat by radiation etc. 35% equivalent to 2310 thermal units, would be available for boiling; and taking the initial temperature of the water as 60° F. to raise the temperature of 124 gallons to boiling point would require about 82 lbs. of wood.

Allowing 30 lbs. to keep it boiling for half an hour, we should require roughly about 1 cwt. of wood for each water cart.

One and a half hours ought to be sufficient to bring the water 'to the boil' and this would allow plenty of time during the night for cooling and "settling."

Such a water cart, complete and filled with water, would weigh about 22 cwt.

The "settling tanks" considering the rough handling they would undergo would require to be strong but need not weigh more than 3 cwt. with furnace complete. Using the hinge at "K" as a fulcrum, this could be easily manipulated by two men.

To carry out these arrangements a special staff would be advisable, their sole duty being to attend to the water supply.

The men of this staff should have some slight knowledge of how water may be infected so that they might avoid anything likely to cause contamination after the water had been purified.

One man to superintend each water cart would be sufficient and this would make a water staff of eight men to each regiment

They would be under the control of the regimental medical officer, whose duty it would be to see that the purification of the water was efficiently carried out and who would be responsible for the water carts being ready to start in the morning at the hour fixed.

As occasion offered, the "carrying tanks" ought to be thoroughly cleaned out periodically and it might be as well to occasionally have all the men's water bottles placed in one of the "settling tanks" and sterilized by boiling.

The purification of water in the field in this way should present no great difficulty in the hands of a properly organised staff and when one considers the number of deaths from Enteric Fever which occurred amongst the troops during the South African War - a number exceeding 8000 - no trouble seems to be too great which could have any effect in diminishing this loss.

GENERAL SYMPTOMS

The symptoms and progress of the disease vary greatly in different cases.

The attack usually begins insidiously, though, in some cases, the onset is sudden.

For convenience of description, the course of the disease may be divided into three stages, according to whether the symptoms are on the increase, or have reached their height, or are declining.

This division into stages is a purely artificial one, each stage gradually merging into the next.

In the first stage, or stage of increment, the symptoms are gradually increasing in severity. The patient usually first presents himself with a history of having been out of sorts for a few days previous. He is usually unable to give the exact date on which he first began to feel unwell. Beyond a little feverish disturbance, there may be no other symptom at this time, but as the disease develops the temperature rises, the skin becomes hot and dry, and the pulse somewhat increased in rapidity. The cheeks are usually flushed, though the countenance is pale.

The patient complains of general malaise. His limbs ache, and there is thirst and loss of appetite, with usually, frontal headache. A coarse white fur, thinning off towards the tip and edges, usually coats the tongue, which is often cracked transversely. In some cases, however, the tongue may be quite clean.

Examination of the abdomen usually elicits pain and tenderness in the right Iliac fossa, with tympanitis and enlargement of the spleen. Diarrhoea, with pea soup stools, is, as a rule, present. A common history is, that the patient, feeling unwell, had taken a purgative, thinking 'his stomach was out of order', and that, since then, diarrhoea had been present.

As the disease progresses the patient rapidly loses flesh. He becomes dull and restless and there is often slight rambling delirium. The face assumes a more flushed appearance. The tongue becomes dry and cracked and trembles when protruded. The feebleness and frequency of the pulse increase. The abdominal symptoms become more marked and on palpation in the right Iliac fossa 'gurgling' may be detected, whilst, over the posterior bases of the lungs, signs of Bronchial Catarrh, are often to be found. As a result of this bronchial catarrh there is usually some little cough, and expectoration. Slight hemorrhage from the congested intestinal mucous membrane may take place during this stage. The characteristic eruption makes its appearance usually between the seventh and tenth days of the illness, coming out in successive crops of rose coloured spots, which are felt to be distinctly elevated. They disappear on pressure, and their number is usually small.

During the second stage, the disease is at its height. The patient lies on his back and seems to be sunk down into the bed. He is dull and apathetic and there is great prostration with drowsiness and delirium. The temperature is at its height and crops of the eruption are still appearing. The tongue is dry and brown, and 'sordes' often cover the lips and teeth. The pulse becomes more rapid and feeble and may exhibit a tendency to dicrotism.

It is during this stage that severe and dangerous haemorrhage from erosion of a vessel in the floor of one of the ulcers is most common. Bedsores are also apt to form and perforation may occur.

In the third stage in favourable cases the symptoms now begin to subside. The fever gradually day by day diminishes and the other symptoms correspondingly decrease in severity and by degrees disappear until at length convalescence is

ultimately established. The average duration of each stage is roughly a week, in ordinary cases.

The following case may be taken as an illustration of the symptoms and progress occurring in an ordinary uncomplicated attack of this disease.

T.S. aged 28, a private in the Somersetshire Light Infantry, "reported sick" on the morning of December 3rd 1900.

He stated that, for the last three or four days, he had not been feeling well, a fact which he attributed to a 'touch of the sun'.

His temperature was 99° F. and his pulse rate 70. His bowels were slightly constipated. No other abdominal symptoms were present. The tongue was fairly clean. His face was red, and peeling from the effects of the sun. Malaise not marked and the patient thought he was for duty.

He was detained in hospital for observation and put on slop diet.

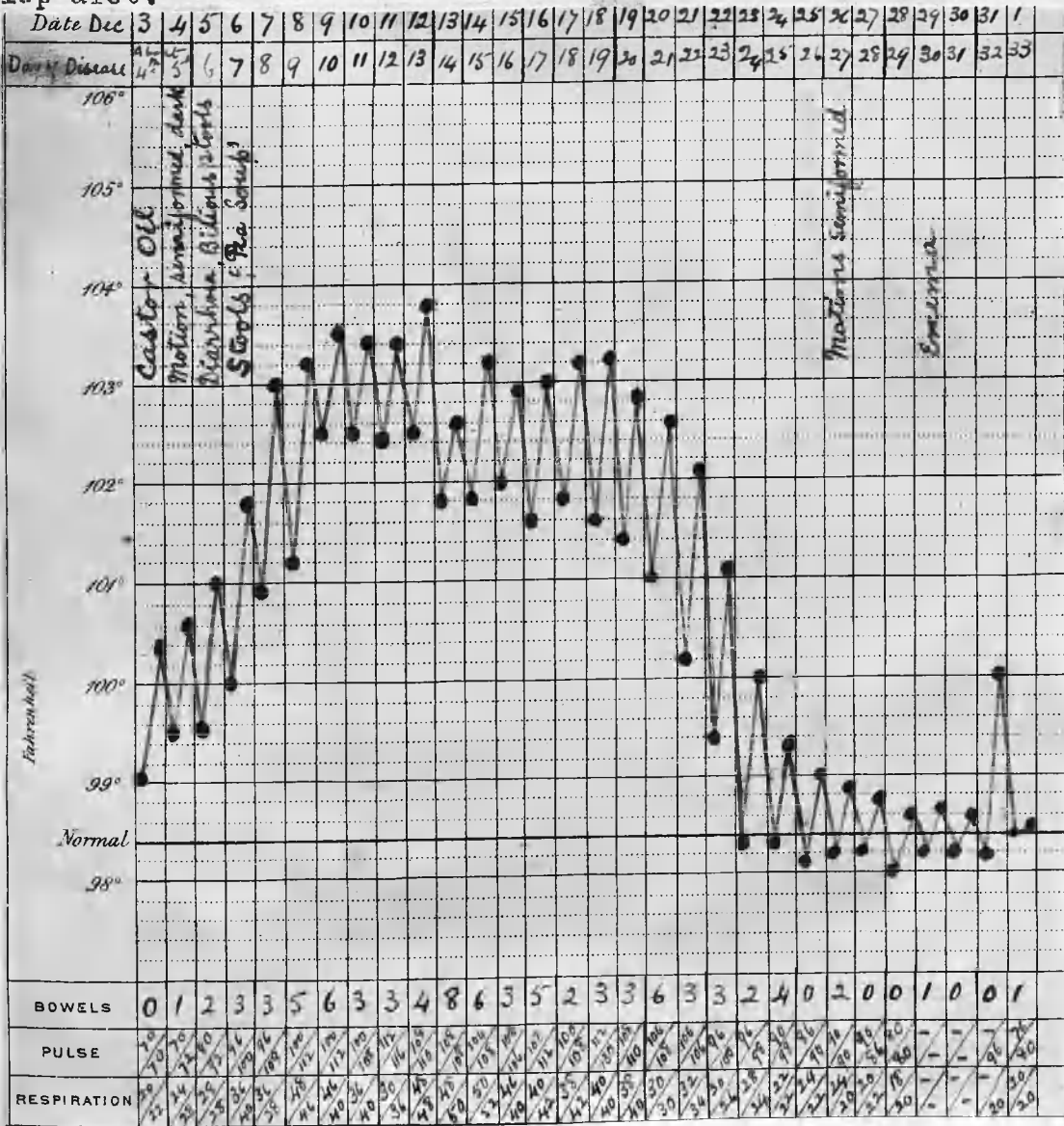


Fig 5. Chart of T.S.

In the evening the temperature was 100.4 and pulse 70.

A small dose of castor oil was prescribed for the constipation.

Dec. 4th. Morning:- Temperature 99.5. Pulse 70. Bowels opened early this morning. Stools semiformal, dark, and not of a particularly offensive odour.

Evening. Temperature 100.6. Pulse 72. Tongue still fairly clean, but redder than normal.

Dec. 5th. Morning. Temperature 99.5 Pulse 80. Patient complains of headache and pains in his joints, and of sometimes feeling cold and at other times hot. There is slight diarrhoea with bilious stools. Some tenderness over right Iliac fossa. Tongue coated with a white fur.

Evening. Temperature 101°. Rapidity of pulse increased reaching 92.

Dec. 6th. Morning. Temperature 100° F. Pulse 96. Patient has had two motions, of a typical typhoid character, since last night. There is some tendency to sickness and vomiting. Abdominal symptoms are more marked. The tongue shows a dirty white fur.

The disease was diagnosed as Enteric Fever.

Evening. Temperature 101.8°F. Pulse 100. Had one 'typhoid' motion during the day.

Dec. 7th Morning. Temperature 100.9, pulse 96. Number of stools 3. The tenderness in the right Iliac fossa, and tympanitis are marked, though no notable enlargement of spleen. Severe frontal headache.

Evening. Temperature 103° F. Pulse 108.

Dec. 8th. Morning. Temperature 101.2°. Pulse 100. Number of motions 5. The vomiting and sickness have ceased. Headache severe. Several 'rose spots' appeared on abdomen.

Evening. Temperature 103.2, Pulse 112. Patient complains greatly of headache.

From Dec. 9th to 17th, the temperature maintained

more or less the same average daily level, rising in the evening and falling again towards morning. It reached its highest point, during this time, on the evening of the 12th. when it rose to 103.8° . During this period the pyrexia was controlled by frequent cold spongings and on the evening of the 12th. as the temperature tended to rise and the delirium and restlessness were marked, the patient was placed for a quarter of an hour in a bath which, at first of a temperature of 95° F. was gradually cooled down to 70° .

On the 14th a slight haemorrhage occurred.

Dec. 18th. Morning. Temperature 101.6 . Pulse 112.

The patient is dull and sunk in the bed. The face is flushed. The tongue is dry, brown, and cracked, trembling when protruded. There is marked tympanitis and gurgling over the right iliac fossa. There are numerous 'rose spots' on the chest and abdomen. The patient is only semi-conscious, and there is muttering delirium.

Evening. Patient inclined to be noisy. Temperature 103.2 . The pulse is very feeble and dicrotic and difficult to count.

The disease had now reached its height. From this time improvement set in, the severity of the symptoms diminished and the temperature gradually fell, first reaching normal on the morning of Dec. 23rd. From this date convalescence was attended with no important symptoms with the exception of an unaccountable slight rise of temperature on Dec. 31st.

All cases, however, unfortunately do not end in this favourable way.

Often the symptoms of the second stage become more marked and the cardiac feebleness extreme. The prostration, delirium, and drowsiness increase, and the patient may pass into a condition of coma. The faeces and urine, when this occurs, are often passed involuntarily. Tympanitis and diarrhoea increase

The face and extremities become blue and cold and finally death may occur, though recovery not infrequently takes place even under the most unpromising circumstances.

The average duration of the disease is between three and four weeks but in mild cases it may be as short as ten days on the other hand it may be more prolonged.

Relapses occasionally occur. These usually, though not always, are milder than the first attack. Relapses usually happen after a period of complete apyrexia but sometimes a relapse occurs before the temperature has quite reached normal. Second relapses are not uncommon and third relapses, even, may occur.

In some of the milder cases, most of the symptoms described above are absent and the patient is never really very ill as far as any prominence of symptoms is concerned.

Even in the mildest cases however, there is danger.

The abdominal symptoms, fever, and diarrhoea, in these cases, if present, are in such a mild form that it is often difficult to arrive at a diagnosis.

This has been, in my experience, more particularly the case when the patient has been inoculated with antityphoid serum which seems to greatly modify the disease, and here the difficulty of diagnosis is greatly increased by the fact that the blood of such inoculated patients will give Widal's reaction even though they are not suffering from the disease.

SYMPTOMS UNDER THE VARIOUS SYSTEMS

Circulatory system. The pulse in Enteric fever is often peculiar, in so far that the increase in rapidity is not at all in that proportion to the rise in the temperature, which one finds in most febrile conditions. It is not infrequent for the pulse rate in some cases never to exceed 100, even with a fairly high temperature. In patients with some febrile disturbance and a history of having been 'out of sorts' for some

time, a relatively slow pulse should always be looked upon with suspicion.

In the later stages of the disease there is often great feebleness and rapidity of the pulse, which is sometimes dicrotic

The more rapid the pulse, usually the more severe is the case.

The temperature in Enteric Fever is usually characteristic.

It rises in the evening and falls again in the morning, but, in the first stage, the morning fall does not bring the temperature down to the point from which the previous evening rise started, so that there is a general tendency upwards. During the second stage, the average level is maintained, the temperature oscillating between an evening rise and a morning fall. In the third stage, the morning fall is greater than the evening rise, and the temperature thus gradually reaches normal.

Figure 5. shows the course of the fever, in a fairly characteristic case.

Profuse diarrhoea, Intestinal haemorrhage, and severe Epistaxis will, each, cause a fall in the temperature.

Alimentary System. The bowels are sometimes confined at first, but diarrhoea occurs in the great majority of cases, sooner or later. This diarrhoea is sometimes very severe, the number of stools 'per diem', at times, being as many as ten or twelve.

The stools, in a typical case, are thin and of a yellowish colour, resembling 'pea soup'. Their odour is usually very offensive. Debris, consisting of undigested food, epithelial matter, and shreds of mucous membrane are deposited on standing. Typhoid stools are alkaline in reaction. I have never seen a case of Enteric fever in which the bowels were confined throughout the whole course of the disease, but this is apt to occur in the case of children.

Sickness and vomiting are often present at the beginning. The sickness is sometimes severe and, though usually confined to the earlier stages, it may persist throughout the disease. Thirst and loss of appetite are almost invariably present from the first.

Tonsillitis, at times, occurs, and there is, occasionally, some difficulty in swallowing in cases in which the throat is congested and sore. In mild cases, the condition of the tongue may remain almost normal throughout the whole course of the attack, perhaps being merely a little drier or a little redder than usual. Most commonly, however, it is covered, except at the tip and edges, with a dirty white fur, or is dry, red, and glazed. As the disease progresses, the tongue becomes dry and brown and transverse cracks, often of considerable depth, are frequently present.

Pain and tenderness over the right iliac fossa are usually found quite early in the disease, and, later, gurgling on pressure may be felt in this region.

Tympanitis, which is often very severe during the height of the disease, is almost always present.

Haemorrhage from the bowel may occur in the early stages of the disease, but is usually slight. It is during the second and third stages that dangerous haemorrhage is most likely to occur. Perforation may take place as long as ulceration is present, even after convalescence has been established for some time.

The spleen is usually enlarged but, in my experience, it is the exception for it to be felt below the ribs.

Nervous system. Frontal headache is common, and is very frequently one of the first symptoms. It often continues throughout the disease and may be severe. Not uncommonly, as the patient becomes duller and more apathetic, he ceases to complain of the headache

As the disease progresses, the patient becomes dull and listless. Very often he is drowsy during the day but restless at night, his sleep being broken and disturbed by dreams.

Symptoms of delirium, under these circumstances, often first show themselves when the patient is in a condition between sleeping and waking. As the disease advances the nervous symptoms become more marked, the drowsiness increases, and delirium, usually of a violent character, is common. In the worst cases there is 'subsultus tendinum' and plucking at the bedclothes, with the gradual merging of the drowsiness and delirium into coma. When this occurs, it usually ends in death, though lengthened coma is sometimes followed by recovery.

The skin is usually hot and dry, though attacks of profuse perspiration are common, especially as the disease approaches its height.

During convalescence, also, profuse perspiration leading to the formation of 'sudamina' is of frequent occurrence.

The eruption of 'rose coloured spots' first shows itself about the end of the first, or the beginning of the second week of the disease.

These spots are circular, flat, and slightly raised above the surface. They disappear under firm pressure, and after death. They usually occur on the trunk and more particularly on the front of the chest and abdomen, but they are occasionally found on the face and limbs. They come out in successive crops each crop lasting about three or four days. By surrounding the fresh spots with a different pencil mark each day, their progress may be noted. These spots continue to appear right up to the end of the disease. The eruption, however, is not infrequently altogether absent.

Urinary system. The urine in the earlier stages of the disease is scanty, high-coloured, and of a high specific gravity.

Later, it becomes more copious and of a pale colour and low specific gravity.

Albumen is occasionally present in the later stages.

The following case which I think is interesting. I have ventured to describe here, though unable to give any explanation of it.

A labourer, aged 32, consulted me in the summer of 1894, complaining of debility, thirst and polyuria. He felt himself getting very weak and was losing flesh, though taking his food well. His urine had all the characters of diabetic urine and, tested with Fehlings solution, gave the characteristic reaction for sugar.

Diabetis was diagnosed and he was put on appropriate treatment for that disease.

His urine was subsequently examined on two occasions afterwards, and little, if any diminution, in the quantity of sugar was found. Unfortunately, in neither case, were the results given by Fehling's test corroborated by any other. About six weeks after the patient first consulted me, he contracted Enteric fever. During the course of this disease, the amount of urine passed was much diminished and when the disease was at its height, being curious to see if the amount of sugar had been much affected by the diminution in the quantity of urine, I tested a specimen. To my surprise, no trace of sugar could be found, either by Fehling's, Moore's, or the Fermentation tests.

The patient unfortunately developed pneumonia a few days afterwards and died; but, though I tested his urine frequently up to the time of his death, I was at no time able to find any trace of sugar.

I cannot think of any explanation which would fit these facts. I am positive there was no mistake in my original diagnosis of diabetis, though unfortunately Fehling's test was

the only one applied, when I made the diagnosis. The other symptoms, however, were all typical of diabetis.

If the patient had lived, it would have been instructive to have seen whether or not convalescence was followed by a return of the sugar.

COMPLICATIONS

Perforation, being due to a rupture of the intestinal wall at some spot weakened by ulceration, may occur at any time from the commencement of this ulceration until the ulcers have healed.

Though usually to be met with as a complication of the second and third stages, cases have been known in which this accident has happened even after convalescence had been well established.

Collapse, with a small rapid pulse, and symptoms of peritonitis usually indicate its occurrence, but, occasionally, this condition is found post-mortem without it having been diagnosed during life.

It is usually caused by errors in diet, the administration of aperients, or by some sudden 'strain' such as may arise, either from vomiting, efforts at stool, or the exertion of sitting up.

That perforation may occur, as long as the ulcers remain unhealed, is a point which should be remembered in the treatment of this disease, since the unhealed ulcers in the early stages of convalescence call for as much care as was bestowed on them during the previous course of the disease.

General peritonitis is a common cause of death in Enteric Fever.

It results invariably, I think, from perforation though it is said sometimes to arise from the extension of the

inflammation through the peritoneal coat, without there being any perforation. In post mortem examinations, however, of patients who have died of this complication, I have never come across a case in which perforation was absent. Sometimes, however, the opening has been so minute that it was only to be discovered by a very careful search, and might easily have been overlooked.

A slight Bronchitis or Bronchial Catarrh is very commonly present in Enteric Fever. Occasionally it is severe.

Hypostatic congestion and Inflammation of the lungs occasionally occur. Pleurisy is also met with. Thrombosis of the femoral vein, with oedema of the leg is, in my experience not by any means uncommon during convalescence. It usually affects the left leg. In all the cases I have seen complete recovery took place.

The danger of embolism, in cases in which thrombosis has occurred, should be met by complete rest.

Tabes Dorsalis I have known, in one case, to follow an attack of Enteric fever, but, whether as a result of the fever or not, it would be difficult to say.

In this case, however, there was no history of syphilis

Phthisis is not, by any means, an uncommon result of Enteric Fever, and, even in South Africa where the patients had everything in their favour as regards climate, I have seen several cases, where this disease developed during convalescence from Enteric fever. It is of course, probable, that, in some of these cases, the tubercular lesion had existed before the Enteric fever, which, by lowering the vitality of the tissues, had merely given an impetus to the phthisical process.

Phthisis has, however, occurred in many cases in which there had not been the least reason to suspect any pre-existing disease.

Otorrhoea and periostitis occasionally occur. Ulceration of the Larynx, Meningitis, optic neuritis, and Cancrum oris are rare complications.

Facial Erysipelas is said to sometimes occur as a complication of Enteric Fever. Unless, however, the patient is exposed to infection, I do not think this would be likely to happen.

I have seen only one case in which this complication occurred during convalescence from Enteric Fever and, in this case, it was found that the patient had surreptitiously visited, in the 'isolation' tent, a friend who was suffering from Erysipelas.

The following case is peculiar in that the initial symptoms were masked by those of alcoholic poisoning, and is given as an example of a case in which recovery followed what seemed an almost hopeless condition.

On January 4th, it was reported, in the morning, to the military authorities, by a hotel manager, that W.E.J. a trooper in one of the South African irregular corps, was lying at his hotel in an unconscious condition. He stated that this man had arrived from 'the front' on furlough about a fortnight ago and had been drinking heavily since then.

On arriving at the hotel, I found the man in a state of unconsciousness with dilated pupils, flushed face, and stertorous breathing. The patient's breath smelt strongly of alcohol, and two empty bottles lay on the floor, which from the smell seemed to have contained rum.

Alcoholic poisoning was diagnosed, and the patient removed to the hospital, where the stomach was emptied by a stomach-pump. The contents were fluid and had a strong alcoholic odour.

In the Evening the patient was somewhat improved and could be roused sufficiently to drink a little milk. His temperature was 104.8 and his pulse 180.

Three grains of Calomel were administered by placing it on the back of his tongue.

Jan. 5th. Morning. Temperature 102° F. Pulse small feeble and difficult to count but very rapid. The patient has had diarrhoea during the night, his stools being passed into bed. They were dark coloured and of an offensive odour. He has passed a restless night.

Evening. Temperature 103°. Pulse about 180, but difficult to count.

Jan. 6th. Morning. Temperature 102° F. Pulse 180. Respirations 60.

Congestion of bases of both lungs.

The patient, though somewhat somnolent, is now sensible. His stools are of a 'typhoid' character. Tongue red and glazed, and there is some tenderness in the right iliac region. The spleen is slightly enlarged. A diagnosis of Enteric fever was made.

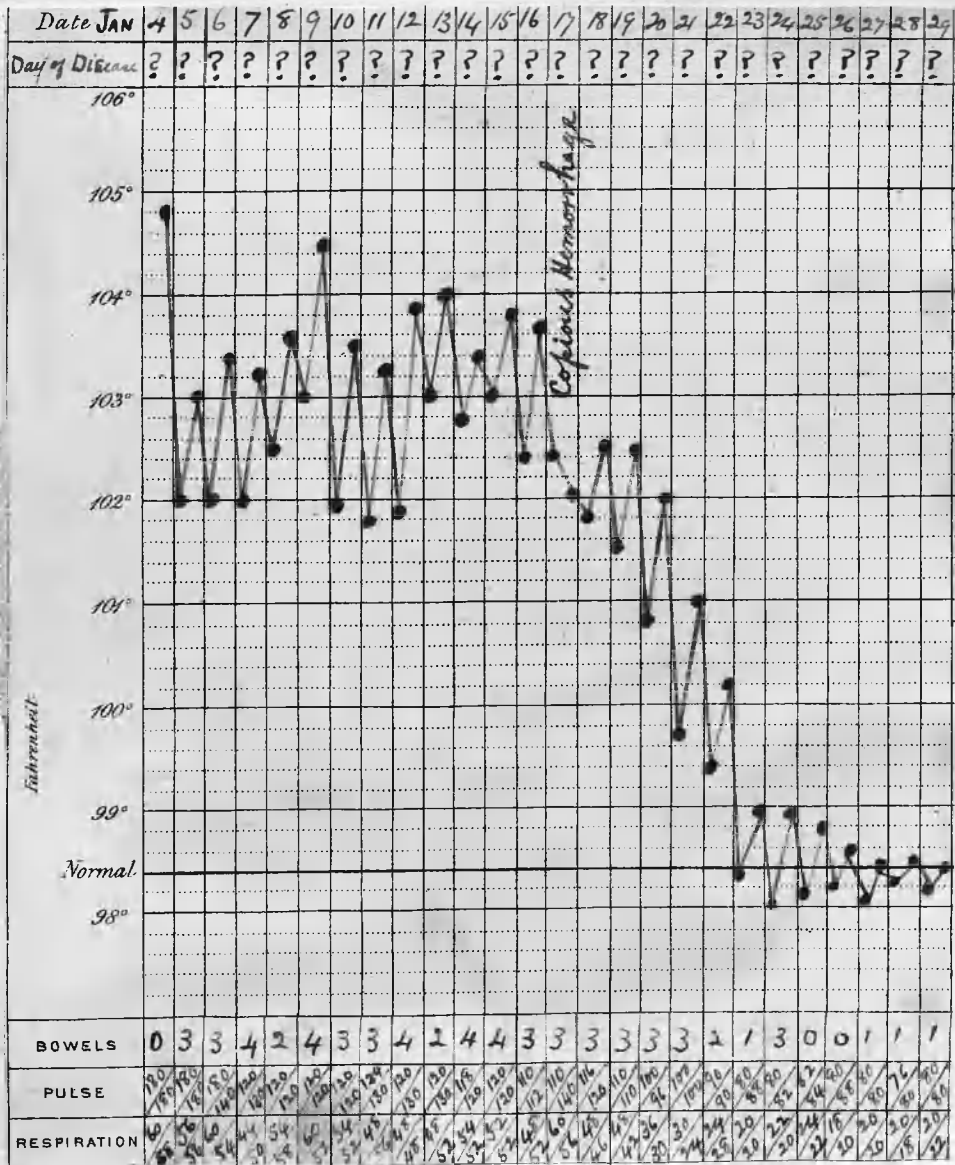


Fig 6. Chart of W.E.U.

Evening. Temperature 103°4. Pulse 140 and stronger.
Respirations 54.

From Jan. 7th to 9th. The condition remained somewhat the same except that the pulse decreased in rapidity and became a little stronger. During this time, the temperature oscillated between 102° F and 104°5° F. Somnolence was still marked. Pulmonary congestion continued.

Jan. 10th. Signs of consolidation over base of right lung, with rusty sputum. A crop of 'rose coloured' spots have occurred on chest and abdomen.

The patient is very prostrated, and delirium, often of a noisy character, is present.

Jan. 11th to 16th. The symptoms increased in severity and the patient seemed to have no chance of recovery. 'Floccitatio' and 'subsultus tendinum' are present. The pulse very feeble, and irregular, and difficult to count.

Jan. 17th. A copious haemorrhage occurred from the bowel. Patient collapsed, and pulse almost imperceptible.

From this time onwards, the patient gradually improved. The lungs cleared up and the temperature finally reached normal on the morning of January 23rd.

Convalescence was interrupted by thrombosis of the femoral vein with oedema of the left leg and foot. Convalescence progressed very slowly and it was not till the end of May that the patient was sufficiently well to be sent to England for a sea voyage.

VARIETIES The broad classification of the disease, into 'slight', 'ordinary', and 'severe', according to the severity of the case, is often useful both clinically and for purposes of description.

Attempts have also been made to distinguish certain forms

of this disease depending merely on the presence or prominence of some particular symptom or group of symptoms, in such cases. Thus we have described cerebral typhoid, bilious typhoid, pneumo-typhoid, and a host of other, so-called, varieties.

Any perfect division, however, of Enteric fever into varieties, in this way, is almost impossible, since the disease assumes so many forms that each case would almost constitute a variety in itself.

There is one form of the disease called Ambulatory Typhoid or Typhus Ambulatorius in which the symptoms are so modified as to almost entitle it to a separate description. In a typical case of this, the disease may be so mild as to cause scarcely any symptoms and, in these cases, is sometimes only discovered when some indiscretion in diet has led to the perforation of an intestinal ulcer.

I believe that cases of ambulatory typhoid, owing to the difficulty in discovering them, may be much more numerous than is generally thought.

Typho-malarial fever is the name given to a form of the disease not uncommonly met with in malarial countries, and due to a mixed malarial and typhoid infection. In Malarial subjects also, it is by no means rare for typhoid fever, like any other acute disease, to take on a more or less malarial type, in which the symptoms are similar to those occurring in an attack of the disease brought on by such mixed infection.

DIAGNOSIS.—Owing to the many forms in which Enteric Fever may present itself, and to the fact that, in certain other diseases, the symptoms occasionally assume a typhoid character, this disease may be confounded with a great number of others.

In the early stages, the absence of a characteristic rash will serve to distinguish it from the other fevers with which

it might be confused at this time. It is in the later stages, however, that it is apt to be confounded with other diseases. Meningitis, acute phthisis, pneumonia, appendicitis, typhlitis, perityphlitis, tubercular peritonitis, malignant endocarditis acute rheumatism, influenza, typhus fever, have all been confounded with this disease at some time or other. Great care, therefore, is required in making a diagnosis.

I have seen cases of meningitis, tubercular peritonitis, and influenza, in which the symptoms so closely resembled those of Enteric fever, that great difficulty was experienced in arriving at any conclusion.

The points to be remembered in distinguishing this disease from meningitis are the less severe headache, the greater feebleness of the pulse, the dry tongue, the diarrhoea, the presence of the eruption, and the absence, or less urgency, of the vomiting.

When one remembers, however, the variability of these symptoms, it will be easily understood that the diagnosis is by no means easy in some cases.

Between Enteric Fever and tubercular peritonitis the diagnosis is often well-nigh impossible. In tubercular peritonitis, there is no eruption, and the tongue is usually cleaner, but Enteric Fever without any eruption and a fairly clean tongue is not uncommon, whilst a dry foul typhoid-looking tongue may be met with in tubercular peritonitis.

Influenza, is not, as a rule, readily confounded with Typhoid fever, but the following case of the former disease, which I find amongst my notes, I have ventured to describe here from the great resemblance which the symptoms bore to those of Enteric fever and which might easily have led to a mistake in the diagnosis.

During the 1894 epidemic of influenza, H.J. aged 45, a boilermaker, and married was suddenly taken ill early in the morning of Oct. 16th with rigors and 'cramps in the stomach.'

He vomited several times, and during the night had two attacks of diarrhoea with stools which his wife described as

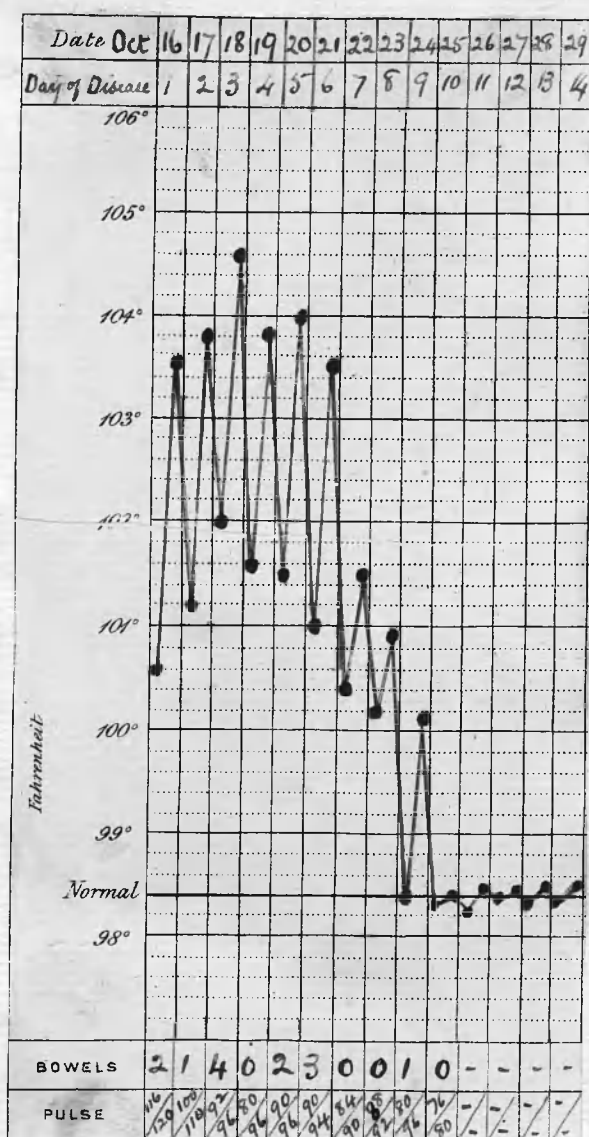


Fig 7. Chart of H.V.

'just like pea-soup', and having a very offensive odour. He had been complaining of being 'out of sorts' for some weeks before this, but had always been able to do his work, though feeling very much 'done up' at the end of the day.

When I first saw him, some hours afterwards, he was lying in bed, on his back, with his legs drawn up, and complaining of severe frontal headache, and pains 'all over his body'. There was some abdominal pain and tenderness not confined to any particular area. The tongue was covered with a thick, dirty white fur. He was still very sick. He had a harsh dry

cough, but, on auscultation, beyond some prolongation of expiration, nothing of note was found. The temperature was 100.6° F and the pulse-rate 116. No enlargement of spleen.

Evening. Temperature 103.5 . Pulse 120. Vomiting was less frequent. There was less abdominal pain but more headache. Throat was sore and congested.

Oct. 17th. Morning. Temperature 101.2 . Pulse 100. There had been one motion, during the night, which was kept for inspection. This stool was liquid, of a yellowish green colour, and with a not particularly offensive odour.

The patient had passed a restless night. There was not so much abdominal tenderness as there had been. No vomiting. Tongue drier. The soreness of the throat was more marked and both tonsils were swollen and presented follicular patches.

Evening. The headache was not so marked and the patient stated he felt easier. Temperature 103.8 . Pulse 110.

Oct. 18th. Morning. Patient had passed a restless night. Bowels acted twice during the night, with stools similar to the one I had seen. There was great prostration and severe headache. Teeth covered with 'sordes'. Abdominal tenderness almost gone. Some tympanitis. Tongue dry and brown. Still a little cough, probably from condition of the throat.

Temperature 102° Pulse 92.

Evening. Temperature 104.6° Pulse 96. Bowels had acted twice during the day. Character of the stools still the same.

Oct. 19th. Morning. Patient had again passed a restless night, and there had been some slight delirium and several attacks of 'shivering'. There was some photophobia. The abdominal tenderness and tympanitis have disappeared. Soreness of throat improved. Temperature 101.6° Pulse 80.

Evening. Temperature 103.8° F. Pulse rate 96. Bowels have not moved since yesterday evening. Patient slightly rambling in his talk.

Oct. 20th. Morning. Patient is in much the same condition as yesterday. He was restless and wandering most of the night, but had a little quiet sleep towards morning. Diarrhoea again occurred through the night, with two bilious stools. Soreness of throat almost gone. No cough.

Temperature 101.5° F. Pulse rate 90.

Evening. Temperature 104° Pulse 96.

Oct. 21st Morning. Patient for the first time has had a good night's rest. Diarrhoea still continues, the patient having had three motions since yesterday evening. Pain in the limbs almost gone. The patient feels very much better.

Temperature 101° F. Pulse 90.

Evening. Improvement continues. Temperature 103.5. Pulse 94.

Oct. 22nd. Morning. Patient has again had a good night's rest. He is quite free from pain and 'feels comfortable'. The bowels have not moved since yesterday morning.

Temperature 100.4 Pulse 84.

Evening. Temperature 101.5 Pulse 90.

Oct. 23rd. Morning. Temperature 100.2 Pulse 88.

Improvement continues.

Evening. Temperature 100.9 Pulse 92. Bowels have not moved for two days.

Oct. 24th. Morning. Temperature normal. Pulse 80. Tongue very much cleaner.

Evening. Slight rise of temperature to a little above 100° F. Pulse 96. One motion, which was formed, was passed during the day.

From this time, the temperature never rose above normal, and convalescence was gradually established.

The complete return to health, however, took place very slowly and was marked by occasional slight headaches, especially towards evening, though there was never at any time any febrile disturbance.

When this patient took ill, one of his children was suffering from Influenza, and during his illness two other people in the same house contracted this disease. In all these three other cases, the course of the disease was typical, and in none of them was there the least doubt as regards the diagnosis.

The symptoms in the above case suggested at first Enteric fever to my mind, but this, I excluded for the following reasons:-

(1) The onset was sudden if we exclude the previous feeling of being out of sorts, which was of some weeks duration and I considered that, if this had been the insidious onset of Enteric fever, the disease would have developed sooner.

(2) The stools were not of a typical typhoid character and, excepting the first two, not of a markedly offensive odour. The abdominal pain and tenderness also was not localised to any particular spot, but was felt all over the abdomen.

(3) There was an absence of any eruption, which was carefully looked for on the seventh day and after.

(4) The spleen was not enlarged.

(5) The shortness of the attack.

The presence of influenza in the house at the time of onset of the illness, with the subsequent occurrence of two other cases, incline me to the belief that this was a case of influenza presenting peculiar symptoms.

The similarity, however, of the symptoms to those of Enteric fever was very marked and this is my excuse for including the case here.

Typhus fever may be confounded with Enteric fever, and, though, being a comparatively rare disease, it is unlikely to

be met with, in this country, I think, from its extremely infectious nature, it is always well to early exclude this disease in making a diagnosis of Enteric Fever.

I consider that, in all probability, where mistakes have been made, they have been most likely due to the great rarity of typhus leading to the possibility of its occurrence not being thought of.

The sudden onset, the different character of the rash, the early occurrence of delirium and the frequent constipation are the points to be considered in making the diagnosis.

With regard to the diagnosis of Enteric fever, it is a point worth remembering that in this country fever continuing for some time without any local cause, sufficient to account for it, is most likely to be either Enteric fever, or of tubercular origin.

When Enteric fever is suspected, an attempt may be made to confirm the diagnosis by one of the following methods.

(1) By the discovery of the bacillus in, either the blood, stools, or urine. When this can be done the diagnosis is of course absolutely conclusive. Even in the hands of competent observers, however, this method, as a test, usually gives unsatisfactory results, and, for ordinary use, is absolutely worthless.

(2) Widal's reaction. This is easy of application and is, I think, far too little taken advantage of, in this country, to clear up the diagnosis in cases of a doubtful character.

It depends on the fact that, when serum or blood from an Enteric fever patient is added to a young culture of the typhoid bacillus and a hanging drop of the mixture made, it will be found that, within a certain time, the bacilli lose their motility and collect in clumps. This test should be applied in every case as soon as Enteric fever is suspected.

The only source of fallacy is due to the fact that blood

from patients who have recently had the disease, or who have been inoculated with Wright's vaccine, gives a positive reaction even when the disease is not present.

(3) Ehrlich's test. A freshly prepared test solution made up as follows :-

A concentrated aqueous solution of Sulphanilic Acid 200 c.c

Pure nitric acid 10 c.c.

Solution of pure nitrite of Sodium ($\frac{1}{2}$ per cent) 6 c.c.

should be added to an equal quantity of urine, made strongly alkaline with ammonia, and, if the urine be from a case of Enteric fever, the mixture should assume a red colour and, after standing from twelve to twenty four hours, deposit a sediment, the upper layer of which should be of a light or dark green or of a violet black colour.

This test, also called the Diazo Reaction, though very marked in many cases of Enteric fever, has been obtained in a greater or less degree in some other diseases especially acute tuberculosis.

PROGNOSIS. In Enteric fever, the prognosis is always uncertain, since even the mildest cases frequently go wrong, whilst those, in which the chance of recovery seems almost infinitesimal sometimes get well.

The gravity of the disease seems to vary in different epidemics, the mortality being variously stated at from 5 to 20 per cent.

In warfare, the general mortality is of necessity high from the unfavourable circumstances under which the disease has often to be treated.

The prognosis depends, of course, on the severity of the disease, the occurrence of complications, and the previous history of the patient.

It may be taken as a rule that, the greater the rapidity of the pulse, and the higher the temperature, the more serious

is the prognosis. This is more particularly the case when the pulse is not only rapid, but exhibits a tendency to a gradual progressive increase in the rapidity.

A feeble and irregular action of the heart is of unfavourable import.

A very guarded prognosis should be made, when there is extreme tympanitis, as this, in addition to being a general indication of the gravity of the case, exerts of itself, by impeding the Cardiac action, an unfavourable effect on the course of the disease.

The prognosis is necessarily worse in complicated than in uncomplicated cases, and will depend, as regards its gravity, under these circumstances, upon the severity and number of the complications.

Perforation, followed by peritonitis, is almost always fatal.

Haemorrhage, apart from its being a not uncommon cause of death, is of unfavourable import, since it often leads to anaemia, and, in this way, weakens the patient's powers of resistance, and prolongs convalescence.

Complications, occurring during the period of convalescence, of course, always delay the return to health, and may lead to permanent effects. Thus, deafness frequently follows otorrhoea. Femoral embolism is not as a rule a dangerous complication, and is usually followed by complete recovery.

TREATMENT. Though, at present, there is no treatment of Enteric fever, which, in the strict sense of the word, could be called Specific, I believe that, by the employment of antipyretics, together with careful attention to intestinal Antisepsis, the course of the disease is somewhat modified, and its severity diminished.

Careful nursing, rest, and attention to the diet, together with the use of Antipyretics, and Intestinal antiseptics, are therefore in my opinion the principal indications for treatment. In addition, the occurrence of prominent symptoms will have to be met by appropriate remedies, and complications treated as they arise.

Nursing. In no disease, more than in this, is it necessary that the physician and nurse should work hand in hand and a nurse, in whom the physician has absolute confidence, is almost a necessity for the carrying out of the treatment.

Directions for treatment, given by the physician, should always be written out so as to obviate any chance of them being misunderstood, and in making out these directions, it is well, especially when the nurse has been trained by another physician, to leave her a certain amount of latitude in carrying out the details.

Though I would strongly deprecate any attempt on the part of the nurse to arrogate to herself the right of objection to any instructions which might not fit in with her own ideas on the subject, I think it is always well to bear in mind that most experienced nurses have preconceived notions with regard to the nursing of such cases, and I believe it is always better, when possible, to make the nursing instructions, to some extent, fit in with these ideas, rather than let any unnecessary and autocratic over-riding of them lead to misunderstanding and ill-feeling.

Moreover, the intelligent co-operation of the nurse in a case such as this, cannot possibly be obtained, if, by a multiplicity of directions, an attempt is made to convert her into a mere machine.

"Autre pays, autre moeurs" applies to hospitals as well as countries and, though one may prefer to have the nursing carried out according to one's own approved routine, it is well to remember that "there are more roads than one to Delhi".

I think therefore that it is always better to give the nurse a general idea of the principles, on which it is wished that the nursing should be carried out, and leave it to her to carry out the details rather than to lead, by injudicious interference, to a feeling of antagonism, which will be almost certain to handicap the physician in his treatment.

This conference of some freedom in working out the details of the nursing can, of course, only be applied to nurses who are experienced in attending Enteric fever cases. If the nurse should not have had any special training in looking after such cases, the instructions will require to be much more detailed.

One point, about which it is wise that the physician should always satisfy himself, is that the nurse has some general idea of the symptoms which would indicate the occurrence of haemorrhage, and it ought to be impressed upon her, that she must at once summon medical aid, as soon as these symptoms appear, without delaying until blood has been actually passed. She should be instructed, also, that, whilst awaiting the arrival of the physician, the patient should be kept as quiet as possible, and stimulants on no account given.

If a milk diet is being given, the nurse should be instructed particularly to take note of any particles of undigested curdled milk, which she may notice in the motions and to, at once, inform the medical attendant, if this should occur.

For the sake of cleanliness, and to prevent the formation of bed sores, as well as to obviate the danger of infection of those in attendance, it is important that all soiled linen

should be removed at once; and the physician, himself, should always make a point of seeing that this is done.

It should, also, be seen that the position of the patient is altered occasionally, during the day, both to avoid the formation of bed sores and to prevent hypostatic congestion of the lungs, and pneumonia, which will otherwise, almost certainly, occur.

It will be found, even in private practice, of great advantage in the care and treatment of this disease, to use a temperature chart on which are noted the morning and evening temperatures, together with the pulse and respiration rates and the number of stools 'per diem'.

Such a chart will show, at a glance, how the disease is progressing and the effect of the treatment can be more accurately gauged in this way than if no such record be kept. When the disease is at its height, I always like to have, in addition, records of the temperature taken every three hours, so that, if the pyrexia should become too great, some means may be taken for its relief.

These latter records of temperature, I have marked on another chart, or they may be merely noted in the nurses note book, as they are only required from day to day, and need not be kept.

Absolute rest is essential in the treatment of this disease, and the patient should on no account be allowed to exert himself in any way.

A bed pan must always be used when he wishes to pass his motions, and, under no circumstances, should he be allowed to sit up in bed.

When a change of position is desirable, the patient should be lifted over, and not allowed to turn himself.

Any effort likely to throw a strain on the already weakened

intestinal wall may lead to perforation, the most serious complication of this disease; and I have seen one case of fatal syncope in a patient who attempted to sit up to use a bed pan.

Diet. The food given should be easily digested, and administered in some fluid form, in small quantities, and at frequent intervals.

A purely milk diet is the one usually employed, but my experience is that milk, in an unprepared form, is by no means an ideal food.

One of the great difficulties I have found in the use of a purely milk diet is the loathing which the patient acquires, after a time, for even the sight of milk.

Of this, I can speak from personal experience, as I was unfortunate enough to contract Enteric Fever in South Africa, and I remember with what disgust I used to look forward to the administration of my hourly dole of milk. Even to this day my distaste for milk remains.

In numerous necropsies on patients who have died from Enteric fever, in which milk had been the diet employed, I have been greatly struck by the condition of the contents of the alimentary canal in many of these cases. It is not at all uncommon to find masses of curdled and undigested milk, sometimes of considerable size, in the stomach and intestines; and, when the milk forms these masses, it must of necessity be as deleterious as a solid diet would be.

If the milk be predigested, this will obviate the danger of these masses being formed and, in several cases, I have employed a diet of milk, previously treated with Benger's Liquor Pancreaticus, with good results. The distaste, however, which a patient shows to milk so prepared, is a great drawback to its use.

If the milk be diluted with soda water, there is less chance of it curdling in large masses, but such dilution necessitates the ingestion of large quantities of unnecessary fluid.

Boiling the milk is said to do away with this risk, but I have seen cases in which it has not done so.

If milk be given, I think it is better to give too little than too much, and I consider the dictum 'that an Enteric fever patient cannot take too much milk' is not only an erroneous, but a dangerous principle to go upon.

I have, lately, to a large extent discarded a purely milk diet in the treatment of Enteric fever, depending more on beef-tea, Chicken broth, raw eggs, meat or Calf's foot jelly, and custards.

The raw eggs, I use, beaten up and mixed with the beef-tea or chicken-broth, which should be cold, adding a little brandy to aid digestion. As a change, milk may be occasionally substituted for the beef tea or chicken broth. The white of the egg should be beaten up into a stiff froth, then the yolk added, and the whole mixed with the beef-tea, chicken-broth, or milk.

A little meat or Calf's foot jelly, or an occasional custard, I do not think does any harm and is a welcome change to the patient.

I find that, by varying the diet in this way, the patient takes nourishment better, and has none of that distaste for his food which one, treated on a purely milk diet, shows.

I have not found such diet, when given in small quantities at a time and at frequent and regular intervals, to increase the diarrhoea, at least to any extent, sufficiently notable to contra-indicate its use.

I always add a little brandy to the food, even where stimulation is unnecessary, as I believe it aids digestion.

Dr. N. E. Norway, in the British Medical Journal of July 12th 1902, strongly recommends the administration of a peptonising mixture with the object of enabling the patient to digest the nourishment given.

He prescribes the following :-

Rj.

Essent. Pepsintiae (Armour)	℥ss - ℥i
Acid, Nitro-hydrochlor. dil.	m. X
Glycerini	m XX
Aquam	ad ℥ss
	M.

This is placed in half a tumblerful, or more, of water, with directions to be sipped or taken as desired to relieve thirst.

This quantity he recommends to be given at first every half hour, gradually lessening the frequency as the fever diminishes. This he uses with an ordinary milk diet.

Under such treatment, he claims that the temperature gradually falls, the pulse becomes slower, and the stools normal.

I have not had any opportunity of giving this treatment a trial, but I think the suggestion is an excellent one and is a step in the right direction, inasmuch as it is a recognition of the fact that the digestive powers, in Enteric fever, require more attention than is generally given to them.

Powdered 'Biltong', made into a paste with boiling water, is used as a diet in this disease by the Boer farmers.

"Biltong" is lean meat, cut into strips, and dried in the sun. This is powdered in a mortar and mixed with boiling water as required, and small quantities of the paste given at frequent intervals.

Antipyretic Treatment. The symptom, which, on account of its prominence, most frequently calls for interference, is pyrexia, which, when excessive, may be reduced either by the external application of cold or by the exhibition of Antipyretic drugs. Since the higher the fever, the more probable is the occurrence of complications, and the graver the prognosis, it is of great importance that the rise of temperature should be controlled in some way, and, for this purpose, I find that the external application of cold gives much better results, than the administration of Antipyretic drugs.

For Antipyretic purposes, cold may be applied to the body in three ways, (1) by Cold Sponging, (2) by the graduated bath, and (3) by wet packing. Of these three methods, I have found cold sponging the most satisfactory.

In employing cold sponging, the room, without being overheated, should be warm, and screens should be placed round the patient's bed to obviate the danger of a chill from draughts. For the same reason, the whole body of the patient should not be uncovered at one time, but only that part which is being sponged.

Having first placed a waterproof sheet, with an ordinary linen sheet on top of it, under the patient, the blankets are removed leaving him covered with only his upper bed-sheet. Then, a small part of the body should be uncovered, and gently sponged for two or three minutes, dried with a soft towel, and again covered before proceeding to another part. In this way the whole body is gone over.

My usual practice is to begin by turning the patient over on his side and sponging his back. After this is dried he resumes the dorsal 'decubitus' and need not again be disturbed.

Then the front of his body and his limbs, one after the other, are gone over in the same way.

The sponging should be continued for fifteen to twenty minutes, and the effect is much greater if the water is ice cold.

The temperature should be taken every three hours, and whenever this exceeds 102.5° F or 103° F, the cold sponging should be repeated until it falls again.

The effect of the cold sponging, under these circumstances, is very pronounced. The patient experiences great relief, the delirium and headache are lessened, and the pulse becomes slower and stronger. Frequently, the patient falls into a sound sleep during the process.

The temperature usually falls about two degrees, the lowered temperature persisting for a variable time.

I have seen no ill effects, resulting from this cold sponging, which may be repeated as frequently as necessary.

One great advantage, sponging, as a means of applying cold externally, has over the other two, is that there is no great preparation required for this method, which can be carried out by the physician or nurse without assistance, and thus the trouble of 'getting ready', which so excites and worries the patient, when using the graduated bath or the wet pack, is avoided.

When a more marked action of External Cold is required, the graduated bath may be employed.

In this, the patient is placed in a bath at a temperature of 94° or 95° F, to begin with, the temperature being gradually reduced by the addition of cold water to about 70° F.

The bath should be placed ready at the side of the bed, and the patient lifted in on a sheet, and left in the bath for about a quarter of an hour. The exact length of time, however, will depend very much on the effect of the bath.

The results are similar to those of cold sponging, but are more marked and more permanent. When the temperature approximates to 104° or 105° F, cold sponging has not a sufficiently powerful effect to be of any great advantage, and it is in these cases, that the graduated bath is of incalculable service.

Its persistent use, however, is not advisable and, in cases, in which to bring down a high temperature, it has to be employed, initially, the effect should be kept up by subsequent sponging with cold water, and not by repetitions of the bath, unless absolutely necessary.

The worry and bustle, incident to undressing and re-dressing the patient, lifting him in, and out of bed, and drying him, together with the fact that assistance is required, are the disadvantages of this treatment and I am not at all sure but what the frequent use of the graduated bath is attended with some risk and that it is apt to conduce to congestion and inflammation of the lungs. I have seen a case, also, where it was followed by serious collapse.

Wet packing has been recommended for the reduction of the temperature in this disease. A sheet is wrung out of cold water and wrapped round the patient.

The application should be continued for about a quarter of an hour.

I have not found this method to have any advantages over cold sponging, and it is much more troublesome to the patient.

Drugs, as antipyretics, do not give in my experience as satisfactory results as may be obtained from the external application of cold, and, in ordinary practice, I do not think they are often required.

Cases occur, however, where, from the conditions under which the treatment has to be carried out, it is often difficult, and occasionally impossible, to employ any of the methods of reducing temperature by the application of cold to the surface, and under such circumstances we must of necessity fall back on drugs to control any excessive rise in temperature.

Thus, a soldier contracting this disease during warfare, if, with a 'flying column', may have to be carried about for

days before any favourable opportunity for transferring him to some stationary Hospital occurs. The constant movement, and the fact that, during this time, the patient is wearing his ordinary clothes, render Cold applications almost impossible, and it is under such circumstances that drugs are invaluable.

Of all the drugs which may be used to reduce fever, Antifebrin is, I think, the best. It may be given in doses of from two to five grains. It certainly reduces the temperature, and does not produce any tendency to collapse, or the profuse sweating, which most of the other antipyretic drugs cause.

Amongst other Antipyretics may be mentioned Quinine, Antipyrin, Salicine and Salicylic Acid, Resorcin, and Phenacetin

Quinine, to be of any use, must be exhibited in such large doses, that the disagreeable effects produced, more than counteract its good, and it is not a drug to be recommended as a rule, though, in those cases of a typho-malarial type occasionally met with in the tropics, its administration is of undoubted benefit, but this is probably not so much due to its antipyretic properties as to the action which quinine has on all diseases of a malarial type.

The profuse sweating, caused by Antipyrin, is the great objection to its use. It sometimes also causes vomiting, and in some cases its administration has been followed by slight collapse. It should, to produce its full effect, be given in a large dose (15 grains), and the dose repeated in an hour if necessary. It is not, however, a drug to be recommended.

Salicine and Salicylic Acid have not such a marked antipyretic action in Enteric Fever, as they have in Acute Rheumatism. Though, in the former disease, they sometimes greatly relieve the headache, they have no great effect in reducing the temperature.

Resorcin has, like antipyrin, the disadvantage of causing profuse perspiration. It seems, however, to somewhat diminish the offensive odour of the stools. It should be given in doses of 15-20 grains as required.

Phenacetin, in 5-10 grain doses, seems, next to Antifebrin, to be the best antipyretic medicine in this disease.

To sum up with regard to the antipyretic treatment of Enteric fever, I believe the control of the temperature is a most important point in the treatment of the disease, and that this control can be most satisfactorily effected by external applications of cold; that cold sponging is the best form of applying cold, and is a sufficient antipyretic in the great majority of cases; that where a more powerful action is required, the graduated bath may be employed initially, and its effect kept up by cold sponging; and finally that, in a disease such as this, where the gastro-intestinal disturbance is so marked a feature, the less medicine given, I think, the better, but if necessary to employ drugs as antipyretics, of these, Antifebrin will be found to give the best results, and that next to it phenacetin is the most satisfactory.

Intestinal Antisepsis. In spite of the general opinion that the multiplication of Eberth's bacillus takes place elsewhere than in the lumen of the bowel, intestinal antisepsis seems to me to have undoubtedly a favourable effect on the course of the disease, and unquestionably reduces the tendency to tympanitis.

The drug which I have commonly used is Carbolic Acid, which I have given in doses of 1-2 grains thrice daily by the mouth. Whether its beneficial effect is due to a local action as it passes along the bowel, or to some remote effect after absorption into the blood, I do not know, but, in my experience, its administration has usually been followed by a diminution in the number of the stools, which were also of a less offensive

odour, and by an improvement in the condition generally.

Salol, in doses of 5-10 grains, has a similar effect in making the stools less offensive, but I do not think it is so serviceable as Carbolie Acid.

Symptomatic Treatment. - Prominent symptoms should be treated as required.

For severe persistent headache, the exhibition of Bromide of Potassium seems to give the best results. The Salicylates, when given as Antipyretics, in some cases, also, seem to have a beneficial effect on the headache, but possess no advantages over the Bromide.

Diarrhoea. - From a consideration of the beneficial results of intestinal antiseptics, in many cases, and from noticing how frequently the checking of diarrhoea is followed by a rise in the temperature, I am convinced that the bowel contents, in Enteric fever, are of a deleterious nature, and that moderate diarrhoea is more beneficial than otherwise. This applies, particularly, to the early stages of the illness, when the disease is in the process of evolution, and is accompanied by a retrograde metamorphosis of the tissues, the products of which add to the general systemic depression and require to be eliminated.

I think it is quite as 'bad medicine' to unnecessarily restrain the diarrhoea in this disease, as it would be 'bad surgery' not to drain a large abscess, and injudicious attempts to control this symptom often, I am convinced, lead to unfavourable results.

Any attempt to diminish the number of stools 'per diem', by merely preventing their extrusion, will lead to flatulence and distension of the bowel, from fermentation of the retained alkaline faeces, which is prone to decomposition and gaseous evolution, and if we take into consideration the condition of

the intestine, any undue expansion of its weakened and diseased coats cannot be viewed with equanimity. Again, this faeces is loaded with the bacillus causing the disease, and it seems to me that for this latter, if for no other, reason its retention is contra-indicated.

It is an important point, therefore, for consideration with regard to the treatment, when, and in what manner, efforts to limit the diarrhoea should be made.

I do not consider four or even five stools, daily, excessive or calling for any interference, but when the number much exceeds this, the diarrhoea will tend to exhaust the system by draining away salts, nutritive material, and fluids, and, under these circumstances, some means must then be adopted to restrain it.

In this disease the diarrhoea is mainly due to the catarrhal inflammation of the mucous membrane of the bowel, and I think our efforts should be directed towards attempting to control the intestinal flux more by allaying the cause and thus lessening the formation of the stools, than by a mere prevention of their expulsion.

Bismuth meets the above requirements better than any other drug and is an invaluable remedy for this purpose. By its direct sedative action on the inflamed mucous membrane, it produces a marked beneficial effect in nearly every case. It should be given in doses of 20 grains of either the carbonate or subnitrate, together with one or two drops of Ol. Anisi, or other Aromatic oil.

If there is any pain, a little Opium may be combined with advantage.

In some cases, where the diarrhoea is so great as to necessitate its arrest at all costs, some powerful astringent may have to be given, but, as a rule, I think intestinal astringents are of questionable benefit in this

disease, and that more satisfactory results are to be obtained by the use of drugs having a local sedative action. Intestinal Antiseptics, by lessening putrefaction and fermentation, and thus preventing the formation of irritant products, diminish the diarrhoea, and, when these are employed, the probability of this symptom requiring special treatment is very much reduced.

In conclusion my tendency is not to interfere with the diarrhoea, unless it is so excessive as to constitute a serious drain on the system, and, when interference is advisable, to use those drugs which have a local sedative, rather than an astringent, action.

Constipation. The same considerations, as induce me to be chary of interfering with a moderate diarrhoea in Enteric fever, incline me to the view, that constipation is a symptom calling for immediate relief. I can see no necessity for allowing this condition to exist, as is often done, for four or five days before taking steps to rectify it and it is my practice, when this symptom is present, never to let more than two days pass without taking some action for its relief.

At the beginning, before ulceration has occurred, ordinary laxatives may often be used with advantage, and in the initial constipation which is so frequently present, castor oil is a most valuable remedy.

After the disease has become established, however, and ulceration has occurred, purgatives are contra-indicated from the risk there is of perforation following their use.

We must then fall back on enemata, and a simple enema of soap and water constitutes a safe and efficacious method of relieving this condition.

Tympanitis - Excessive distension of the abdomen is a condition which calls for immediate relief, since not only may it lead to perforation, through the distended and diseased walls of the intestine giving way, but, also from its interference with an already enfeebled heart, it is apt to give rise to cardiac failure.

As, once this condition has occurred, treatment does not give very satisfactory results, our efforts should be directed more towards preventing it.

The distension being due to decomposition of the intestinal contents leading to the evolution of gas, everything, which will tend to prevent this decomposition taking place, will diminish the chance of its occurrence, and with this object intestinal antiseptics are invaluable as preventatives.

In the actual treatment of this condition, external applications to the abdomen are not, in my experience, of much real benefit, though hot fomentations to some extent relieve the discomfort.

The application to the abdomen of cold in the form of pounded ice between two pieces of flannel, as recommended by Dr. Cayley is not, I think, of much benefit.

The best results, I have obtained from the use of turpentine enemata, and in cases where the distension is not markedly excessive these will be usually found to answer well.

Should the accumulation of gas, however, be very great, the only satisfactory method of treatment consists in the careful introduction of a long tube through which the gas is allowed to escape.

Nothing, however, in many cases, seems to be of any great service.

Bedsores - Every effort should be made to avoid the occurrence of these, by frequently changing the position of the patient, and by prompt attention to any threatened portions of skin. The slightest tenderness, therefore, should be immediately attended to.

Equal parts of Olive oil and Brandy, rubbed with the palm of the hand over the tender spot, are of great use in rendering the skin tough and not so sensitive. Painting the threatened point with Flexile Collodion, or covering it with "Papier Fayard" will be found most excellent means for preventing the formation of bedsores.

A water-pillow under the patient's pelvis forms a useful adjunct to either of the above methods of treatment.

When, however, the skin has given way, the sore should be dressed with lint, dipped in Carbolic Oil and covered with a pad of cotton wool; or a thick linseed poultice may be sprinkled with Iodoform and applied to the sore.

When the sloughs have separated, Unguentum Resinae, or other stimulating dressing, should be used.

Alcoholic Stimulants. - Enteric fever being a disease of a markedly Asthenic type with impairment of the cardiac and cerebral functions, alcohol will be found an invaluable remedy, from its stimulating effect on these functions, and though mild and moderate cases of the disease often do well without it, in the severer forms, alcohol will be found almost indispensable, in a great many cases.

The indications for its exhibition are great prostration, or much feebleness of the heart and pulse. It is also often of great service in those cases with low muttering delirium, and it should as a rule be given freely, if pulmonary complications are present.

When its administration is followed by increased strength of the pulse, diminution of the prostration and delirium, with less dryness of the tongue and more natural sleep, it is doing good, and should be continued, as long as beneficial results follow.

On the other hand, should the first few doses be followed by an increase in the fever and nervous symptoms, its use is contra-indicated, and it should at once be withheld.

No hard and fast rules, with regard to the administration of alcohol in this disease, can be laid down, each case having to be considered on its own merits. As a stimulant, however, it should be given, only, when the conditions are such as to indicate its use & when its exhibition is followed by a beneficial result; and should be discontinued as soon as the necessity for its administration ceases. It should never be given needlessly, or when it does not produce the effect desired. A continuous use of Alcohol is in most cases unnecessary, and, in some, may even be harmful.

Again, as a rule, the administration of alcohol is not to be recommended before the end of the first week, as stimulants, in the beginning of the disease, are of doubtful benefit. If the patient, however, has been a hard drinker alcohol will be required from the very first.

If a rapid action is required the alcohol may be given alone and concentrated; if a more sustained influence is what we are aiming at it should be taken with the food and in a diluted form.

Previous intemperance considerably modifies the action of alcohol and the most marked results are obtained in cases where there has been prior abstinence.

Brandy, is, I think the best form in which to administer alcohol but, if there is much sickness, champagne may be

substituted with advantage.

With regard to the dose, no strict rule can be laid down as it will depend very much on the effect produced. I believe, however, that, having determined upon the use of alcohol, it is a mistake to give it in too small doses.

I usually begin with half an ounce of brandy every two hours, perhaps increasing this dose if well borne. In serious cases, or in those habituated to its use, this amount may have to be even doubled.

Small quantities of Brandy, not sufficient to cause stimulation, added to the food, aid digestion and I believe might be given in every case with advantage.

TREATMENT OF COMPLICATIONS :

Haemorrhage from the bowel, occurring during the early stages of the disease, being merely due to the intense congestion of the mucous membrane, is not usually of any great moment and, in most cases, calls for no special treatment. The haemorrhage of the later stages, however, occurring, as it does, chiefly in connection with the separation of the sloughs or from the erosion of some vessel in the floor of an ulcer is always a source of anxiety and this is more particularly so when it is accompanied by symptoms of collapse.

The prompt exhibition of some form of styptic medicine, with absolute mental and bodily rest, are the indications for treatment.

Acetate of Lead, Tannic Acid, Ergot, Turpentine have all been recommended and of all these I think turpentine gives the best results.

I usually prescribe it in the following mixture :-

Rj

Ol. Terebinth	℥iv
Pulv. Gum. Acac	℥iiss
Syrup. Aurant	℥i
Mist Amygdalae ad	℥vi M

Sig ℥ss. every hour.

This may be combined with the administration of opium 'per rectum', or Morphia, hypodermically, together with hypodermic injections of Ergotine

Peritonitis, with which may be considered its almost invariable cause, perforation is a most serious complication, and its occurrence reduces the chances of recovery to a minimum. Perforation, being due to the yielding of the floor of an ulcer, may occur at any time from the onset of the ulcer to its final cicatrization.

The possibility of the occurrence of this complication must, therefore, be borne in mind in the treatment, during the whole course of the fever, after the first week or ten days, and at the beginning of convalescence

During this period, steps should be taken to minimize the risk by avoiding anything which might be likely to act as an exciting cause

Exertion, straining at stool, Tympanitic distension of the bowel, immoderate peristalsis, want of care in abdominal palpation, are all circumstances which, by throwing a strain on an already weakened and diseased intestinal wall, may easily cause it to give way.

By directing our efforts, therefore, towards avoiding such exciting causes, we will do much to minimize the danger of the occurrence of this complication

If perforation should occur, however, attempts to arrest the intestinal movements with the object of securing a local rest, to allow of adhesions forming, and to diminish

the chance of escape of the bowel contents, will be the indication for medicinal treatment.

For this purpose opium must be given in large doses.

The medicinal treatment, however of this complication, is not satisfactory, and I think that surgical interference is urgently called for in every case.

The number of reported cases of operation, for perforation in Enteric fever, is not large enough to furnish sufficient data, on which to base an opinion as to the probable success of surgical interference in these cases, but, though I have no actual experience of the operative treatment of ruptured typhoid ulcer, I am convinced that it is the only rational method to adopt and the one which will probably be found to give the greatest chance of saving the patient.

PULMONARY COMPLICATIONS. should be met by appropriate treatment. For their avoidance the patient should be protected from draughts, and kept in a room at an equable temperature. A low form of pneumonia (hypostatic) is apt to occur if, from carelessness or want of knowledge on the part of the nurse, the position of the patient is not frequently changed. The physician should therefore satisfy himself that during each day this is occasionally done.

If any of the other complications or sequelae of Enteric fever occur, these must be combated by the employment of the necessary treatment, always remembering, however, that, where possible, it is better to prevent than to cure.

Care during Convalescence - After the temperature has reached normal, and the patient is on the road to recovery great care must still be exercised.

Relapses are, in a great number of cases I am convinced, due to the too early employment of solid food.

Dietetic indiscretions, it must also be remembered, may in the early stages of convalescence, even lead to a fatal result, by causing perforation of the, as yet, unhealed ulcers.

Patients, on recovery from Enteric fever, often exhibit a voracious appetite and it is almost impossible to persuade them to continue their previous diet.

I believe, however, that no change in the food should be made, until there has been at least a fortnight of Apyrexia, and that even then caution, in the dietary is still necessary.

During convalescence, nutritious food and tonics are indicated.

It is important that the food should be easily digestible, as, apart from the danger of an indigestible diet leading to perforation, which, it is stated, has occurred as late as three months from the termination of the disease, the action of the bowels is easily deranged for some time after recovery from enteric fever.

Of Tonics a combination of iron with one of the vegetable tonics, I have found of the greatest benefit.

The following prescription is the one I employ

Rj.

Tinct. Ferri perchlor ℥ss

Tinct. Calumbæ ℥ii

Glycerini ℥i

Aquam ad ℥vi

M.

Sig. a dessert spoonful thrice daily in a little water after food.

Easton's syrup is also a most valuable tonic, and is to be recommended in some cases.

In malarial subjects, Arsenic, I find, is a better tonic than iron.

The following combination is a most excellent one;

Rj.

Liq. Arsenicalis	℥i
Tinct. Nuc. Vom	℥iii
Tinct Cinchonae Co	℥i
Infus. Cascarillae ad	℥viii

M.

Sig: ℥ss thrice daily after food.

Change of air, or a sea voyage when these are possible materially aid recovery.

For at least six months, after an attack of enteric fever, I think the patient should avoid any great muscular exertion, since in this disease there is a tendency to degeneration of all the muscular elements of the body, to which the cardiac muscle is no exception.

Any great effort, therefore, when the heart muscle is in this weakened and relaxed state might lead to more or less permanent ill effects.

At the beginning of the South African War, it was the custom to send home all Enteric Convalescents no matter how well they seemed, but, in the later stages of the campaign, this was not so.

Enteric convalescents were then often discharged from hospital to 'light duty' at the 'base', and, as men were required 'for the front', drafts, from these convalescent camps were sent to join their regiments.

Though no man who did not seem 'fit' was returned to his regiment in this way, many of those returned, in a short time had to be re-admitted into hospital being quite unfit for service.

Palpitation was the symptom most frequently complained of, and, in some of these cases, I have seen a slight oedema

of the ankles follow a heavy day's march.

Rest for a month or two longer was always followed by a complete disappearance of the symptoms.

Owing, also, to the danger of pulmonary troubles or tuberculosis supervening, the avoidance of exposure, especially whilst in a fatigued condition is, for some time after recovery from enteric fever, very necessary; and a too early exposure of the soldier to the fatigues and hardships of a life in the field is greatly to be deprecated.

In conclusion, with regard to the care and treatment of enteric fever "attention to little things" should ever be our motto.

There is no specific for this disease, nor yet any routine treatment. Each case must therefore be treated on its merits and it is only by constant great care and attention to details that one can look for success in the treatment of Enteric Fever.
