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THE GENERAL TREATMENT OF ENTERIC FEVER.

T H E S I S

Presented for the Degree of M.D.

by

Claude Buchanan Ker, M.B.,

April 30th, 1896.



"La Thérapeutique, comme les autres parties de la science, doit tout attendre de l'observation."

Louis.

SYNOPSIS.

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I N T R O D U C T I O N .

The experience, on which this thesis is based, is limited to about 500 cases of Enteric Fever, seen chiefly at the Edinburgh City Hospital during the past five years. The writer, however, has limited his statistics to the cases treated at the City Hospital during the past 12 months. These are 184 in number and have been treated either on antiseptic or expectant-symptomatic principles. The main object of the writer's work has been to compare these two methods of treatment, and as regards the former to see how far antiseptics is practicable in the treatment of Enteric Fever. With this in view he has tried a considerable number of antiseptic drugs, and, thanks to the extraordinary kindness of Dr Muirhead, has been in most cases permitted to settle in what manner cases admitted to the Hospital were to be treated. Notes were daily made of all the cases, and special attention was paid to the condition of the tongue, the odour of the stools, and the occur-

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rence or persistence of tympanites. The writer has also done his best to determine whether the duration of the fever was in any way affected by the treatment.

It is impossible to expect very reliable results, considering the small number of cases classified. They have the advantage however of being consecutive cases treated under similar conditions. They were subjected to different forms of treatment, and thus may be said to have acted as control cases to each other. But anyone who has seen much Enteric Fever is well aware that its mortality varies in such a marked manner at different periods, that it is exceedingly unsafe to dogmatize on the results of any statistics based on such a small number of cases. The writer is aware that his very limited experience of some drugs, as for instance Thymol, can only give the barest indication of their qualities.

With a view of making this thesis as complete as possible, the results of other observers with other remedies have been briefly summarized. For

the purposes of comparison, also, the writer has included a chapter on Antipyresis both by drugs and by refrigeration.

Serotherapy is at present so much before the profession that no account of the treatment of Enteric Fever would be complete without some allusion to the experiments made in this direction. The writer has treated one case with serum but obtained negative results.

Finally the writer would remark that he has limited himself entirely to the question of General Treatment. The Treatment of Complications has not been touched upon except incidentally.

Many of these cases will appear to have been treated without much system. This is due to the fact that, when a complication becomes alarming, it may be necessary to intermit the systematic treatment, however unscientific such a proceeding may be. Louis, in the introductory remarks to his chapter on Treatment, points out this as one of the great difficulties of estimating the value of a new therapeutic

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remedy. 'In a serious disease' he says 'where there is always a risk in trying a new treatment, we cannot remain mere spectators.' On the contrary we have to fall back upon what we know is likely to save life, however anxious we may be to see if the drug, which is being used, will ultimately benefit the patient.

CHAPTER I.

History of the Treatment of
Enteric Fever.

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History of the Treatment of Enteric Fever.

Enteric Fever has been only recognised as a distinct specific disease so comparatively recently that the History of its treatment is practically that of all acute fevers. The ancients, however, were acquainted with cases which the researches of Murchison have established as true Enteric. That author has in many instances noted the treatment advised by the physicians of former days. Thus Spigelius in 1624 recommended copious venesection, antimony, warm fomentations and clysters. Sydenham in 1685 also recommended venesection and emetics at the commencement of the Fever, enemata of milk and sugar, opium to check diarrhoea, and wine when the fever assumed a hectic character. He also noted that purgatives were always injurious. This latter observation is fully in accordance with the views of Baglivi (1696) who wrote 'Fuge Purgantia tanquam pestem.' This writer trusted to moderate venesection, baths, warm fomentations to the abdomen, and, above all, patience. Strother in 1727 considered bleeding 'an adequate

cure.' Langrish and Manningham, however, writing shortly after, condemn venesection entirely. Towards the end of the eighteenth century Currie applied his system of Affusion both to Typhus and Enteric.

Before considering the treatment recommended by the authorities in the early part of the nineteenth century, it will be well to notice the general treatment of fever as practised by their predecessors. Starvation of fevers seems to have been, as a rule, considered the best method of cure. Alcoholic remedies were in the Middle Ages generally condemned. Boccaccio in the Conclusion to his Decameron is obviously stating the accepted opinion of the physicians of his time when he says 'Who knows not that wine, which all men find pleasant and salutary (at least so say the good drinkers of our times,), may be most pernicious to one sick of a fever?' From what has been said above we recognise that a lowering treatment was the ideal one, all the early writers coinciding in advising the use of venesection. The immortal Dr Sangrado of Le Sage, who has been identi-

fied by commentators as a Dr Hecquet of Paris, not only bled all his patients, those suffering from fevers included, but made them drink copious draughts of water. The latter treatment would probably benefit his enteric patients more than the former and indeed has a distinguished advocate in the person of Dr Débove of Paris at the present time.

We may also assume that very large quantities of drugs, some of them no doubt of a very nauseous character and of a positively deleterious influence, were administered to those unfortunate enough to suffer from any continued fever. Dr Osler, in his interesting article in the Lancet of this year, quotes the following passage from Thomas Dover, famed in his own day as a buccaneer and in ours as the originator of the powders now known by his name. 'I must confess 'I could never bring an apothecaries bill to three 'pounds in a fever; whereas I have known some of 'their bills amount to forty, fifty and sixty pounds.' We may well wonder whether patients so drenched with drugs survived. While sympathizing with Dover, there

is room for speculation whether this sudden prick of his conscience, which does not appear to have troubled him at the sacking of Guaiaquil, was not rather due to an inveterate objection to apothecaries than to any tenderness for his patients. He certainly was not afraid of using his own powder freely, as he says he had given it in doses up to one hundred grains.

At the beginning of this century, to judge from the classical work of Louis, enteric fever was treated mainly by bleeding, tonics, and blisters, with the occasional application of ice to the head. Louis goes with extraordinary minuteness into the therapeutic effects of these agents on his own cases, and while admitting the risk of laying too much stress on results obtained from the observation of small numbers of patients, he arrives at the following conclusions. Bleeding is useful if employed in the first ten days of the fever. It has no immediate effect on the symptoms, but may shorten the course of the disease by two or three days, and probably has saved

life in certain cases. It should not be practised more than twice, about 10 to 12 ounces being removed on each occasion. Venesection he considers to be preferable to local depletion by leeches or cupping. In any case bleeding is injurious if practised after the first fortnight of the disease. We may observe here that it is quite comprehensible that a moderate abstraction of blood might benefit patients in the early stages of the fever, as it is largely at that period that nature relieves them by epistaxis or by congestive haemorrhage from the bowel.

Louis is satisfied that a tonic treatment can exercise a favourable influence on the duration of the disease. He thinks it probable that it can also save life. The tonics he employed seem mainly to have been preparations of cinchona. As regards blisters he utterly condemns their use, after employing them to a considerable extent in the series of cases which he reports. Neither did they, nor ice to the head, do anything to relieve delirium, which he had considered the chief indication for their employment.

While maintaining a disappointing silence on the great question of diet this author is strongly convinced of the value of fluids in large quantities. He also advocates copious enemata, 'véritables fomentations intérieures,' and a cool room. He is silent on the question of purgation. Most of his own cases had diarrhoea, and he seems to have trusted to enemata in those which were the reverse. He winds up an exceedingly careful exposition of the treatment of his time by confessing its obvious imperfection and prophesying a more satisfactory method for the future.

The writer has stated the views of Louis at some length, because his work was undoubtedly the best on the subject in the early part of this century. No one who has read it will deny that we owe a debt of gratitude to its author, although we may regard with mixed feelings the somewhat unfortunate name of 'Typhoid' which he has bequeathed to the profession, and which it will probably take another century to eradicate.

Leaving Louis and his times we come to more

modern writers, whose work will be mentioned with reference to the various treatments they originated, which will be subsequently discussed at more length.

CHAPTER II.

Management and Diet of Enteric Fever.

Section I. Management.

Section II. Diet.

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Management and Diet of Enteric Fever.

Section I. Management.

Complete rest is the primary requisite for an Enteric patient. The less he is moved the better. It is of course necessary to send many cases to Hospital, as they cannot obtain the nursing which they require at home, but it is probable that the deathrate of cases which are not moved is less than that of those which are. The patient may doubtless be moved without appreciable risk during the first ten days of the disease. During the third week, however, when ulceration becomes a factor to be considered, only very bad surroundings can justify removal. Many cases arrive at the City Hospital very prostrate, some even have haemorrhage in transit, and a certain proportion of very severe cases can be said never to rally from the additional exhaustion caused by the drive. Dr Muirhead, however, has made an interesting inquiry into the distance travelled by a large number of patients, and has come to the conclusion that the

length of the drive makes no difference to the death-rate. The writer, fully admitting the correctness of this view which is based upon elaborate statistics, would be inclined to attribute a certain number of deaths annually to the fact that the cases were moved at all, irrespective of distance.

The ward in which the patient lies should naturally be well aired, and an open fireplace is an advantage even if hot pipes are used to warm the room. So far as possible the temperature should be kept low. There is no fear of a fever patient catching cold, and one observer, de Souza, keeps the room actually cold, with a view of decreasing the temperature of his patients. The objection to this is that any patient with a normal temperature may suffer. It is therefore a good plan to remove such patients so far as possible into convalescent wards kept at a more comfortable heat.

The bedclothes should be very light. The patient himself should be sponged twice daily with tepid water

containing a little vinegar or whisky. The usual indications for the nursing of any acute disease should be carefully attended to.

Whether the patient is being treated antiseptically or not the condition of the mouth requires great care. At the City Hospital boroglycerine is used to smear over the tongue, and those patients who are too ill to do this for themselves have it done for them. In very foul conditions of the mouth our practice is to swab it out with listerine.

The condition of the bowels is naturally one of great interest. It is discussed more fully afterwards under the head of 'Antisepsis by Elimination.' The question of the use of bed-pans is a debated point. At the City Hospital, unless the patient is in a very low condition, it has always been the practice to use night-stools, and the medical superintendent has never seen an accident arising from this custom. If the patients are very prostrate, it is preferable to let them pass their evacuations into a sheet than use a bed-pan which is more likely

to cause dangerous straining owing to the unaccustomed position.

Section II. Diet.

All writers are agreed that no acute disease needs a more careful dietary than Enteric Fever. Many limit the food of the patient entirely to fluids, some entirely to milk.

The first point to remember is that the patient's strength must be maintained at any cost. The second is that the digestion of the patient is exceedingly deficient, and lastly we have to face the fact that partially digested foods may aggravate the ulcerated condition of the lower bowel and even cause a fatal termination. So, however anxious we may be to follow Graves' dictum and feed the fever, our power to do so is not a little restricted.

At the City Hospital the diet is liberal and farinaceous food is not forbidden. Lauder Brunton, however, believes that such food encourages the multiplication of the bacteria. But if the bowels are kept freely open this objection may be disregarded.

The patients, whose treatment will be discussed in the following chapters, had the following dietary. They had something every two hours, either milk half diluted with water or chicken tea. A tablespoonful of a very light custard pudding was given with milk at dinner time. Arrowroot or Benger's food, was given in the morning and evening. A large number of the patients had an egg or half an egg daily in the form of egg-flip. Beef tea was given if there was not excessive diarrhoea. The general rule was to give little at a time and feed often. Only in cases suffering from vomiting was the milk peptonized. In the presence of haemorrhage this diet was of course modified.

As regards drink the patients were encouraged to drink as much as possible. A cooling mixture of dilute hydrochloric acid and lemon syrup well diluted with water was very popular with most of them. The beef and chicken teas were made very salt to encourage drinking. Aerated waters were not used as they are apt to cause tympanites.

Stimulants were given sparingly. The indication usually followed by the writer is a faintness of the first sound of the heart as heard at the base.

The diet of Convalescence is one of the most interesting questions connected with the disease. When are we to give solid food? At the City Hospital Dr Muirhead's custom is to improve the diet as soon as the temperature is normal and, in certain cases, even before the evening temperature has reached the normal line. He usually starts with potato very finely mashed in meat gravy. Occasionally the temperature rises a little but very seldom. About three days later the patient is advanced to fish. The amount given is always exceedingly small at first.

In cases where the temperature fluctuates for several days at about the same level, and the period of the fever is after the 21st day, an improvement in the diet will often bring the temperature to normal. This may be called the fever of inanition and its only treatment is food. An example of the condition and its remedy is shown in Chart I, and is

only one of very many instances which may be seen in other charts in this volume.

This increase in the diet is against the views of many writers who would keep the patient on milk till he has had a normal temperature for a week. We have had no accidents resulting from early feeding, and convalescence is rendered shorter by it. As regards relapses, their cause is to be sought rather in the spleen than in the bowel, and feeding does not influence their frequency.

What are termed recrudescences, that is rises of temperature lasting from one to six or seven days, without the diagnostic symptoms of the original fever, may undoubtedly often be due to feeding. But if the bowels are kept freely open this risk is minimized. Constipation causes many more recrudescences than actual feeding.

CHAPTER III.

Expectant and Expectant-Symptomatic Treatment.

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Expectant and Expectant-Symptomatic Treatment.

Dujardin Beaumetz treats his cases by a method which he calls 'Armed Expectancy.' The patient is to be let alone if the temperature remains below 102°F . Salol and Salicylate of Bismuth are given as antiseptics. Saline aperients are administered every two days. If the temperature rises above the point mentioned he uses a sponge two or three times daily. If it exceeds 103° he gives 15 grains of Antipyrine every 4 hours in black coffee till the temperature falls below 100°F . He uses tonics as the pulse demands.

It is not with this method that the writer proposes to deal in this chapter. It appears to him that in such treatment the Armament is more noticeable than the Expectation. Such a treatment is both antipyretic and antiseptic.

On the other hand the purely Expectant position is untenable. To allow constipation, for instance to last a fortnight, without making an attempt to

move the bowels, or to allow meteorism to remain unrelieved is repugnant to modern therapeutics.

By the Expectant-Symptomatic Method, one which is very largely used in this country and has the approval of the highest authorities, the writer would imply the general support of the patient's strength to assist him in sustaining the attack of the germ, and the treatment of the complications as they arise.

Burney Yeo stigmatizes this treatment as agnostic. This is no doubt partly true, but, till we have more proof that there are remedies which directly attack the germ, it has a great deal to be said in its favour. It leaves a considerable amount of latitude to the physician, and therein differs from the method of Brand who objects to any modification of his system, whatever complications may arise.

We have now to determine what are complications. In the writer's opinion they are excessive diarrhoea, constipation, haemorrhage, meteorism, hyperpyrexia, respiratory conditions or peritonitis. Many others may of course arise but these are the most important

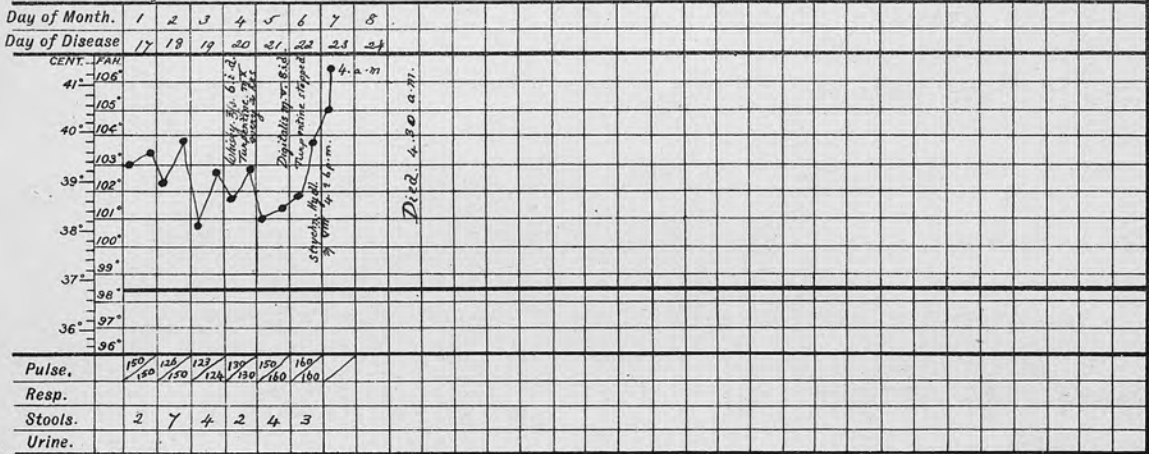
with which we have to deal. As we have said above, the primary indication of all is to sustain the strength, and by attention to this point we are always lessening the risk of heart failure.

It is obvious that no hard and fast rule can be laid down as to what is excessive diarrhoea, what is an undue amount of constipation, or what is hyperpyrexia. These will be defined differently by different physicians. The question of hyperpyrexia is fully discussed in the succeeding chapter. We may say here however that we seldom interfere with a temperature of under 105° at the City Hospital, and the cases to be mentioned as treated symptomatically had, except in a very few cases, no treatment directed against the temperature.

In all 51 cases were treated by this method of whom six died. While this is a higher proportion of deaths than under most of the other treatments used, it is misleading to lay too great a stress on the mere deathrate. The average age of the cases was $16\frac{1}{2}$ years. They were admitted on the 12th day, a day later on an average than those under other

Meteorism. Turpentine. Death.
 17th Day of Enteric. July. 1895.

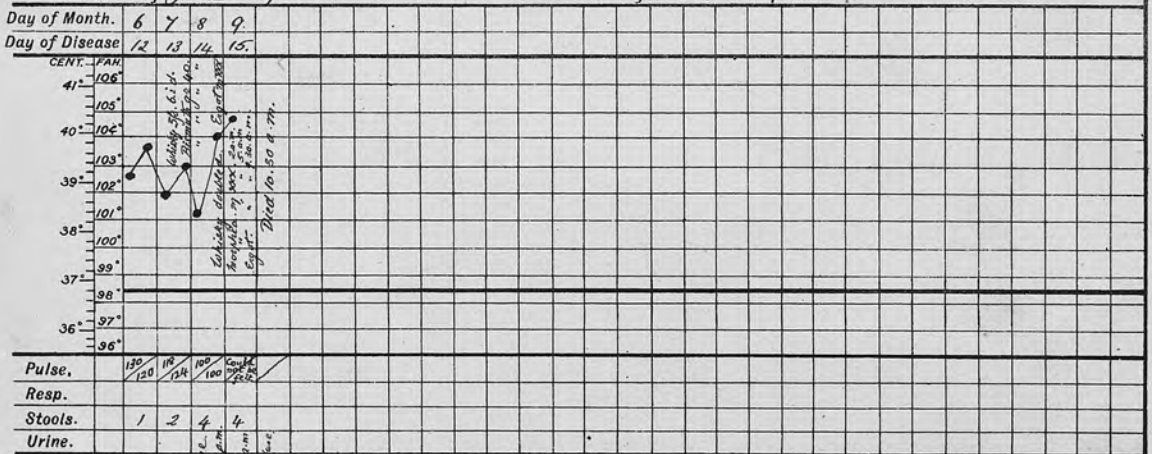
Records of Temperature, Pulse, Respiration, Stools and Urine, from
 In the case of *Charles Moir* Aged 26 Occupation



*Two fatal cases under
 expectant symptomatic
 treatment.*

No antiseptics. Haemorrhage. Death.
 12th Day of Enteric. July 1895.

Records of Temperature, Pulse, Respiration, Stools and Urine, from
 In the case of *John Simpson* Aged 35. Occupation



treatments. The fever lasted nearly 26 days, $2\frac{1}{2}$ less than the average of the Naphthol, and longer than that of the Calomel cases. The average day of discharge was four days earlier than that of the Naphthol cases..

As regards the conditions which the writer has classified as Complications for want of a better name, there were 4 haemorrhages, two of which were slight. Recrudescences occurred in 6 cases, and there were 5 relapses. It is only in the matter of deaths that there is much difference between the treatments, a most important difference undoubtedly.

If we consider the deaths, we find that three died of heart failure and toxæmia, one of perforation, one in convalescence from starvation and exhaustion, and one who also died late in the disease, on the 42nd day, was complicated with tuberculosis. Three were adults, ambulatory to the day of admission, which was in all three late, the 17th, 18th and 20th days respectively. The writer does not believe that any treatment would have saved them. The other three

Head symptoms. Death. Perforation
 8th Day of Enteric. Aug. 1895

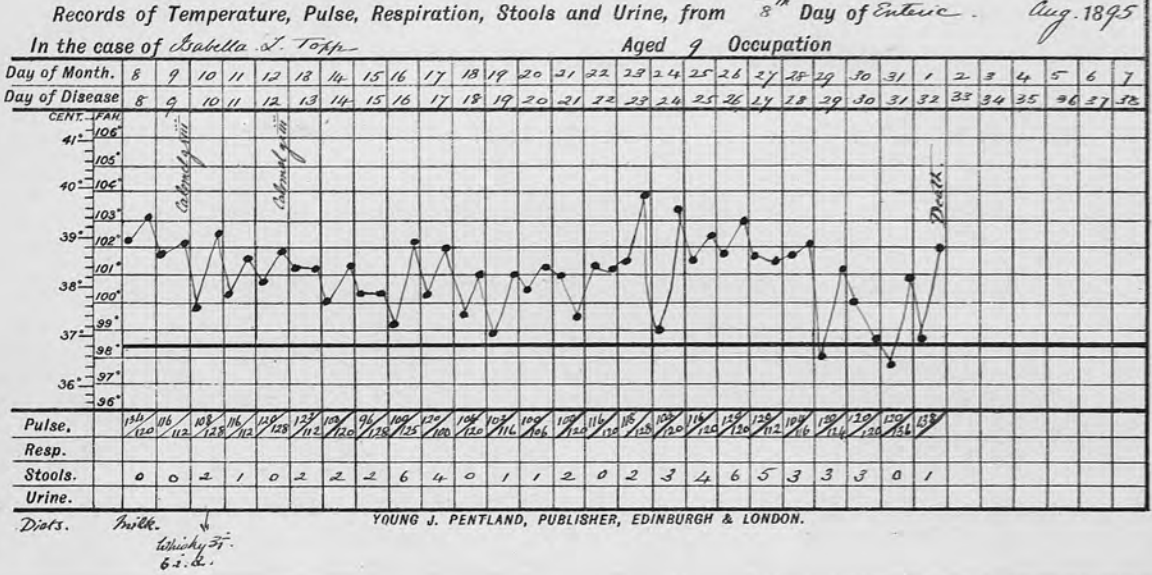


Chart of a case with fatal Perforation.

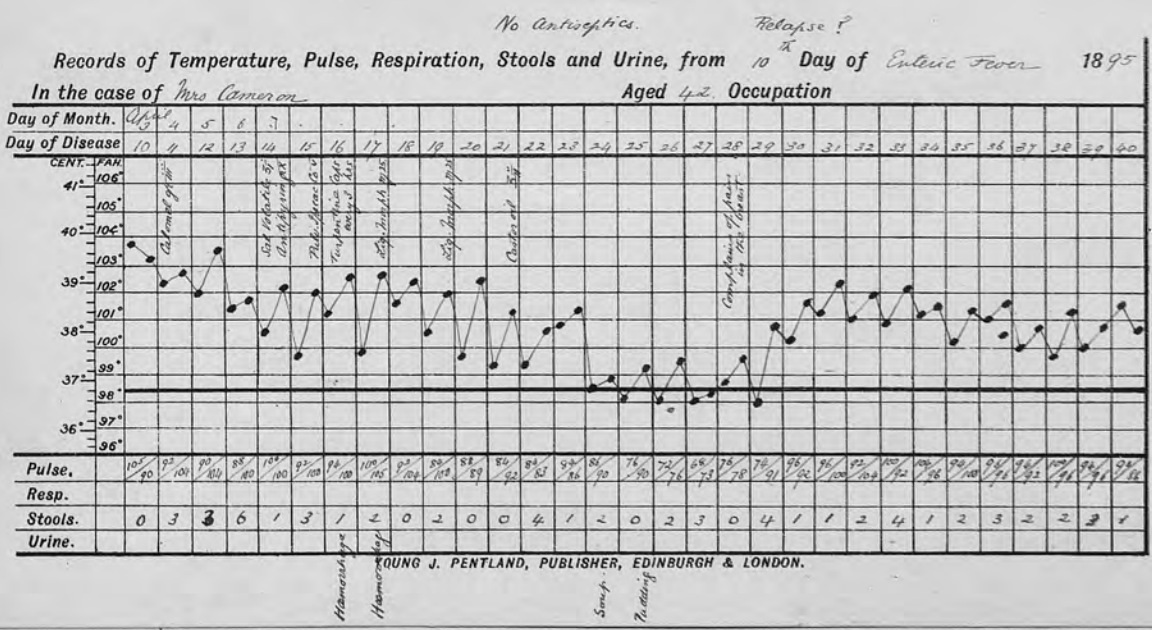


Chart of a Case which relapsed.

were children admitted on the 8th, 19th, and 8th days of the fever. Curiously enough the perforation case was admitted as early as the 8th day and had no solid food in any form till her death on the 32nd.

The expectant-symptomatic treatment is somewhat unfairly treated by the inclusion of the three adults mentioned above. They were so ill on admission as to render us cautious about giving them antiseptic remedies of which we knew little, and none of them was expected to last 48 hours. By careful nursing, however, and judicious stimulation they survived long enough to cast an unfair slur on the treatment.

The detailed statistics of these cases will be found in the appended tables. There is nothing further to be said about their treatment. The complications were treated as they arose. If the cases were very constipated they received a drachm of castor oil at night. They were mostly started with a dose of Calomel. Any further remarks on them would lead to a discussion of the treatment of haemorrhage and other complications of Enteric Fever,

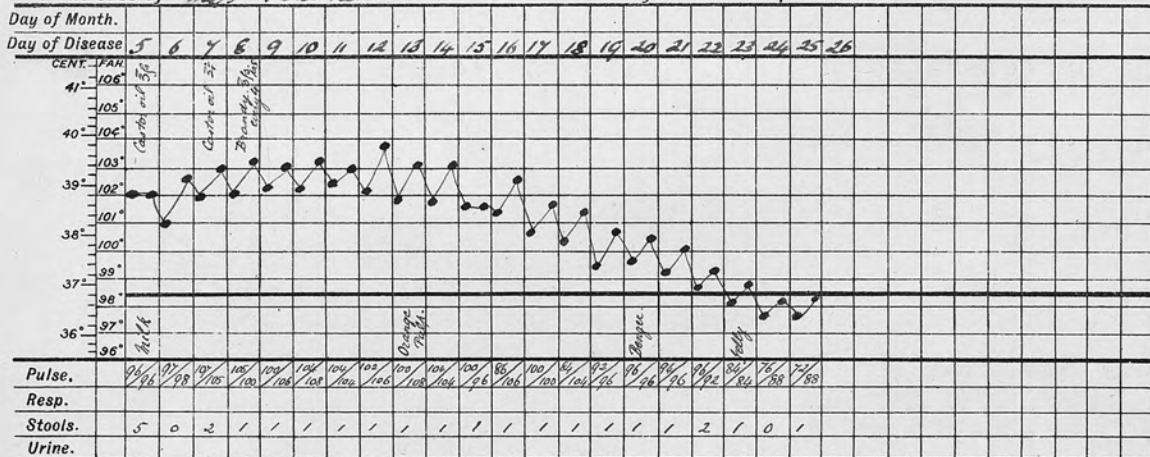
No antiseptics

Records of Temperature, Pulse, Respiration, Stools and Urine, from 5th Day of Enteric.

1895

In the case of *Miss McCracken*

Aged 30 Occupation Nurse



YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.

A purely expectant Case.

which would be foreign to the object of the writer who professes to deal only with the general treatment of the disease.

A comparison of the various treatments will be found in his conclusions. In the meantime he will only say that this treatment, that of Murchison, Moore, Fagge, Duckworth, and many other leading physicians in this country can still be trusted to give admirable results.

CHAPTER IV.

Treatment directed against the Temperature.

- Section I. Antipyresis.
- Section II. Antipyretic Drugs.
- Section III. Hydrotherapy & Refrigeration.

CHAPTER IV.

Treatment directed against the Temperature.

Section I. Antipyresis.

In a disease like Enteric Fever, the principal feature of which is a prolonged high temperature, it is only natural that the reduction of this temperature should be the chief aim of many authorities. Murchison, while emphasizing equally several other points, gives the Reduction of Temperature as one of the five great indications of Treatment. This is also fully in accordance with the views of Liebermeister who regards a high temperature without remissions as a very grave source of danger to the heart. This writer is fully convinced that a continued temperature of 102° Fahrenheit is infinitely more depressing to the patient than a temperature varying from normal to 106° daily. He states that the danger is not from the consumption of the tissues, but from the deleterious effects of the prolonged high temperature upon them. If the parenchymatous degeneration of the heart, so caused, reaches a certain point, it is too late to treat.

He remarks 'We see the disturbing influence of the fever, and it is our first duty to endeavour so far to hold this under control as to save the organism from destruction.'

Other authors, however, are by no means inclined to admit that a high temperature is necessarily deleterious. Cantani for instance believes strongly in its beneficial results as may be seen in the following passage. 'Fever is a general, probably beneficial, reaction of the organism to changes in metabolism and the blood produced by the causative agent. This reaction is necessary to bring about cure in acute disease. It is useful short of exhaustion, heart failure, or hyperpyrexia. The temperature is not a measure of the gravity - a low temperature may be due to want of reaction, or a high temperature to the energy of the organism.'

Pyrexia, then, may be of use, according to this authority,

- (1) by diminishing the vitality and virulence of the living causes of the disease.

- (2) by increasing the power of resistance of the tissue elements in their phagocytic activity.
- (3) by altering the nutritive soil in the tissues and rendering it less favourable to the growth of the germ, or in other words by sterilization.

And he quotes the definition of Boerhave 'Quid est febris? Est naturae irritatae conamen ad expellendum stimulum inconsuetum,' and Borsieri's remark 'Quos interdum morbos remedia non curant, febris curat.' In fact the theory of the beneficial results of fever is practically as old as the time of Hippocrates.

Taking into consideration another infective fever namely Relapsing Fever, we find that there is good reason to believe that the germs in this case may be destroyed by the continued high temperature which has been occasioned by their presence. Fagge quotes the experiments of Heydenreich who discovered that the germ disappears before the commencement of the crisis. This observer noted that the spirillum,

which is the cause of this disease, remains alive outside the body at a temperature of 60° or 70° F. much longer than when kept at blood heat, and that at fever temperatures it dies more quickly still. He therefore concludes that the pyrexia, which was itself called into existence by the presence of the germ, ultimately proves fatal to it. If we work on this analogy there is no reason to believe that the same thing does not happen in Enteric fever.

It is generally admitted that prolonged high temperature damages the tissues to a certain extent, and it may be granted that the heart and kidneys, and the viscera generally, especially suffer. Hare of Philadelphia points out that the excessive bodily heat may also act on the nervous centres and cause 'heat exhaustion' much as in certain forms of sunstroke. The point, however, which may still be considered as undecided is, 'Are we justified in interfering with the course of a specific fever by attempting artificially to lower the temperature? What effect does such a reduction have upon the duration and subsequent

course of the fever?'

It is of course to be clearly understood that the opponents of antipyresis in fever have no objections whatever to combating the temperature when it becomes hyper-pyretic, nor do they object to such mild measures as the occasional use of a tepid sponge, generally so grateful to the patient, or the prescription of some mild febrifuge, such as that containing a little dilute hydrochloric acid, as recommended by Hilton Fagge, but which as that author remarks is probably a mere placebo. It is obvious that the comfort of the patient must always be carefully considered by the practitioner so far as it can be obtained without imperilling his chances of recovery, and such means as above quoted can certainly do the patient no harm. Opinions, however, are still divided as to whether the systematic use of antipyretics or cold baths is desirable. Some authorities consider that such treatment while temporarily relieving the temperature may actually prolong the disease. The writer has had no experience of the systematic

use of antipyretics but the Medical Superintendent of the Edinburgh City Hospital is firmly convinced that, when cases were so treated under his care, the average duration of the disease was longer and the patients themselves did hardly so well as when under the Expectant symptomatic treatment.

Before going in detail into the treatment by antipyretics, it will be well to consider what means we have at our disposal for the reduction of temperature and how they act.

The Thermal Nervous System is described by Macalister as consisting of three factors.

(1) The Heat Adjusting Mechanism or Thermotaxis.

(2) The Heat Producing Mechanism or Thermogenesis.

(3) The Heat Discharging Mechanism or Thermolysis.

Disorders of Thermotaxis imply irregularity of the temperature. Disorders of both Thermotaxis and Thermogenesis imply heightened temperature and increased body heat. Disorders of all three factors imply hyperpyrexia and a rising temperature. In fever Thermotaxis is first disturbed. Then Thermo-

genesis becomes excessive, and lastly Thermolysis is impaired or fails to act. In recovery from fever Thermolysis acts first, as for instance by a critical sweat, Thermogenesis next becomes less excessive, and finally Thermotaxis is restored.

There are two main theories as to the cause of the rise of temperature.

(1) Impairment of the Inhibitory force by which the heat producing mechanism is kept within bounds.

(2) Increased activity of the process by which heat is naturally formed.

These two theories supplement each other. According to Samuel if the heat centre alone is affected the result is Simple Fever. If the exciting cause affects other centres the result is Infective Fever.

Having considered so far as possible the cause of the high temperature, which in the case of Enteric is of course primarily due to the entrance into the blood of the bacillus of Eberth, let us consider the means whereby this temperature may be reduced.

Bodily heat may be decreased by -

(1) Decreased production of heat.

(2) Increased dissipation of heat.

(3) Increased production and increased dissipation where the second factor is more active than the first.

(4) Normal production and increased dissipation.

The remedies which lower the temperature can be roughly classed in three groups. (Hare.)

(1) Those which reduce heat production alone.

(2) Those which act both on dissipation and production.

(3) Those which only dissipate heat.

We know at present of no therapeutic agent which comes under the first of these heads. Possibly, at some future date, a drug having these qualities may be discovered.

The second class includes Quinine, Salicylic and Carbolic Acids, the Antipyrin group, and probably Baths.

The third class is represented by Cardiac Sedatives, Aconite and Antimony.

Putting aside for the moment the question of Hydrotherapy, the lowering of temperature by drugs may be in the first instance considered.

Section II. Antipyretic Drugs.

Subsection 1. Quinine.

The well known antipyretic action of this drug has naturally caused its free use in Enteric fever especially by those, such as Liebermeister, who aim at a complete remission at some period of the day. It has been used, both alone, and as an adjunct to the treatment by baths, though Brand repudiates it and objects to its employment. Murchison does not advise its use and believes large doses injurious. He considers that it may be of some service towards the end of the disease when the temperature is of a remittant type. In typhus he found that it reduced the temperature and did little or no harm, but that the temperature rose again invariably, and that the course of the disease was unaffected. Cayley, the editor of his last edition, considers quinine disturbs bodily function and that its physiological effect is inferior to that of the bath. It is, however, he thinks, preferable to the Salicylates which are more liable to cause depression, delirium, and albuminuria. It

may be given according to this author in doses from 15 to 40 grains per diem. Moore follows Murchison in limiting the use of the drug to the later stages of the disease. Fagge practically condemns it altogether.

The physicians of France on the other hand, to judge from the recent monograph of Brouardel and Thoinot, use quinine largely in the treatment of Enteric Fever, especially in those cases which are not severe enough to make baths necessary. Bouchard (in addition to the use of warm baths), in every case where the morning temperature exceeds 104° F. or the evening 105.8° F., gives a massive dose of quinine, 30 grains every 3 days during the first fortnight, with somewhat smaller doses, if the temperature still requires it, in the succeeding weeks. However such temperatures are not very usual in Enteric Fever, or when they do occur are not likely to last very long, so we may assume that very much quinine is not given. Jaccoud starts his cases with considerable doses of Quinine on three successive

days, irrespective of the height of the temperature. Bernheim and Laurent recommend its use in cases with 'Fastigium à ligne horizontale,' that is to say where the remissions of temperature are very slight, a condition which in their opinion constitutes a real danger. They admit that such interference is 'toxic' and subject to accidents. In their experience a dose of less than thirty grains is useless as an antipyretic.

Liebermeister believes in its use in an emergency in doses of $7\frac{1}{2}$ grains repeated every 10 minutes till 45 grains have been taken. This he considers as more reliable than a cold bath when it becomes necessary to obtain a command over the temperature rapidly.

The writer's own experience of Quinine has been limited practically to its employment as an antipyretic agent in the last stage of the disease where the temperature sometimes fluctuates obstinately for days, at no very great height above the normal line, but sufficiently high to prevent the patient being allow-

ed to rise. Used in this manner in doses of $2\frac{1}{2}$ gr. every 4 or 6 hours he has often seen the temperature favourably influenced, but whether this was not rather due to the tonic effect of the drug, and the subsequent amelioration of the patient, he is not prepared to say. Judicious feeding alone will often steady such a temperature. During the last year at the City Hospital Quinine has only been given in six cases of Enteric Fever. These are noted below and the Charts of four of them are copied.

Cases in which Quinine was used.

1. A girl of 12 years of age, who had up to the date of the interference been treated completely expectantly, was given Quinine gr.V every 6 hours from the 19th to the 23rd days with a view of causing a lysis to begin. The temperature remained practically unaffected and did not attain the normal till the 27th day.

2. A girl, aged 18, whose temperature was in the state of lysis, had a rigor and a temperature of 103° F. on the 20th day. Another rigor occurred on

the 21st day when Quinine gr XX was administered. The dose was repeated on the following day in anticipation of another rigor, which did not occur. The effect on the temperature is well seen in the Chart, and appears favourable. The rigors were probably due to septic absorption from a raw surface left by a separating slough. The antiseptic action of Quinine is here probably more marked than the antipyretic. The case had been treated with Calomel.

3. A girl, aged 8, treated expectantly had her morning temperature normal on the 10th day. The evening temperature of the same day was 103°F. The appended Chart shows the subsequent temperature every 4 hours. On the 13th day Quinine gr xv was given at 6 p.m., and modified the midnight rise of temperature noticed on the two previous nights. Given earlier at 2 p.m. next day it seemed even more successful. On the 15th day given at 7 p.m. it did not meet with the same success. It was not repeated and the temperature was allowed to fluctuate, attaining normal on the 25th day.

It is interesting to note, as regards the chart of this case, that the daily chart shows no rise of temperature above 100°F . during the period covered by the four hour chart here copied. This suggests that much reliance should not be placed in an ordinary morning and evening chart in Enteric Fever.

4. A girl, aged 8, treated systematically with calomel and guaiacol, had a temperature rising constantly to 104°F . at midnight. On the 22nd day Quinine gr xv was given at 4 p.m. That night the temperature did not rise above 103°F . at midnight, when the dose was repeated. In the morning the temperature showed a marked remission and the next midnight temperature was only 102°F . On the 24th day Quinine was again given at 6 p.m. and the temperature at midnight was normal.

There were, however, considerable fluctuations of temperature two or three days later, and it is perfectly possible that the permanently normal point might have been reached sooner without Quinine.

Extract from 4 hour chart.

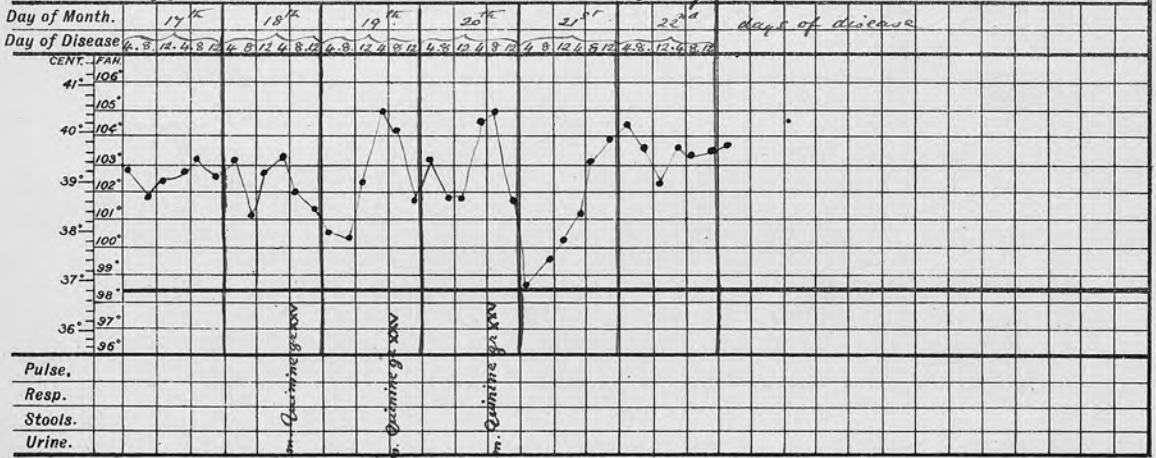
Quinine

Records of Temperature, Pulse, Respiration, Stools and Urine, from Day of

1895.

In the case of *Jane Macmillan*.

Aged 29. Occupation



YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.

This case on *Benzenaphthol* from the 14th day. Shows no diminution of temperature

Case 5.

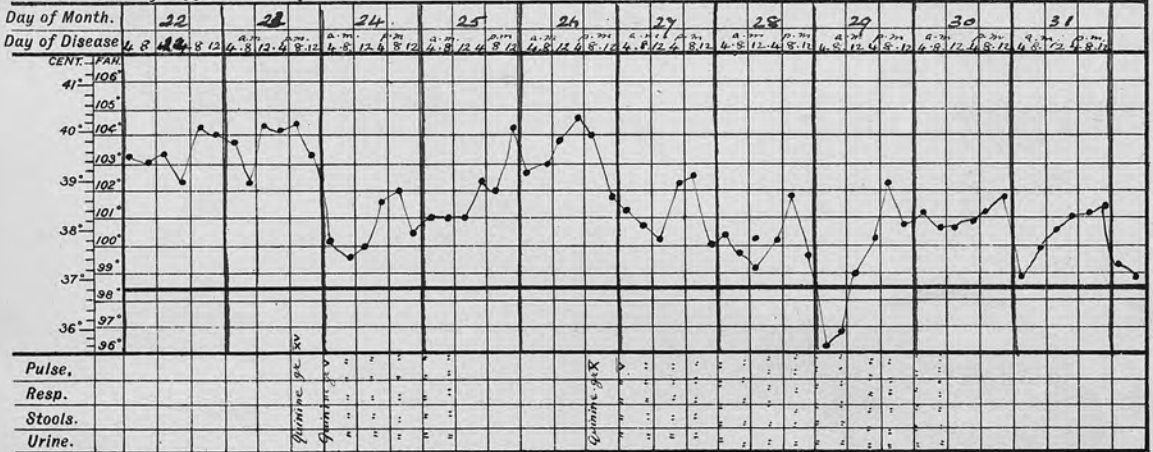
Quinine - 4 hour chart [extract]

Records of Temperature, Pulse, Respiration, Stools and Urine, from 22nd Day of Enteric

Sept 1895

In the case of *William Gibbs*

Aged 13 Occupation



YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.

Asterismal till 5 days' date.

Case 6.

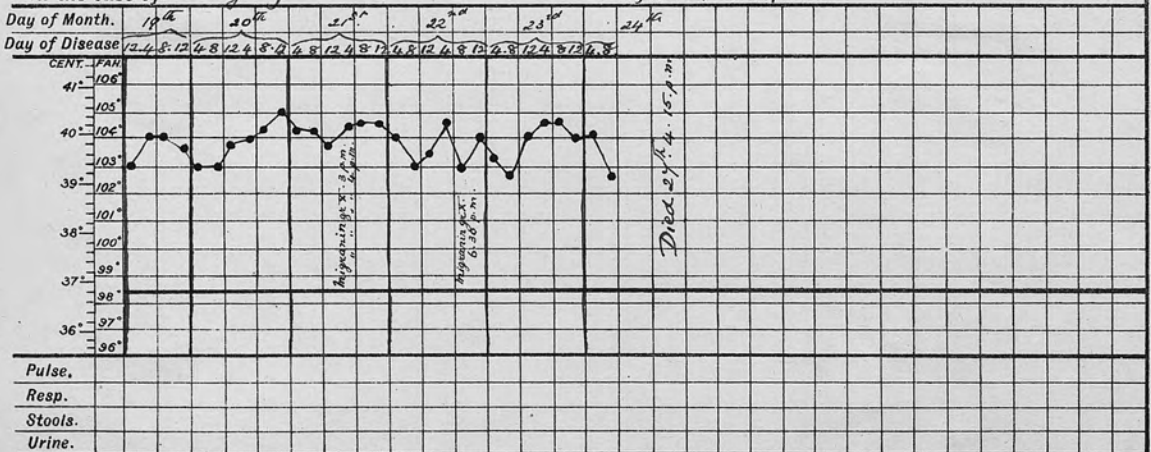
5. A woman, aged 29, treated with Benzonaphthol, had a high temperature throughout the course of the fever and on the 18th day, as there was no sign of a fall, Quinine gr xxv was given at 6 p.m. The result may be seen in chart.

The temperature next night was even higher and the Quinine was repeated, the same thing occurring on the following day. On the morning of the 21st the temperature came down with an alarming rapidity and some symptoms of collapse. This caused the treatment to be discontinued and the want of permanent effect on the fever and its course can readily be seen in the chart.

6. A boy of 13, treated with Benzonaphthol had a temperature which showed no signs of falling about the 21st day. On the 22nd at 8 p.m. Quinine gr xv was given, followed by gr v every 6 hours after. This kept the temperature controlled and there was no rise above 102° next day. On the drug being discontinued at 8 a.m. on the 24th day the temperature again began to rise. The rise continued during the

Extract from Chart To show the want of effect of Inigrain

Records of Temperature, Pulse, Respiration, Stools and Urine, from *Day of Enteric. Dec 1896*
 In the case of *John Gray* Aged 34 Occupation



25th, and remaining high on the 26th gr x were given at 8 p.m. on that day, followed as before by gr v every 6 hours. This secured a fall in the temperature, which however, in the afternoon rose again to a point higher than that touched when under Quinine before. On the morning of the 29th day it fell far below normal and hot bottles and stimulants were called into requisition. Next morning, in spite of the continuation of the treatment, the temperature was higher than it had been at a similar hour for three days previously, and it was considered advisable to stop the Quinine.

A glance at the chart will make this case more readily understood. The normal was not attained till 5 days later and we are justified in concluding that the Quinine did not, at least, curtail the case.

In only two of these cases was any improvement apparent. In both the improvement was quite possibly more apparent than real. The Quinine was given mainly after the principles of the Continental physicians in fairly massive doses. In the cases

where small and frequent doses were given no satisfactory fall of temperature occurred. In the rest of the cases we find two where the large dose caused a collapse which, if not really dangerous in a well appointed and nursed hospital, might have been exceedingly serious in private practice. The writer considers, in common with most British authorities on Enteric Fever, that Quinine does not shorten the duration of the disease, is inefficient as a antipyretic when given in small doses, and in large doses may be positively dangerous.

Subsection 2. Antipyrine, Antifebrin, Kairine,
Thalline, Phenacetin, Migranin,
Lactophenin, Malakin, & Thermodin.

Antipyrine.

When this drug was first introduced to the notice of the profession, its remarkable antipyretic qualities caused its use to be popular in all fevers and Enteric was no exception to the general rule. While, since that epoch, there has undoubtedly been a considerable reaction against the indiscriminate use of the

drug, it is at the present day very largely used both in this country and the Continent.

Hare of Philadelphia in his laborious and singularly complete essay on 'Fever, its Pathology and Treatment' has collected an enormous amount of evidence on Antipyrine and the other drugs of the same group. In his opinion antipyrine should play a secondary role in the reduction of the pyrexia of the typhoid state, reliance being mainly placed on cold applications. Even if antipyrine were innocuous, and we know that it is not perfectly harmless, it throws the trouble of its excretion on kidneys perhaps overtaxed already. It should only be given, says this author, when baths are unavailable. He denies that it can shorten the duration of the fever, and quotes Ernst of Zurich who found that, even when the temperature fell considerably, the delirium and other symptoms took their usual course.

Antipyrine is classed by Hare as one of those drugs which influence both the production and the dissipation of heat. It does not merely act peripherally. Saundby, experimenting with a view of

seeing whether it was merely the surface temperature that fell, found the rectal temperature fell proportionately in two cases of Enteric under his treatment.

Although undoubtedly Antipyrine is used largely in this country to reduce the temperature in Enteric Fever, the standard works on the subject almost unanimously condemn its use. Fagge says it has to be frequently repeated, is dangerously depressing, and may cause vomiting. Moore dismisses it as 'too depressing.'

On the Continent, however, Antipyrine is still used systematically. Clement gives $22\frac{1}{2}$ grains every time the temperature rises above 102.2°F. , and repeats this courageous dose every 3 hours till it is reduced below that point. Bernheim and Laurent recommend from 15 to 30 grains daily.

Strümpell, while not altogether approving of antipyretics, believes antipyrine to be of use in relieving headache and restlessness. He prefers 15 to 30 grain doses. Reihlen thinks hourly doses are more effective than a single administration, and has

given as much as 100 grains in the 24 hours.

Zinn, writing in 1895, after trying many antipyretic drugs in a series of 190 cases, speaks very favourably of the use of antipyrine. By its action the temperature can be kept down nearly to the normal, and the action of the drug on the nervous system is of great value. The author, however, concludes that antipyrine has no action on the duration of the disease, and since it would not always appear wise to interfere artificially with the temperature he has used it little in the last two years.

American physicians have recently adopted the bath treatment too extensively to write much in favour of antipyretic drugs. Stewart of Philadelphia thinks that when antipyrine is used, 5 grain doses repeated at intervals are sufficient.

Besides its antipyretic action it is said to have the additional advantage of being styptic.

All the physicians, however, who use antipyrine, agree that it may in certain cases be somewhat risky, and it is well to see what these dangers are. Firstly

its action on the heart is undoubtedly depressing, secondly it may, especially when given at a moment when a natural fall of temperature is about to occur, cause a dangerous collapse, and thirdly it has been shown to retard the elimination of toxins by the kidneys. Brouardel, indeed, thinks this last danger mainly theoretical but most authors agree that attention must be given to this point.

Hare has collected all the cases of untoward results following the administration of antipyrine which had been published up to 1891. His record includes 130 cases and no less than 42 of these are cases of Enteric, no other heading claiming more than seven. It is only fair to point out, however, that the drug has been very largely used in Enteric fever, which might account for the apparently disproportionate number of accidents, but still the figures appear somewhat significant. A certain number of these cases merely suffered from erythematous rashes, but about 20 appear to have experienced alarming collapses.

The writer has in his own experience seen one such collapse in a case where the temperature fell from 105^o to 95^o F. The dose was only 15 grains, and had been given to relieve headache rather than with any view of affecting the temperature. The headache, to the best of his recollection was effectually cured, but the circumstances of the relief so given have not inspired him with any confidence in the drug. In short, even if he believed that antipyresis was par excellence the treatment of Enteric Fever, he would absolutely decline to give Antipyrine either for the reduction of the Temperature or for any other purpose whatsoever.

Antifebrin. (Acetanilide.)

Like Antipyrine this substance has been used to a considerable extent in the treatment of Enteric Fever. It is of course used exactly on the same principle for the reduction of temperature. No writer seems to suggest that it in any way curtails the disease. The majority of those who have used it, however, think that it produces an amelioration in the condition of

the patient. It is cheaper than antipyrine and the dose has the advantage of being smaller.

Hare quotes the results of Guttman who treated 81 cases with doses of 7 grains night and morning. This author considers it equal to the bath. Smaller doses than the above he thinks inefficient. He also claims that the period of apyrexia following the administration of this drug is longer than in the case of antipyrine, which assertion is, however, strenuously denied by many observers.

The most lucid account of the treatment by Antifebrin which the writer has been able to find, is that of R. W. Pierce of Sydney in the Practitioner of 1890. He treated systematically considerably over a hundred cases and appears very satisfied with the results. He is exceedingly impartial in pointing out the defects of the drug but believes that by due caution these defects may be minimised. His method is to give a dose of 5 to 10 grains whenever the temperature exceeds a certain point, 103° or 101° F. according to the nature of the case treated. This

dose may be repeated, if necessary, up to 6 or 8 times in the 24 hours. The temperature usually falls within 40 minutes of administration - and attains its minimum in 2 to 4 hours. The effect is more marked in children and most obvious when the drug is given synchronously with the usual remission. When the temperature, after the effect has passed off, begins to rise, he repeats the dose.

Under this treatment the tongue moistens, free perspiration occurs, and a peripheral anaesthesia, most grateful to the patient, is set up. There is a general feeling of comfort and, if the treatment is persisted in, asthenic delirium is averted, assimilation and nutrition are improved, and organic degeneration is prevented. The method is less likely to cause collapse or haemorrhage than the bath, and it can be adopted with far less worry to the patients. Where pneumonia has already developed it is improved, where it has not developed it is averted. The main point to be observed is that it should not be attempted to keep a temperature, which previously averaged 104° F.,

absolutely normal. Such a course is liable to lead to collapse. Haemorrhage is a contra-indication, and herein the drug differs from Antipyrine which is said to be styptic. Pierce also believes Antifebrin to be a valuable eliminative agent, and thinks that it lessens the risks of bedsores and suppuration.

The bad results observed in his cases were

(1) Frequent Rigors after the effect of the drug wears off, and

(2) Alarming but transitory cyanosis.

In such cases he suspended the drug for a few days only and substituted digitalis or belladonna.

As regards the effect on the duration of the fever this writer candidly admits that the fever is probably prolonged. Many of his cases were of a very long duration which might, he thinks, indicate that the suppression of temperature possibly retarded a satisfactory elimination by heat of the febrile materies morbi. The intensity of the disease, however, is toned down. The only case of which he gives full data did not attain the normal till the

53rd day, and he does not say that this is unusual. In this case a temperature of 104° is observed frequently up to the 49th day. This supplements the observations of Wood of the City Fever Hospital, who, as already stated, found that cases treated with antipyretics lasted longer.

Hare in his list of untoward effects of antifebrin notes 4 cases of typhoid, where collapse, cyanosis, or rigors occurred. Osler considers that the profuse perspiration sometimes following its ingestion may absolutely prohibit its use in certain cases.

Rose writing in the British Medical Journal thinks it should not be used in the later stages of the fever, though at other times it may be used systematically.

Hawkins Ambler in the same Journal notes a case of enteric where the drug appeared to aggravate the disease; it, however, was successful in other cases.

Strümpell recommends great caution but admits the efficiency of the drug in aggravated cases. The writer has not found much mention of antifebrin in French medical literature.

While possibly, then, Antifebrin may be less dangerous than Antipyrine, and in most cases as efficient, the writer, having no personal knowledge of its use in Enteric fever, is inclined to believe that it resembles the last named drug sufficiently closely to make him exceedingly cautious in its employment.

Kairine.

This drug, especially about the period of its introduction, was used as an antipyretic in Enteric fever, principally by Filehne and Guttman. It never came very much into use in this country, but Cayley has used it with moderately satisfactory results. He thinks that in some cases it is beneficial, and noticed a general improvement of symptoms apart from the lowering of the temperature. Prostration, however, may be increased and it should not be given when the heart seems failing. Like the other members of its group it may cause cyanosis.

Greene, Archer, Shingleton Smith and others have reported cases treated by this drug. In none of the reports does it appear that the duration of the

disease was favourably affected, though all these observers were completely satisfied with its antipyretic power.

Guttman gave Kairine hourly in $7\frac{1}{2}$ to 15 grain doses. The drug if freshly prepared caused no unpleasant symptoms. It acted more rapidly than Quinine but the effect was more transitory. Filehne advised that its use should be discontinued when the temperature fell to 100°F. , or that the dose should be reduced to 4 grains per hour. till the temperature again rose, when the 8 grain doses this author recommended might again be resumed. As much as 16 grains every hour has been given. The urine turns a dark green colour. It is exceptionally nauseous to take.

Practically all who have used the drug admit it is merely an antipyretic. Its price no doubt has had a good deal to do with it being supplanted by newer preparations. The writer has had no personal experience of Kairine.

Thalline.

This drug has been used in Enteric by Jaksch, Ehrlich,

and others, and by Minot in America. It is not claimed that it exerts any appreciable influence on the duration of the disease. Hare concludes it is inferior to the rest of its group. Its effects are very transient, and it is liable to nausea. The sweating is often very excessive. It is slightly antiseptic.

Moore considers it has a powerful antipyretic action, but that it is too trying on the heart and kidneys to be safe. It is also said to have a deleterious action on the haemoglobin of the blood.

Phenacetine.

That occasional and often frequent doses of this drug are given in Enteric fever the writer is well aware. He has not, however, seen any regular method described in which Phenacetine plays the principal part. It speedily reduces pyrexia, and the arrival of the temperature at the normal does not appear to be accompanied by the evil after effects noticed in the case of other antipyretics. The writer has had no experience of it in Enteric, but his acquaintance

The Chart of Case 1. will be found

on page 41.

with it in other diseases would lead him to use it more readily than any other antipyretic, if cold affusion and other means of the same type failed to reduce the temperature in a case of hyperpyrexia.

It is said that, though the drug does not cure Enteric fever, it diminishes the headache and clears the mind. Any antipyretic to be satisfactory should be able to effect so much at least.

Migranin.

This drug has been occasionally used at the City Hospital recently, originally with a view to relieve headache and afterwards chiefly to test its action on the temperature. As the writer has not found any literature relative to its use in Enteric fever, he is obliged to limit his remarks to the results of his own experience.

Case 1. Male, aged 34, admitted on 20th day of the fever received Migrinin gr x, repeated an hour after, for severe headache on the 22nd day. A single dose was given on the 23rd day. The headache in both cases was relieved, but on neither occasion was the

temperature affected.

Case 2. A male, aged 21, admitted in a dying condition on 21st day received a dose of Migranin gr x at a period when his temperature was 107° F. His temperature did not improve, and he died shortly after with a temperature of 108.4° F. in spite of the application of cold.

Case 3. A female, aged 27, was given Migranin gr x every 6 hours during a relapse. The Chart is appended. For the first 24 hours the drug was given every 3 hours. The temperature was controlled considerably during the administration as will be seen from the Chart, and there was on no occasion any collapse. After the drug was discontinued the temperature rose, and remained high for two days, after which lysis commenced.

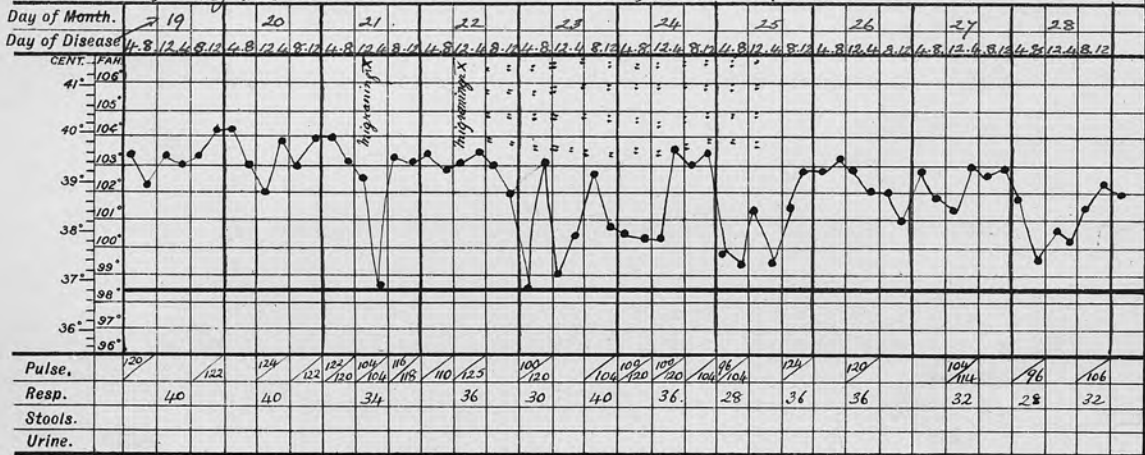
Case 4. A male, aged 17, was given during a relapse, which had persisted longer than usual, Migranin gr x repeated in an hour, with a view to give a downward tendency to the temperature. The temperature was only reduced by a degree and a half for two hours.

Migrainin gr \times every 6 hrs from 22nd to 25th days. Extract of chart.

Records of Temperature, Pulse, Respiration, Stools and Urine, from 19th Day of Enteric. Jan. 1896.

In the case of Mary Call.

Aged 26. Occupation



YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.

Case 6.

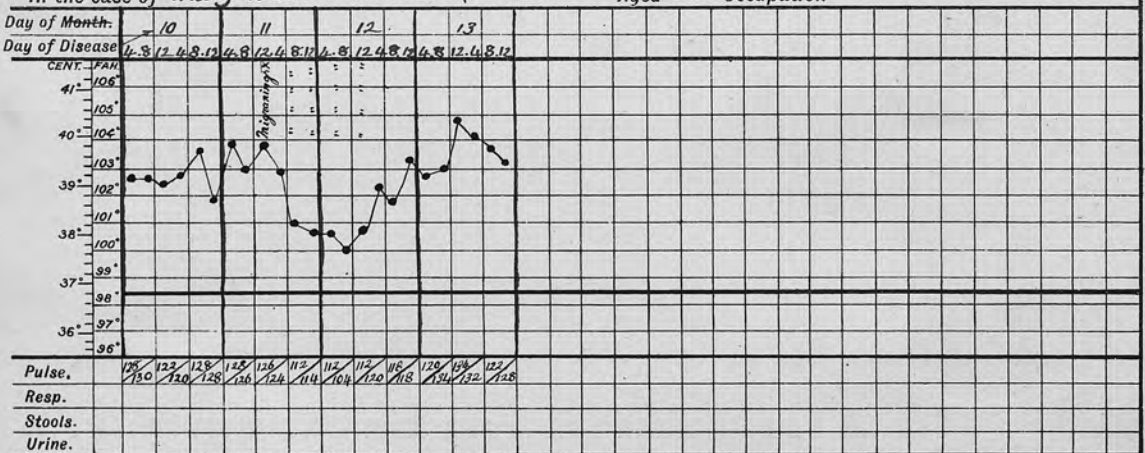
Migrainin gr \times every 6 hrs 11th day.

Records of Temperature, Pulse, Respiration, Stools and Urine, from Day of

18

In the case of Mary Bain. Extract of Chart.

Aged 12 Occupation



YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.

Case 7.

Case 5. A female, aged 14, had on the 11th day a temperature never below 104° F. Migranin was given in ten grain doses every 6 hours, to cause a remission if possible, and the result is well seen in the chart. The drug was discontinued on the following day.

Case 6. A female, aged 26, on the 21st day suffered from a headache which was treated with a single gr x dose of Migranin. The effect on the chart was so marked that the drug was started systematically next day. The temperature shows a well marked morning remission while the treatment is continued. The height however, of the evening exacerbation does not appear to be much affected.

Case 7. A female, aged 12, the sister of Case 5, was given ten grains of Migranin on the 11th day of the disease for a prolonged high temperature. The dose was given every 6 hours for one day and the remission is well marked on the appended chart. The temperature, however, the day after the treatment was stopped, had risen higher than before.

These Cases of course are in no way systematic. The writer thought them worth appending, as they show at least that, where hyperpyrexia does not exist, migranin has as a rule a considerable antipyretic power in enteric fever. Though it was given over a prolonged period in two Cases, there was no sign of collapse or of any ill effect. Those who are accustomed to use antipyretic drugs in Enteric will probably find it more satisfactory than some of the drugs mentioned above, and though it is not nearly as powerful as antipyrine in its free state, it appears to be free from the bad results which sometimes attend the use of that drug. The Caffeine in the compound might also be of service, in causing a diuretic effect and so to a certain extent neutralizing the effect of the Antipyrine, though doubtless the drugs composing migranin have their characteristics considerably changed. On his small experience as given above, the writer would not be very much afraid of using it in Enteric.

Other Coal-Tar Derivatives.

Zinn has used lactophenin, malakin and thermodin in

Enteric fever. The two latter failed to give good results. The antipyretic action of the lactophenin, however, is very considerable and almost constant. It produces marked sweating, but no definite action on the general state was noted. The duration of the disease remained unaltered. Zinn has decided apparently not to continue using it.

Subsection 3. Carbolic Acid.

Besides its well known antiseptic properties, phenol has a considerable antipyretic action and has been used considerably to reduce fever. It will be more convenient to discuss the drug under the head of antiseptics where it will be fully considered.

Subsection 4. Salicylic Acid.

It is doubtful whether this remedy, so much nowadays associated with acute rheumatism, is any longer used in the treatment of Enteric fever in this country. In France, however, it is still used largely by several physicians. It is of course used purely as an antipyretic, few believing that it influences the

duration of the malady. Jaccoud administers salicylic acid for three days consecutively in his cases, having previously subjected them to a three days course of Quinine. On the first day the dose is 30 grains, on the second and third $7\frac{1}{2}$ only. Bernheim and Laurent regard Salicylic acid as a most useful adjuvant in the treatment of Enteric Fever. Its antiseptic power is an additional advantage. It is useful as an antipyretic and does not lower a normal temperature. The dose should not exceed 45 grains in 24 hours, and its action is more valuable when it is not too much divided into small fractions of that amount. Should a larger amount than that specified above be given, haemorrhage, dyspnoea and cerebral complications may ensue.

As above stated the Salicin group of drugs is not much used in this country for this purpose. Moore mentions them merely to say they are dangerous. Cayley does not mention them at all. The Salicylate of Bismuth has recently been considerably in vogue but rather in the rôle of an antiseptic, under which head

it will be subsequently considered.

Hare sums up salicylic acid as being uncertain in its action in Enteric, less safe to handle than the antipyrine group, and as having no real effect on the duration of the fever.

Subsection 5. Other Drugs with Antipyretic Action.

Besides these modern antipyretics, other drugs have been used to reduce temperature which need not be considered at any great length as their use is now superseded by more convenient preparations. Perhaps Digitalis has been the most recommended and it has a weighty advocate in Liebermeister. It powerfully lowers temperature but has to be used for some days before producing any effect. The case quoted by Cayley does not show any shortening of the fever, and the temperature seems liable to rise to a considerable height up to the last. It need hardly be said that the greatest caution has to be exercised in its administration. It should only be used when the heart is strong and the pulse slow. It seems rather to favour impending paralysis. Both French and

English writers agree that it is too difficult to handle to be generally recommended.

Veratria has been also used. Cayley considers it speedy in action but does not recommend it, and Moore briefly dismisses it.

Aconite and Antimony have both had their day, but are far too depressing to be used in a prolonged fever like Enteric.

Belladonna is another drug which has been found favourably to influence the temperature, and some writers have almost claimed it as a specific. As the writer has seen Atropine used to a considerable extent in certain cases of Enteric he proposes here to consider this remedy at somewhat greater length than those just mentioned.

Atropine.

Murchison quotes Dr J. Harley as observing that Belladonna was useful in continued fevers. It reduced the pulse, moistened the tongue, and ameliorated the general symptoms of pyrexia. He recommended 20 minims of the Tincture every 4 hours, or injected 1/90 gr

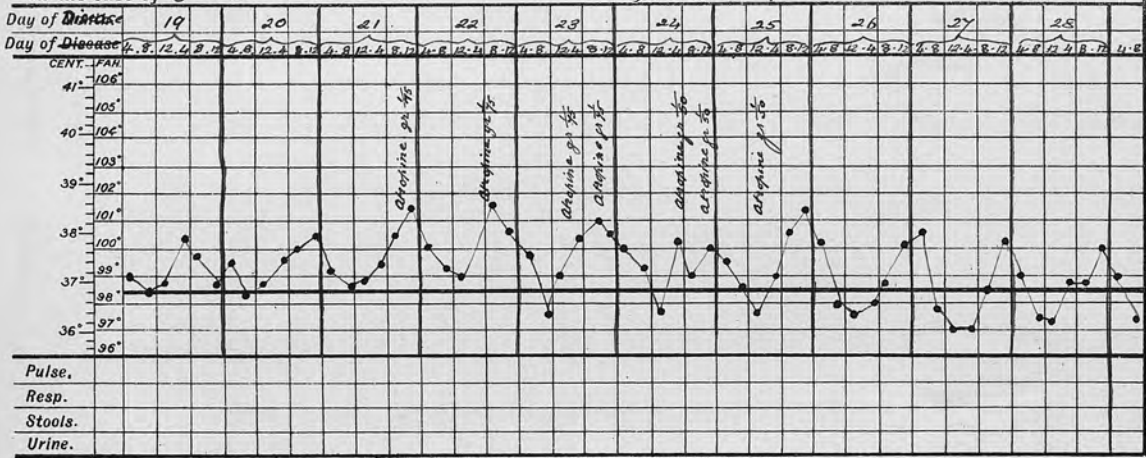
of Sulphate of Atropine. Dr B. Kelly in 1870 found that the above dose of the Tincture reduced the temperature and relieved the delirium and local congestions of Enteric fever to such an extent that he considered it a specific.

Dr Muirhead has recently been giving subcutaneous injections of Sulphate of Atropine to cases whose lysis has been interrupted by a temperature swinging up nightly to often a considerable height, even when the morning temperature has been persistently normal. This method of treatment was suggested to him by the improvement noticed in the temperature of phthisical patients who are being treated with Atropine for night sweats. As the temperature in both cases may be due to the absorption of toxines, it may be that the amelioration observed may be due rather to an antiseptic than a purely antipyretic action. In any case the temperature of most of the subjoined cases was apparently favourably influenced up to a certain extent.

Case 1. A male, aged 30, treated with Benzonaphthol

Atropine for temperature fluctuation.

Records of Temperature, Pulse, Respiration, Stools and Urine, from 19th Day of Enteric Sept. 1895
 In the case of *J. Frank Brown* Aged 30 Occupation

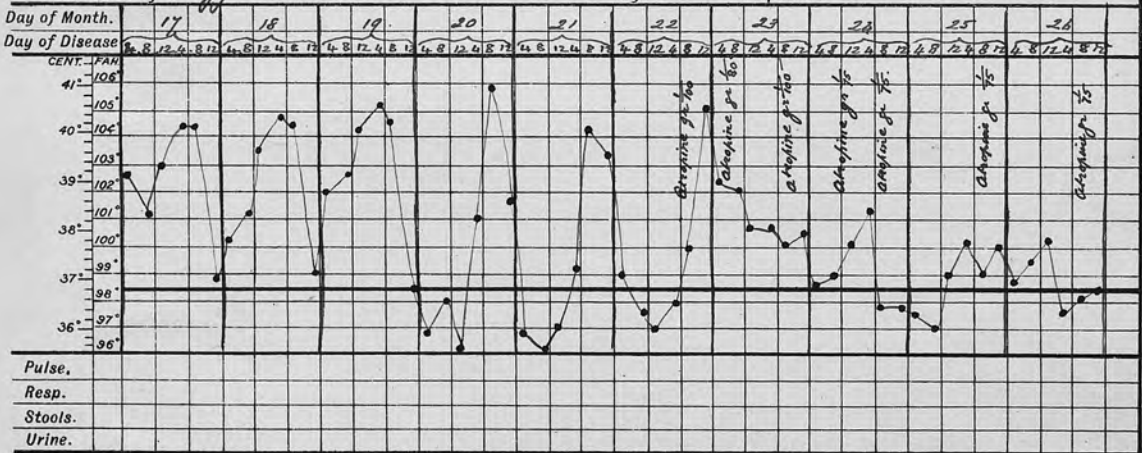


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Case 1.

Showing temperature kept by Atropine.

Records of Temperature, Pulse, Respiration, Stools and Urine, from 17th Day of Enteric Atropine. 98
 In the case of *Maggi Allan* - Aged Occupation



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Case 2

had a temperature nearly normal on the 19th day, but on the two following days it was slightly higher instead of lower. Atropine was given as noted on the Chart, but failed to influence the temperature till the 23rd day when its dose was more than doubled. On the 25th less Atropine was given, and the temperature was higher. The Atropine was then stopped and the Chart shows a pretty example of a lysis. In this case the drug was not very successful. After its discontinuance the temperature fell steadily, and had it not been given at all it is perfectly possible the normal would have been sooner attained. The patient showed no ill effects, his tongue remained moist and he was perfectly comfortable during the treatment.

Case 2. A female, aged 18, treated with Benzonaphthol, developed on the 17th and following days a temperature varying daily from 105° and upwards to subnormal. Atropine was given on the 22nd and subsequent days as noted in the Chart and the good effects were apparently very marked. The temperature in this case was regarded as due to septic absorption. This

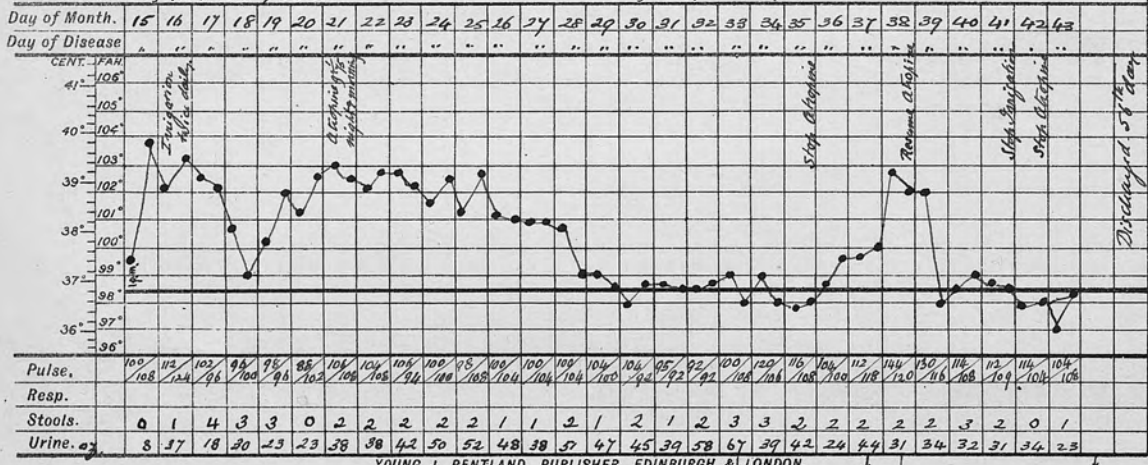
patient relapsed later and through the course of the relapse, which had all the symptoms of the true disease, had two injections of 1/75 gr of Atropine daily. The treatment had little or no effect but it is interesting to note that her tongue remained moist throughout and that she had no unpleasant symptoms.

Case 3. A female, aged 30, treated with Benzonaphthol, had a continued fever till the 34th day, when, as the temperature was swinging up and down, it was thought Atropine might improve her condition. A dose of 1/75 grain was given night and morning, and from the 35th day till the 41st the temperature was considerably lower, never exceeding 100° F. On the 37th day it became normal. After the drug was stopped the temperature rose to 102° for two nights, thereafter regaining the normal line. In this case then there seems no doubt about the control exercised by the Atropine.

Case 4. A female, aged 15, treated expectantly, till the 27th day when Atropine was given daily at noon

Atropine. Irrigation

Records of Temperature, Pulse, Respiration, Stools and Urine, from ¹⁵(8) Day of Enteric. Oct. 15. 1895.
 In the case of *Mrs Campbell.* Aged 57. Occupation



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Potato

Fish
milk only.

Fish

5
Case 5

in doses of 1/50 of a grain to check the great strides of temperature. The temperature showed no signs of moderating till the 40th day, when it was much lower but not normal. From this point it rose and the treatment was discontinued on the 45th day as useless, the temperature not attaining the normal till the 65th. The tongue was, however, markedly improved after the Atropine was started.

Case 5. A female, aged 31, was admitted suffering from Enteric fever complicated by jaundice. There was spasmodic pain in the neighbourhood of the gall bladder and Atropine was given, as much to relieve this as for any other purpose, on the 21st day of the disease. The pain was relieved but the temperature was unaffected and the case prolonged, the normal not being reached till the 30th day, as will be seen in the Chart. The Atropine was stopped on the 35th day. The subsequent rise noted on the Chart may be due to premature feeding, but the fact that an interval of 3 days elapsed between the first addition to the diet and the recrudescence possibly contradicts this.

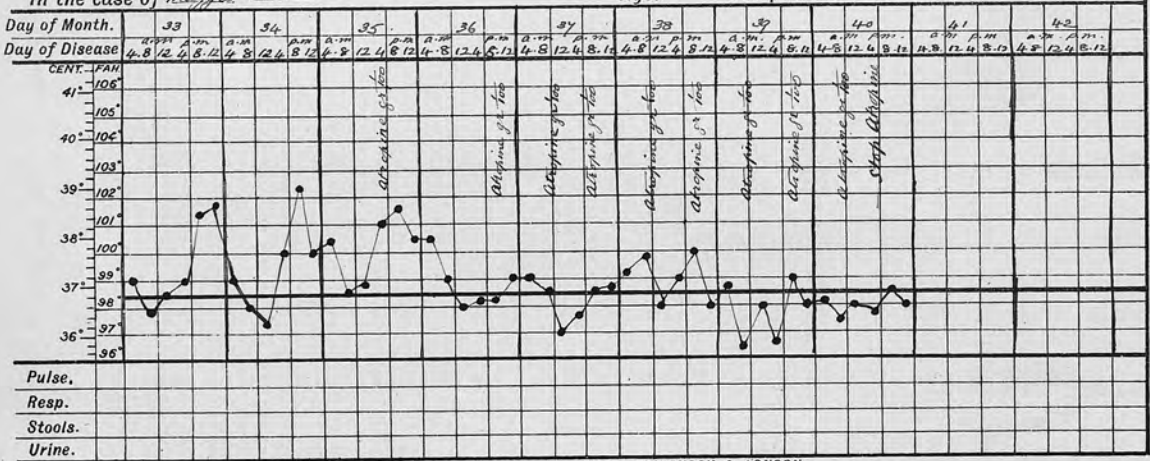
Extract from 4 hour chart of Remission treated with Atropine

Records of Temperature, Pulse, Respiration, Stools and Urine, from 33rd Day of Enteric.

1895.

In the case of *Maggie Lorimer*.

Aged Occupation



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Case 7.

Atropine

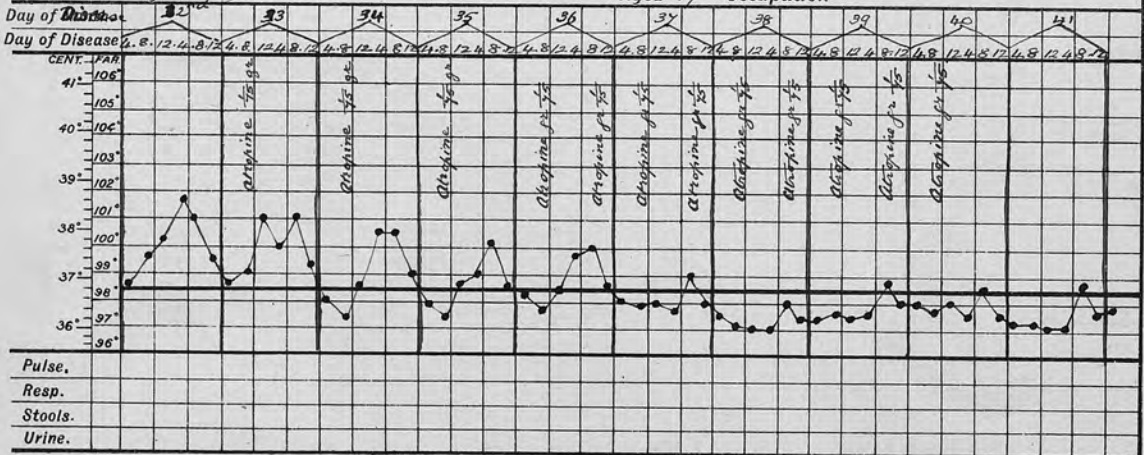
Extract from 4 hour chart 32nd to 41st days.

Records of Temperature, Pulse, Respiration, Stools and Urine, from 32nd Day of Enteric

Dec 1896

In the case of *T. J. Johnstone*.

Aged 17 Occupation



YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.

Case 6.

However we can give the credit of the fall of temperature at least as much to the stoppage of solid food as to the Atropine.

Case 6. A male, aged 17, treated with Calomel, took a little longer than usual to reach the normal. Atropine was given at 9 a.m. for 3 days without very marked results. On the 36th day a second dose was given at 9 p.m. and this dose being continued daily the temperature ceased to fluctuate.

Case 7. A female, aged 13, treated with Guaiacol and Calomel, had a Recrudescence from the 28th day of the fever. This was treated with Atropine with the result shown in the Chart. The only fallacy in this case is that it is of course impossible to tell if the normal would not have been reached as soon, or sooner, without the treatment.

Case 8. A male, aged 42, treated with Beta-naphthol, was given Atropine on the 35th day to check the swings of temperature. The treatment was successful up to a certain point, that is to say the nightly

rises, for three days after the administration commenced averaged 2 degrees less than for three nights previous to the drug being given. The drug was then omitted for a night, and, as the temperature rose no higher, the treatment was discontinued. It is very questionable whether it really did any good.

An obvious fallacy is present in all these cases except one. That is to say the Atropine was not administered till a lysis might be reasonably expected. In one or two cases, however, the improvement is so marked that it may be accepted as a fact that the temperature was really influenced by the treatment. The second of the series of cases is perhaps the most striking. In several others where the results were not so marked the downward tendency of the temperature appears shortly after the administration of the drug. The fact that in at least two cases the temperature rose after the Atropine was discontinued is in its favour.

As regards the case where it was used earlier in the fever it appears to have had no effect on the

temperature at all.

The cases present no instance of unpleasant results following the treatment. In one case (case 4), the pulse became considerably weaker, but in none of the others was this noted, and there is no proof that the drug was responsible in the instance mentioned. The tongue in every case remained remarkably moist and in many cases cleaned. In Case 4, a dry, fissured and raw tongue became moist and slightly furred after two days treatment. These facts are in accordance with the observations of Harley and Kelly.

The writer himself cannot say that he has been so impressed with the use of Atropine as to desire to use it frequently in Enteric fever. He certainly would be tempted to use it in a case like Case 2, which he believes really benefited from its administration. But a powerful alkaloid of this type would need a much stronger case made in its favour, than the cases quoted above can establish, if it is to be used in general practice. Safe enough it may be in a Hospital, but the writer would not care to give it unless he had the patients under more continued

observation than can be secured in family practice, and in any case he does not believe that Atropine is of great value in the large majority of cases.

Subsection 6. Conclusions on Antipyretic Treatment
by Drugs.

We have seen, in working through the formidable list of drugs considered above, that the physician has a large choice when he is desirous of lowering a patient's temperature. Nearly all these substances powerfully reduce temperature. The question is are we to use them or not? On the one hand we have Liebermeister, Bouchard, Jaccoud and many others answering in the affirmative. On the other hand are Murchison, Cantani, Fagge and a numerous following giving a negative reply. The writer owns that personally he is prejudiced against interfering with any temperature short of a hyperpyrexia. If such interference is to be carried out, he would prefer to accomplish it by some form of refrigeration. As regards drugs he follows Yeo who writes 'That by this means a temporary reduction of temperature may be

speedily brought about there can be no doubt; but is the general condition of the patient better after the exhibition of these toxic drugs? And is the course of the fever advantageously modified? The writer admits that his experience of these drugs is very limited, but he has never seen any real improvement in a patient after their use, while even the supporters of the system do not claim that the course or duration of the disease is altered.

Before, however, coming to a satisfactory conclusion it is absolutely necessary to define hyperpyrexia. This varies in the opinion of different authors, so far as Enteric fever is concerned, from 102° F. to 105° F., always assuming that there is no marked remission at any period. The great reason for interfering with a steady temperature, of 103° for instance, is the effect on the heart. Is the failure of the heart, so much dreaded by the supporters of antipyretic drugs, really due to a degeneration caused by a prolonged temperature? Is it not at least as likely to be due to a toxæmia of the

nervous system acting on the innervation of the heart? It is absurd to deny a cardiac degeneration is caused by high temperature. The point is does that degeneration go far enough to put life in danger? If the toxins are powerful enough so to derange the brain as to cause delirium, we may fairly assume that the nervous centres are generally poisoned. The delirium is not due to prolonged high temperature; why should the failure of the heart be necessarily attributed to that cause? The heart fails in cases, where the merest trace of albumen is present in the urine, showing that the temperature has not damaged the kidneys excessively. Now if antipyretic drugs are given, the toxæmia in many instances is liable to become worse, owing to the defective elimination due to the coal tar antipyretics which are usually employed. This accounts for many observers noting that though the temperature falls the delirium often remains. The supporters of antipyretic medication have no startling instance of a great fall of the deathrate to show, except in the

case of the bath treatment, which, as we will see later, possesses many advantages over that by drugs, while it has few of the disadvantages under which the latter labours.

The writer himself would consider a prolonged temperature of 105° F. hyperpyrexia. An occasional rise over that point, not very common in his experience, he would totally disregard except so far as to order a tepid sponge, more for the satisfaction of the patient than for fear of the consequences. Should a continued temperature about 105° exist, he would trust to the ice coil, cold packs, or the ice cradle. But in view of the dangerous qualities of some of the drugs discussed, he would only use them with the most extreme caution, or preferably not at all. Phenacetine would probably be the safest to use for a few days; for an emergency Quinine has more evidence in its favour. Migranin, which possibly is the safest of all, has failed on the only occasion the writer has had to use it in hyperpyrexia.

Where hyperpyrexia, however, does not exist it

is probably better to leave the patient's temperature alone, and not interfere with the efforts of nature to throw off the disease. The writer will conclude these considerations with the opinion of Sir Dyce Duckworth. 'Fever is good, useful, necessary and natural. The way to get well is frequently by fever.'

Section III. Hydrotherapy and Refrigeration.

- Subsection A. Warm Baths.
1. Continued.
 2. Cooled down.
 3. Tank Bath.
- " B. Affusions, Sponges,
Cold Packs.
- " C. Enemata and Compresses.
- " D. Refrigerant Apparatus.
1. Ice Cradle.
 2. Ice Coil.
- " E. Brand's Method.
- " F. Refrigeration by the
Ambient Air.

Section III. Hydrotherapy and Refrigeration.

We have seen above that, according to Murchison, Baglivi recommended the use of baths in Enteric Fever. The first detailed account, however, of a water treatment is that by Currie, who described his system of 'Affusion' in 1797. This method consisted in the application of cold to the surface by pouring buckets of water, at the temperature of the air, over the patient's head. Currie recommended that affusion should be used only when the temperature was considerably above normal, never during or after profuse perspiration, and as a rule between six and nine p.m., when the temperature is usually highest.

'Under these restrictions,' he writes 'the cold affusions may be used at any period of fever; but its effects will be more salutary in proportion as it is used more early.'

He preferred salt water to fresh, but the use of the latter is not proscribed. The cases he reports show an improvement and lowering of the pulse, a relief of the headache, and often a complete cessation

of the delirium. Many of the cases noted by this author seem to have been enteric fever.

Currie also recommended tepid affusions, especially in the case of Children or where lung complications existed.

Horn in 1805 advised the use of baths, wet packs, sprinkling with cold water, and douches. Chomel suggested warm baths with the additional employment of cold affusion in the ataxic forms of the disease.

Finally in 1861 Brand introduced his now famous method of treatment by bathing. Brouardel gives him the credit of being really the first physician to realize the value of the bath, remarking, 'il faut reconnaître de toute justice que c'est avec lui que la pratique s'en est élevée à la hauteur d'une véritable méthode, on peut dire d'un dogme thérapeutique.'

Before discussing the method of Brand which is the most popular of all the treatments by cold water, it will be well to consider what other methods have been or are at present in use, and to consider each briefly. There are then:-

the principal of which are the difficulty of keeping the temperature constant, and the necessity for a special nurse to look after the patient.

2. Warm Baths Cooled Down.

This is the method advocated by Ziemssen, who uses a bath 9° F. lower than the patient's temperature, and then reduces the bath in the course of half an hour to 68° F. At this temperature shivering begins, and the patient is withdrawn. These baths may be given four or six times daily, and the indication for their employment is a temperature of 104° F.

Bouchard uses a modification of the same process, starting the bath at a temperature of 3° F. below that of the patient, and not bringing it lower than 86° F. The bath lasts an hour and may be repeated if necessary eight times in the 24 hours. This method seems to be easier to manage than that of Riess, and is probably less likely to cause shock to the patient.

3. The Tank Bath.

This method was devised by Dr Barr of the Liverpool Southern Infirmary. It differs from the system of

Riess in the fact that the temperature maintained is never less than 90° F. and the patient is as a rule not withdrawn from the bath till his morning temperature, at least, is steadily normal. The tank is an oblong wooden box, lined with lead coated with shellac varnish. It is six feet long, two feet ten inches wide, and twelve inches deep. It is provided with a large waste pipe through which it can be emptied in a few minutes. It has also hot water laid on. The patient lies on a piece of bed-ticking, and an air pillow keeps the head out of water. A blanket is wrapped round him, and the tank is provided with a half lid to carry the weight of the bedclothes which included a waterproof sheet. As long as the patient's temperature does not drop below 100° F. that of the bath need not be maintained above 93° . Should however the patient's temperature approach nearer normal, that of the bath should also be proportionately raised towards that point, Dr Barr never having had to raise it above 98° .

The originator of this method at first enjoined

his patients to pass both urine and faeces into the bath. The difficulty of keeping the water clean, however, induced him to have an extra sheet of bed-ticking with a hole cut for the buttocks, on which the patient could be raised from the tank by a mechanical contrivance devised for lifting paralysed patients. But even with this precaution the water is constantly fouled with urine, and where there is much diarrhoea, with faeces also. Dr Barr puts a pound of Boric acid in the tank but this is not sufficient. He tried perchloride of Mercury with the result that he sterilized the water for two days, after which, to use his own expression, he 'sterilized' also the patient, who showed signs of mercurialism. The condition of the water in the tank, indeed, appears to be the chief objection to this method. The temperature according to the author is easily regulated, a bucket of water being added and withdrawn every two hours.

Dr Barr asserts that the tank accomplishes what should be the object of the physician in a case of

fever. Thermogenesis is diminished, thermolysis is regulated, and the thermotaxic mechanism is improved. The evening exacerbation is gradually lessened in intensity. The remission becomes greater and longer. As regards the circulation, the vaso motor tone is improved, and to this Barr attributes the fact that he had no haemorrhage in his cases, which however were only 12 in number when he first reported them. Any complications of the respiratory system are said to rapidly disappear.

The appetite and digestion improve, the tongue moistens and cleans. The diarrhoea markedly diminishes. The delirium is greatly lessened, the patients so far recovering their senses as to object to their prolonged immersion. Barr thinks that the wasting is less. As the urine was passed into the tank he has no observations to offer on the question of diuresis.

The patients remain in the tank during the whole course of the disease. One case reported was immersed 31 days. The duration of the fever is unaf-

fect. Of the 12 cases reported none died.

Till some handier method is invented to insure against the water being polluted, the treatment is hardly likely to find favour. Barr considers such objections 'aesthetic,' but they will hardly be regarded as such either by the average practitioner or the average patient. The second objection is that such a method requires a great deal of labour on the part of the nurses. Till it is proved that the results justify this labour, the treatment is hardly likely to be adopted in Fever Hospitals. It is on the other hand probably less objectionable to patients than is the Brand system.

Dr Barr unfortunately treated most of his cases antiseptically with naphthaline, and this dual treatment renders it still more difficult to apprise the value of the Tank. In the meantime the profession will probably wait for the results of a more extended trial.

Subsection B. Affusions, Sponges, Cold Packs.

1. Affusions, as practised by Currie, and approved

of by Recamier, Trousseau, and others, may be ordered when ever the temperature reaches a point which in the opinion of the physician is deleterious. The patient sits in a bath, and cold water, from 50° to 60° F. is poured over the head and back for a few minutes. If a douche is used, the application should not last, according to Brouardel and Thoinot, more than two minutes. The writer has used this method in scarlatina, but has no experience of it in enteric.

2. Sponges. The cold sponge is often very grateful to the enteric patient, and, while it controls the temperature slightly, it is hardly powerful enough, as it is used ordinarily, to injure the patient. The writer has used it mainly in cases where the temperature exceeds 106° F. It should be applied very rapidly, and the patient should be lightly dried. On the Continent it is used frequently, and a very much lower temperature than the one noted above is considered the indication for its use.

The sponge of tepid water can be used much more freely, and is usually much enjoyed by patients, who

experience great relief from its use. Without exercising a very powerful effect on the temperature, it is often quite sufficient in hyperpyrexia to check the rise and sometimes even to bring down the temperature several degrees. It causes no shock, which is always to be dreaded when cold water is used in cases where the heart's action is feeble.

3. Cold Packs. These are of two varieties.

(a) A sheet is wrung out of ice cold water. The patient is enveloped head and all for 20 seconds only. He is then rubbed down. This is the method advised by Dujardin Beaumetz and is said to be very effectual in lowering temperature.

(b) The second method is the 'prolonged pack.' In this the patient's head and feet are left out of a sheet similarly prepared, and a blanket is wrapped round over all. This may be continued for 10 minutes and be repeated at short intervals. It seems much in favour with the Paris physicians, and is certainly less trouble than the bath, and probably less disagreeable to the patient. It has a distinguished ad-

vocate among English writers in Hilton Fagge.

Subsection C. Methods of Partial Refrigeration.

1. Enemata.

Foltz of Lyons in 1875 proposed the injection of a litre of water at a temperature of from 50° to 60° F. every two or four hours. He found that this treatment influenced the temperature favourably. The writer has, however, been unable to discover whether this method is extensively used in France or elsewhere. The use of enemata in enteric is very general, though the object aimed at is not always the same. At the City Hospital the method is employed under the name of Irrigation, with the double object of clearing out the lower bowel and flushing the kidneys. This will be referred to later, the writer preferring to give his experience of it, under the head of antiseptic methods of treatment, while at the same time admitting that a powerful antipyretic effect may be produced. Dr Buchman of Indiana considers that the temperature may be lowered two or three degrees by the introduc-

tion of two or three quarts of water. This amount is however somewhat alarming.

2. Cold Compresses, Icebags, etc.

Large abdominal compresses soaked in iced water and frequently renewed have been recommended by Jacquez. Riegel has applied icebags to the head, chest and abdomen with favourable results.

None of these methods would however appear to have the value of the treatment by baths. They may all undoubtedly be of extreme usefulness in hyperpyrexia where it is sometimes inadvisable or impossible to bathe the patient, but they have hardly the chance of influencing the course of the disease as much as immersion is said to do. No doubt the enemata promote diuresis, but the local application of cold can hardly procure this result which is one of the chief triumphs of the bath treatment, whereas the enemata cannot do very much towards relieving delirium, which it is quite possible might be improved by icebags to the head.

Subsection D. Refrigerant Apparatus.1. The Ice Cradle.

This consists of an ordinary surgical cradle long enough to cover the whole body, and of sufficient width to allow the patient to move easily beneath it. To it are suspended zinc pails containing ice. A coverlet is thrown over the patient and an aperture left at each end to allow free circulation of air. The patient lies naked, or covered with thin gauze. A hot water bottle is usually placed at his feet.

Dr Fenwick, who originated this method at the London Hospital, has treated many severe cases of Enteric with good results. Some have lain in the cradle for a fortnight, the temperature never rising above 104° in the axilla. Fenwick does not consider it applicable to hyperpyrexia, as the action is not rapid. He admits that at first it is uncomfortable to the patient.

The writer has seen this contrivance applied in cases both of scarlatina and enteric fever in the Edinburgh City Hospital. In the scarlatina case

it was used for hyperpyrexia and was not very successful. In the two enteric cases, in which it was employed, the patients remained at least two days in the cradle. The temperature remained certainly below 104° , but their discomfort was very great and great difficulty was experienced in preventing chilling of the extremities which are very liable to suffer. It is not a treatment which the writer would feel inclined to recommend in hyperpyrexia, and to obtain a constant control of temperature the ice-coil would appear to offer greater advantages.

2. The Ice Coil.

This is an arrangement of a coil of tubing laid on the abdomen. Through it ice cold water is allowed to run from a receptacle over the head of the patient. It has a considerable effect on the temperature, which was remarkably controlled in two cases treated in this manner at the City Hospital 18 months ago. It is not distressing to the patient and should do good when there is any peritonitis present. The writer believes that the coil has been used by Professor Greenfield.

Subsection E. Brand's Method.

Of all the varied methods at present in vogue for the treatment of Enteric Fever this celebrated system is probably the most popular. Introduced by Brand of Stettin in 1861, it has gradually come to be adopted by nearly all the leading physicians in France and America, and, though never general in this country, it has been approved of by such great authorities as Cayley and Broadbent. A treatment, which is in itself so troublesome to the nurses and so irksome to the patient must have singular advantages to command such popularity. Brand himself claimed that it was a specific. Most of his followers do not go so far, but content themselves with the assertion that it is at least far more than a merely antipyretic treatment. The writer, while fully admitting this, follows Brouardel in considering that a treatment, the application of which is regulated by a figure on the thermometer, must be at least primarily antipyretic.

The technique of the method is as follows. Whenever the temperature taken in the rectum reaches 102.2 F. the patient is placed in a bath of 65° F.

A compress, soaked in water about five degrees lower, is placed on the head, or water may be poured over the head and shoulders. Compresses dipped in ice-cold water are placed on the chest and abdomen. The patient remains in the bath 15 minutes, during which he is encouraged to rub himself and is systematically rubbed down by the attendants. This is done to stimulate the peripheral circulation. About 8 or 10 minutes after the commencement of the immersion, shivering usually begins but this is to be disregarded and the full time prescribed should be occupied in the process. The patient is then removed from the bath and wrapped in a coarse linen sheet over which a blanket is folded, the extremities being thoroughly dried and rubbed. A little wine or spirits is then given. The bath is to be repeated every 3 hours, unless the temperature remains below 102.2 F. The diet should consist of liquids. No drugs are given.

The writer is indebted to the admirable work of Dr Stewart of Philadelphia for the above details, which are also in accordance with the descriptions

given by Brouardel and Thoinot, and Osler.

We may here remark that Brand has availed himself of all the methods of water treatment suggested by his predecessors, utilizing both the affusion of Currie and the compresses of Jacquez. To these he has added the bath.

Most writers agree in recommending that the bath should be administered at the bedside of the patient who is thus disturbed as little as possible. It is important for the sake of the skin that the water be pure and frequently changed. Some authorities however allow the use of the same water for 24 hours.

The advocates of Brand's method lay great stress on the absolute necessity of carrying out the above instructions to the letter. Any deviation from them will give results far less favourable. The physician, we are to judge from their reports, is on no account to be rashly led into using his own judgment as to the modification of the details. The Brand treatment is the one above described; all others are spurious and may be positively injurious to the patient.

The only latitude allowed to the practitioner is as regards the temperature of the first bath. Brand sanctions the use of water at a higher temperature, usually that of the room, in certain cases which are more advanced in the disease, or who suffer from the symptoms of cardiac degeneration. But even in these cases his rule seems to be relaxed for the first day of the treatment only.

All who have used this method agree that the earlier the patient is brought under treatment, the more striking is the success of the baths. Brand himself claims to have abolished the classical typhoid symptoms from all cases which come under his care before the 5th day. All that remain are the rose rash, a moderate temperature, an unimportant bronchial catarrh, an enlargement of the spleen and an infiltration, no more, of the intestinal glands. Stewart asserts that this picture is equally true of those cases which do not come under treatment till the 10th or 11th days. Even this is a comparatively early date to secure an enteric patient in this coun-

try as the statistics included in this thesis show.

Neither age, sex, menstruation, pregnancy, diarrhoea nor constipation are to modify the treatment in any manner. Diarrhoea may be controlled by ice bladders on the abdomen, constipation relieved by enemata of cold water. Young children are especially favourable subjects for the treatment. Lacaze has the following remarkable quotation from Bouveret who was one of the apostles of the treatment in France.

'It is in children and young people that the Brand system gives the best results. In older subjects success is not so certain. Typhoid fever is essentially a disease of youth and should always result in recovery. If death supervenes it is because

- (1) the treatment has been imperfect,
- (2) the treatment has not been commenced from the start, or
- (3) the treatment has not followed the Brand system.'

The second reason given is obviously impossible to contradict.

What is the effect of the baths on the tempera-

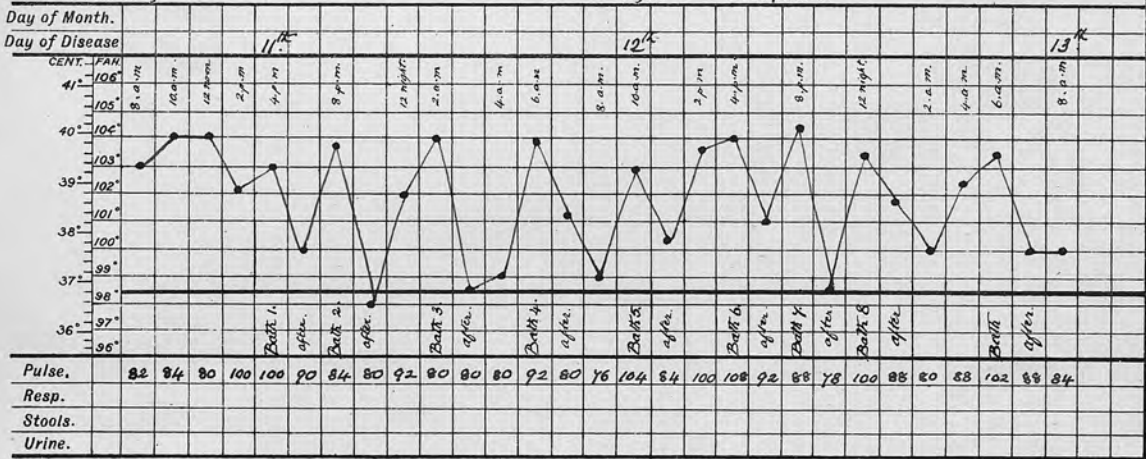
Chart from Osler showing marked action of the Baths.

Records of Temperature, Pulse, Respiration, Stools and Urine, from 11th Day of Enteric

18

In the case of D.M.

Aged Occupation



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Charts from Osler.

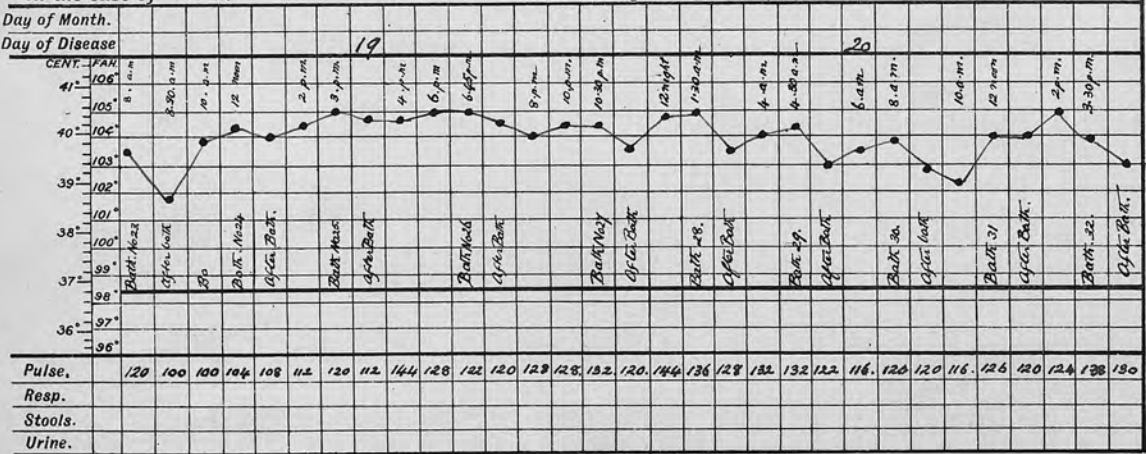
Chart from Osler showing very slight action of Baths.

Records of Temperature, Pulse, Respiration, Stools and Urine, from 19th Day of Enteric

18

In the case of M.M.

Aged Occupation



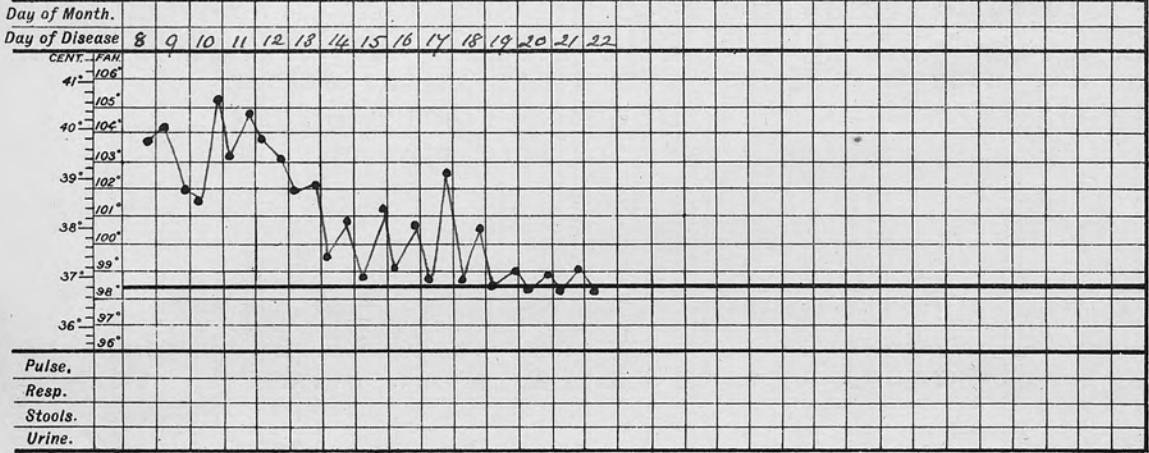
YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.

ture? Wilson considers they not only reduce the temperature but keep it down. The latter point seems very doubtful. They undoubtedly secure a remission more or less lasting, but as a rule the temperature rises again quickly. The first effect of the bath seems to be an increase in heat production, with an actual rise of temperature. It is only a few minutes after immersion that it begins to fall. The fall continues for a quarter of an hour after the withdrawal of the patient from the bath and then remains stationary for a longer or shorter period. The fall is usually from one to three degrees Fahrenheit. The amount of the reduction is influenced by the period of the disease, by its intensity, or by the idiosyncrasy of the patient. Some authors recommend a slightly warmer bath towards the stage of lysis, when the fall is apt to be considerable. The charts shown on the opposite page give a fair idea of the difference in the effect of the bath on two different cases. They are copied from the work of Osler. The third Chart given is from Lacaze and gives a general

Chart from Alacaze showing course of a case treated by the Brand System.
 Records of Temperature, Pulse, Respiration, Stools and Urine, from 8th Day of Enteric

In the case of a female

Aged 11 Occupation



idea of the temperature curve of a case treated by 23 cold baths during the course of the fever. We may here note that there is no limit to the number of baths which may be given, 200 not being an unknown figure.

The Brand treatment, if we except cases which are abortive, does not appear to affect the duration of the fever. None of the cases which the writer has seen described in various publications seem shorter than the average, whereas some appear to linger as long as any case, otherwise treated, will occasionally do. On the other hand there is no ground for believing that the average duration is longer than in an untreated case.

Cases under any treatment occasionally abort. Brand claims to have caused a large number to do so. This is a statement difficult to contradict, but the writer is inclined to believe that many cases were treated by this observer, which were not enteric at all, diagnosis being nearly an impossibility at the early period at which some of them came into his

hands.

As regards the question of Relapse, the experience of the supporters of the Brand method is as varied as that of those who prefer other modes of treatment. Osler reports that of 229 consecutive cases treated by him in the Johns Hopkins Hospital, 9.2 per cent had relapses. The first 33 of this series of cases were treated symptomatically and in no case relapsed. The remaining 196 were subjected to the Brand treatment and furnished all the cases of relapse composing the above percentage. But the incidence of relapse varies so considerably at different periods, even in cases treated similarly, that no inference can be drawn from these figures. It is very questionable whether any treatment is really responsible for a genuine relapse.

Contraindications for Brand's Method.

Brand himself has hardly admitted that such contraindications exist. If peritonitis supervenes or perforation has occurred the baths should not be given. Collapse also contraindicates their use.

If profuse haemorrhage occurs, most authorities do not recommend a continuation of the treatment; if, however, it is not very severe, there are many who do not regard it as any contraindication. As has been said above cases of grave cardiac disease should not be subjected at first to the low temperature ordinarily prescribed.

The Advantages of the Brand System.

We have already remarked that this treatment has many claims to be considered as something more than merely antipyretic. In the first place it appears to exercise an extraordinary influence on the amount of water passed by the patient, and what is still more important on the elimination of the toxines. In an ordinary case of Enteric fever the urine is scanty and of a high specific gravity. This condition persists till lysis is fairly established when the urine becomes less high coloured, abundant, and of a low specific gravity, with a notable increase in the amount of urea eliminated. According to the obser-

vations of Roque and Weil, made for the purpose of studying the elimination of the toxins in typhoid fever, the uro-toxic coefficient (the quantity of toxic matter which a unit of weight produces in a unit of time,), is in an untreated case only about double that of health, and continues above normal for four or five weeks after the fever has abated. If the bath treatment, however, is employed the uro-toxic coefficient becomes greatly increased, attaining an amount equal to five or six times the normal. This increase lessens with the subsidence of the fever and falls to normal coincidentally with its disappearance. In the same manner the urine increases in amount as soon as the baths are started, it loses its febrile characteristics, and the discharge occurs during the period of advance and not that of lysis. All authorities are agreed as to the advantages of a free diuresis in enteric fever, and a treatment which can show such an elimination must obviously possess great advantages. That the discharge of toxins is not caused by the antipyresis alone is

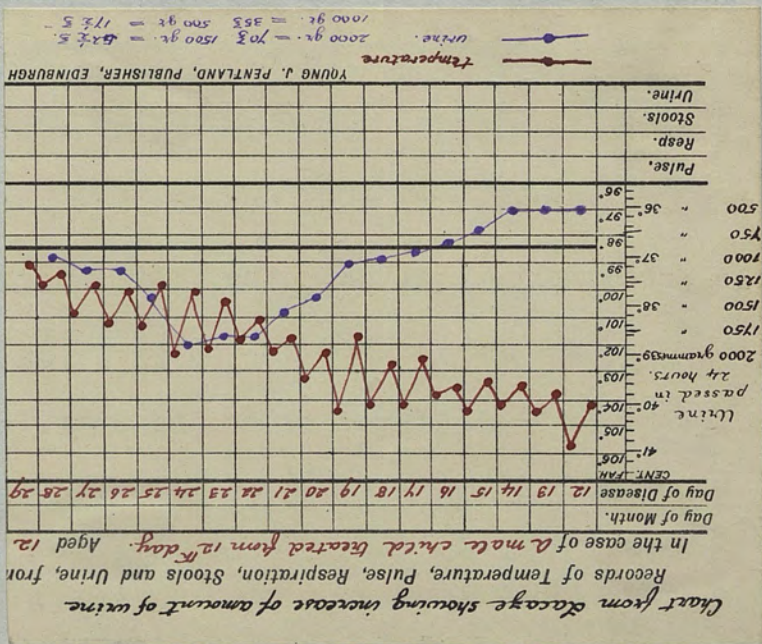


Chart of Urine passed.

(inverted by accident)

proved by the fact that, when the coal tar antipyretics are employed, the uro-toxic coefficient falls below normal, to increase enormously during convalescence. A chart is appended, taken from the work of Lacaze, to show the increase of urinary discharge after the commencement of the baths.

It is this advantage, the free diuresis, to which probably the great results of Brand's method are due. Juhel-Renoy, who has had a very large experience of it, writes 'After an experience of six years, based on a considerable number of my own cases, I am convinced that in that (diuresis), lies the great success of balneotherapy, on that depends its incontestable preeminence over all other forms of treatment, because no other method is capable of stimulating a similar emission of urine, no other allows elimination of so large a quantity of extractive matter.'

The second advantage is the lowering of the temperature. The value of this is of course a debated point, but if the heart and internal organs

really suffer to a dangerous extent from a prolonged high temperature, the remissions caused by the Brand system can only benefit the patient.

Thirdly the bath is said to exercise a valuable tonic action on the central nervous system. It thereby enables it the better to withstand the toxic influences of the infecting principle and its products. This is due to a reflex stimulus from the peripheral nerve endings. The action of the heart is improved, the digestive power strengthened, and the rate of the respiration decreased. Finally the delirium, tremors, and other nervous symptoms are conspicuous by their absence, and the convalescence is rapid, while there appears to be a wonderful immunity from complications.

The bath is also said to prevent bedsores and skin boils. Lacaze makes a great point of this, and we gather from the stress which he lays upon it that such conditions are not rare in French Hospitals. In well cared for patients, however, they do not often occur in the writer's own experience. Osler moreover has declared that the tendency to boils caused by the baths is one of its few disadvantages.

Objections to the Bath Treatment.

The first great objection which is likely to strike anyone, who, like the writer, has no personal experience of the system, is the repugnance which the patient himself is likely to feel for such a treatment, a repugnance which in this country would be exceedingly difficult to overcome. In private practice even if the patient consents, the technique is difficult to carry out and to apply it safely and satisfactorily requires two trained nurses or the presence of the medical man himself, an obvious impossibility when we consider the patient may require 8 baths in the twenty four hours. Most of the institutions which receive enteric patients are hospitals supported by the rates, and under the control of a County Council or Municipality. The patients in them are not so directly under the physician's control as in a charitable institution, which they enter voluntarily and from which they may be expelled if they decline treatment. The Hospital for Infectious Diseases is bound to keep any fever patient,

whether he submits to treatment or not, as he is, on principle, in the hospital not for his own good but for that of the community at large. Moreover the average Town Council is always ready to support such a patient against treatment which it would probably consider experimental. That the patients do as a rule object to the bath is not denied by the American physicians who believe in its efficacy. That they should so object is perfectly natural. To be put for a quarter of an hour in a cold bath, to be kept in it from 3 to 5 minutes after the teeth begin to chatter, is unpleasant enough to contemplate. To experience it must be infinitely worse. It is true that many writers assert that after the first 10 or 20 baths the patients themselves are glad to undergo the treatment which they feel is doing them good.

Again, patients in the typhoid state, and it appears to be those who benefit most, are hardly in a position to object.

The treatment also appears to require cool courage on the part of the Physician. An American writer,

J. C. Wilson, a great believer in Brand's system, writes. 'The frequent disturbance for the sake of taking temperatures and bathing, the fact that the patients are compelled to rise from their bed and with the aid of the attendants to step into the bath, the pallor, shivering, and the blueness of the extremities which shows itself during the course of the bath and continues for a varying time after the patient is put to bed, demand conviction on the part of the physician, and the courage of conviction to continue.'

The second great objection to this treatment is the risk of fatal collapse, haemorrhage, or lung complications.

1. As regards collapse, provided that the heart is carefully examined before the bath, that the first bath is not too cold, and that the friction which is an integral part of the treatment is properly applied during the bath, the consensus of opinion appears to be that the risk is very slight.

2. The question of haemorrhage is a much debated point. Brand says its frequency is diminished and

not increased. Cayley points out aptly that the only haemorrhage of moment in enteric is not congestive, but ulcerative, and from vessels of considerable size, not likely to be affected by external conditions.

3. As regards the occurrence of lung complications, Brand claimed to have abolished them. Osler on the other hand thinks the baths exercise no special influence on the respiratory system. They do not aggravate the bronchitis, in his opinion, and they certainly do not cause either pneumonia or pleurisy. Indeed they are largely used in the treatment of pneumonia in France, and Lacaze reports numerous cases successfully treated by the Brand system.

Conclusions regarding Brand's Method.

In summing up the opinions of various writers on this system, we are forced to admit that it has an enormous amount of evidence in its favour. It can show most remarkable statistics as regards the deathrate of cases so treated, and we must take it for granted that all the cases included in these statistics were true enteric. The cases of Brand himself are open to

some doubt, for he includes cases treated before the 5th day, many of which according to his own account aborted, and which, laying all prejudice aside, were quite possibly not enteric at all. But even then the change in his deathrate is most striking, as will be seen in the table appended to this summary. One must at the same time remember that the improvement in the hygiene both of our cities and our hospitals, which was already becoming marked at the time these statistics were published, would alone tend to give the patients a better chance. The improvement of hygiene and nursing in this country has caused a drop in the deathrate of hospital cases almost as remarkable. The mortality of Murchison's cases, 17 per cent, would be regarded as enormous today in most of our fever hospitals. Osler, who writes very temperately on the question, is satisfied that the deathrate is considerably lowered. Were this not the case, he declares, he would not suffer such a harsh and disagreeable treatment in his wards for a single day. Cayley also considers that the deathrate is most mark-

edly affected, and his statistics certainly bear out his contention. Broadbent thinks many lives would be saved if cold bathing was resorted to in serious cases.

We have no reason to believe from the evidence before us that the duration of the disease is shortened by the treatment. All writers agree that the convalescence is rapid; but without comparative tables, showing the number of days in hospital of large numbers of cases, it is difficult to say how far this statement may be accepted. The great bar to the introduction of the method in this country is undoubtedly the objections of the patients to it. In crowded hospitals there would be a difficulty in obtaining sufficient nurses to carry it out, and in private practice these difficulties would be greater. The genuine system has not been much used in Great Britain, Cayley giving his baths at a temperature of from 70° to 75° F., but whether he derives the full advantage of the treatment by this milder system is doubtful.

The reduction of temperature by baths probably does not affect heat production very much, and opponents of antipyretic drugs allow that advantage may be gained by lowering the temperature by the bath. The increased diuresis, and the rapid elimination of the toxins, which appear to be established facts, and the slight diarrhoea, which some authors associate with this method, will always remain the principal causes of the success of the treatment. The gradual conversion to this system of the Continental and American physicians leads us to believe that before long it will have a fair trial in this country also, unless indeed serotherapy offers greater advantages still.

Subsection F. Refrigeration by the Ambient Air.

This has been suggested by de Souza. In winter he keeps the temperature of the room as low as 50^o F., covering the patient with only one sheet and one blanket. If the temperature of the patient falls considerably, something extra is thrown over the feet. The temperature of the room is graduated so far as possible to suit that of the patient, the former

being raised as the latter is reduced.

Such a treatment is obviously difficult to carry out in summer. Still every one recognises that keeping the patient cool is a great advantage. Something more than is usually done at present in our hospitals might be done in this direction. It should be perfectly simple to carry out, even if we cannot expect to keep the temperature of the ward as low as 50° .

The greatest difficulty would be that patients would have to be shifted to warmer wards as their temperature approached normal. This would cause considerable trouble in Hospitals where many acute cases are being treated simultaneously.

Conclusions on Refrigeration generally.

The writer has, in mentioning each method, given his views on its efficacy, and has gone somewhat at length into the Brand System. He therefore feels that it is unnecessary to say anything more than that, while objecting to antipyresis on principle, he considers that many of these methods might be used with advantage in hyperpyrexia.

CHAPTER V.

Treatment Directed Against The
Bacteria and Their Products.

Section I. Antisepsis.

Section II. Antisepsis by Elimination.

Section III. Antisepsis by Drugs.

Section IV. Antisepsis by Serotherapy.

CHAPTER V.

Treatment Directed Against The Bacteria And Their Products.

Section I. Antisepsis.

In recent years, when the principle of Antisepsis in Surgery has been attended with such great results, the adoption of the principle by physicians may be regarded as a natural process of evolution. It is, moreover, obvious that it would be in the Infective Diseases that any experiment of Medical Antisepsis would be first tried. It has been, therefore, the aim of many physicians to attack the germ at the moment when it is deranging the functions of the human organism.

The great difficulty has been so to graduate the force of the remedy employed as to destroy the germ and not injure the patient. It must be confessed that at present this difficulty remains in all its force, and it is a difficulty which is thoroughly realized by all the supporters of Antiseptic treatment in Enteric Fever. Various critics of the principle of

Antiseptics may , like Latham in his Harveian oration in 1888, suggest that the patient and not the germ succumbs. Those who habitually use antiseptics, while they would gladly kill the germ, if the means existed, do not at present pretend to do so. Their claim is that they modify its activity and neutralize its products, and it must be admitted that, even if they only succeed so far as this, they have a strong case in their favour.

Burney Yeo, who has perhaps done more than any other writer to popularize the Treatment in this country, writes:- 'The development, activity, and life of these organisms can be influenced and modified by exposure to agencies and conditions over which we have a certain amount of control.' In his view the indications are to firstly support and strengthen the resisting powers of the organism attacked, while it is passing through a more or less grave crisis, and secondly to diminish the gravity of this crisis by opposing or counteracting the activity of the special morbidic microbe with which the organ-

ism is infected.

Stewart of Philadelphia, while admitting that the germs which gain a nidus in the liver, mesenteric glands, and spleen are inaccessible to insoluble Antiseptics, considers that better results are obtained by the use of certain of these drugs than by the expectant-symptomatic method alone.

It is probable that local Antisepsis then is the most that can be hoped for. We may also assume that this antisepsis is rather adverse to the toxic products of the germ than to the germ itself. It may in certain cases, as Guaiacol is said to do in phthisis, form non-toxic combinations with poisonous proteids in the blood, and so influence general symptoms very largely. It should prevent or check tympanites depending on the evolution of gas from decomposing food, it should improve the tone of the alimentary canal, it should limit excessive ulceration, and it should deodorize the stools. Whatever the Antiseptic drug, Antisepsis to be of any use should do so much at least.

The number of drugs that have been tried as intestinal or general Antiseptics practically proves, however, that this method has not yet attained perfection. Many seem to be of about equal value. They are useful up to a certain point. But there is at present no one remedy which we can adopt as the specific in our combat with the Eberth's Bacillus and its products.

Although the action of these drugs is limited they mostly appear to have the advantage of being innocuous to the patient, and the writer is assured by the nurses at the City Hospital that the modification of the foulness of the stools, which they effect, has rendered nursing in Enteric Wards much pleasanter. The idea of Antisepsis is a clean one, and even if it comes to be regarded as of no special value in the disease, it will probably continue to be practised as a part of the treatment on hygienic principles.

Before considering Antiseptic Drugs it will be well to consider other methods of keeping the alimentary canal moderately clean.

Section II. Antisepsis by Elimination.A. Purgation.

It is obvious that the fermentation of putrefying food substances, imperfectly digested, within the intestine must do harm to the patient. And yet this is a risk which an Enteric patient is specially liable to run, because of the somewhat exaggerated dangers of haemorrhage or perforation when purgatives or aperients are used. The influence of constipation on an Enteric temperature is very marked, and the first thing we are inclined to enquire about, when we note a temperature slightly higher than the day before, is the state of the bowels. A small dose of Castor oil, or a few grains of calomel rectify this condition at once. The longer interference is postponed, the greater is the risk when it is undertaken. The writer cannot agree with those who allow the bowels to remain locked up four days or a week as the case may be. In a moderately large experience of Enteric Fever, about 500 cases, he has never yet seen an accident which could possibly be attributed either

to the use of aperients or enemata judiciously administered. Dr Muirhead prefers two motions a day in an enteric patient to one, and it is the rarest thing at the City Hospital to interfere with the efforts of nature to expel the poison by diarrhoea.

Larroque was one of the first physicians to insist on the advantage of two motions a day. He used Seidlitz chiefly to secure this evacuation. The writer will touch later on the use of Calomel, which personally he prefers to any other drug for this purpose, and will merely remark here that it can be used in 3 or 5 grain doses throughout the whole course of the disease. Castor oil, which he has chiefly employed in the cases of the series which is classified as Expectant-Symptomatic, gave results nearly as good. A drachm dose was given at night, if no motion occurred during the day. A drachm dose of fluid magnesia is sometimes useful. Henry's Solution he has also used, but in two cases it was followed by great evolution of gas and distressing tympanites.

As has been said above, the result of the evacua-

tion of faeces is a fall of temperature, in this case to be welcomed, as the cause of the pyrexia has been removed, and in no way to be compared to an artificial antipyresis. The mouth and tongue naturally improve and distension disappears or is less liable to occur.

The researches of Gilbert and Dominici, communicated in the December of last year to the Society of Biology of Paris, established the fact that the administration of a purgative increases in a marked manner the elimination of microbes in the faeces. The faeces of a healthy man, after a saline purge, contained 20 milliards of microbes, the average being only 12 milliards. On the following day a formed stool was passed containing little more than half a milliard of microbes. In other words the proportion of microbes to faeces was reduced to less than a twentieth of the normal, and these observers claim, with some justice, that 'The Purgative, then, had disinfected the bowel and produced an asepsis, which, if not absolute, was in any case remarkable.'

It is true we cannot purge, in the ordinary ac-

ceptance of the term, our enteric patients. But the systematic use of aperients will probably tend towards the establishment of an asepsis such as the above. This asepsis lasts a very short time and the action should be kept up. According to the results of the experiments mentioned, the small intestine microbes are more virulent than those of the large, and the increase of the total number in the faeces after a purgative is largely at their expense. The improvement, then, may be even greater than the figures express.

We also have it in our power to keep the large intestine clean by means of enemata. Given with caution these are perfectly safe.

B. Diuresis.

In discussing the Brand treatment of Enteric we noted that the free Diuresis which it promotes was one of its outstanding advantages. Fortunately, however, we have at our disposal various means, less irksome to the patients than cold baths, to secure this desirable flushing of the kidneys. The most obvious of

these is the supply of large quantities of fluid to the patient, and for this purpose there is nothing better than cold water. Débove of Paris treats his patients with nothing else. Some of them are reported to take as much as from 7 to 8 litres daily. They are not merely encouraged to drink, they are forced to drink. Débove's statistics show a death rate of 11 per cent on a large number of cases with no other treatment than the above.

Patients often do not ask for water; they seldom, in the writer's experience, refuse it when it is offered. It is therefore necessary for the nurses to frequently give the patients, especially those in the typhoid state, a draught of water or some other diluent drink. Milk has a considerable diuretic effect, and Tressider of Nottingham has written on its advantages in the treatment of Enteric Fever from this point of view. Weak beef and chicken teas are also valuable for the same purpose. They can hardly be given too diluted, and it is extraordinary what quantities some patients will drink.

The result of the addition of this large amount of fluid to the blood is the dilution of the toxins circulating in it. Not only is there a probability that they are more freely eliminated from the system through the kidneys, but the kidneys themselves, having to deal with them in a more dilute solution, are probably far less taxed.

Should drugs be used to promote this diuresis? The writer is averse to the use of any drug in Enteric, when its functions can be fulfilled by some other method as by the flushing system above mentioned. Digitalis has been recommended but a drug of its power is rather too risky to use for such a purpose. One of the advantages of Calomel as a purgative is that it also exercises as a rule a marked diuretic effect.

C. Irrigation of the Large Intestine.

This system of securing elimination of poisonous and waste material is at once diuretic and aperient. It is therefore easier to discuss it by itself, than to include it under either of the heads above. We have in a previous chapter seen that the use of large

enemata is common in Enteric Fever for various purposes, amongst others for the reduction of temperature. Buchman writing in the New York Medical Record in 1889 reported 6 Cases treated by washing out the colon with a 'large enough quantity of water thoroughly to cleanse it.' He concluded that 3 quarts of water can be passed into the colon, that the temperature is rapidly lowered, that tympanitic distention disappears with the evacuation of the water, and finally that putrefactive fermentation is prevented. The lowering of the temperature doubtless largely depends on the temperature of the water used. On the other hand the chart can be only favourably influenced by the removal of toxic substances which otherwise would be readily absorbed.

Shuell in the New York Medical Journal, 1893, recommends irrigation of the colon with a view of removing from it as early as possible all ptomaines and decomposing substances. He uses a soft rubber tube, 3 feet long. The water should be allowed to flow while the tube is being introduced, and it is possible to flush the intestine up to the caecum. The water

used by Shuell is warm and rendered aseptic by previous boiling. Two quarts should be introduced and the gut be distended to wash out the sacculi. Towards the end of the fever caution should be exercised, as not infrequently the solitary glands in the great intestine are deeply ulcerated.

Shuell found that when this treatment is commenced early, the cases are usually comparatively mild, though the duration of the disease is unaffected. He used the injections every 3 days for the first fortnight of the fever. He does not note any increase of diuresis.

At the City Hospital Dr Muirhead has a similar system, though it differs in various details from that of Shuell. In the first place the amount of fluid allowed to flow into the colon is seldom more than 3 pints. Secondly the method is employed throughout the duration of the disease, and thirdly it is usually administered twice daily.

The water used varies from 80^oF. as a maximum to a little lower than the temperature of the room. A douche can is hung at a level of about 18 inches

higher than the patient, to prevent too great a pressure, and the water dribbles into the upper part of the rectum through a French rubber catheter attached to the soft rubber tube of the douche can. The tube can be clamped to prevent too rapid a flow. The more slowly the water flows in, the more easily is it retained by the patient, who usually lies on his left side with the buttocks slightly raised.

Patients after one or two irrigations find no difficulty in retaining the fluid twenty minutes or more, and when it is finally rejected it brings away a certain amount of faecal matter. Usually one third or even one half of the total amount injected is passed by the kidneys. Patients, especially adults, find a great relief in irrigation, and many of them would willingly submit to it more often than it is ordered.

More or less systematic irrigation has been employed in more than 20 of the writer's cases. In nearly all the general appearance of the patient improved after two or three days treatment. Some of

the cases had Antiseptic drugs also, some had not. The temperature usually fell the day after the treatment commenced. A chart is shown on which this result may be noticed. Distension nearly always disappears after three or four irrigations. The Urine was always increased in amount.

The writer regards Irrigation as a useful adjunct to the other forms of treatment at our disposal. In his opinion it is at its best when employed in conjunction with three grain doses of Calomel every second or third day. The Calomel cleans out the small intestine, and the irrigation washes the faecal matters from the colon. If desired, an antiseptic can be added to the water employed. At the City Hospital Boracic Acid is usually used, but it is possible that a stronger antiseptic might be employed with advantage.

Those who favour an Antipyretic method of treatment can, by the use of colder water, also lower the temperature directly by this method. One case has received irrigations at the temperature of 50^o F. The result was a dangerous collapse from a too con-

siderable fall of temperature. This is well seen in the chart. It is true that the alarming symptoms followed an injection given at 4 a.m., when the natural depression of the patient would render such an accident more likely to occur, but the occurrence has strengthened the writer in his objections to interference with temperature. Personally he is quite content with the secondary effect on the temperature produced by the removal of the various poisons which assist the bacillus of Eberth in maintaining the pyrexia. An irrigation at the temperature of the room is, in his opinion, quite sufficient, and there is less liability to complaints from patients, if it is as high as 80^oF. Really cold water may, it is true, have an antipyretic action, but it is not nearly so pleasant to the patient as when the temperature is slightly raised.

Section III. Antisepsis by Drugs.

- Subsection A. Naphthalin, the Naphthols.
- " B. Guaiacol, Thymol, Camphor
Turpentine and Eucalyptus.
- " C. The Metals:-
Mercury, Bismuth, Iron,
Arsenic and Antimony.
- " D. Carbolic Acid, Salol, and
the Salicylates.
- " E. Chlorine, Iodine, Chloroform,
Iodoform, Sulphurous Acid and
Bisulphide of Carbon.
- " F. Quinine.
- " G. Other Antiseptics: -
Charcoal, Tannic Acid.

Antiseptic Drugs generally considered.

The writer had hoped to be able to classify the various drugs to be considered in this section as General and Local Antiseptics. Quinine may be considered as a type of the former, and Naphthol of the latter. But it would be impossible to divide the drugs, which have been used for Antiseptic purposes, into these two classes, as many of them seem to act both generally and locally. The writer has been obliged therefore for convenience to divide these remedies into six rough groups, while perfectly admitting that the substances included in some of the groups have no resemblance to each other. This is particularly the case with the last in which all the drugs, which did not naturally fall under other headings, are included.

The main objects with which the drugs are given are -

- (1) To so far as possible disinfect the alimentary canal.
- (2) To neutralize the toxins circulating in the blood.

We may discover how far these objects are carried out by attention to four main points.

(1) Are the Stools rendered less foul or completely deodorized?

(2) Does Tympanites disappear, or, if it does not exist at first, does it appear in spite of the drug?

(3) Does the tongue point to an aseptic condition of the alimentary Canal?

(4) Are relapses prevented, or are they less frequent than under other treatments?

The state of the temperature too is worthy of attention as we may imagine that a certain proportion of it in a sharp case is due to the ordinary bacilli of the bowel. If therefore the temperature shows a marked decrease after treatment has started, we would suppose that the drug employed has to a certain extent controlled the action of the faecal microbes.

The question of the duration of the fever is also one of importance, but, as few authors profess to be

able to abort the disease with drugs, it is secondary in interest to the points mentioned above. The writer has carefully collected the dates of all his cases and this question will be more fully considered in the chapter devoted to his conclusions on the whole question of treatment.

Subsection A. Naphthalin and the Naphthols.

Naphthalin.

This drug has been used somewhat extensively on the Continent as an Antiseptic in Enteric Fever. Those who have used it seem satisfied with its action. Schwartz found that it diminished the bacilli in faecal matter by one third. He recommended its combination with Calomel. This opinion is shared by Sehrwald who also investigated the bacteriological action of the drug and came to the following conclusions. That it retards but slowly, at the temperature of an ordinary room, the development of enteric and putrifactive bacteria. That at a temperature of 98^o F. its action is much more marked, suggesting that it is in its gaseous state when it destroys germs.

That it has a special antagonism to the typhoid bacillus and may decrease the number in the intestine to one tenth. Finally that to gain the full advantage of its antiseptic power it should be administered in fine powder or solution.

Wolff in 1891 reported a consecutive series of 100 cases with two deaths, and believes that 16 of these cases aborted owing to its use. He administered from 15 grains to one drachm daily in emulsion or capsule. The odour of the drug is very disagreeable. He recommended that it should be carefully purified, as, if impure, it is apt to cause haematuria.

In this country Barr has used Naphthalin as an adjunct to his tank bath treatment. Caton has also employed it with success in the Liverpool Royal Infirmary.

The writer has not had the opportunity of seeing cases treated with this remedy. He gathers, however, from the literature on the subject, that it is more or less toxic, and has no advantages over the naphthols to counteract this defect.

Naphthols.

The drugs included under the above heading are:-

Alpha-Naphthol, Beta-Naphthol, Hydro-Naphthol, and the salts of Beta-Naphthol, the Benzoate and the Salicylate. With the exception of Betol, the Salicylate of Betanaphthol, the writer has had personal experience of all those drugs, and his present series includes cases treated by Hydro-naphthol, Beta-naphthol and Benzo-naphthol (the Benzoate of Beta-naphthol). Hydronaphthol appears to be the same drug as Beta-naphthol, sold as a proprietary remedy under a different name. It is practically the latter drug in an impure condition.

Purified Naphthol is non-toxic and is non irritating. Teissier of Lyons has shown it to be especially inimical to the Eberth's bacillus. This observer prefers Alpha-naphthol which he usually combines with Salicylate of Bismuth. Moncorvo finds that it is readily tolerated by children and is valuable in removing tympanites. Maximovitch also prefers this particular variety of the drug. The consensus of

opinion however appears to be that it is more disagreeable, and more liable to irritate the stomach than Betanaphthol. The writer has used Alpha-Naphthol occasionally, but not enough to come to any definite conclusion as to whether it is preferable to its isomeric variety.

Beta-naphthol was introduced as a Therapeutic agent in Enteric Fever by Bouchard who gave it in combination with Salicylate of Bismuth. This combination was tried some years ago in the City Hospital, when the writer was resident physician, with fairly good results. Bernheim and Laurent object to it as being apt to constipate, and it may be necessary to give magnesia in addition. The writer also has experienced this disadvantage and is inclined to believe that this method of treatment is more satisfactory in cases suffering from severe diarrhoea.

Mitchell Clarke, in the Practitioner of 1888 and again in 1890, reports his results with Hydronaphthol. He gives three to four grains every two or three hours. Under this treatment the diarrhoea stops and

the stools are deodorized. He sums up the advantages of the drug as follows:-

1. The duration of the fever is reduced.
2. The stools are rendered less offensive.
3. The abdominal tenderness is diminished.
4. The tongue and mouth clean early.
5. There is no albuminuria.
6. Convalescence is more rapid.
7. There are fewer complications.
8. The risk to the attendants is diminished.

These contentions are a fair example of what is claimed by the supporters of antiseptic treatment.

Clarke found that Naphthol retards slightly milk digestion, and also the peptic digestion of egg albumen. There is no effect on pancreatic digestion.

Mason of Boston has reported 675 cases treated with Hydronaphthol. He is satisfied with the results obtained.

Stewart of Philadelphia prefers Betanaphthol and has used it extensively in his cases. He has also had experience of its salicylate, Betol, which he has

found an admirable antiseptic in fetid diarrhoea.

The writer proposes to compare the results of the three forms in which Naphthol has been given during the last year at the City Hospital, discussing each drug separately. While he believes that Hydronaphthol is merely an impure variety of Betanaphthol, he has kept the cases treated by these two drugs perfectly distinct.

Hydronaphthol.

Hydronaphthol has been given in 8 cases during the last year. Seven of these had no other systematic treatment. The eighth was treated systematically with Calomel.

The drug, which is very peppery and burning to the taste, was always given in wafer paper. The largest amount given was six grains every six hours to an adult. The average dose for any patient over 12 years of age was five grains every 6 hours.

Several of the patients were admitted in a typhoid condition and ran a severe course. They were nearly all started with a three or five grain dose

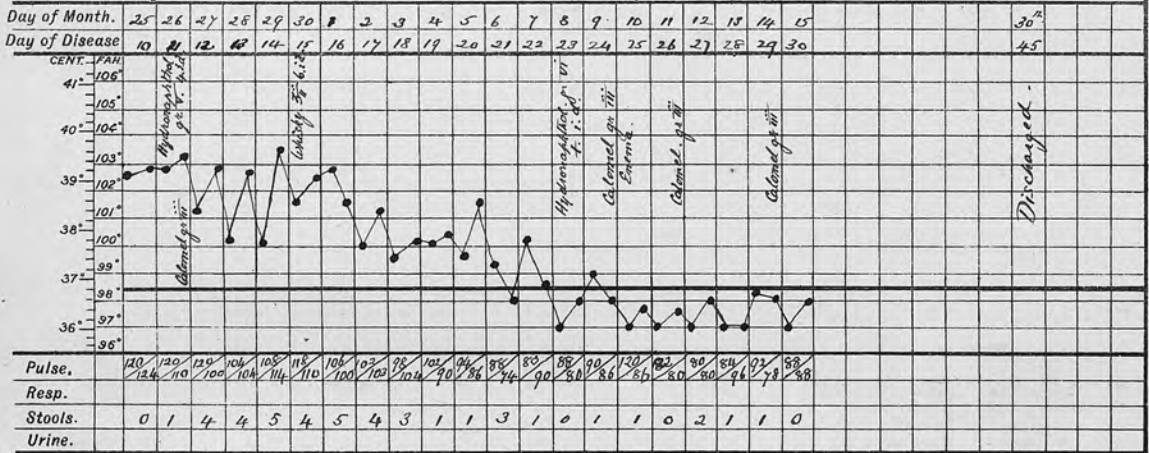
Hydonaphthol.

Records of Temperature, Pulse, Respiration, Stools and Urine, from 10th Day of Enteric

June 1895

In the case of *Adeline Bemel*.

Aged 11 Occupation -



Diets. Soup. Pudding. Benger's YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON. Fish. 33rd day.

Chart 1.

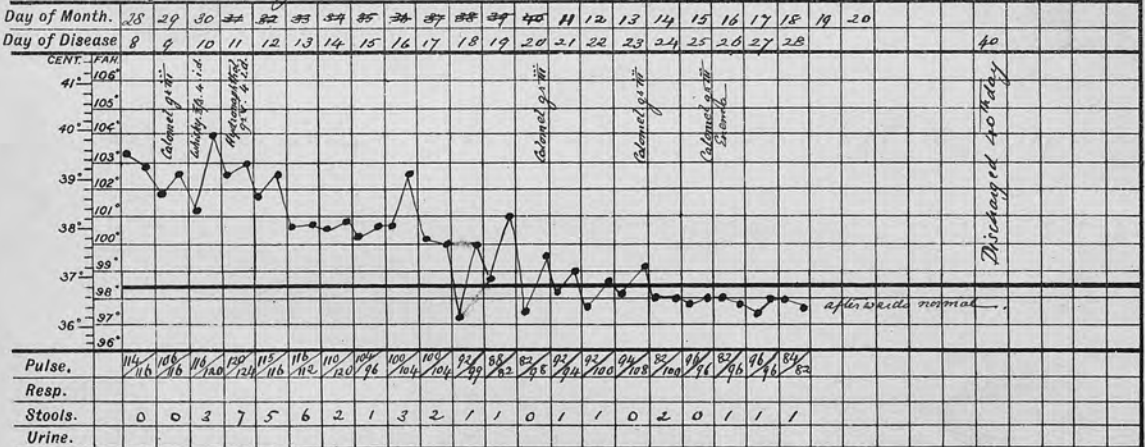
Hydonaphthol.

Records of Temperature, Pulse, Respiration, Stools and Urine, from 8th Day of Enteric

June 1895

In the case of *Bella Malony*.

Aged 14 Occupation



Diets. Soup. Pudding. Milk.

YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.

Chart 2.

of calomel, which is a routine practice at the Hospital. The average date of admission was the 10th day, and the average age was 14½ years. Four were males and four females.

Temperature.

In two cases the temperature seemed favourably affected by the drug. Chart (i) shows a case where remissions of temperature were noticed the day after the Hydronaphthol was started. Chart (ii) shows a considerable drop of temperature the day after the treatment commenced. In the other cases no effect on the temperature was noticed.

Tongue.

In only two cases was there a marked improvement in the condition of the tongue before the temperature reached the normal. In three cases the tongue remained foul and crusted throughout. In the remainder the cleansing process was not rapid.

Stools.

The stools were in all cases rather less foul than in cases where antiseptic treatment is not employed. But

in only two cases are they noted as being very much improved. In no case were they odourless.

Tympanites.

Distension existed in three cases. In two of these it did not appear to be modified. In the third it disappeared rapidly. The other cases, which all came in without tympanites, did not develop it in the course of the disease.

Duration.

The average duration of all cases was 26 days. We may safely conclude then that the drug does not shorten the course of the fever.

Complications.

Two cases suffered from haemorrhage, and in both instances the haemorrhage was severe. In the first case the antiseptic had been given systematically for four days before the haemorrhage (see Chart iii), in the other for five days. In neither case did it prevent the progress of the ulceration.

One case suffered from a recrudescence, but in this case it appears to be due to constipation. The temperature remained up some days. Fish had been

given four days before its commencement, but this would hardly have caused the rise of the temperature, had the bowels been kept properly open.

One case had a relapse. This, curiously enough, was the man who was also treated with calomel. He came under treatment late, the 16th day, and was a sharp case. The combination of Naphthol and calomel should prevent relapses if they are due to reabsorption from the bowel, as the germs should not only be attacked but also cleared out of the canal. This case points strongly to the fact that the retention of the bacilli in the spleen is the true cause of relapses.

Convalescence.

The patients in most cases picked up rapidly. The average day of discharge was the 55th of the disease, and the patients remained in the Hospital on an average 45 days.

Benzonaphthol

This drug, the Benzoate of Beta-naphthol is said to possess advantages which Beta-naphthol itself is without. It splits up into naphthol and Benzoic

acid, the latter being excreted by the kidneys. As Benzoic acid is slightly antipyretic and is also diuretic, we should expect to find in the following series of cases a modification of the temperature and an increase in the amount of urine passed. The writer may say at once that neither of these results were noticed.

The drug itself is easier to take than the others of the group. It has a faint aromatic odour, and practically no taste. It was usually administered in wafer paper and the ordinary adult dose given was 16 grains three times daily.

Twenty cases were treated with this antiseptic, and in two of these calomel was given systematically. The average day of admission was the 11th and the average age of the patients was 18. Eleven were males, the rest females.

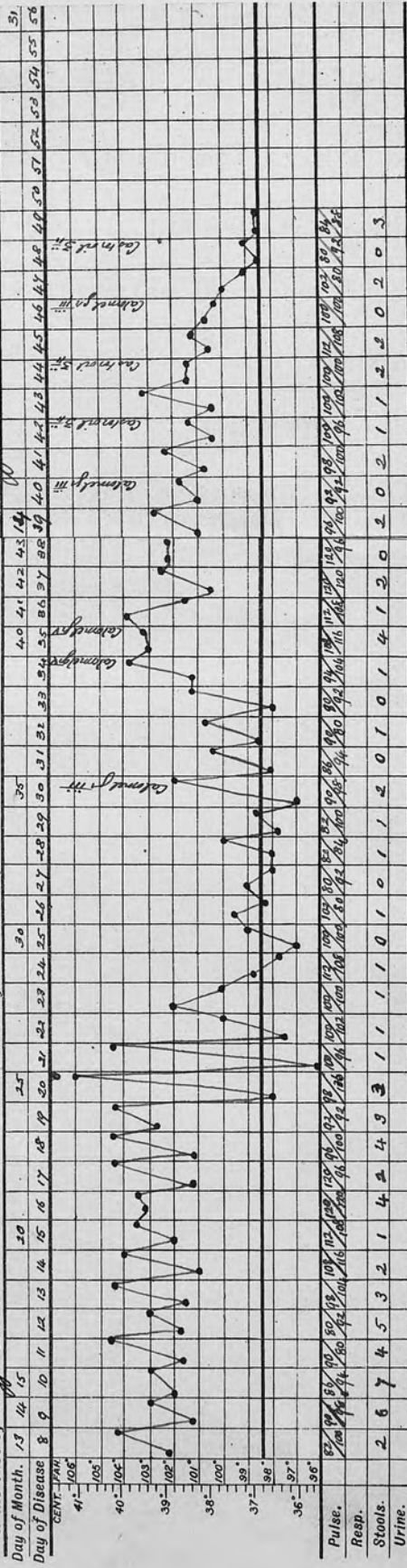
Temperature.

In only four cases could it be said that the temperature appeared to be benefited by the treatment. One of these, moreover, had also calomel, which usually affects the temperature in a marked manner. In one

Chart 1. Relapse after Benzognaphthol

Benzognaphthol. *Atropine*. *Relapse.*
 from 9th to 13th Dec. *from 23rd to 24th Dec.*

Records of Temperature, Pulse, Respiration, Stools and Urine, from 8th Day of Enteric. *Apr 1895*
 Aged 18. Occupation *e of Messrs. Allan*



YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.

case rigors and a high temperature supervened on the 20th day, as shown in Chart(i). If this was due, as the writer is inclined to believe, to septic absorption, benzonaphthol, which had been given for ten days previously, certainly failed in this case. The temperature was subsequently treated by atropine, and the case is noted under that heading in a previous chapter.

Tongue.

In nine cases the tongue appeared to begin cleaning rapidly after the treatment was commenced. In two the tongue was moist and clean on admission and remained so. In the remainder no special improvement was noticed.

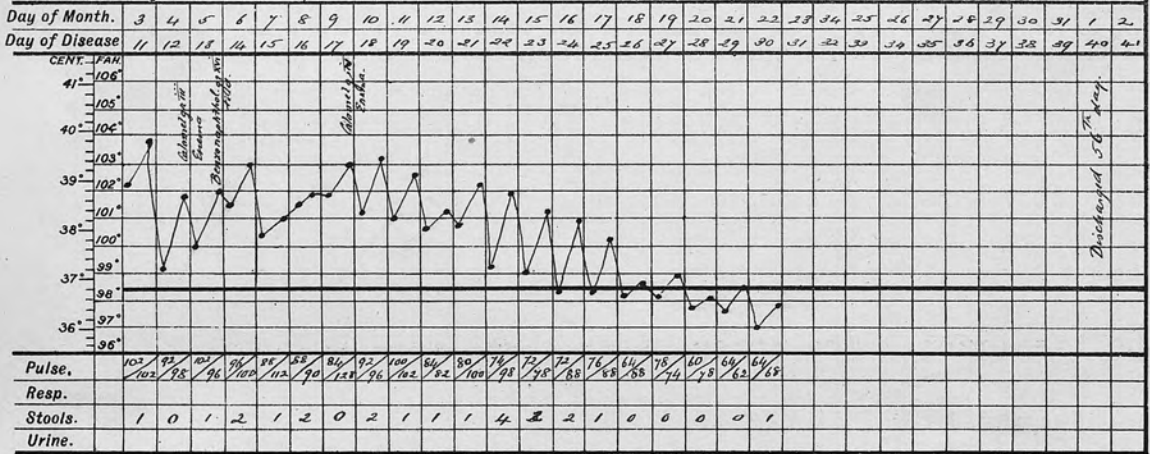
Stools.

In one case only are the stools noted as 'practically odourless' after about a week's treatment. In two they were 'very much improved,' that is to say they had lost their offensiveness, though a faint faecal odour remained. In all the rest except one, in which the dejecta remained positively foul, there was

Benzonaphthol.

Records of Temperature, Pulse, Respiration, Stools and Urine, from 11th Day of Enteric. Aug 1895

In the case of Frank Early Aged 22. Occupation Mason.



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Chart of a case treated with Benzonaphthol.

a slight modification of their offensive character.

Tympanites.

In nine cases there was tympanites more or less severe on admission. In six cases it improved after treatment commenced, although in one it took six days to disappear, and in another it recurred in the face of the treatment. The three other cases were absolutely unaffected by Benzonaphthol.

Duration.

The average duration of the fever was 31 days; there was one case which was normal as early as the 13th day, and which may be called Abortive.

Complications.

There were two cases of haemorrhage, one only being severe, occurring on the 21st and 22nd days of the disease respectively. In one case Benzonaphthol had been regularly given for a week before the bleeding took place. The other patient had only had it for two days.

Recrudescences were two in number. Both these were due to constipation. There was no early feeding to account for them.

Relapses were also two in number. They were characterized by all the symptoms of the original fever.

Convalescence.

This was in most cases rapid, considering how long many of the patients were in attaining the normal. The average date of discharge was the 60th day of the disease, and the patients remained on an average 48 days in hospital.

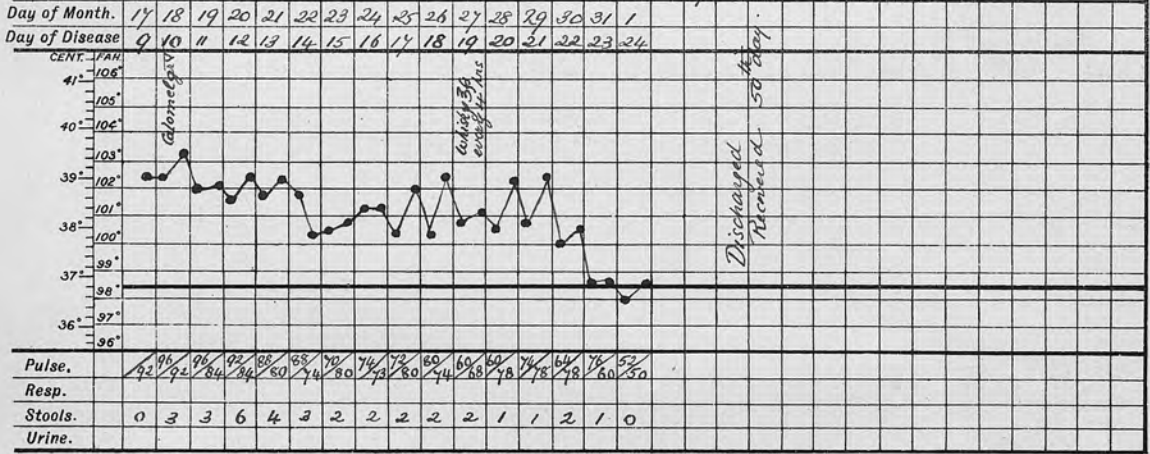
Beta-Naphthol.

Betanaphthol is disagreeable to take, producing a burning sensation in the mouth. Like the other antiseptics, it was given in wafer paper. The adult dose varied from six to twelve grains every four hours. This is a larger amount than most authors recommend.

Nineteen cases have been treated during the past year at the City Hospital. Many of these came in delirious, and the majority of the cases were very sharp. The average day of admission was the 10th. The average age of the patients was 20 years. Fourteen were males.

B. Naphthol gr XII every 4 hrs from 9th day
 Records of Temperature, Pulse, Respiration, Stools and Urine, from 9th Day of Enteric. Dec 1895

In the case of *Francis O'Hare* Aged 27 Occupation



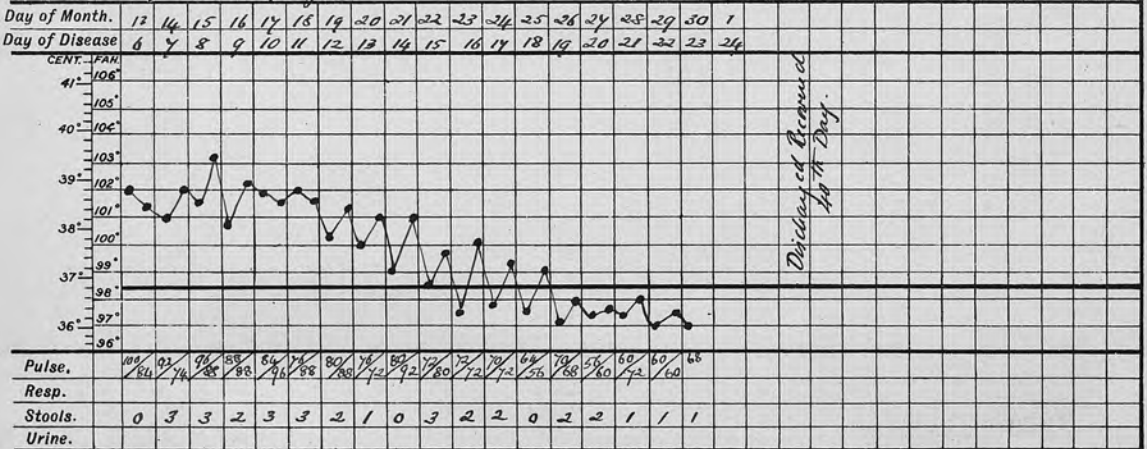
Benger's food
Arrowroot
Custard

YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.
Fish 26 day.

Naphthol β Charts.

B Naphthol gr VI every 4 hours from 9th day
 Records of Temperature, Pulse, Respiration, Stools and Urine, from 6th Day of Enteric. Nov. 1895.

In the case of *Robert Gray* Aged 25 Occupation



YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.
Fish

Temperature.

In one case the temperature averaged considerably lower after the exhibition of the drug commenced. In the others if we except the abortive cases to be noticed shortly, no difference was observed. We may conclude that the drug has no real influence on the temperature.

Tongue.

In eleven cases the tongue became moist and cleaned almost at once. In one it started cleaning the day after the treatment began and cleaned very slowly but steadily. In the remaining seven cases the tongue was unaffected by the treatment, in one of them remaining dry and cracked till after the temperature fell.

Stools.

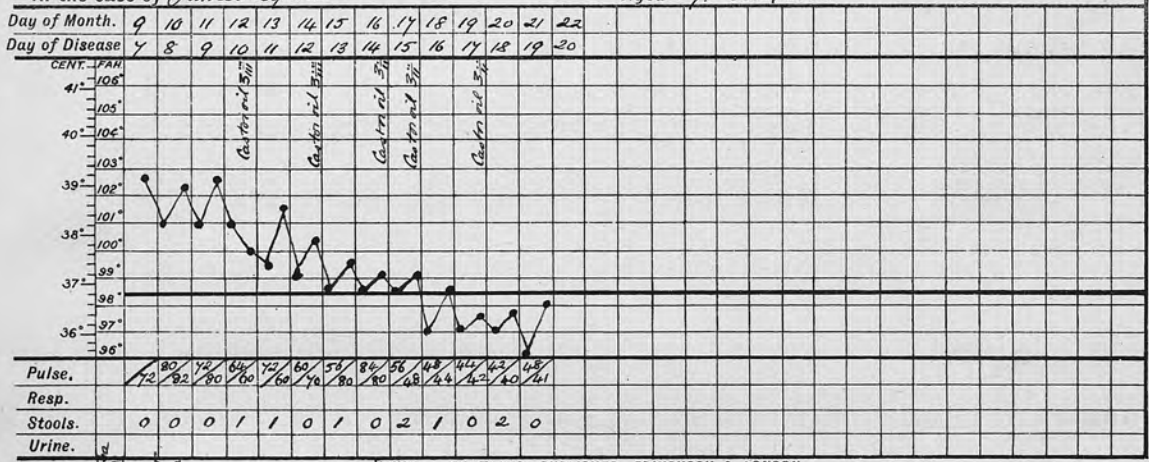
The stools were in all cases modified favourably. In two they were practically odourless. In the majority of the other cases they were 'very much improved.'

Tympanites.

This complication was present in eight cases on admission. In six of these it disappeared almost at

Braphkhol gr vi every 4 hrs from 7th to 9th Day of Enteric - Dec 1895

Records of Temperature, Pulse, Respiration, Stools and Urine, from 7th Day of Enteric - Dec 1895
 In the case of James Lynch - Aged 17 Occupation

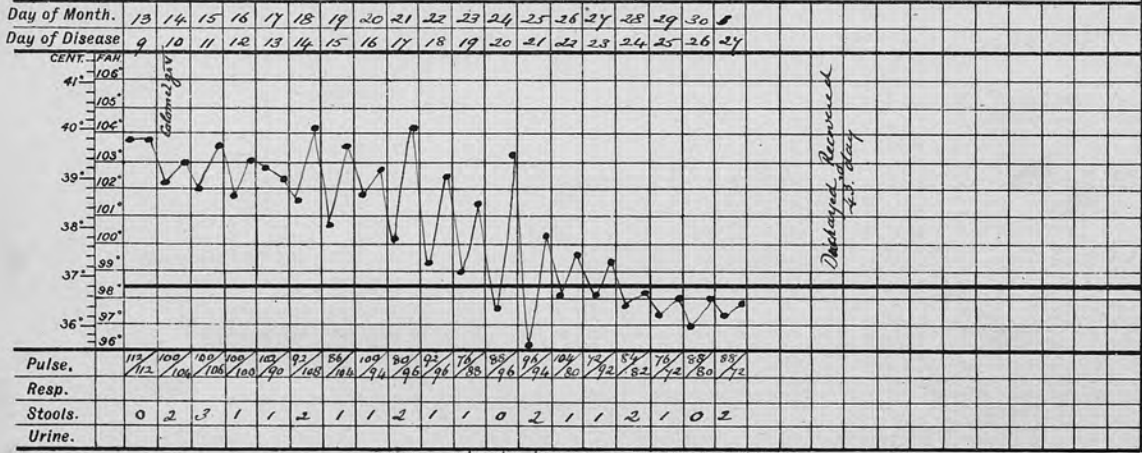


Diets: Chicken, Curried, Bologna, Consommé, Consommé, Steak
 Boro, Boro, Boro, Fish.
 YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.

Naphkhol B Charts

Braphkhol gr vi every 4 hrs from 10th day.

Records of Temperature, Pulse, Respiration, Stools and Urine, from 9th Day of Enteric Nov. 1895
 In the case of John Lockhart. A. Aged 22 Occupation



Fish, Fish.
 Want take fish.
 YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.

once after treatment commenced. In the other two it was slow in improving, and in one of them it recurred, with an attack of peritonitis from which the patient suffered. In one case a patient who had no distension on admission developed it to a distressing extent after he had been a week on Betanaphthol. This however was largely due to a saline aperient.

. Duration.

The average duration of the fever was practically 27 days. Three cases may be classed as abortive, all of them attaining the normal on the 16th day. In none of them was there any doubt about the diagnosis, and the general appearance on admission pointed to the dates given being correct.

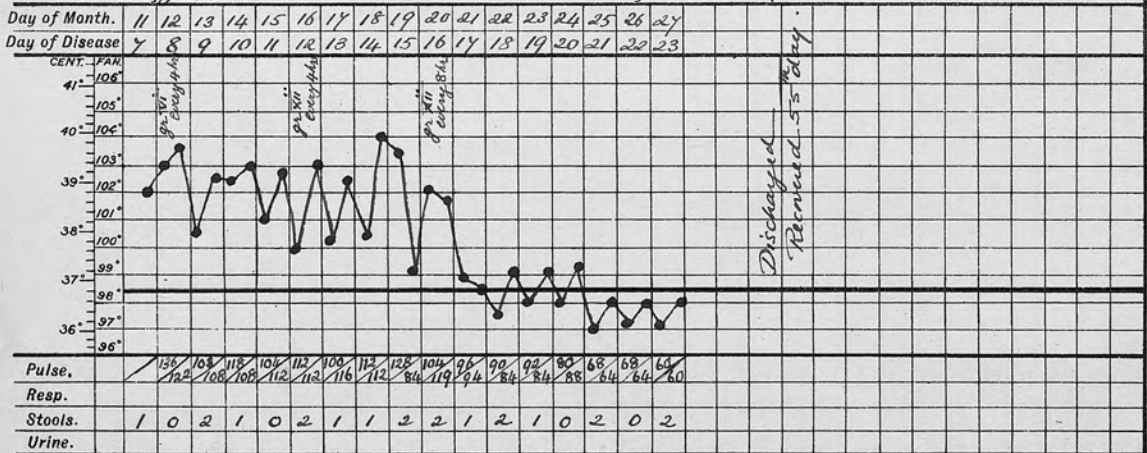
Complications.

There was one ulcerative haemorrhage, very slight occurring about the 23rd day. There were no recrudescences, and only one relapse, which ran a typical course. One case developed thrombosis in the left femoral vein. One suffered from peritonitis. There was one case of apical pneumonia.

Bnaphthol-gr vi every 4 hrs from 8th, gr xii from 12th days
 Records of Temperature, Pulse, Respiration, Stools and Urine, from 7th Day of Enteric

Dec 1895

In the case of *James Pentice* Aged 11 Occupation



Chicken Tea - Annaroot - YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.
 Custard - Benger's - Corn flour - Fish

The Urine.

In the case of the Betanaphthol patients attention was paid to the question of Indican in the Urine. In four cases Indican was noted after a weeks treatment by Betanaphthol. This as a rule decreased steadily, but in one case persisted at least a fortnight. This points to the fact that even 36 grains of Naphthol per diem for a week does not thoroughly antiseptize the bowel.

Those cases which had been more than a week on Betanaphthol had a very dark urine. In the case of several patients who had 72 grains daily the urine was passed absolutely opaque, and became black on standing. There was, however, no albuminuria, and there is no reason to believe that the drug damaged the kidneys. Baatz has, however, reported two cases of nephritis occurring in children after local applications of naphthol.

Convalescence.

This was in all cases very rapid. The average day of discharge was the 53rd and this would have been much

lower, had not the relapsed case remained in hospital till the 100th day. The average stay in hospital was 42 days.

Summary of the Naphthol Cases.

These cases show a very good record. Forty seven cases were treated in all, in no way selected, and occurring at all periods of the year and the epidemic. Not a single death occurred. Only three of these cases were treated also with other drugs, calomel being on each occasion the additional treatment.

The Average day of Admission was the 10th. The Average age of the patients was 18. There were 29 males and 18 females. In no case did the drugs cause any sickness or vomiting, and in no case did the patient complain of the treatment. The cases were at least of average severity. The temperature only appeared favourably modified in seven cases. We may therefore fairly conclude that the naphthols have no influence to speak of on the pyrexia of Enteric.

The tongue appeared to clean rapidly in 22 cases, somewhat less than half of the total number treated. The writer is doubtful whether this improvement can be attributed to the drugs alone, as the tongues of untreated cases often show a rapid and marked improvement after admission to hospital.

The stools were practically deodorized in three cases. In about 14 or 15 they were not offensive. In all except one, where they remained foul, their foulness was modified favourably. Betanaphthol seemed the most successful drug in its action on the faeces, possibly owing to the fact that it was given in much larger doses than the others.

The tympanites, which was present in 20 cases on the day of admission, disappeared rapidly in 12 cases, slowly in 3 cases and was unaffected by the treatment in the remaining 5. In two of these cases it recurred and in another case it developed for the first time after a week's treatment. The Naphthols may be said on the whole to act well in this complication.

The duration of the fever was on an average twenty eight and a half days. This record contradicts the opinion of those who believe that the

fever can be cut short by the Naphthols. Four cases may be called abortive. but in one of these calomel was given. In any case the writer has no reason to believe that these abortive attacks had their natural course checked by drugs.

The Complications include five haemorrhages, three of which were severe, three recrudescences and four relapses. Most of the haemorrhage cases had been under one of the naphthols for several days, and we may therefore assume that the antiseptics they produce is not complete enough to prevent ulceration. The occurrence of the relapses also proves that we cannot accept the views of some writers who maintain relapses can be prevented by systematic treatment.

The Convalescence was uneventful and fairly rapid. The average day of discharge was the 56th and the patients remained in hospital 45 days.

If we compare these results with the contentions of Mitchell Clarke, quoted some pages earlier, we find in accordance with them that the stools are rendered less offensive, and that there is no albuminuria,

though this latter condition is not an invariable concomitant of Enteric. In contradiction to them we notice that the duration of the fever is absolutely unaffected, that the improvement of the tongue is disappointing, and that convalescence is no more rapid than in ordinary cases.

The writer, however, believes that Beta-Naphthol does not injure the patient, and that it will do as much as we can at present expect from any intestinal antiseptic.

Subsection B. Guaiacol.

It is now many years since Pecholier used creasote in Enteric Fever. He considered that it diminished the intensity and shortened the duration of the disease. Creasote has also been used by other physicians and this fact no doubt suggested the use of Guaiacol, which is a preparation of beechwood creasote and has the advantage of a fixed chemical composition.

Guaiacol is better known as a remedy in phthisis.

Some physicians have attributed any improvement that followed its exhibition to tonic or stomachic properties, but the observations of Schetelig, who found that subcutaneous injections were followed by equally favourable results, contradict this view. Seifert and Holscher have found that absorbed Guaiacol does not circulate in a free condition in the blood, but as a new combination, not yet exactly ascertained. This combination is however not fatal to the tubercle bacillus. These observers believe that, during absorption, it combines with poisonous proteids in the blood, which are produced during the disease by metabolism due to the bacilli. When combined with Guaiacol these proteids are said to lose their toxic character. We may fairly assume that a similar action takes place in Enteric fever.

Holscher has given Guaiacol, in the form of the Carbonate, in 60 successive cases of Enteric fever. Not one of these cases died. The Carbonate of Guaiacol is a white crystalline substance, insoluble in water, tasteless, and with a slight odour. It is said not to decompose till it reaches the intestine.

The writer, however, has in one or two cases noticed an odour resembling creasote in the breath within twenty minutes of a first dose, so it would appear that, in some instances at least, there is some decomposition of the drug in the stomach. Guaiacol is excreted in the urine, saliva, and perspiration, and can be detected by distillation with sulphuric acid, when the odour can be detected in the clear distillate.

Holscher reports that, in cases where the treatment was commenced early, an abortive action was produced on the disease, the temperature rarely attaining any great height. In other cases, especially in those most severe, the tongue rapidly became moist and the appetite returned. He considers that it is not an antipyretic as much as an antiseptic, and that a high degree of pyrexia does not yield to it. He notes that its action is most favourable in cases complicated by marked bronchitis, this being in accordance with the writer's own experience, the drug doing very well in cases with respiratory complications. Holscher does not mention any effect on the odour of the stools,

but he regards the drug as useful in preventing the formation of toxines in the intestine.

Montgomery has treated 19 consecutive cases without a death. He used Guaiacol itself, and not the Carbonate. The dose was $\frac{1}{2}$ to $1\frac{1}{2}$ drops every two hours. A little calomel and frequent warm enemata were given. He also combated the temperature by the external application of Guaiacol, slowly dropped on to the abdomen and, after being rubbed in, covered with oiled silk. The effect on the temperature is a fall within 30 minutes, the remission lasting two or three hours.

Carpenter, another American physician, has used the drug externally in Enteric as an antipyretic. He found that the fall of temperature was usually two or three degrees, and was preceded by profuse sweating.

The writer has tried the Carbonate in 23 cases of all ages and has given ix to xii grs every 4 hours as an adult dose. The cases with one exception did very well, the fatal case being that of a man who was 'ambulatory' up to the 12th day of the disease, when he was admitted in a serious condition. Fourteen of

the cases had no other treatment than the Guaiacol, nine had in addition doses of calomel occasionally.

Regarding the details however of the history of these cases, there is not much cause to be particularly satisfied with Guaiacol as an antiseptic. The stools were probably less offensive than they would have been, had the drug not been given. In four cases only, however, are the stools noted as 'odourless' or 'very much improved.' In one of these cases creasote could be smelled in the stools. Curiously enough this very case had a relapse, and although Guaiacol gr xii every 4 hours had been given continuously during the interval of normal temperature and also during the relapse, towards the end of the latter the stools were positively foul.

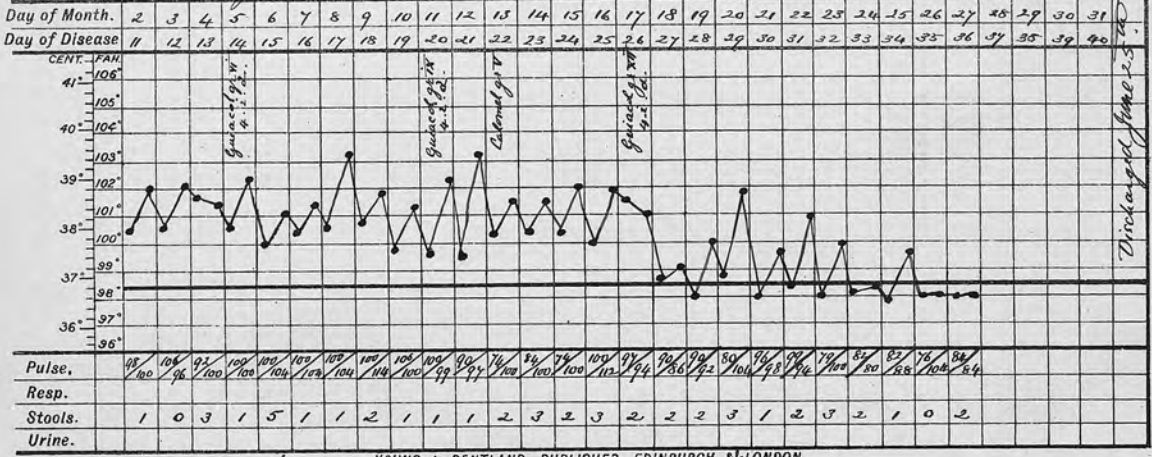
In seven cases there was marked and rapid improvement in the condition of the tongue. In five however of these cases calomel was given, which might possibly have contributed to this effect.

In four out of the five cases in which marked tympanites was noted the administration of Guaiacol

Guaiacol.

Records of Temperature, Pulse, Respiration, Stools and Urine, from 11th Day of Enteric. May. 1895

In the case of Mrs. Ogles. Aged 24. Occupation



YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.

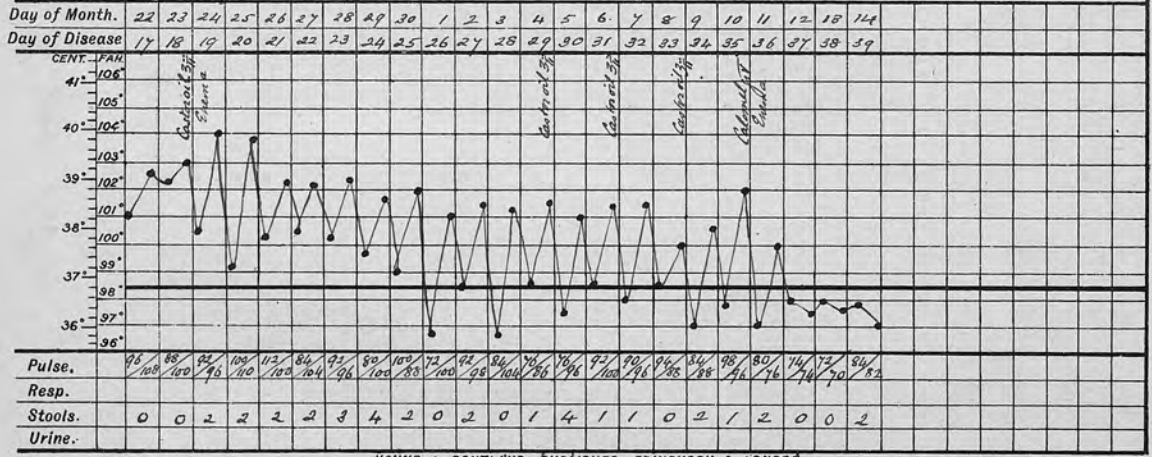
Diet. Milk, Chicken Tea, Pudding, Potato, Fish, Gravy.

Chart 1.

Guaiacol. Early Feeding

Records of Temperature, Pulse, Respiration, Stools and Urine, from 17th Day of Enteric Oct. 1895

In the case of Honey Wood. Aged 16 Occupation



YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.

Diet. Potato, Fish, Bread & milk, Chicken

Chart 2.

seemed to exercise a favourable effect.

The writer was hopeful that Guaiacol would have an effect in lessening haemorrhage, basing this belief on the fact that T. R. Fraser in his *Materia Medica* lectures in 1888 mentioned among the other qualities of creasote that it was an excellent styptic. Haemorrhage occurred in 3 of this series of cases. The first case was a man, aged 22, admitted the 18th day when the Guaiacol was given. The haemorrhage occurred on the 19th day and was exceedingly slight and not repeated. The second, also a man aged 30, who started Guaiacol on the 13th day and had a single haemorrhage of about 8 ounces on the 18th day. The third was the fatal case above mentioned, who, after commencing Guaiacol on the 13th day, had a moderately severe haemorrhage on the 19th and some oozing till the 21st, when it ceased. He died on the 23rd day but the haemorrhage did not affect the result. He was treated also with turpentine after the first loss of blood.

On consideration of these cases one fact may be

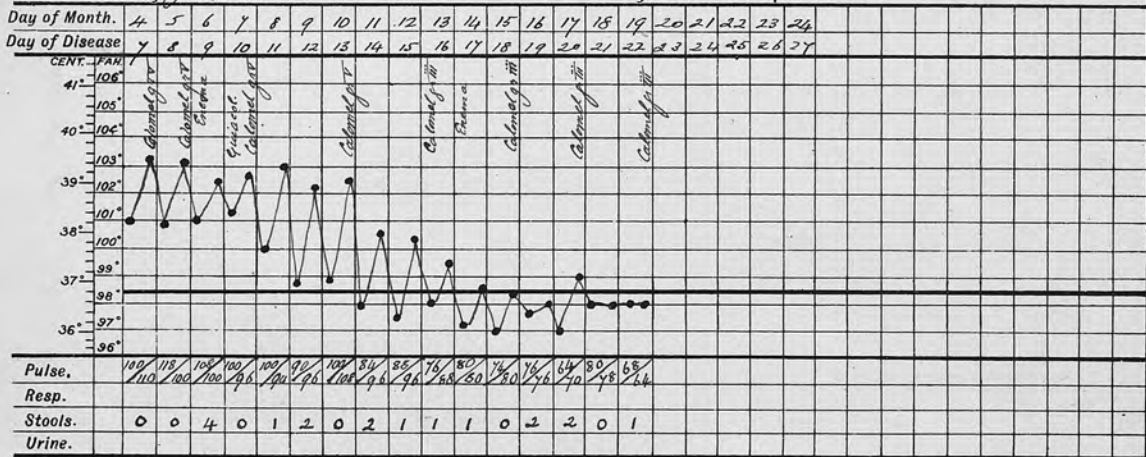
Quiacon. Calomel

Records of Temperature, Pulse, Respiration, Stools and Urine, from 7th Day of Enteric

1895

In the case of John Wilson

Aged 15 Occupation



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iv. Soup. Pudding. Fish. Potat. Fish. Chicken.

Chart 3.

Hæmorrhage

Death

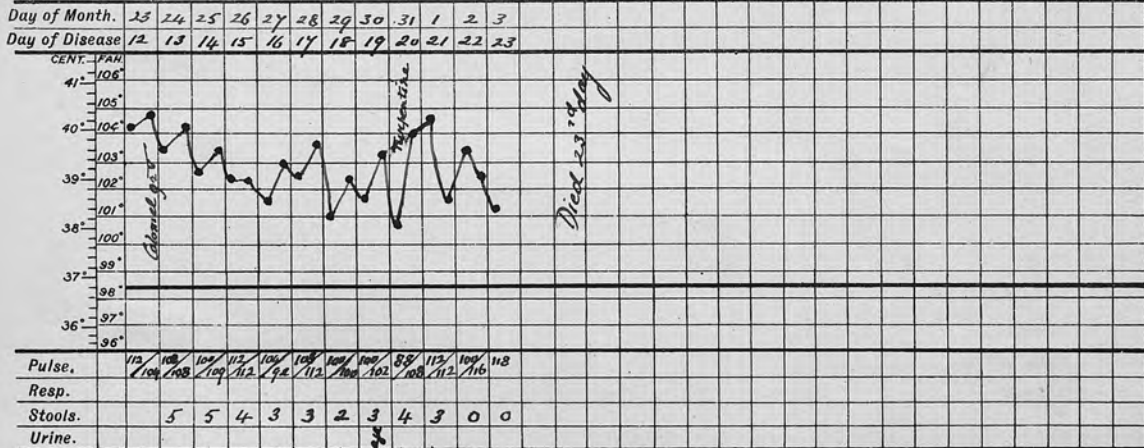
Quiacon gr. ii every 4 hrs from 13th gr. xii from 17th

Oct 1895

Records of Temperature, Pulse, Respiration, Stools and Urine, from 12th Day of Enteric

In the case of Peter Monteith

Aged 21. Occupation



YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.

Chart 4.

noted, that haemorrhage was present and was unimportant. It would be impossible to expect that Guaiacol could prevent an ulcerative haemorrhage; in these cases it seems to at least have controlled the amount lost.

The temperature was in only two cases at all markedly improved after the administration of this antiseptic. In two more the temperature was very low, but had been so before the drug was given. In one case it is noted that long swings of temperature persisted towards the close of the disease in spite of the systematic administration of Guaiacol. Of course it is perfectly possible that the improvement in the two cases first mentioned was merely apparent. The writer has thought it advisable to note them because Guaiacol, externally at any rate, is said to have an antipyretic action.

As above noted, one case had a genuine relapse, with typical stools, rose spots, and enlarged spleen, running from the 41st to the 67th days, and commencing 7 days after the evening temperature first touch-

ed normal. This is evidence against the statement that the systematic administration of antiseptics prevents relapse.

Of the two recrudescences that occurred, one was probably caused by constipation and lasted 6 days. The other may have been aggravated by early feeding, but, as the feeding was not withdrawn and the temperature only remained up 10 days, we may consider it as possibly due to separating sloughs and septic absorption which a satisfactory antiseptic would have prevented. On the other hand, if the food had not been given, and had not perhaps encumbered the intestine with extra septic material, the Guaiacol might have had a better chance.

As regards the duration of the fever the series contains one case which may be considered abortive. This was a child of $3\frac{1}{2}$ years of age. He came in on what inquiry elicited to be the 7th day and his temperature was normal morning and evening on the 14th. The writer is prepared to admit the dates may be a week wrong or more, and it is obvious that in a child of this age even attentive parents might find

for Charts see p.p. 153 154.

it difficult to get an accurate history. The onset in this case, however, appeared sufficiently marked to accept the date given. Of the diagnosis there was no doubt, and it was strengthened by the post mortem examination of a sister who died in the hospital with the characteristic lesions. The case however cannot be entirely credited to Guaiacol as it was started with Calomel gr iii on the 7th and 8th days. The average date of attaining the normal was the 29th day when Calomel was not systematically given, and the 22nd day when it was. A glance at the tables will however show that the average age of the latter group was 3 years younger than the former. The average date of admission of the Calomel cases will also be seen to be 3 days earlier. The average stay in the house of the cases taken together was 45 days.

Charts are appended showing the temperature of cases treated with Guaiacol, both alone and in conjunction with Calomel. The first (No 1.) shows an ordinary case. The second (No 2.) a case where the temperature was possibly kept up by feeding somewhat

early, on the assumption the temperature was one of inanition. The third (No 3.) shows a case where the Guaiacol treatment was combined with Calomel and the doses of the latter are clearly noted on the chart. The dates in this case are not improbably too early, but the history pointed to those given. The last (No 4.) is that of the fatal case. This was a man of 21 who was ambulatory up to the 12th day when he was admitted. He had from his admission typhoid symptoms and delirium. His abdomen was greatly distended, and his tongue was dry and crusted. He improved in no manner as regards these symptoms, and required paraldehyde for the sleeplessness with which he was troubled. He had Guaiacol, 6 grains every 4 hours from the 13th, 9 grains from the 17th days, but except as regards the odour of his stools the drug was a failure. He had haemorrhage on the 19th day and this was treated with turpentine, but he certainly did not lose enough blood to cause his death, which occurred on the 23rd day probably from the virulence of the poison. On post mortem examination besides intense ulceration in the ileum the large intestine showed

ulcers for about 6 or 7 inches up the ascending colon.

Carbonate of Guaiacol has the advantage of being easy to take. It was usually administered in wafer paper, but is easy to swallow without.

In conclusion the writer considers that, while he is convinced that the drug does not exercise any unfavourable influence on the fever, it does not on the other hand cause a marked improvement in the patients. It has some effect on the stools but this is very variable. It causes as a rule no particular improvement in the tongue. It does not prevent relapses. It has, in this set of cases, had some effect on tympanites, but not nearly so marked as the effect of turpentine under similar conditions. It may lessen haemorrhage and in some cases may possibly lower the temperature, but its advantages are not remarkable enough to recommend its use except perhaps in conjunction with the systematic use of Calomel.

Thymol.

Henry of Philadelphia has recommended the use of this antiseptic. He has given it in doses up to

$2\frac{1}{2}$ grains every 3 hours, 20 grains in the 24 hours. Theoretically there is much to be said in its favour, as it is only slightly soluble, and non-toxic, while its antiseptic power is said to be four times that of Carbolic Acid. It causes, however, a burning sensation in the fauces and has to be given as a pill or, as the writer has prescribed it, in wafer paper.

Henry considers thymol the most reliable of all intestinal antiseptics. When the drug was given early, the tongue moistened and cleaned rapidly, tympanites subsided, diarrhoea diminished and mental symptoms disappeared. The temperature also has been favourably influenced.

These observations are in accordance with the experience of Testi, who treated 150 cases at Faenza. The temperature of these cases was reduced, and this reduction was due, in the opinion of Testi, to lessened heat production. The tympanites and diarrhoea were diminished, and the putrefactive products in the excreta were notably lessened. The excretion of urea was reduced, owing probably to less tissue waste.

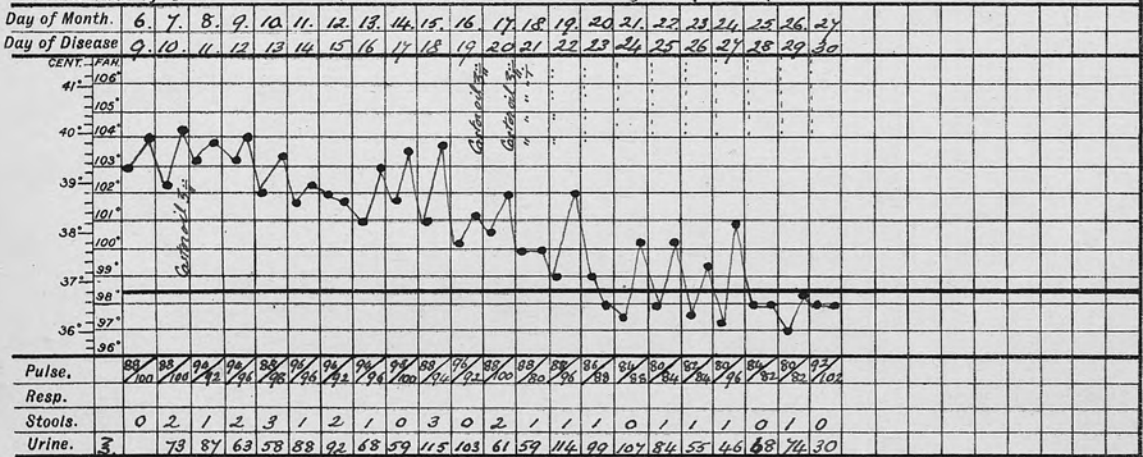
Thymol gr IV every 4 hours from 11th day -

Records of Temperature, Pulse, Respiration, Stools and Urine, from 9th Day of Enteric

Feb. 1895.

In the case of *James Watson*

Aged 14 Occupation



YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.

The drug increases the blood pressure and has no injurious action on the heart.

We will now examine how far these statements are corroborated by the writer's cases. These were only 11 in number, so it is impossible to attach much importance to them, but they were sufficiently numerous to give some indication of the action of the drug.

Of the 11 cases 8 were males. The average day of admission was the 10th. The average age of the cases was 19½ years. The drug was administered in wafer paper and the dose varied from 1½ grains to 6 grains every 4 hours. The average case had 4 grs. every 4 hours. Except in one case, which was delirious, there was no difficulty in giving the drug to the patients.

The temperature may be said to have been absolutely uninfluenced in every case. In no instance was there a noticeable lowering of the temperature after the treatment was started.

The tongue in 6 cases seemed favourably influenced. In the remaining cases it remained dry or foul till the temperature fell.

The stools were in all cases except one, where the dose of Thymol was only $1\frac{1}{2}$ grains every 4 hours, very much improved. In most cases a faint aromatic odour of Thymol was perceived, while the actual faecal odour was hardly noticeable. In one case the dejecta may be said to have lost the faecal odour completely.

The tympanites did not seem affected by Thymol to any very marked extent. It was a feature of 7 of the total number of cases. In no case did it disappear rapidly, in three it was certainly unaffected by the treatment, while in one it recurred severely in the face of the treatment.

One of the cases unfortunately died. She was a girl of 14, admitted as early as the 6th day, and was complicated with pneumonia. She lasted till the 23rd day of the disease when her temperature became hyperpyretic and she died. There was no case of haemorrhage or relapse. Two recrudescences occurred, the cause of neither being obvious.

As regards the duration of the fever it was unaffected. The cases reached normal on the 27th day on

the average. No case was abortive. The cases were at least of the average severity and the writer has no reason to believe that the treatment modified the intensity of the disease. Convalescence was in most cases rapid, the patients leaving the Hospital on the 53rd day. The average time they spent in Hospital was 41 days.

Two cases developed a rash which we believed to be due to the drug, but the writer has been unable to find any note of such a rash occurring in cases under the care of other observers. The first instance was that of a woman of 26, who had $2\frac{1}{2}$ grains of Thymol every 4 hours from the 14th day of the disease and on the 35th had a slight papular rash on both wrists. By the 38th day this had extended, the papules having coalesced and formed large raised patches, extremely irritable, and all over the body. The treatment was continued as we had no proof that the Thymol was to blame. On the 40th day the appearance presented was that of bright pink spots surrounded by a paler zone, round which again was a deep pink irregular margin.

On the 41st vesication of the patches over the knees, elbows and wrists occurred, and it was thought advisable to stop the drug. The skin condition then improved and there was profuse desquamation all over the body. A similar rash to a slighter extent, but with the same tendency to vesicate, occurred in the fatal case. It was noticed on the 20th day and she had had 4 grs. of Thymol every 4 hours from the 6th. The treatment in this case was stopped at once, and the rash had almost completely disappeared at her death on the 23rd day.

It is impossible to say definitely that these rashes were not merely septic, but their great similarity, and the fact that their character was totally unlike any rash seen in the wards before, justify a conclusion that they were due to Thymol. It is however interesting that the case which had 6 grain doses throughout never showed any symptom of skin inflammation.

The writer is unable to say whether the excretion of urea was diminished in his cases or not. Indican

persisted in the urine in one case for three weeks after the treatment was started, but this case had relatively small doses.

To sum up, Thymol seems a powerful antiseptic if we judge by its action on the stools alone. It is decidedly inferior to Betanaphthol and Turpentine in the treatment of tympanites, and its action on the tongue is disappointing. The writer cannot agree with Henry and Testi that the temperature is lowered. Like other antiseptics it has no effect whatever on the duration of the fever. In spite of the rashes, which occurred in the writer's cases, he considers it a remarkably harmless antiseptic to give, and it certainly seems to exercise a powerful disinfecting action in the bowel.

Camphor.

This drug has been used as an antiseptic by Dr Jane-way of New York. Being slightly soluble it should act low down in the intestinal canal. It has the additional advantage of being a cardiac stimulant. The writer has no personal experience of its use.

Turpentine.

The systematic use of this drug was recommended many years ago by Dr H. C. Wood. He gave $7\frac{1}{2}$ minims every 2 hours from the 12th day onwards, and considered the remedy a specific in those cases whose tongues were clean, glazed, and red. It is admitted by nearly all writers to be the best therapeutic agent in haemorrhage and tympanites, and, although it has not been used to any great extent systematically, there are few physicians who have not had some experience of its employment in Enteric fever.

Turpentine is of considerable value as an antiseptic. While not very easy to take uncovered it may be readily administered in capsule. Large amounts of it may be given without any unpleasant effects to the patient. If its use is too prolonged albuminuria is liable to occur, but careful attention to the urine will prevent any damage to the kidneys resulting from the treatment.

Turpentine was given in 20 cases for intercurrent complications, either haemorrhages or severe cases

of tympanites occurring in cases treated by the expectant-symptomatic method. Its effect on both complications was admirable.

It is, however, with turpentine as an antiseptic that we are at present concerned. Only 6 of the writer's cases were treated systematically with it, all of which, with one exception, were males. Their average age was $17\frac{1}{2}$, and the average day of their admission was the 12th.

No less than two of these cases died. One of them, a man of 44, did not come in till the 20th day and was suffering from haemorrhage on admission. The haemorrhage was not the cause of his death, which occurred on the 25th day, but it had weakened him so excessively that he had no chance of recovery. In such a case the treatment can hardly be held responsible.

The other fatal case was that of a lad aged 17, of a weakly constitution and imbecile, who, after being tided successfully through the fever, died in a relapse. The case is interesting as the Medical Superintendent of the City Hospital had never seen a relapse end fatally, in spite of his enormous ex-

perience of the disease.

The temperature was unaffected in every case. The tongue only showed marked improvement in one case. Tympanites, which existed in three cases, improved very rapidly in all. As regards the stools, in all the cases, except one, they had a very strong odour of turpentine. In most instances this completely masked the faecal odour, if indeed the latter had not been entirely dispelled by the antiseptic qualities of the drugs. In the exceptional case the foulness of the stools was only slightly modified but this was accounted for by the fact that, whereas the rest of the patients had 10 minim doses every 2 hours, the dose in this case was only 5 minims.

The average duration of these cases was 30 days, which is a slightly higher average than most other treatments show. The number of cases is however so small that it would be unsafe to conclude that the duration of the fever is prolonged under this treatment. In any case there is no reason to believe that it is cut short. The intensity of the disease, judging from

head symptoms and prostration, is quite unaffected.

The Relapse, above mentioned, is the only complication worth noting. Convalescence was rapid. The cases went out on the 52nd day after remaining 43 days in Hospital.

The writer does not think turpentine is to be preferred to the Naphthols or Guaiacol as an intestinal antiseptic. It is true its action on the stools is perhaps more marked than that of any antiseptic except Thymol, while its action on tympanites rivals that of Corrosive Sublimate. But this latter action is probably more due to a stimulation of the intestinal muscle than to a strict antiseptic process. It has one great advantage, that of being an excellent diffusible stimulant, but on the whole the writer, while considering it one of the most useful remedies in the treatment of intercurrent complications, cannot on his present experience of it prefer it to some of the other drugs named.

Eucalyptus Oil.

Kesteven has used this oil in 220 cases, and was

fortunate enough only to have 4 deaths. He gave it in doses of from 5 to 10 minims, made up with sal volatile and chloroform. Possibly the latter may have contributed towards his good results as it is known to be very fatal to the Eberth's bacillus. Kesteven found that the temperature was lowered after the treatment commenced and that the duration of the fever was shortened. The stools smelled strongly of the oil, and the tongue cleaned rapidly. These results are certainly remarkable, but as the writer has never used Eucalyptus he does not feel competent to criticise them.

Subsection C. The Metals.

1. Mercury.

Yeo quotes Sir Thomas Watson as remarking long ago on the universal recovery of fever patients treated with salts of Mercury till the mouth was sore. If more modern practitioners cannot point to such striking results, they at least have used Mercury freely in the treatment of Enteric Fever, and the good effects

of one mercurial salt, Calomel, have made some observers believe that it is capable of aborting the fever.

(a) Calomel.

Liebermeister advises that a large amount of this drug should be given to patients coming under treatment before the 9th day. His method is to administer three or four doses of 8 grains each in the first 24 hours. He believes the drug shortens the duration and modifies the intensity of the fever. Bouchard prefers smaller doses of one and a half grains daily for four days in the early part of the fever. Wunderlich came to the conclusion that five grain doses administered twice only in the course of the first week cut short the fever. Moore has given doses as large as ten grains, repeated thrice at a forty eight hours interval, and combined with one grain of Opium. He believes that, if given early, it renders the case milder in its subsequent course.

To explain the success of Calomel is not very easy. It is said to have no particular effect on

the Eberth's bacillus, but Wassiljeff found that it had a powerful action on the putrefactive germs in the bowel. This observation seems to have been confirmed by other experimenters. For this reason the drug is popular with many who use Guaiacol, Naphthalin or Naphthol, which are said to have a greater effect on the enteric bacillus than on the putrefactive organisms. The combination of the drug with any of these antiseptics is said to be more successful than the use of either drug alone.

The antiseptic action of Calomel may be in part due to the increased amount of bile, the normal intestinal antiseptic, which flows into the intestine after its administration. While Calomel does not increase the secretion of bile, it seems, clinically at all events, to increase its excretion. The green stools, after a dose of Calomel, are easily distinguishable from the ordinary ochre dejecta of the Enteric patient.

There are two main methods of giving Calomel systematically in Enteric.

(1) The continuous administration of frequent fractional doses, amounting to one and a half or two grains per diem.

(2) The intermittent administration of an aperient dose every two or three days throughout the fever.

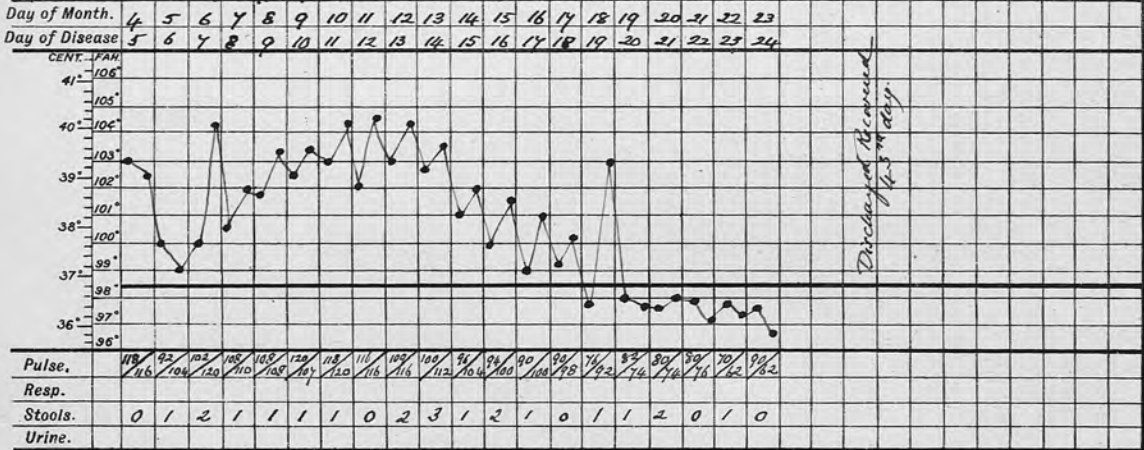
The latter system is the one adopted at the City Hospital. The former is favoured by several American physicians amongst whom are Woodbridge and McCormick.

In the writer's opinion the latter system is much less likely to mercurialize the patient than the former. The only occasion when the gums were touched in a case treated with Calomel was in one in which one grain had been administered night and morning for three days. During this period no satisfactory motion had occurred. The larger and intermittent dose has the advantage of assisting to eliminate itself satisfactorily, and even if a much larger amount is administered than by the continuous method, mercurialization is less likely to occur.

Calomel.

Records of Temperature, Pulse, Respiration, Stools and Urine, from 5th Day of Enteric. Nov. 1895

In the case of *Mary Gaffney*. Aged 4. Occupation

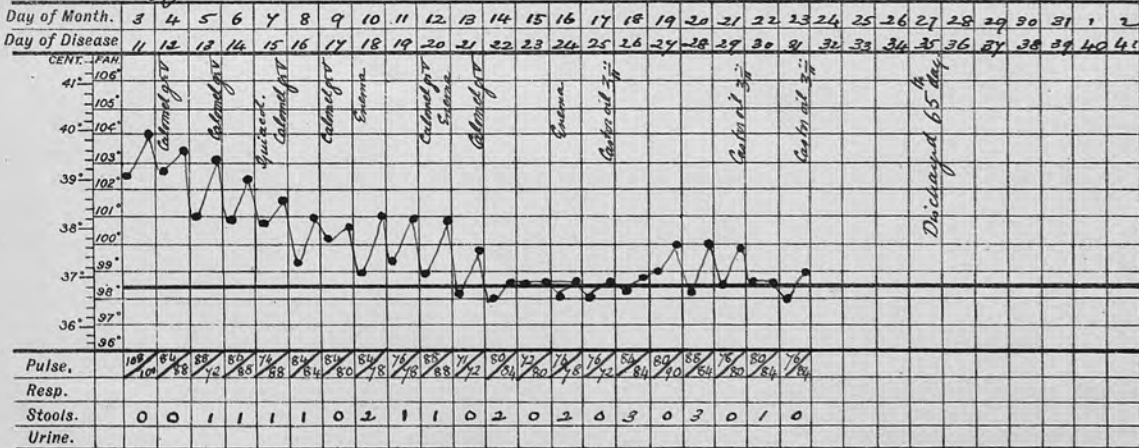


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 Calomel for 1st, 6th, 11th, 12th, 20th days.
 " for 7th, 14th, 15th (twice), 16th.
 Potato. Fish.

Calomel. Guaiac.

Records of Temperature, Pulse, Respiration, Stools and Urine, from 11th Day of Enteric. Oct. 3rd 1895.

In the case of *James Lormer*. Aged 21. Occupation



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 Soup. Pr. dding. Bengen's food.
 Potato. Fish. Chicken.
 Phlebitis

Every case which has not a motion within 24 hours of admission to the City Hospital is given five grains of Calomel if an adult, three if under 12 years of age. As the majority of the cases treated in the last year have been somewhat constipated, very few have not had this routine dose.

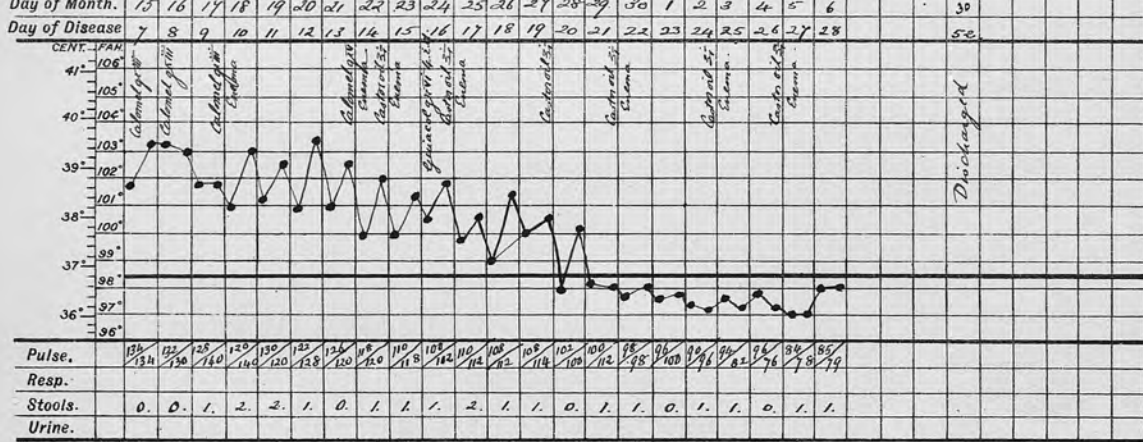
It is however with Calomel given systematically as an antiseptic that we have here to deal. Thirty one cases have been treated in this manner during the last 12 months without any other treatment to speak of. None of these cases died.

The cases were not selected except as regards one point, that of age. The difficulty of getting children to swallow antiseptics, which have to be given in wafer paper, compelled us to treat most of the children either expectantly or by Calomel. This accounts for the average age of the Calomel cases being as low as 11 years. The average day of admission was the 11th day. The cases were by no means all children, there being adults of 34 and 46 years respectively and a fair number of adolescents.

Guacal & Colmel

Records of Temperature, Pulse, Respiration, Stools and Urine, from 7th Day of Enteric June 1895

In the case of John Inglis Aged 5 1/2 Occupation

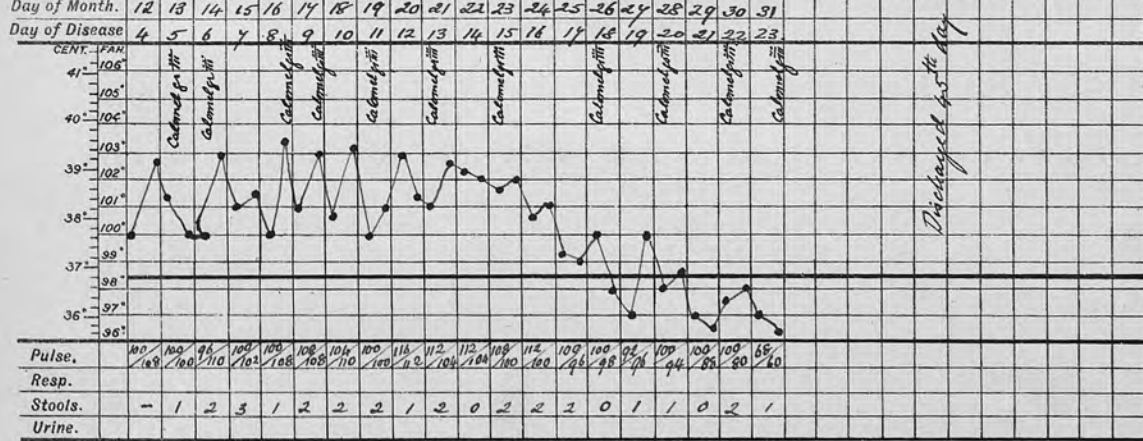


YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.

Colmel

Records of Temperature, Pulse, Respiration, Stools and Urine, from 4th Day of Enteric Oct 1895

In the case of George Ray Aged 7 Occupation



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The Temperature.

In most cases there was an increase in the morning remission the day after the Calomel was given. Besides this temporary effect the temperature seemed permanently influenced in five cases, possibly so in two others.

The Tongue.

In five cases the tongue, foul on admission, cleaned so rapidly that we may assume it was influenced by the drug. In the majority of the other cases it cleaned quickly, but not remarkably enough to convince the writer that the Calomel caused the improvement. In four cases it was certainly uninfluenced by the treatment.

The Stools.

While in two cases the offensiveness of the stools was considerably lessened, much improvement was not noticed in the others.

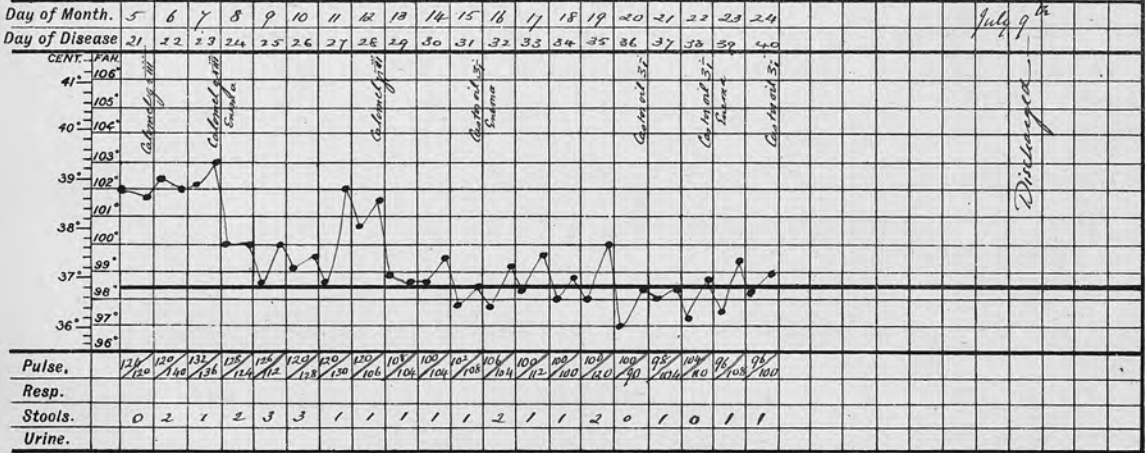
Tympanites.

In seven cases marked tympanites existed on admission. In two the Calomel did no good. The other cases were

Calmel

Records of Temperature, Pulse, Respiration, Stools and Urine, from ? Day of Enteric June 1895

In the case of Neil Quinn Aged 5 Occupation

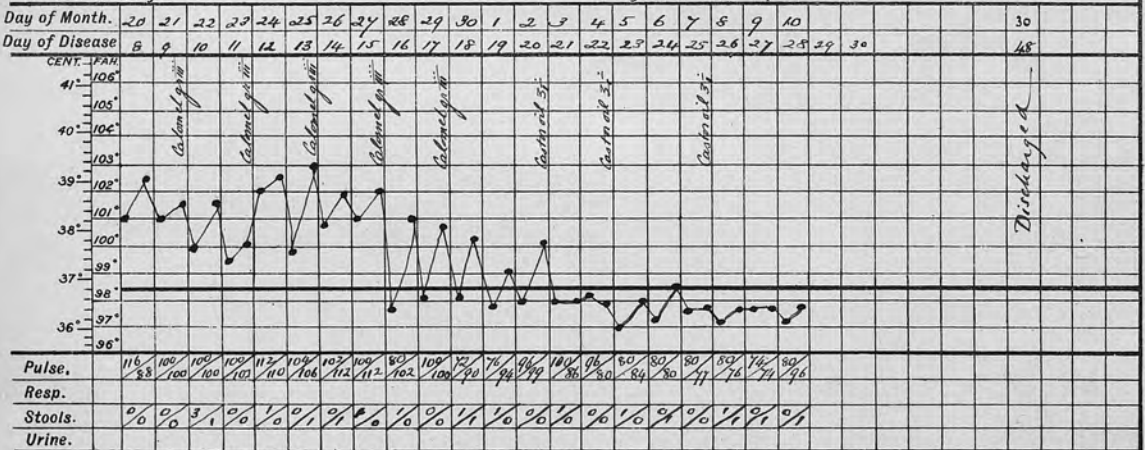


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Calmel

Records of Temperature, Pulse, Respiration, Stools and Urine, from 8th Day of Enteric June 1895

In the case of Daniel Coall Aged 11 Occupation



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Diets. Milk. Chicken tea. Pudding. Bengal's food. Eggs etc. Fish. 4 1/2 ha. Chicken.

relieved remarkably quickly, the tympanites in only one case remaining more than two days after the first dose. Tympanites did not develop in any of the cases which were free from it on admission.

Complications.

There was a slight congestive haemorrhage on the 9th day in one case, but no case of ulcerative haemorrhage. There were four recrudescences, all slight, and no relapses.

Duration.

The average duration of the fever was 23 days. Considering the average age of the cases there is nothing in this figure to suggest that Calomel affects the actual length of the disease. Four cases, a somewhat high proportion, terminated by the 16th day. The writer is of course unable to state as a positive certainty the dates of any case, but the history, combined with the symptoms of the patient, renders these dates probable.

Convalescence.

In most cases convalescence was rapid. The average

day of discharge was the 49th and patients remained in the house, on an average, a fraction over 38 days.

A certain number of other cases were treated systematically with Calomel, in conjunction with Guaiacol or the Naphthols. These were 12 in number; the average age was 17, the average date of admission the 9th and they attained normal on the 22nd day. Of these cases none died. There were however one relapse and one recrudescence. No haemorrhage occurred in any of the cases.

We have here then a series of 43 cases receiving doses of Calomel every second or third day throughout the course of the fever, and there is not a single fact to show that such treatment is in the least unsafe. While most authors have declared that it is extremely dangerous to give aperients after the 14th day, five grain or three grain doses of Calomel were given to adults or children respectively on the 16th, 17th, 18th, 19th, 20th and succeeding days, the writer being able to produce an example of the administration of the drug on any day from the 14th to the

28th, as will be seen in the detailed tables. There is not an instance of haemorrhage in these cases, nor is there a perforation. It is true the patients were mostly young, but among them were several adults who were sharply ill.

Among the cases, which did not get Calomel systematically but which received an occasional dose for constipation, there is only one in which a slight haemorrhage occurred, and that was two days after the drug was given. This haemorrhage was a mere oozing, the stools being black but no blood being passed. The patient died a week later from toxaemia, but the haemorrhage certainly did not influence the result.

Diarrhoea is never caused by Calomel, at least not in the writer's experience. Loose motions do not contraindicate its use. It does not cause griping or unpleasant sensations in the patient, and so far from causing an uncomfortable looseness, it as a rule merely carries the contents of the canal into the lower bowel. An enema is usually given the morning after a dose of Calomel to clear the rectum out. Those

cases which have been treated with Calomel and Irrigation have done very well, and at present it is the treatment which Dr Muirhead considers most satisfactory. If desired, an insoluble intestinal antiseptic can be also given.

(b) Perchloride of Mercury.

This drug has been used by Loranchet, Petresco and many other physicians. It has the disadvantage of being decidedly difficult to handle if doses, large enough to exercise an appreciable antiseptic effect, are given.

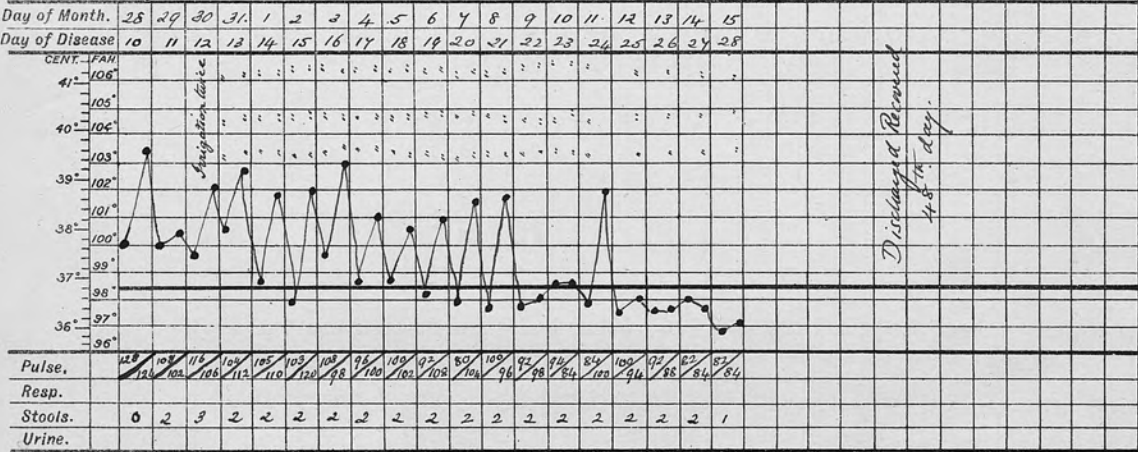
Wedgewood has reported 21 consecutive cases treated by Corrosive Sublimate, in half drachm doses of the Liquor, combined with Tincture of the Perchloride of Iron. No case died, diarrhoea was rare, and the absence of complications was remarkable. The Binioidide of Mercury has also been used with Iron in the Treatment of Enteric Fever.

The success which the writer has met with in treating the fetid diarrhoea of infants with small doses of the Liquor Hydrarg. Perchl. led him to be-

Hydrarg. Perchlor. from 10th day.

Records of Temperature, Pulse, Respiration, Stools and Urine, from 10th Day of Ectric. Oct. 1895

In the case of *Isabella Murdoch* Aged 11. Occupation



YOUNG J. PENTLAND, PUBLISHER, EDINBURGH & LONDON.

lieve that the drug would be also useful as an anti-septic in Enteric. With Dr Muirhead's permission the remedy was tried in 8 cases with the following results.

The average age of the patients was $12\frac{1}{2}$ years, the eldest being 23 and the youngest 8, and the average date of admission was the 10th day. The doses given were one drachm of the Liquor ($\frac{1}{16}$ of a grain of the Perchloride) every 4 hours to adults, and half that amount to children.

There were in this series unfortunately no less than 2 deaths, and owing to a mistake, much to be regretted, we cannot absolve the Perchloride from having assisted to cause one of these. This was a girl of 23, who on admission was menstruating, and her urine was not tested till she had been two days under treatment. There was then a little blood in the urine, but as she still had a slight menstrual flow this was disregarded, and it was not till 2 days later that the writer discovered that she was suffering from acute nephritis. The mercury was at once stopped, this being the 16th day, and she did

not die till the 23rd. She had no uraemic symptoms, and at the time of death no oedema, and the death was due to the toxæmia resulting from the Enteric germ. On post mortem examination it was found that a chronic interstitial nephritis had existed previously, and an acute condition had supervened. This would naturally hinder the elimination, so much to be desired in Enteric Fever, and that the nephritis was indirectly the cause of her death there can be no doubt. On the other hand it is possible that it had been lighted up by the fever previous to the 10th day when she was admitted to Hospital. In other respects in this case the mercurial did well, the great tympanites, which she suffered from, disappearing at once.

The other fatal result occurred in a boy of 11 years who suffered from great tympanites, and who had drachm doses every four hours, from the 14th to 17th day of the fever. The distension was unrelieved. On the 16th day he suffered from vomiting but not enough to account for his death which was due to heart failure.

The temperature was only improved in one case,

the course of which seemed much milder after the administration of the drug.

The tongue improved very rapidly in two cases. In the other cases it was unaffected by the treatment.

The stools were decidedly less offensive in three cases. In the others the improvement was not very marked.

In only one case was the tympanites unaffected by the treatment. In the other six, in which it existed, it was relieved almost at once. The abdomen in most instances became flaccid in 48 hours.

The Duration of the fever was unaffected. The average was as high as 27 days. There was one relapse, one recrudescence, and one very slight haemorrhage. Convalescence was in most cases rapid.

In 6 of the cases irrigation of the large intestine was also employed. None of these cases died. In no case was there any mercurialization during the fever. In one case, a child with very bad teeth, the gums were slightly touched in early convalescence and

the administration was stopped.

Small numbers of cases are so notoriously without statistical value that the writer does not regard the alarming death-rate of these, 25 per cent, as any contraindication to the use of the Perchloride. Still it is obvious from the above record that it should be used with extreme caution, and perhaps a smaller dose of half a drachm to an adult every 3 hours might be attended with better results. The drug is an admirable antiseptic and it is far the best remedy, with perhaps the exception of turpentine, for tympanites. In conjunction with Irrigation, which assists its elimination, it is a most valuable therapeutic agent in Enteric fever.

It is difficult to believe that the ten minim doses of the Liquor, given by a large number of physicians, can be more than a mere placebo unless they are frequently repeated. Dr Leslie Mackenzie treats his cases at the Leith Fever Hospital in this way, only giving the dose thrice daily. The cases do well, but one must regard the treatment as expectant

rather than antiseptic. The writer has also seen cases treated similarly by Dr Devereux in the Tewkesbury Cottage Hospital.

(c) Grey Powder.

Harley in the Lumleian Lectures of 1889 says that his routine practice is to give 2 grains of Hydrarg. c. Cret. night and morning in conjunction with Dover's Powder. He has not found that his patients get mercurialized.

(d) Mercurial Inunction.

Kalb in the Annales Med. Chir. 1885 reports cases treated with Mercury by Inunction, a method he considers preferable to mouth administration. He rubs 15 grains of the ointment into the abdomen on the first day of treatment for half an hour. On the second day the Inunction is repeated, on the inner side of the thigh. The dose is given daily for 6 days.

Kalb found that a temporary fall of temperature occurs after the first day of treatment, and that 80 per cent of the patients present a normal temperature in 10 days. If, as we presume, he means 10 days of

treatment, and if he gets his cases no earlier than our average here, the 11th day, we see that his cases terminate naturally about the 21st day in most instances. But it would not appear that the average duration of the malady is curtailed.

2. Bismuth.

The recent researches of Vaughan, Harley and Surveyor have shown that, outside the body, Bismuth Subnitrate is more antiseptic than Betanaphthol. The latter seems more efficacious however in the alimentary canal. These observers conclude that the constipating action of Bismuth lowers its value as an intestinal antiseptic. They assume that the Subnitrate, while forming Sulphide of Bismuth with Sulphuretted Hydrogen in the bowel, liberates free Nitric Acid. If this is the case its antiseptic power may be partly due to this change. Carles has recently published work which seems to bear out this supposition.

Bouchard combined salicylate of Bismuth with Naphthol in the treatment of his cases and obtained favourable results. It is open to question, however,

whether the Bismuth is to get the credit of this method, as Harley and Surveyor found that Betanaphthol alone was as efficacious as Betanaphthol combined with Bismuth in reducing the numbers of colonies of bacteria in the intestinal canal of dogs.

Bismuth Subnitrate has been long given for the diarrhoea of Enteric. Wood of the City Hospital gives 30 grain doses frequently, when the diarrhoea is very severe. The writer has been however unable to ascertain if this salt has been used systematically as an antiseptic. From his own point of view the constipation, caused by its use, is enough to condemn it.

3. Iron.

Anderson, writing in the British Medical Journal (Vol.I.1891) claims the Perchloride of Iron as a specific. He gave 5 minims every hour of the day and night till a week after the temperature was normal. He found that it arrested diarrhoea, that the temperature fell, and that typhoid symptoms never supervened. After the Diarrhoea ceased he gave a

mild aperient daily.

Illingworth in the same volume of the Journal used the drug in conjunction with the Biniodide of Mercury. The foul odour of the dejecta disappeared in three days and the stools became solid and natural. Wedgewood has given the Perchloride, also combined with Mercury, in twenty minim doses every 4 hours with excellent results.

In both these latter cases, however, the antiseptic action of the Mercury must have largely assisted in procuring the good effect. The astringent action of the drug would doubtless be useful in the event of haemorrhage or profuse diarrhoea.

Professor Fraser has used the Tincture of the Perchloride of Iron in the treatment of Enteric Fever with good results. He gives small doses of two drops every two hours. Under this treatment the diarrhoea is moderated, and no doubt the condition of the blood is improved. The writer is however not aware that the drug is administered with an antiseptic purpose.

4. Arsenic.

This drug has been used with good effect by Kirkpatrick who found it controlled diarrhoea. Its action on the heart is also in its favour in cases where there is a threatening of heart failure.

5. Antimony.

Surgeon Major Lawrie has used antimony in Enteric, and considers it has a specific action. If tartar emetic is given, 1/16 of a grain every two hours, the case is cut short. The drug would seem to the writer far too depressing for a prolonged fever like Enteric.

Subsection D. Carbolic Acid.

We have seen in a previous chapter that Carbolic Acid has been recommended for its antipyretic action. It is as an antiseptic, however, that it has been chiefly used.

Charteris gave $2\frac{1}{2}$ grains doses of the drug in keratin coated pills to patients at the Belvidere Hospital. The dose was given thrice daily. Under

this treatment the motions became less offensive, and there was marked improvement as regards the diarrhoea. McNaught found that the fever was curtailed, and the temperature lowered. Sloan, after treating a fair number of cases, concurs with the above statements. Grimshaw has published 116 cases of Enteric fever treated with Carbolic Acid and Iodine combined. He concluded that it lowered the temperature and limited the ulceration. None of his cases died. He began the treatment, however, so late in most of them that, in the opinion of the writer, not much stress can be laid on his conclusions as regards the temperature, as his cases would be naturally in defervescence.

Pope of the Leicester Fever Hospital has also tried the above treatment. He admits that it has no bad results. But, although in certain cases the morning remissions seemed more marked than in the cases under other treatments, the duration of the fever averaged 30 days. The stools were entirely unaffected. Pope concludes that Carbolic Acid has but a slight effect on the temperature and none on

the mortality, complications, or general course.

Surgeon Lieut. Col. Quill gives Carbolic Acid, combined with Chloroform, in 3 minim doses of the pure liquified acid every 2 hours. He declares that, unless given freely, the drug is useless. It should be well diluted. The mortality of his cases, treated in India, was reduced from 37 to 9 per cent. He considers that the average duration is shortened, that there is a continuous depression of the febrile temperature, and that the stools are almost completely deodorized. Further that there are no typhoid symptoms, no tympanites, no secondary complications, and few relapses. One is inclined to wonder what this observer's cases died of.

The evidence on the value of Carbolic acid then seems very varied. Still there is sufficient in its favour to justify its use. The writer has no personal experience of it, and therefore can hardly offer an opinion. He feels, however, that it is a somewhat toxic drug to employ in large doses, when drugs, such as thymol, exist which are infinitely more antiseptic and less poisonous.

2. Salol.

The action of Salol as an antiseptic depends upon its decomposition in the intestinal canal into salicylic and carbolic acids. Its antiseptic value is that of these two substances. It would appear to be an ideal antiseptic for enteric, as Dr Lockhart Gillespie has informed the writer that in experiments on dogs he found that the decomposition does not take place till the ileum is reached. Other observers however maintain the change occurs throughout the whole small intestine. We may presume that a great deal depends on the amount of food taken, on the rapidity with which it passes downwards, and on the functional activity of the pancreas.

Professor Fraser in *Materia Medica* lectures delivered in 1888, in discussing the value of the drug in rheumatism, pointed out that the decomposition is necessary for the success of the drug, and that in feverish conditions the pancreas may not be working normally. The value of the drug may therefore be limited in Enteric Fever, where all the organs of the

body, including the pancreas, must suffer more or less from the prolonged temperature.

Given however a complete decomposition, and granting with Gillespie that it is not till it reaches the ileum that it occurs, the existence in the free state of two such powerful antiseptics as carbolic and salicylic acids in the very site of the ulceration would make salol theoretically the most perfect antiseptic at our command.

Many observers have found that Salol is of great value in fetid diarrhoea, and Dr Stockman has told the writer that it can always deodorize the stools completely in such cases. The writer had a considerable experience of salol about four years ago, when Resident at the City Hospital, and found that the offensiveness of the enteric dejecta was certainly modified.

Dujardin Beaumetz, believing in the value of intestinal antiseptics in Enteric fever, prefers salol which he considers is better tolerated than Naphthol. He regards it as the disinfectant par excellence of

the intestines. It has a marked effect in destroying the odour of faecal matter. This physician gave it in doses of from 30 to 60 grains daily.

Cahall gave 3 grs. every two hours, night and day, to 16 cases of Enteric Fever. He found that the drug was easily taken and caused no unpleasant results. Tympanites rapidly disappeared, and the most severe diarrhoea was controlled. The temperature rarely rose higher than it was on the first day of treatment and after the first week steadily fell. In no case did the condition of the heart necessitate the administration of alcohol. The only ill effect was a partial suppression of urine in some cases, but not severe enough to cause an intermission of the treatment. This observer considered that the duration of the fever was shortened.

Church has given salol (grains 5) every 4 hours with good results. He noted however one case where a severe herpetic eruption supervened after 3 days administration.

The writer has unfortunately no notes of a series of about 30 cases treated some years ago with 15 gr.

doses thrice daily. To the best of his recollection, however, the intensity & duration of the fever were unaffected. The stools, as mentioned above, were certainly improved. While having all due respect for the opinion of Dujardin Beaumetz, he personally prefers naphthol as an antiseptic. It has not the toxic effects which might result from carbolic & salicylic acids, & its success does not, like that of salol, depend primarily on the condition of the pancreas.

3. The Salicylates.

The only Salicylates, which, to the best of the writer's belief, have been used as antiseptics in Enteric Fever are those of Bismuth and Betanaphthol, both of which are mentioned elsewhere.

Subsection E. Chlorine, Chloroform, Iodine, Iodoform, Sulphurous Acid, and Bisulphide of Carbon.

The writer has included in this group various drugs which are to a large extent volatile & possibly act as gases in the body. The principal of these is undoubtedly Chlorine.

Chlorine.

This remedy has been advocated strongly by Yeo, who

combines it with Quinine. He regards the latter as a general antiseptic while he considers the action of Chlorine to be largely local in the alimentary canal. One would be inclined however to believe that the Chlorine would be all absorbed in the stomach.

Yeo's prescription is as follows:-

In a twelve ounce bottle place thirty grains of Chlorate of Potash and forty minims of Hydrochloric Acid. Fill up with water and add either 36 or 24 grains of Sulphate of Quinine. One ounce of the mixture may be given every 2 hours if necessary.

He sums up his benefits from this procedure as follows:-

- (1) There is a modification and sustained depression of the febrile temperature.
- (2) There is an abbreviation of the average course of the fever.
- (3) The physical strength and intellectual clearness of the patient are remarkably maintained.
- (4) The evacuations are deodorized.
- (5) There is a remarkable cleaning of the tongue.

(6) Convalescence is more rapid and more complete.

(7) There is a greater power of assimilating food.

These results are certainly very good. Dr Muirhead however using Yeo's prescription in a series of cases did not find that they are always attained.

In this treatment much must be due to the Quinine of which as much as 36 grains daily may be given.

The antiseptic qualities of this drug will be discussed later.

Yeo is disappointing in the cases which he quotes. He often does not give the dates. An analysis of the four cases which are given in his book leads the writer to the following conclusions.

(1) Only one was normal in less than three weeks from admission. Considering it is unusual to get a case before the 7th day of the disease the duration of the fever can hardly be said to be curtailed.

(2) The case mentioned was 17 days before attaining the normal. Even then if we add on 5 days of ill-

ness before admission, which is a low figure, we have a fever of 22 days.

(3) The stools seem to have been favourably modified in all cases.

(4) The only case which had tympanites is not said to have improved rapidly. We may therefore assume that condition was uninfluenced by the treatment.

Yeo considers that the Chlorine is really effective and that the Quinine is not alone responsible for the amelioration of the patient. To prove this he quotes an instance, where by a dispenser's mistake chloroform water was substituted for chlorine water, and where the temperature previously controlled by the proper formula rose at once. This, of course, may be merely a coincidence but it is certainly interesting.

Among other observers who have used Chlorine water we may note Boyd of Dublin, who gave his experience of this remedy in the British Medical Journal in 1892. He considers it the best antiseptic, and

makes the remarkable statement that one quarter of his cases, so treated, terminated before the 14th day.

The writer has no experience of Chlorine but he is doubtful if it is as reliable as some other antiseptics, basing this view on the experience of Dr Muirhead at the City Fever Hospital.

Chloroform.

We have seen just above that the substitution of Chloroform water for Chlorine water did not give Yeo good results. Quill, however, in consideration of the fact that a half per cent solution of Chloroform is fatal to the Enteric bacillus, has given Spirits of Chloroform with Carbolic Acid and made up with Chloroform water. He has largely reduced his death-rate in the severe forms of the disease seen in India, and considers that no little of the good effect produced is due to the Chloroform. Putting the Carbolic aside, the dose he gives is 10 drops of the Spirit in one ounce of the water, repeated every two hours.

Iodine.

This remedy has been given in Iodide solution by Magonty and others, but appears to Murchison to have no specific effect. Iodine has also been recommended in conjunction with Carbolie Acid, equal parts, as an antiseptic in Enteric fever, by Bartholow. It is absorbed in the stomach and must be regarded as a general antiseptic.

The writer has used the above combination, not so much as an antiseptic as to control vomiting. He considers it par excellence the treatment for vomiting occurring in the course of an enteric fever.

Iodoform.

Bouchard for a long time used this drug as an antiseptic in conjunction with charcoal. He ultimately gave it up because of its unpleasantness to the patient. Renaud recommends about 10 grains daily. It is said to efficiently deodorize the evacuations. The writer has had no experience of it. It has been used in this country with success by Caton at the Liverpool Royal Infirmary.

Sulphurous Acid.

Dr Wilks of Ashford in the British Medical Journal of 1870 claimed this remedy was an antidote in Enteric. All the cases, over 170 in number, treated in a particular epidemic by this observer, recovered except one who was the only individual who refused this remedy. The drug was given in sufficient quantities to make the breath, perspiration and excreta smell strongly of it. It allayed tympanites and cleaned the tongue.

Other observers have not however had the same results as Wilks.

The Sulphites have also been employed in this disease, but Murchison considered that they were liable to excite diarrhoea.

Bisulphide of Carbon.

This drug has been used by Dujardin Beaumetz who gave it in water. He claims that by it he deodorizes the evacuations and destroys the contagious principle.

Petresco tried the remedy in a 2 per cent solution in Mint water, giving three or four ounces daily. He found that the whole disease was rendered milder, and

that there was a remarkable immunity from complications. At the time he gave it his deathrate was 10 per cent, while that of the other physicians of Bucharest, using other methods, was as high as twenty five.

The writer has never used this drug. One would be inclined to believe that its nauseous character would counterbalance most of the advantages obtained by its employment.

Subsection F. Quinine.

We have seen in the chapter devoted to antipyresis that Quinine is much in favour with continental physicians as an antipyretic. Bouchard regards it also as a general antiseptic, and uses it for this purpose in conjunction with such local antiseptics as naphthol. Yeo follows Bouchard's views and combines it with Chlorine water. The largest dose he gives is about 36 grains a day but considerably less is prescribed as the fever abates. He does not regard this treatment as antipyretic, as the temperature is seldom affected till the treatment has lasted 48 hours.

Eberth has shown that Quinine checks the culture of his bacillus, and it is on this fact that these observers base their treatment. Bouchard regards the lowering of the temperature as due to an antiseptic rather than to a strictly antithermic action. Yeo quotes Sir Thomas Watson who alludes to its use by Dundas as a specific in continued fevers.

The writer would be perfectly willing to believe in the strong antiseptic action of Quinine in the blood, if the cases quoted by Yeo showed any diminution in the duration of the fever. But, as he has shown in the remarks he has already made on Yeo's method of treatment by Quinine and Chlorine, these cases are at least of the average duration. The cases, also, treated with Quinine by Wood at the City Hospital averaged as long as those treated symptomatically. We may be satisfied with local antiseptics, even if the fever is not curtailed. But a general antiseptic is nothing, if it does not directly attack the germ or its toxins. And, whatever it may do in the laboratory, is there a particle of evidence to show that it does so in the blood? True,

Bouchard lowered his deathrate remarkably, but we have had the same deathrate, about 11 per cent, for years at the City Hospital, without Quinine or any special treatment at all. Moreover deathrates have been lowered in the last 25 years all over Europe by improved sanitation, improved nursing, and a sounder knowledge of the disease.

Quinine is doubtless valuable as an antipyretic, if antipyresis is desired, but the writer requires more evidence to believe that it is reliable as an antiseptic.

Subsection G. Other Antiseptics.

1. Charcoal.

This has been recommended by Jenner, and also used by Bouchard who combined it with Iodoform. Large doses are necessary if any good result is to be obtained, and they must be very difficult to administer to patients in the typhoid state. Even then it is doubtful whether Charcoal, in a moist condition, has any marked antiseptic power.

2. Tannic Acid.

This drug has been recommended by Cantani with a view to check the activity of the bacteria and to render the ptomaines innocuous. The writer has no personal experience of its use. Yeo has employed it with success as an enema in diarrhoea.

Conclusions on Antiseptic Drugs.

The writer is of opinion that much may be done in Enteric Fever by a treatment conducted on strict antiseptic principles. While personally he prefers calomel of all the drugs considered, many of the others, particularly the Naphthol group, gave most favourable results. Guaiacol is especially useful in cases complicated with tuberculosis or respiratory affections, otherwise it is not as satisfactory as the Naphthols. Thymol seemed the most successful of all the drugs tried in deodorizing the evacuations. As regards other considerations it did not give such satisfactory results, particularly failing to relieve

tympanites. Indeed the large proportion of the thymol cases in which this complication occurred, 7 out of 11, almost suggests that it may cause or aggravate meteorism.

The Perchloride of Mercury was not as successful as the Subchloride. Still in relieving tympanites the writer believes it has no rival. The evacuations however are unaffected. So powerful a drug is to be avoided, unless indeed we are content with half a drachm of the liquor every 4 hours as an adult dose. Turpentine had not a long enough trial to gauge accurately its powers. Certainly it deodorized the evacuations and relieved tympanites. Its effect on the tongue, however, is not so marked as some writers would have us believe.

Of the drugs the writer has not had any experience of during the past year, salol will be probably found the most satisfactory. The writer's recollection of it would not, however, lead him to believe it to be better than the naphthols, while it is undoubtedly more toxic. Chlorine water and Quinine, after Yeo's

prescription, have never been very successful at the City Hospital.

The writer's recollection of the use of Bismuth Salicylate combined with Naphthol is to the effect that, while the combination may have certain advantages in severe diarrhoea, it is too constipating for general use. He has had to depend too much on the literature of the subject to be able to offer any personal opinion on the advantages of the other drugs he has named.

To make an antiseptic treatment thorough, it is necessary to cleanse the mouth frequently with antiseptic fluids, and to favour the elimination of waste products from the body. The following chapter contains detailed statistics of the different remedies, and tables showing the incidence of complications and relapses. The unfortunate difference in the average ages of some of the groups makes it difficult to come to any very definite conclusion, and the very small number of cases is liable to make any conclusion fallacious. The writer however will tabulate his opinions thus.

1. There is no antiseptic drug known which has any certain effect in shortening the duration of Enteric Fever.
2. Certain of these drugs give more favourable results than a purely symptomatic treatment.
3. By their use the nursing is rendered pleasanter and the air in the wards more pure.
4. The majority of these drugs can be given in large quantities without injury to the patient.
5. The intensity of the disease is probably in some instances lessened.
- 6.. No drug that we know of can render the bowel completely aseptic.
7. No drug will prevent the occurrence of relapses.

These conclusions may not be very favourable to the antiseptic treatment. Still, as we know that most of the remedies are harmless, there is a cleanliness about the principle of Antisepsis which will commend it to many. The writer believes strongly in combining frequent doses of Calomel with these

ed by a rise of temperature and in some instances by rigors. This would point to some general reaction occurring, but whether against the disease or the injection it would be difficult to say. The cases seem to have done well, and remissions in the fever followed quickly. The constitutional symptoms of the disease also disappeared early.

Rumpf experimented with sterile dead cultures of other micro-organisms. He considers that, with cultures of the bacillus pyocyaneus grown in thymus bouillon, his results in 30 cases of enteric were only slightly less favourable than those of Fränkel.

These experiments cannot of course be regarded as experiments with an antitoxin. The serum used is not that of the blood of an animal previously immunized. They are more to be compared to the treatment of tuberculosis with tuberculin, and the object is to increase the reaction of the human organism. It has been suggested that the extract of thymus gland used is at least as active in causing the reaction as are the cultures.

Brouardel notes the experiments of Chantemesse and Vidal, references the writer has been unable to verify. These observers treated two cases with a typhoid antitoxin, a serum from the blood of an immunized animal. Their results were apparently not remarkable.

The most recently published work is that of Börger who has treated 12 cases of enteric with antitoxic sheep serum. The average age of the patients was 23 and they came under treatment on the 11th day on an average. In 8 cases no result was noticed. In four the course of the disease was possibly affected. The average day of admission of these four cases was the 7th, so it would appear the earlier the patient comes under treatment the better is the result. Most of the cases were also treated with baths. There was one death and one relapse.

The dose of the serum varied from 10 to 100 c.c. The total amount any individual received varied from 25 to 200 c.c. The last figure applies to the fatal case, who was by the way admitted as early as the 8th day. The cases reached normal on an average on

the 22nd day of the fever. One case terminated on the 11th day after having been 5 days under treatment, and having received on admission 30 c.c. of the serum.

Börger concludes that the difficulty of getting an enteric case early will always militate against the success of this treatment. It can therefore never have the same results as that by diphtheric antitoxin. The serum is however harmless even in large doses, and in mild uncomplicated cases recognized before the 10th day it may possibly exercise a favourable influence.

The writer has only, up to the date of writing, had the opportunity of treating one case with Antitoxin. The preparation used was that of Messrs Burroughs and Wellcome and is derived from an immunized horse. The patient, a boy of 11 years, was injected with 5 c.c. of the serum on the 10th day of the disease. On the 12th day albumin appeared in considerable amount in the urine but the injection was repeated. The case thereafter ran such a severe course and the albuminuria became so marked that the writer did

not care to persist in the treatment, which had originally been sanctioned by Dr Muirhead. He believes that the albuminuria was probably due to the serum, but, whether this is the case or not, there is no doubt that the disease was not influenced for the better. An hourly chart showing the temperature from the time of the first injection is appended, as is also the daily chart of the case.

It is too early to come to any conclusion on the merits of antitoxin. But the writer believes with Börger that the difficulty of getting the cases early will prevent its results being very striking for some years to come. Again, the mortality of Enteric Fever is comparatively low, so we can never expect the remarkable reduction of it which has, in the case of diphtheria, forced the use of antitoxin on the profession.

CHAPTER VI.

General Conclusions.

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General Conclusions.

The Remedies which have been touched upon in the above pages have already received full consideration. It only remains for the writer to briefly summarize his views on their relative value.

Under the heading of 'Statistical Tables' a full summary of the figures relating to the cases treated during the past year will be found in the Appendix. The first two pages of this Appendix give the comparative results obtained by the expectant symptomatic and antiseptic methods of treatment respectively. If we consider these tables we find that, while the number of cases treated by the antiseptic method is more than double that of the expectant symptomatic group, the deathrate of the former is less than half that of the latter. The average age of these cases, a point which must always be carefully considered in enteric statistics, is practically the same. The next point which favours the antiseptic treatment is

that the incidence of relapses is proportionately much rarer. On the other hand while the expectant symptomatic cases were admitted on an average more than a day later, which must influence the deathrate unfavourably, these cases terminated on an average nearly two days earlier, and this in spite of the boasted qualities of antiseptics in shortening the duration of the disease. They also left the Hospital three days earlier than those treated by antiseptics. In other words the duration and the convalescence of the cases under expectant symptomatic treatment was shorter than the antiseptic cases. The large death-rate certainly tells against the former treatment, but the writer has already explained in the third chapter of this volume that this deathrate is hardly to be regarded as a fair index of the facts.

If we compare the various antiseptics, the calomel statistics appear at first sight the best, but the very low average age of the cases renders the results far less striking than those of the naphthol group. Guaiacol was moderately successful, and the

writer would prefer it to any other antiseptic in cases with respiratory complications. The number of the Thymol, Turpentine and Perchloride of Mercury cases is so small that it would be rash to make very definite statements as to their comparative value. The writer has fully discussed already the advantages they appear to possess.

Coming in the next place to the other treatments mentioned in the preceding pages, the writer considers that, in its present state of imperfection, it is impossible to prophesy the future of serotherapy. At present, apparently, it is not likely to give very brilliant results, but quite possibly it is the treatment of the future.

The writer considers that antipyretic treatment is against the principles of nature and that, in a disease which runs a definite course, interference is not justifiable except in hyperpyrexia. Admitting that the definition of hyperpyrexia is very difficult, he would submit that an enteric temperature is not hyperpyretic unless it is above 106° , or has remained

never below 105° for two days. Under such circumstances cold applications, preferably cold sponges or, if they are not sufficient, the ice coil either on the head or abdomen, are the safest remedies for attacking the temperature.

Antipyretic drugs are liable to cause collapse. They do not in many cases relieve the delirium. The coal tar group retards the excretion of the toxins, thus preventing the elimination which might save the patient's life.

Brand's system of baths stands on a different footing from other antipyretic treatments from the fact that it promotes diuresis. It has undoubtedly had a great success, and appears to give results as good as any treatment at our disposal. But the difficulty of its execution and the repugnance it causes in the patients will probably always prevent its wide use in this country.

The writer's own view is that an eliminative and mildly antiseptic treatment is the ideal one. This can be secured by the combined use of calomel, in 3 or 5 grain doses every second or third day, and

irrigation of the large intestine. The bowel is kept free of decomposing material and the amount of urine is largely increased. The facts given in a preceding chapter under the head of Calomel prove that that drug can be given throughout the fever freely with no ill effects. In children particularly it is invaluable and if any drug had the power of aborting Enteric, which the writer does not believe, that drug in his experience would be Calomel.

To tabulate briefly then his conclusions the writer is of opinion that

- (1) There is no specific treatment for Enteric Fever.
- (2) No drug will shorten its natural course.
- (3) A strictly antiseptic treatment gives slightly better results than a purely expectant symptomatic treatment.
- (4) Antipyretic treatment is undesirable and often dangerous.
- (5) Eliminative treatment is the most satisfactory and this can be secured by the use of calomel

and irrigation of the large intestine.

It has been well said that we cannot treat Typhoid fever but only the Typhoidized, that is to say the organisms whose own force is reacting against the poison. What the physician has to do is not to interfere with the efforts of nature to expel or destroy the germ, but to support the human organism and so far as is possible to assist nature. One of the first great principles of Medicine, which the writer was taught as a student, was to 'favour Elimination,' and his experience of Enteric Fever has not led him to prefer any other principle in the treatment of that disease.

F I N I S.

APPENDIX A.

Statistical Tables.

COMPARATIVE RESULTS.

No. of Cases	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	NAME Complications OF DRUG.	Remarks on Course of Case.	Result.
19.	20.7	10.8	26.9	53.2	42.9	BETANAPHTHOL	HAEMORRHAGES - ONE - SLIGHT. RECRUDESCENCES - NONE RELAPSES - ONE.	R. 19. D. 0.
8.	15.	10.0	27.0	58.0	47.0	HYDRONAPHTHOL	HAEMORRHAGES - TWO. RECRUDESCENCES - ONE RELAPSES - ONE	R. 8 D. 0.
20.	18	11.0	31.0	60.0	48.0	BENZONAPHTHOL	HAEMORRHAGES - TWO RECRUDESCENCES - TWO RELAPSES - TWO	R. 20 D. 0.
47.	18.5	10.6	28.5	56.4	45.4	NAPHTHOLS ALL CASES.	HAEMORRHAGES. 10.6 per cent RECRUDESCENCES 6.3 " " RELAPSES 8.5 " "	R. 47. D. 0
23.	18.	10.0	26.0	56.0	45.0	GUAIACOL.	HAEMORRHAGES 13.04 " " RECRUDESCENCES 8.6 " " RELAPSES 4.3 " "	R. 22 D. 1.
11.	19.6	10.9	28.7	53.3	41.9	THYMOL.	HAEMORRHAGES 0 " " RECRUDESCENCES 18.0 " " RELAPSES 0 " "	R. 10 D. 1.
6.	17.6	12.1	30.4	52.5	43.0	TURPENTINE	HAEMORRHAGES — RECRUDESCENCES 0 " " RELAPSES 16.6 " "	R. 4 D. 2.

COMPARATIVE RESULTS.

No. of Cases	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
8.	12.5	10.6	27.3	71.5	60.5	PERCHLORIDE OF MERCURY	HAEMORRHAGES 12.5 per cent. RECRUDESCENCES 12.5 " " RELAPSES. 12.5 " "	R. 6. D. 2.
31.	11.8	11.0	23.0	49.0	38.3	CALOMEL.	HAEMORRHAGES .0 " " RECRUDESCENCES 12.9 " " RELAPSES .0 " "	R. 31. D. 0.
43	13.5	10.7	22.9	49.6	36.3	ALL CALOMEL CASES, INCLUDING TWELVE ALSO TREATED BY OTHER ANTISEPTICS	HAEMORRHAGES .0 " " RECRUDESCENCES 11.6 " " RELAPSES 2.3 " "	R. 43 D. 0.
51.	16.4	12.1	25.8	52.0	40.6	EXPECTANT SYMPTOMATIC	HAEMORRHAGES 7.8 " " RECRUDESCENCES 11.7 " " RELAPSES 9.8 " " DEATH RATE 11.7 " "	R. 45. D. 6.
126.	16.5	10.8	27.2	55.4	44.4	ALL CASES TREATED BY ANTISEPTICS	HAEMORRHAGES 7.1 " " RECRUDESCENCES 9.5 " " RELAPSES 5.6 " " DEATHS. 4.6 " "	R. 120. D. 6.
177.	16.5	11.2	26.8	54.5	43.3	ANTISEPTIC AND EXPECTANT SYMPTOMATIC TAKEN TOGETHER	HAEMORRHAGES 7.3 " " RECRUDESCENCES 10.1 " " RELAPSES 6.7 " " DEATHS 6.7 " "	R. 165. D. 12.
185.	16.8	11.4	26.8	54.5	43.3	ALL CASES ADMITTED INCLUDING EIGHT WHICH DIED WITHIN 48 HOURS.	HAEMORRHAGES 8.6 " " RECRUDESCENCES 10.1 " " RELAPSES 6.7 " " DEATHS 10.8 " "	R. 165. D. 20.

EXPECTANT SYMPTOMATIC.

TABLE I.

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
I.	11 F	11 ^h	27 ^h	67 ^h	56	RECRUDESCENCE	Distension. Never Present Tongue Cleaned rapidly.	R
II	25 M	7 ^h	20 ^h	45 ^h	38		Distension. None throughout Tongue improved slowly	R
III	8 F	11 ^h	18 ^h	66 ^h	55	RELAPSE	Had Benzoylphenitrol in Convalescence 15 days before Relapse. Distension None Tongue Cleaned rapidly.	R
IV	11 M	8 ^h	20 ^h	42 ^h	34		Distension None throughout Tongue Cleaned rapidly	R
V	9 F	8 ^h	-	-	-	PERFORATION DIED 32 nd DAY	Distension None Tongue Never cleaned. Strict milk diet throughout.	D
VI	42 F	10 ^h	24 ^h	66 ^h	56	RELAPSE HAEMORRHAGE	Distension Somewhat persistent Tongue Cleaned slowly.	R
VII	29 F	5 ^h	23 ^h	45 ^h	40		Distension - None Tongue Cleaned rapidly.	R

EXPECTANT SYMPTOMATIC.

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
<u>VIII</u>	26 M	17 ^E	—	—	—	HEART FAILURE	Distension - Intense and unimproved by Turpentine Tongue - Never cleaned	D
<u>IX</u>	10 F	11 ^E	18 ^E	45 ^E	34		Distension - improved slowly Tongue " "	R
<u>X</u>	14 M	13 ^E	23 ^D	46 ^E	33		Distension none Tongue cleaned rapidly	R
<u>XI</u>	18 F	11 ^E	20 ^E	42 ^D	31		Distension - none Tongue cleaned slowly Occasional doses of Castor oil.	R
<u>XII</u>	7 F	8 ^E	18 ^E	45 ^E	37		Distension rapidly disappeared Tongue cleaned quickly Occasional doses of Castor oil	R
<u>XIII</u>	12 F	11 ^E	27 ^E	42 ^D	31		Distension none Tongue cleaned quickly.	R
<u>XIV</u>	6 F	17 ^E	24 ^E	67 ^E	50	RELAPSE.	Distension disappeared quickly but recurred severely in Relapse. Tongue cleaned quickly	R

EXPECTANT SYMPTOMATIC.

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
<u>XV</u>	22 M	18 ^h	—	—	—	HAEMORRHAGE SLIGHT. CARDIAC FAILURE.	Distension - Moderate, unrelieved. Tongue never cleaned.	D
<u>XVI</u>	28 M	14 ^h	30 ^h	54 ^h	40 ^h		Distension None throughout Tongue: Improved rapidly. Two doses of Calomel for constipation.	R
<u>XVII</u>	22 M	19 ^h	27 ^h	58 ^h	39		Distension None Tongue Cleaned rapidly. Two doses of Calomel for constipation.	R
<u>XVIII</u>	13 F	21 st	30 ^h	63 ^h	42	RECRUDESCENCE.	Distension None Tongue Cleaned slowly.	R
<u>XIX</u>	24 F	15 ^h	27 ^h	35 ^h	20		Distension None Tongue Very foul but cleaned quickly	R
<u>XX</u>	5 M	12 ^h	18 ^h	32 ^h	20		Distension None Tongue Cleaned rapidly	R
<u>XXI</u>	17 F	20 ^h	30 ^h	40 ^h	20		Distension Considerable gone in a week Tongue Cleaned rapidly	R

EXPECTANT SYMPTOMATIC.

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
<u>XXII</u>	22 M	12 ^h	30 ^h	72 ^h	60	RELAPSE	Distension None Tongue Cleaned very slowly	R
<u>XXIII</u>	8 F	4 ^h	25 ^h	57 ^h	53		Distension None Tongue Cleaned slowly	R
<u>XXIV</u>	2 M	12 ^h	24 ^h	46 ^h	34		Distension None Tongue Cleaned slowly, Quinine for swinging temperature	R
<u>XXV</u>	9 M	8 ^h	20 ^h	39 ^h	31		Distension None Tongue cleaned slowly	R
<u>XXVI</u>	4 M	5 ^h	17 ^h	34 ^h	28		Distension - Severe & prolonged Tongue Cleaned slowly Two doses of Calomel	R
<u>XXVII</u>	15 F	15 ^h	21 ^h	36 ^h	21		Distension Slight & transient Tongue Cleaned slowly	R
<u>XXVIII</u>	18 M	8 ^h	13 ^h	29 ^h	21		Distension None Tongue Cleaned rapidly Abortive.	R

EXPECTANT SYMPTOMATIC.

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
<u>XXIX</u>	10 M	13 ^h	24 ^h	47 ^h	34		Distension Considerable Impaired by emetals Tongue Cleaned at once	R
<u>XXX</u>	7 M	6 ^h	25 ^h	47 ^h	41		Distension Considerable, Developed after admission Tongue Cleaned slowly.	R
<u>XXXI</u>	5 F	19 ^h	-	-	-	TUBERCULOSIS	Distension Considerable Tongue Cleaned slowly slowly	D
<u>XXXII</u>	12 M	16 ^h	35 ^h	43 ^h	27		Distension Considerable Tongue Cleaned slowly	R
<u>XXXIV</u>	22 M	12 ^h	32 ^h	58 ^h	46	PAROTITIS.	Distension None Tongue - Dry fissured & glazed throughout	R
<u>XXXV</u>	24 F	11 ^h	32 ^h	45 ^h	34	VOMITING.	Distension None Tongue Clean throughout.	R
<u>XXXVI</u>	12 F	13 ^h	27 ^h	49 ^h	36		Distension None Tongue Cleaned rapidly	R

EXPECTANT SYMPTOMATIC.

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
<u>XXXVII</u>	4 M	12 ^h	25 ^h	38 ^h	26		Distension Disappeared quickly Tongue Cleaned rapidly	R
<u>XXXVIII</u>	9 F	13 ^h	19 ^h	57 ^h	38	RECRUDESCENCE.	Distension None throughout Tongue Cleaned slowly	R
<u>XXXIX</u>	27 M	8 ^h	27 ^h	38 ^h	30		Distension Considerable at first Tongue Sticky throughout	R
<u>XL</u>	10 M	10 ^h	26 ^h	52 ^h	42		Distension - Great, developed in Hospital. Tongue Dry and caked throughout.	R
<u>XLVI</u>	30 F	17 ^h	39 ^h	94 ^h	77	HAEMORRHAGE CONSIDERABLE 29 th DAY RE RELAPSE.	Distension None Tongue Cleaned slowly.	R
<u>XLVII</u>	9 M	13 ^h	28 ^h	67 ^h	54	PNEUMONIA RECRUDESCENCE.	Distension None Tongue Cleaned slowly	R
<u>XLVIII</u>	6 F	13 ^h	23 ^h	44 ^h	31		Distension None Tongue Cleaned slowly	R

EXPECTANT SYMPTOMATIC.

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
<u>XLIV</u>	34 M	20 ^h	-	-	-	HAEMORRHAGE SLIGHT.	Died 28 th day. Distension None Tongue Never cleaned	D
<u>XLV</u>	28 F	7 ^h	32 ^h	64 ^h	57		Distension None Tongue Cleaned slowly	R
<u>XLVI</u>	38 F	6 ^h	17 ^h	60 ^h	54	RECRUDESCENCES	Distension None Tongue Cleaned slowly	R
<u>XLVII</u>	35 M	8 ^h	55 ^h	70 ^h	68	NEPHRITIS THROMBOSIS.	Distension None Tongue Cleaned very slowly.	R
<u>XLVIII</u>	14 F	20 ^h	24 ^h	80 ^h	60	RECRUDESCENCE.	Distension None Tongue cleaned very slowly Irrigation	R
<u>XLIX</u>	15 ^h F	21 st	65 ^h	83 ^h	62		Distension None Tongue cleaned slowly	R
L	31 F	15 ^h	30 ^h	56 ^h	41	JAUNDICE, RECRUDESCENCE.	Distension None Tongue cleaned slowly	R

HYDRONAPHTHOL

TABLE I.

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
I	12 M	18 ^h	32 ^o	76 ^h	58		Dose. gr ⁱⁱⁱ every 6 hrs from 21 st gr ^v " " " " 25 th Tongue - cleaned steadily Distension - none Stools - improved	R
II	15 F	8 ^h	29 ^h	57 ^h	49	HAEMORRHAGE SEVERE	Dose. gr ^v every 6 hrs from 8 th Tongue - remained dry Distension - none Stools - unimproved	R
III	11 F	10 ^h	23 ^o	45 ^h	35		Dose. gr ^v every 6 hrs from 11 th Tongue - improved at first only Distension - unaffected Stools - unaffected Temperature - low throughout	R
IV	14 F	8 ^h	22 ^o	40 ^h	32		gr ^v every 6 hrs from 8 th day Tongue - unaffected Stools - not much improved Distension - none Temperature - low throughout	R
V	15 M	9 ^h	22 ^o	71 ^h	62	HAEMORRHAGE SEVERE RECURRENCE	gr ^v every 6 hrs from 10 th day Tongue unaffected No distension	R
VI	11 F	8 ^h	25 ^h	43 ^o	35		gr ^v every 8 hrs from 9 th day Distension improved rapidly Tongue and stools not much improved Temperature low throughout.	R
VII	25 M	8 ^h	31 ^o	53 ^o	45		gr ^v every 6 hrs from 11 th day Tongue improved Distension unaffected Stools - much improved	R

HYDRONAPHTHOL WITH CALOMEL

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
I								
<u>VIII</u>	18 M	16 th	32 nd	49 th	63	RELAPSE	Dose gr ^v every 6 hours and Calomel gr ^v every 3 rd day. Tongue unimproved Distension none Stools not much improved	R

BENZONAPHTHOL

TABLE I.

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
I	14 M	6 ^h	20 ^h	27 ^h	21	RELAPSE 42 nd DAY	Dose gr VIII t.i.d. from 13 th day Stools improved	R
II	7 M	14 ^h	28 ^h	62 ^h	48	RECRUDESCENCE	Dose gr VIII t.i.d. from 17 th day Tongue improved rapidly Distension - none Stools not much improved	R
III	22 M	11 ^h	26 ^h	56 ^h	49		Dose gr XVI t.i.d. from 13 th day Tongue improved rapidly Distension none Stools much improved Temperature unaffected	R
IV	26 M	10 ^h	30 ^h	50 ^h	40		Dose gr XVI t.i.d. from 22 nd day Tongue only slightly better Some abdominal tenderness Stools not much improved	R
V	6 M	14 ^h	20 ^h	40 ^h	26		Dose gr XVI t.i.d. 14 th - 27 th days Tongue - unaffected Temperature remained high Stools - unaffected	R
VI	29 F	11 ^h	38 ^h	67 ^h	56		Dose gr VIII t.i.d. from 13 th Tongue quite unaffected Distension None Temperature unaffected Stools not much improved	R
VII	12 F	11 ^h	28 ^h	61 ^h	50		Dose gr XVI t.i.d. from 19 th day Tongue improved Distension improved quickly Stools less offensive	R

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BENZONAPHTHOL

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
<u>VIII</u>	24 M	18 ^h	40 ^h	55 ^h	37		Dose gr XVI t. i. d. from 19 th day Tongue improved Distension improved quickly Stools less offensive	R
<u>IX</u>	30 M	11 ^h	25 ^h	48 ^h	37		Dose gr XVI t. i. d. from 19 th No particular improvement noticed.	R
<u>X</u>	18 F	8 ^h	29 ^h	76 ^h	68	RELAPSE	Dose gr XVI t. i. d. from 9 th - 15 th Tongue improved Stools less offensive Distension disappeared but recurred severely.	R
<u>XI</u>	21 M	14 ^h	32 ^o	73 ^o	59	HAEMORRHAGE (SEVERE) (22 ^o DAY) RECURRENCE	Dose gr XVI t. i. d. from 15 th Tongue - Improved only at first Distension - Unaffected Stools - Practically odorless Temperature - Unaffected	R
<u>XII</u>	30 F	15 ^h	37 ^h	70 ^h	55	HAEMORRHAGE. (SLIGHT) 21 st PLEURISY.	Dose gr XVI t. i. d. from 19 th Tongue improved otherwise negative	R
<u>XIII</u>	18 F	8 ^h	44 ^h	73 ^o	65	RIGORS	Dose gr XVI t. i. d. from 19 th Tongue improved Stools much less offensive Great distension and rigors after 22 days treatment.	R
							Dose gr V.	

BETANAPHTHOL

TABLE I.

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
<u>I</u>	10 F	14 ^u	24 ^u	47 ^u	33		gr III every 4 hrs from 14 th day. Distension - Gone in 4 days Tongue Improved rapidly Stools Somewhat improved Temperature Unaffected	R
<u>II</u>	9 F	14 ^u	21 st	42 ^o	28		gr III every 4 hrs from 15 th day Distension - none Tongue - improved quickly Stools - comparatively inoffensive Temperature - unaffected	R
<u>III</u>	22 M	9 ^u	22 ^o	44 ^u	35		gr VI every 4 hrs from 10 th day Distension - none Tongue - cleaned quickly Stools - improved Indican - decreased steadily	R
<u>IV</u>	25 M	6 ^u	19 ^u	40 ^u	34		gr VI every 4 hrs from 7 th day Distension - none Tongue - cleaned at once Stools - modified Temperature low throughout	R
<u>V</u>	17 M	7 ^u	16 ^u	36 ^u	29		gr VI every 4 hrs from 7 th , gr XII, 10 th Distension - Disappeared at once Tongue Cleaned rapidly Stools Modified Abortive?	R
<u>VI</u>	30 M	10 ^u	18 ^u	43 ^o	33		gr VI every 4 hours from 11 th Distension - Not present Tongue - Unaffected Stools - modified Temperature - averaged lower	R
<u>VII</u>	23 M	14 ^u	28 ^u	63 ^o	49	PNEUMONIA THROMBOSIS	gr VI every 4 hrs from 10 th day. Distension - Slight - gone in 2 days Tongue - Cleaned rapidly Temperature Unaffected Stools - slightly improved	R

BETANAPHTHOL

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
<u>VIII</u>	4 M	15 ^h	16 ^h	57 ^h	41		gr iii every 4 hrs from 10 th day Distension - not present Tongue - Began to clean Stools ^{at once} modified Abative ?	R
<u>IX</u>	18 M	14 ^h	30 ^h	52 ^h	38		gr vi every 4 hrs from 14 th day Distension - Improved slowly Tongue - Dry and cracked ^{throughout} Stools - Not much improved	R
<u>X</u>	27 M	10 ^h	27 ^h	47 ^h	37		gr vi every 4 hrs from 10 th day Distension - Never present Tongue - unaffected Stools practically odorless	R
<u>XI</u>	42 M	15 ^h	47 ^h	60 ^h	53	HAEMORRHAGE, SLIGHT	gr vi every 4 hrs from 15 th day Distension - Not present at first but became severe. Tongue - unimproved Stools - improved Indican - appeared in urine.	R
<u>XII</u>	31 F	16 ^h	28 ^h	53 ^h	34		gr vi every 4 hours from 16 th day Distension - not present Tongue - improved quickly Stools - slightly improved Indican, in urine after 8 days treatment	R
<u>XIII</u>	26 F	0 ^h	52 ^h	78 ^h	70	CONGESTIVE HAEMORRHAGE. PERITONITIS.	gr vi every 4 hours from 8 th day Distension - Improved slowly but recurred. Tongue - Never cleaned Stools - Almost odorless	R
							gr vi every 4 hrs from 8 th , gr xiii from 10 th	

BETANAPHTHOL

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
XIV	13 M	8 ^u	21 st	55	47		gr VI every 4 hrs from 8 th , gr XII from 10 th Distension - Not present Tongue Cleaned rapidly Stools Improved Temperature Unaffected.	R
XV	11 M	7 ^u	21 st	50 ^u	43		gr VII every 4 hrs from 8 th , gr XII till 16 th than gr VI Distension not present Tongue unaffected Stools much improved Indicanuria 13 th -15 th days	R
XVI	27 M	9 ^u	23 rd	50 ^u	41		gr XII every 4 hours from 9 th Distension - improved rapidly Tongue - unaffected Stools - modified	R
XVII	19 M	12 ^u	16 ^u	32 rd	20		gr IX every 4 hrs from 12 th day Distension - improved rapidly Tongue - cleaned quickly Stools - modified Abstruse?	R
XVIII	27 F	12 ^u	42 nd	100 ^u	88	RELAPSE. 53 rd DAY.	gr XII every 4 hrs 13 th -51 st day. Distension - not present Tongue - improved rapidly Stools - modified Temperature - unaffected	R
XIX	13 F	11 ^u	39 ^u	60 ^u	59	HIP JOINT DISEASE.	gr VII every 4 hrs from 11 th day Distension - None throughout Stools - modified Tongue - unaffected	R

GUAIACOL

TABLE I

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
I	5 M	7 ^h	21 ^h	50 ^h	43	SLIGHT PERITONITIS DISTENSION	Distension improved Tongue unaffected Stools not much better. Calomel.	R
II	9 M	7 ^h	20 ^h	67 ^h	60	SOME PERITONITIS DISTENSION	Tongue only improved.	R
III	12 F	13 ^h	19 ^h	41 ^h	28		Not much improvement noted.	R
IV	24 F	11 ^h	27 ^h	65 ^h	54		Ran a mild course. Stools somewhat better Tongue cleared slowly	R
V	8 F	16 ^h	25 ^h	63 ^h	47		High temperature which had to be treated with quinine	R
VI	29 F	11 ^h	38 ^h	67 ^h	56	HIGH TEMPERATURE	Temperature apparently improved.	R
VII	16 M	17 ^h	37 ^h	53 ^h	36		Stools unimproved Tongue unaffected Temperature unaffected	R

GUAIACOL

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
VIII	Y F	4 ^h	31 st	39 ^h	28		Calomel also given Tongue improved rapidly Stools modified. Temperature unaffected.	R
IX	30 M	7 ^h	23 rd	46 ^h	39	PNEUMONIA.	No favourable result after Guaiacol	R
X	15 M	7 ^h	17 ^h	46 ^h	39		Temperature probably improved Tongue - not much better Stools slightly modified. Calomel systematically.	R
XI	22 M	18 ^h	30 ^h	52 ^h	34	HAEMORRHAGE. VERY SLIGHT. 19 th DAY	Temperature unaffected Tongue - cleared slowly Stools - slightly better	R
XII	30 M	12 ^h	38 ^h	76 ^h	64	HAEMORRHAGE 3 rd ONLY	Guaiacol was given for 4 days before the haemorrhage No improvement in temperature stools or tongue.	R
XIII	21 M	11 ^h	22 nd	65 ^h	54	PERITONITIS	Distension improved Stools - modified Tongue unaffected. Calomel systematically.	R
XIV	11 M	8 ^h	19 ^h	46 ^h	38		Results of treatment negative - Calomel systematically	R

THYMOL

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
I	19 M	14 ^h	24 ^h	59 ^h	45	RECRUDESCENCE	gr ip every 4 hrs from 14 th day Distension - None Tongue - cleaned slowly Stools - unaffected Temperature - unaffected	R
II	45 M	18 ^h	31 ^h	52 ^h	34	THROMBOSIS	gr iv every 4 hrs from 19 th day Distension - None Tongue - cleaned quickly Stools - much improved Temperature - unaffected	R
III	14 F	6 ^h	-	-	-	PNEUMONIA. HYPERPYREXIA.	gr iv every 4 hrs 8 th -19 th Distension - improved slowly Tongue - never moistened Stools - had odour of thymol Temperature - unaffected	D
IV	26 F	11 ^h	44 ^h	69 ^h	58		gr ip every 4 hrs from 14 th day. Distension - none Tongue - cleaned slowly Stools - had odour of thymol Indican on 43 rd day in urine.	R
V	14 M	9 ^h	28 ^h	49 ^h	40		gr iv every 4 hrs from 9 th day. Distension unaffected Tongue unaffected Stools much improved Temperature unaffected	R
VI	31 M	6 ^h	25 ^h	48 ^h	42		gr vi every 4 hrs from 9 th day Distension improved slowly Tongue unaffected Stools much improved Temperature unaffected	R
VII	9 F	8 ^h	19 ^h	49 ^h	41		gr ii every 4 hrs from 10 th day Distension - none Tongue cleaned quickly Stools much improved Temperature unaffected	R

TURPENTINE

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
I	10 M	18 ^h	32 ^h	52 ^h	34		<p>by X every 2 hrs from 18th day.</p> <p>Distension - improved -</p> <p>Tongue " "</p> <p>Stools slightly modified</p> <p>Temperature unaffected</p>	R
II	44 M	20 ^h	-	-	-	HAEMORRHAGE ON ADMISSION	<p>by X every 2 hrs from admission.</p> <p>Distension - none</p> <p>Tongue - never cleaned</p> <p>Stools - modified</p> <p>Temperature - unaffected</p>	D
III	14 M	15 ^h	34 ^h	-	-	RELAPSE	<p>by X every 2 hrs from 16th, 4 hrs from 29th</p> <p>Distension - improved quickly</p> <p>Tongue unaffected</p> <p>Stools never quite odourless</p> <p>Temperature unaffected</p>	D
IV	17 M	9 ^h	29 ^h	54 ^h	45		<p>by X every 2 hrs from 13th, 4 hrs 22nd</p> <p>Distension - none</p> <p>Tongue - clean throughout</p> <p>Stools - faecal odour masked</p> <p>Temperature unaffected.</p>	R
V	6 M	6 ^h	27 ^h	54 ^h	48		<p>by X every 4 hrs from 16th day.</p> <p>Distension - disappeared</p> <p>Tongue - unaffected</p> <p>Stools - much improved</p> <p>Temperature - unaffected.</p>	R
VI	12 F	5 ^h	30 ^h	50 ^h	45.		<p>by X every 2 hrs from 7th, 4 hrs from 11th</p> <p>Distension - none</p> <p>Tongue - unaffected</p> <p>Stools - improved</p> <p>Temperature - unaffected</p>	R

CALOMEL

TABLE I.

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
I	18 F	15 ^h	23 ^o	55 ^h	40	RIGORS	grv, 15 th , 16 th days and frequently afterwards. Distension - None Temperature fell rapidly Tongue cleaned quickly	R
II	5 M	21 st	29 ^h	55 ^h	34		grviii 25 th , 23 rd , 28 th days and after Distension, relieved at once Temperature - unaffected Tongue cleaned rapidly	R
III	11 M	8 ^h	21 st	48 ^h	40		grviii 9 th , 11 th , 13 th , 15 th , 17 th days Distension none Temperature fell after each dose Tongue - unaffected	R
IV	20 M	15 ^h	22 ^o	46 ^h	31		grv 15 th , 17 th , 18 th , 20 th and occasionally after. Distension - None Tongue cleaned rapidly Temperature influenced -	R
V	15 F	13 ^h	21 st	41 st	28		grviii 14 th , 15 th , 16 th days and frequently after 20 th . Tongue cleaned rapidly Temperature affected favourably	R
VI	6 M	13 ^h	16 ^h	40 ^h	27		grviii 15 th and 15 th days and after Distension Relieved at once Tongue Cleaned slowly Abortive?	R
VII	11 F	21 st	27 ^h	55 ^h	34		grviii 22 nd , 26 th , 28 th and frequently after. Distension - Relieved at once Tongue Cleaned slowly	R

CALOMEL

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
<u>VIII</u>	10 M.	7 ^h	16 ^h	40 ^h	33		gr ⁱⁱⁱ every second night from 7 th Distension - None Tongue - cleaned quickly Abusive?	R
<u>IX</u>	15 M	11 ^h	30 ^h	71 st	60	RECRUDESCENCES	gr ⁱⁱⁱ 15 th , gr ^{ifs} 17 th , 18 th , 20 th , 27 th , 29 th Distension - Disappeared Tongue - Remained dry slowly.	R
<u>X</u>	8 F	14 ^h	24 ^h	41 st	27		gr ⁱⁱⁱ 18 th , 20 th , 22 nd , 25 th days Distension - None throughout Tongue - Cleaned slowly	R
<u>XI</u>	11 F	4 ^h	17 ^h	35 ^h	31	SLIGHT CONGESTIVE HAEMORRHAGE ON 9 th DAY	gr ⁱⁱⁱ 5 th , gr ^v 7 th , gr ⁱⁱⁱ 8 th , 15 th , 17 th &c Distension - none Tongue - cleaned quickly	R
<u>XII</u>	34 M	11 ^h	29 ^h	42 nd	31		gr ^v 12 th , 16 th , 18 th , 20 th , 22 nd , 25 th , 27 th , 29 th Distension - none Tongue unaffected	R
<u>XIII</u>	5 M	15 ^h	23 rd	49 ^h	34		gr ⁱⁱⁱ 16 th , 18 th , 21 st , 22 nd days and after Distension relieved at once Tongue unaffected	R
<u>XIV</u>	7 M	4 ^h	20 ^h	45 ^h	41		gr ⁱⁱⁱ 5 th , 8 th , 9 th , 11 th , 13 th , 15 th , 18 th , 20 th , 22 nd 23 rd days and after. Distension unrelieved Tongue unimproved	R

CALOMEL

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
XV	5 F	5 ^h	15 ^c	43 ^o	38		gr ^v . 4 th , gr ⁱⁱⁱ 9 th , 10 th and after. Distension None Tongue - Cleaned slowly. Abotivie.	R
XVI	4 M	11 ^h	21 ^h	38 ^h	27		gr ⁱⁱⁱ 13 th , 14 th , 16 th , 22 nd , 24 th and after. Distension - Unrelieved. Tongue clean throughout	R
XVII	7 ¹ / ₂ M	20 ^h	33 ^o	57 ^h	37		gr ⁱⁱⁱ 22 nd , 23 rd , 27 th , 28 th , 30 th , 32 nd , 33 rd . Distension none Tongue cleaned slowly Stools improved.	R
XVIII	11 M	8 ^h	20 ^h	37 ^h	29		gr ⁱⁱⁱ 9 th , 12 th , 14 th , 17 th , 19 th , 21 st , 23 rd days Distension none. Tongue cleaned slowly.	R
XIX	11 F	5 ^h	20 ^h	43 ^o	38		gr ^v 6 th , 7 th , 9 th , 12 th days. gr ⁱ night and morning on 14 th , 15 th , 16 th . Gums touched. Tongue cleaned rapidly.	R
XX	46 M	18 ^h	35 ^h	74 ^h	56	RECRUDESCENCE	gr ^v . 19 th , 20 th , 22 nd , 25 th , 31 st , 36 th days Distension - None throughout Tongue unaffected	R
XXI	12 M	10 ^h	23 ^o	57 ^h	41		gr ⁱⁱⁱ 10 th , 11 th , 12 th , 16 th , 18 th , 20 th , 22 nd . Distension - None Tongue cleaned quickly	R

CALOMEL

No. of Case.	Age and Sex.	Day of Admission.	Day of attaining Normal.	Day of Discharge.	Days in Hospital.	Complications.	Remarks on Course of Case.	Result.
XXVI	17 M	21 st	30 th	62 nd	41		gr. v. 22 nd , 23 rd , 26 th , 28 th , 30 th , gr. iii 32 nd , 35 th , 37 th . Distension - None Tongue - Cleaned at once	R
XXVII	7 M	12 th	32 nd	90 th	78		gr. iii 13 th , 16 th , 18 th , 20 th and after Distension - None Tongue - Cleaned at once Temperature improved.	R
XXIV	7 F	8 th	19 th	46 th	38		gr. iii 7 th , 13 th , 15 th , 17 th and after Distension None Tongue Clean throughout Temperature Favorably affected	R
XXV	7 M	6 th	15 th	40 th	34		gr. iii 7 th , 12 th , 14 th , 19 th , 21 st . Distension - None Tongue cleaned quickly Temperature lowered by each dose. Abortive?	R
XXVI	6 M	10 th	21 st	41 st	31		gr. ii 10 th , iii 12 th , v 15 th , iii 18 th , 20 th , 22 nd . Distension None Tongue Cleaned quickly	R
XXVII	7 M	7 th	19 th	47 th	40		gr. iii every 3 rd evening. Distension None throughout Tongue did not clean rapidly	R
XXVIII	12 F	11 th	23 rd	45 th	34		gr. iii 12 th , 13 th , 16 th , 18 th and 22 nd days Distension, slight relieved at once Tongue Clean throughout Temperature fell after each dose	R

APPENDIX B.

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