The Bradshaw lecture on the treatment of enteric fever / by F. Foord Caiger.

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Publication/Creation

London : John Bale, Sons & Danielsson, 1905.

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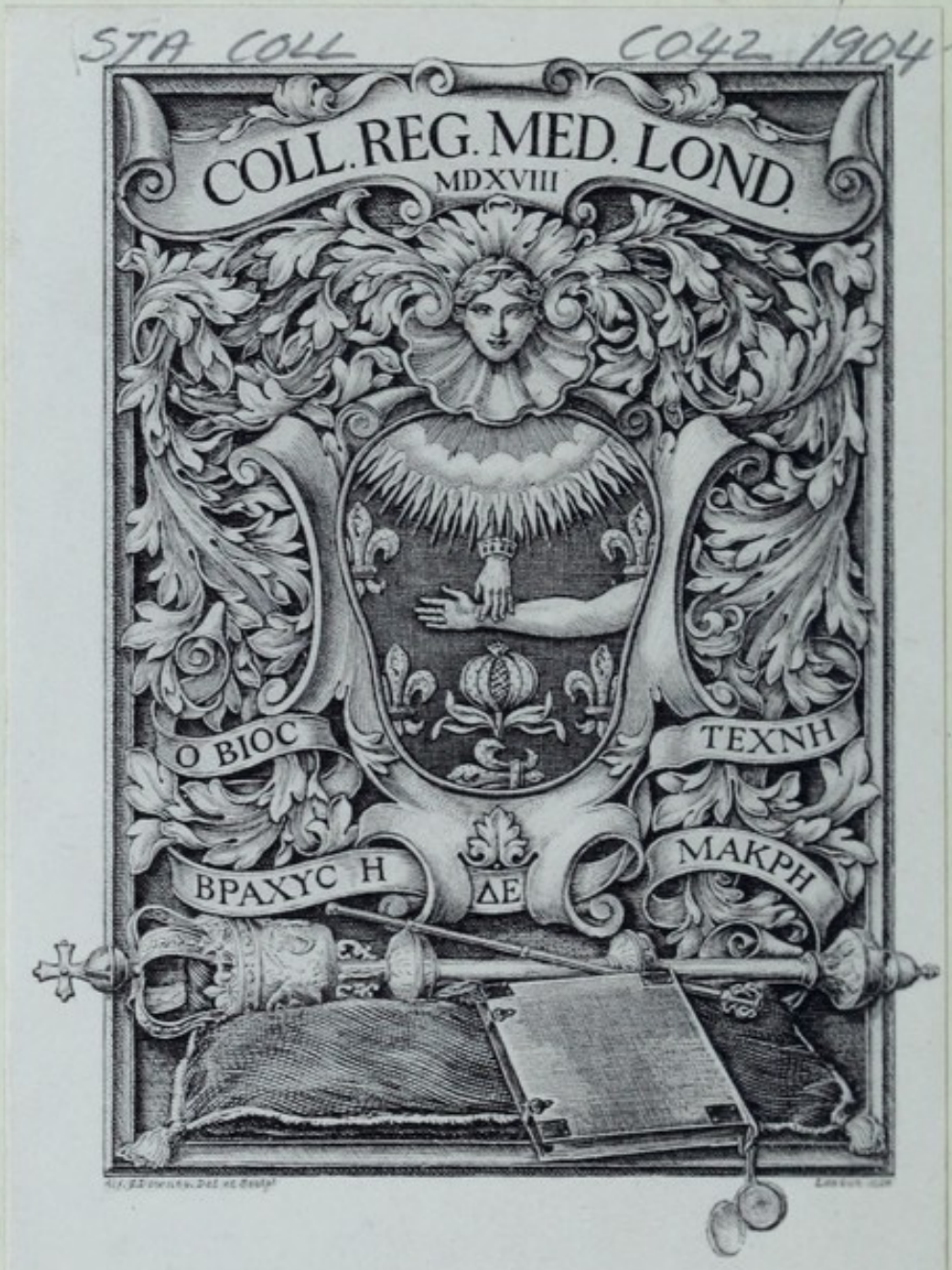
THE TREATMENT OF ENTERIC FEVER



SOUTH WESTERN HOSPITAL,
STOCKWELL. S.W.

Sept. 13 06.

Dear Dr Payne.

In compliance with your courteous request I have pleasure in enclosing a copy of the Bradshaw Lecture 1905. for the College Library with kind regards.

Yrs very truly.

F. Foord-Kelly

THE BRADSHAW LECTURE

ON

THE TREATMENT OF ENTERIC FEVER.

Delivered at the Royal College of Physicians of London on November 15th, 1904.

BY

F. FOORD CAIGER, M.D.Lond., F.R.C.P.Lond.

Medical Superintendent, South-Western Fever Hospital, Stockwell.

London:

JOHN BALE, SONS & DANIELSSON, Ltd.

OXFORD HOUSE

83-91, Great Titchfield Street, Oxford Street, W.

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MR. PRESIDENT AND GENTLEMEN,—My first duty is to express my grateful appreciation of the honour which the President has done me in deputing me to deliver this lecture. In my choice of a subject I have been guided by the President's wish that it should be one more or less identified with my daily work and I have therefore selected the treatment of enteric fever as seemingly not inappropriate.

During recent years a great deal has been said, and still more has been written, as to the treatment of typhoid fever—and that by some of the most eminent members of our profession. It is not unnatural, therefore, that I should feel some diffidence in bringing the subject before you on this occasion; and yet, when one reflects that our case mortality to-day remains at a height of more than 15 per cent., and that in this country alone some 5,000 or 6,000 persons annually die from the disease, I feel that it is not, perhaps, without some justification that I venture to recall your attention to the important question of its treatment. To attempt to deal at all exhaustively within the time at my disposal with a subject as wide as that of the treatment of enteric fever would be manifestly impracticable, for in addition to a discussion of numerous

measures of a directly remedial character, it would involve the careful consideration of various points of no less importance in connection with the dietary and the nursing of the case. Moreover, the subject is one which has, perhaps, offered a wider field for discussion and been a source of greater difference of medical opinion than in the case of any other disease. I propose, therefore, to confine my remarks entirely to the field of therapeutics, with special reference to various measures which, as the result of my experience, I have come to regard as worthy of some confidence.

From a therapeutic point of view it may be stated broadly that the treatment of a case of enteric fever will probably be conducted on one of two well-recognised lines—an active remedial method or a passive, or so-called expectant, method, each of which has its firm adherents. But whether we favour the exhibition of remedies having for their object a direct interference with the natural course of the disease, or whether, as is so much the fashion of to-day, we adopt an expectant attitude and are content to restrict our efforts to combating individual symptoms in the event of their assuming a threatening aspect and to relieving any complications which may arise during the course of the illness, the fact must never be forgotten that the treatment of enteric fever is not merely a matter of therapeutics, but implies the general management of the case.

Now, it may be asserted generally that our management of any case of serious illness is likely to be successful in proportion as it is adapted to the special circumstances which characterise that attack, due regard being given not only to the underlying morbid process, of which certain of the symptoms are the recognised expression, but also to the personal factor which in some instances contributes so largely to the general aspect of the case; and to this rule enteric fever is no exception. Experience clearly indicates that what is best for one patient may not necessarily be so for another, and that the best results will be achieved, not by a slavish adherence to any particular method of treatment to the exclusion of others, but by the adoption of such measures as seem best adapted to the idiosyncrasy of the individual patient and the particular type of his attack.

The methods of treating enteric fever by means of

remedies which are assumed to be capable of exerting a direct controlling influence over the natural course of the disease may be appropriately referred to as either: (1) specific; (2) antipyretic; or (3) antiseptic, according to their conception and to the nature of the agents employed, and they may conveniently be discussed under these headings.

I.—First, as to specific treatment. The remarkable success which has attended the treatment of diphtheria by the injection of antitoxic serum and in less degree that of tetanus, not unnaturally encouraged the hope that a curative serum might be prepared which would prove equally efficacious in the case of typhoid fever. But unfortunately such favourable anticipations have not been realised. In the case of the two former diseases, the serum of the horse which has been successfully immunised against these infections is found to be highly antitoxic, besides possessing some anti-bacterial power. In the case of typhoid fever, however, the serum of a horse after repeated inoculations with the virus, though possessed of anti-bacterial properties, as in the case of diphtheria and tetanus, is found to be practically devoid of any antitoxic value and consequently useless as a curative serum. Until a serum can be produced which is antitoxic in addition to containing anti-bacterial substances, it would seem that all attempts to confer a specific passive immunity in enteric fever must, as in the case of cholera, apparently be doomed to failure. It should be mentioned, however, that Chantemesse claims to have produced a serum with which a remarkable success in the treatment of enteric fever is said to have been achieved. Speaking at the Seventh French Medical Congress held last month in Paris, he stated that out of 545 cases of the disease which had been treated in his wards at the 29th Bastion between April 1, 1901, and October 1, 1904, only 22 proved fatal, representing a mortality of 4 per cent. Planté and Foucauld with the same remedy were reported in January last year to have treated at the Marine Hospital of St. Mandrier 151 cases with 13 deaths, a mortality of 8·7 per cent. The two series together comprise 696 cases with a fatality of 5 per cent., a success which is really phenomenal.

As to the nature of this serum there is at present some uncertainty. For its preparation a horse is immunised by

repeated inoculation with toxic products of the typhoid bacillus obtained by special methods of cultivation. The serum eventually acquires curative properties, but the process is a slow one, requiring a good many months for its accomplishment. Chantemesse states that the serum retains its properties unimpaired by keeping, an observation which suggests that its mode of action is not a bactericidal one. On the other hand, the fact that its injection is often followed by definite, though not prolonged, constitutional disturbance, and the very remarkable fact, as stated by Chantemesse, that the more seriously ill the patient is and the more advanced the disease the smaller should be the injection, seems hardly compatible with the action of a serum which is merely antitoxic. It has been suggested by Dr. A. E. Wright, that its curative properties may be explained on the assumption that an active immunity is conferred on the patient as a result of the transference from the horse of unneutralised bacterial poisons which act as vaccines when introduced into the human organism. It is to be regretted that more precise information as to the exact nature of Chantemesse's serum is not forthcoming, since its success in practice is apparently very striking. Any reference as to the efficacy of the serum, however, is unfortunately weakened by the fact that various other remedies, such as baths, packs, and cold effusions, were used in these cases in addition to serum therapy whenever their employment appeared to be indicated.

The beneficial influence which, it is claimed, may be exerted on the progress of the disease by previous inoculation with attenuated cultures of the typhoid bacillus, which material, it may be observed, is not a serum, though often wrongly so called, but a vaccine, assuredly possesses some claim on our confidence. By this method, undertaken primarily as a protective measure, an active immunity is conferred, at any rate for a time, and we are therefore prepared to believe that a certain amount of controlling influence might be exerted on the course of the disease, even though it may have failed to avert infection. The procedure, which was initiated by Dr. Wright when professor of pathology at the Army Medical College at Netley, consists of the inoculation of sterile cultures of the typhoid bacillus which have been attenuated by exposure to heat. The process is analogous to

the anti-cholera inoculations successfully practised in India by Haffkine and more recently on an extensive scale against plague. It is interesting to note that the work in each instance has for its prototype the world-renowned antirabic inoculations of Pasteur, who to some extent, however, must be regarded as having been working in the dark, since the specific infecting agent of rabies has not even yet been determined. The immediate effect of the inoculation, as Wright has been careful to point out, is to induce a temporary lowering of resistance. This "negative phase," as he terms it, corresponds with a diminution of the bactericidal power of the blood, and until it has passed off the subject is apparently not only more susceptible to enteric fever, but the attack is likely to be more severe if contracted. Under the system of dosage which it has so far been customary to employ, this period of heightened susceptibility has appeared to last for from one to two weeks, but with improved methods of administration, founded on exhaustive experimentation, and confirmed by riper experience, Wright has shown that it may be very substantially reduced.

The success attendant on Wright's method of anti-typhoid inoculation has been a source of considerable difference of opinion amongst those who have had practical experience of its use. Although the inoculations have been carried out on an extensive scale, more especially amongst the British troops in India and in South Africa during the recent war, the difficulties in the compilation of accurate records, the impossibility in many instances of getting data which are strictly comparable, and the unsatisfactory conditions under which the inoculations were so often performed, have tended to impair materially the authority of the published results. When, however, the numbers comprising any statistical record are large and the separate groups contained in it are comparatively numerous, such fallacies certainly tend to exert less influence, and the inference carried becomes proportionally stronger. This, of course, holds good in respect to the statistics of anti-typhoid inoculation.

If we refer to the records dealing with inoculation among the British regiments serving in India as published in the Army Medical Reports, we find that amongst 15,384 men inoculated during the years 1899 to 1901 in various parts of the Indian Empire, the incidence of enteric fever

was 0·8 per cent. as against 1·5 in the uninoculated, and amongst the 2,260 attacks comprised in the series the case mortality in the inoculated was 15·6 per cent. as against 26·6 per cent. in those who had not undergone the treatment. Again, the combined results in a variety of military hospitals in South Africa as furnished in a report by Dr. R. W. Dodgson, the special commissioner appointed to inquire into their working, show that in respect to 4,138 cases of enteric fever the case mortality amongst the inoculated was 8·2 per cent., whereas it was 15·1 in those who were not inoculated. In this instance the reduction in mortality was almost 50 per cent., and in the case of the staffs of three of the hospitals, viz., Nos. 8, 9, and 10 general hospitals, located in Bloemfontein during the epidemic of 1900, the reduction obtained was nearly a threefold one, but in this instance the number of attacks, viz., 109, was but small. An investigation as to the value of Wright's method of anti-typhoid inoculation was undertaken by the College of Physicians last year at the request of the War Office, and a special committee of the College was appointed to inquire into it. Careful examination of the whole of the evidence available has tended to show that not only is a considerable degree of protection conferred by the inoculation, but that it is also capable of exercising a mitigating influence upon the severity of attack. Further investigations are now being undertaken with the object of effecting an improvement in the vaccine and of extending our knowledge as to the best and most appropriate dosage, and encouraging as the results up to date undoubtedly are, it may be confidently expected that with additional light on these points still better results may be looked for in the future.

II.—Next, as to the antipyretic method of treatment. On the assumption that pyrexia is the most important factor in a case of enteric fever the exhibition of remedies which have the power of reducing the body heat has been very extensively employed. Although certainly less practised in this country than on the Continent, the method has received the support of some of our most distinguished clinicians. An antipyretic effect may be brought about either by drugs, or the direct application of cold to the surface by means of cold baths, packs, sponging, &c., or by a combination of both.

Of the various drugs which are recognised as possessing

antipyretic power, such as sulphate of quinine, antipyrin, antifibrin, phenacetin, salicylates of sodium and quinine, resorcin, kairin, and thallin, even digitalis and veratria, the best for the purpose is undoubtedly quinine. Not only does quinine possess a marked antiseptic influence over living cultures of the typhoid bacillus, as was experimentally demonstrated by Eberth, but its administration is not attended with the depressant influence on the heart, in some instances leading to dangerous collapse, which antipyrin, in common with the other tar products I have named, is prone to exert. Nor is it, except when given in excessive doses, productive of the mental confusion, delirium, and vomiting which so often attend the use of the salicylates. Quinine, moreover, in addition to its value as a cardiac tonic, is believed not to exert any inhibitory influence on the elimination of toxins from the system, as is said to occur with the drugs of the antipyrin class. If quinine be given with the object of lowering the temperature it must be administered in large doses, from 15 to 20 grains or more, preferably twice in the twenty-four hours ; or, better still, according to the method recommended by Bouchard, which is to give four doses of $7\frac{1}{2}$ grains, repeated at intervals of a quarter of an hour in the evening of every third day during the first fortnight of the fever. In any case it is a favourable sign if the administration of the drug be followed by a marked fall of temperature. It should be remembered that the full physiological effect of quinine as an antipyretic is not reached until after the expiration of four or five hours, and occasionally even eight. The time of its administration, therefore, should be regulated accordingly. By giving large doses of quinine at the times when the temperature naturally tends to remit, the pyrexia can sometimes be made to assume an intermittent course, resembling that so characteristic of normal defervescence. It is very problematical, however, whether an effect produced under such obviously artificial conditions possesses any advantage over a pyrexia of less variable range, provided it be moderate in degree.

For my own part I do not favour the use of antipyretic drugs—at any rate, in antipyretic doses—in cases of moderate fever, as I firmly believe such pyrexia to be a natural element of defence against bacterial invasion, and that in proportion as one is successful in stifling what

appears to be a reactive pyrexia by means of a powerful antipyretic drug, one is acting the part of a very questionable friend in tying the hands of one who is striving to defend himself against an antagonist who has already secured an advantage. In cases, however, in which the pyrexia becomes excessive and in itself represents an additional element of danger by reason of its damaging effect on the cardiac muscle and the central nervous system, vigorous antipyretic measures are certainly indicated, as in these circumstances the symptom pyrexia calls for prompt repression. For its accomplishment I much prefer the direct application of cold to the surface, supplemented, if necessary, by a dose of sulphate of quinine, but to this I shall have occasion to refer again when speaking of symptomatic treatment.

Of the various methods of treating enteric fever by means of cold application to the surface, or, to speak more correctly, by the abstraction of heat or refrigeration, there can, I think, be no doubt that the most effective by far is the repeated employment of the cold bath, a form of treatment strenuously advocated some forty years ago by Brand of Stettin. This, with slight modifications at the hands of his numerous followers, has been very widely employed on the Continent, in America, and elsewhere; and, it must be admitted, with signal success. Treatment by means of frequent cold bathing had been extensively practised by James Currie, of Liverpool, some seventy or eighty years previously, though subsequently it fell into disuse. Currie's methods were undoubtedly somewhat crude and apparently more exacting, although the same principle was involved. He placed his patients in a wooden tub and buckets of cold water were poured over them, a procedure which is hardly in accordance with our views as to the proper way of dealing with a case of enteric fever at the present day. But even in Currie's time, as Collie has pointed out, a cold bath treatment was no new thing, since the records show authentic evidence of its employment by the ancients. Asclepiades, for instance, was in the habit of sending his fever patients to bathe in the springs of Catilliæ, where they apparently derived great benefit.

It is claimed that the cold-bath treatment, when properly carried out, effects a mitigation of the general symptoms of the disease (some of which, though recog-

nised as normal accompaniments of enteric fever, are averted altogether), and a reduction of the case mortality by a half or even two-thirds. This contention is supported by published results. Thus in the Prussian army the case mortality was reduced from 25 per cent. to 8 per cent. by means of the cold bath. Jurgensen effected a reduction from 15·4 per cent. to 3·1 per cent. Drasche, of Vienna, brought down his hospital mortality from 16·2 per cent. to 9·3 per cent.; Tripier and Bouveret, of Lyons, reduced their mortality from 25 per cent. to 7·5 per cent. Osler, of Baltimore, lowered the death-rate from 21·8 per cent. to 7·4 per cent. Thompson, of New York, reduced his mortality from 19 per cent. to 7 per cent.; Hare, of Brisbane, from 14·8 per cent. to 7·5 per cent. The general experience, then, would show that the fatality from enteric fever can be brought down to somewhere about 7 per cent. by a thorough application of the cold-bath treatment. Hare's record is particularly interesting. For a period of ten years all cases of enteric fever admitted into the General Hospital at Brisbrane were treated with the cold bath. They numbered 1,902, and the results were compared with those obtained in a consecutive series of 1,828 cases received into the hospital during the four and a half years immediately preceding its adoption. The case mortality in the two series was, as I have stated, 14·8 and 7·5 respectively. The record is of particular value, since for a period of seventeen months before, and three years after, the cold-bath treatment was introduced, both the management of the wards and the care of the patients were under the personal supervision of Dr. Hare himself.

It was particularly insisted upon by Brand that to procure the full benefit of the treatment it must be commenced at an early stage of the disease. Brand maintained that if the treatment were commenced by the fourth day and continued throughout the attack according to his instructions, not only would the pyrexia be kept at a lower level, but the intestinal lesion would be held in check, the affected follicles in these circumstances not proceeding to ulceration, and consequently the occurrence of both hæmorrhage and perforation would be averted. If, on the other hand, the baths were not commenced until a later stage of the illness, the occurrence of actual ulceration could not be avoided, although the

course of the illness generally would be favourably influenced in proportion as the treatment was early adopted. Brand's instructions were that the bath should be given every three hours whenever the rectal temperature registered 102·2° or over, and that the temperature should be taken again half an hour after the bath, when a fall of about 2° might usually be expected.

In this country the use of the cold bath has been mainly restricted to the combating of hyperpyrexia in special cases. As a systematic method of treating enteric fever it has received comparatively little support, although it has been recommended by such high authorities as Sir William Broadbent and Dr. W. Cayley. Professor Osler, who is a firm supporter of the cold-bath treatment, strikes the right note when he states that he regards it as "not so much special and antipyretic, as tonic and roborant," and were one to supplement this criticism by claiming for it in addition a powerful eliminative agency, one would probably not be over-estimating its virtues. Although Brand claimed for the cold bath that its action was essentially protective against a high temperature, the fact that he enjoined more or less continuous friction of the skin throughout the period of the patient's immersion suggests that he was probably alive to its action as an eliminant. It is by no means improbable that it is to its salutary influence on the nutrition of the skin, and to its power of maintaining the excretory activity of both the skin and kidneys, that the cold bath mainly owes its marked superiority over all other therapeutic procedures of which the primary aim is refrigeration.

According to Dr. Dreschfeld the good effects of the cold bath are readily seen. The pulse becomes slower, and the tension of the artery is increased; the number of the respirations diminishes, the tongue becomes moist, and the appetite improves. The nervous system is especially relieved, the delirium disappears for a time, the patient becoming much calmer, and the sleep more natural; while the diarrhœa, when present, if not diminished after the first two or three baths have been given, is certainly not increased. The cold bath is contra-indicated when the cardiac action is weak and irregular, the pulse intermittent, or cyanosis marked; as also with intestinal hæmorrhage or perforation, and in the case of old persons and young children. The chief drawbacks

which appear to militate against the general adoption of the cold-bath treatment are the cumbersomeness which admittedly characterises the procedure, and the increased tendency to relapse which is observed to follow its employment. The former objection, having regard to the amount of labour involved in repeatedly placing the patient in the bath and subsequently removing him, usually proves to be well-nigh insurmountable in private practice. In a hospital ward the objection has less weight, but the disinclination usually evinced by the patient and the prejudices of his relatives are factors which have to be reckoned with. So true is this that Osler, while continuing the use of the bath, says that he "prays for a method which, while equally life-saving, may prove to be, to put it mildly, less disagreeable." Although a rectal temperature of 102·2° degrees was taken by Brand as the determining point for the bath, to be repeated if necessary every three hours, with an immersion of from fifteen to twenty-five minutes or more at a temperature of 68°, irrespective of the onset of shivering, many of his followers have pursued a less drastic method. Some physicians, for instance, have taken 103°, or even 103·5°, as the determining temperature, and have removed the patient on the occurrence of definite shivering. It is generally admitted, however, that the results obtained under these conditions in practice have fallen short of those achieved by Brand.

Again, the "graduated bath," as it is termed, has been widely recommended, originally, I believe, by Ziemssen. By this method the temperature of the bath, which at the moment of the patient's immersion is about 90°, is afterwards rapidly reduced by means of ice to 70°, or slightly lower. Sir William Broadbent, who speaks well of the treatment, is inclined to prefer immersion at an initial temperature of 80° rather than 90°. The graduated bath is certainly more adapted to the condition of patients whose circulation is feeble and in whom there is much respiratory distress, those, in fact, who are unable to bear the shock of sudden immersion at the lower temperature, which, on the other hand, is of such marked value as a stimulant in cases where there is considerable nervous depression. This is equally true whether the bath be employed as a systematic measure of treatment, or whether, as is more usual in this country, it is simply used as an occasional weapon against an unduly high temperature.

Some thirteen years ago Dr. James Barr, of Liverpool, advocated the treatment of typhoid fever by means of the continuous tepid bath, the patient being immersed in a tank for a period of from one to three or more weeks, in fact, if necessary, during the whole course of the fever. The temperature of the water is maintained at a level of but a few degrees below the normal temperature of the body, and in proportion as the pyrexia abates the temperature of the water is raised, until at the completion of defervescence it nearly approximates to that of the patient. Dr. Barr claims for his method that it obviates the drawbacks which are incidental to Brand's while attaining the same good results. He states that of forty cases treated by the continuous bath a fatal result occurred in only one instance. Such a record is, of course, eminently satisfactory, but relapses, as Dr. Barr, I believe, himself admits, are unduly frequent. One can hardly think that the tank treatment can be a popular one with patients, and the method is impracticable under ordinary conditions in private practice.

More recently Dr. Barr has devised a method which, though maintaining the hydrotherapeutic principle in a modified form, is attended with less inconvenience. The patient, instead of being immersed in tepid water, is slung in a hammock which is stretched on a frame erected over the bedstead. The surface of the abdomen and the lower part of the chest are covered with a light flannel compress, on to which a stream of water at a temperature of 80° is allowed to trickle continuously, the excess of water as it escapes being collected in a bucket placed beneath the hammock at its most dependent part. The patient wears no body linen, but his legs and thighs are covered with a blanket, and his comfort is increased, if necessary, by keeping a large spirit lamp continuously burning under the bed. By this means the sensation of chilliness is to a large extent removed, while the evaporation of the water is facilitated and its refrigerative influence is correspondingly increased. A large bed cradle is placed over the patient, covered only with a single sheet so as to interfere as little as possible with the vaporisation of the water. Dr. Barr speaks very highly of this method in severe attacks, and says that it has so far been successful in every case in which he has employed it.

Another means of refrigeration which has been used a good deal is what is known as the "ice cradle." The patient, but lightly if at all covered, lies under a bed cradle in which are hung a number of little pails containing ice. These are frequently replenished, and as a result the temperature of the air surrounding the patient is maintained at a low level. It probably falls far short of the cold bath as a systematic method of treatment, but it is certainly devoid of the difficulties which are incidental to the bath on whatever lines it may be employed. From a purely antipyretic point of view the "cold-air bath," as it might be termed, is excellent, but is without any influence in stimulating the excretory activity of the skin and kidneys, and thus promoting the elimination of toxic products, which is so marked an attribute of the cold bath.

The use of the wet pack, whether applied to the whole surface of the body or to the chest and abdomen, simply, in the form of what is sometimes called an "ice poultice," though capable of extracting a considerable amount of heat from the skin, is mainly useful by its sedative effect on the nervous system. Although the temporary application of a cold compress to the abdominal wall for the relief of pain or tenderness is often of the greatest value, the influence it exerts on the internal temperature of the body, as revealed by a thermometer placed in the rectum, is frequently very transitory. And the same thing is true of the practice of cold sponging of the surface. Cold sponging, like the occasional application of a wet pack or an ice poultice, though often employed with undoubted advantage in special cases, can hardly be regarded, for reasons that I have already mentioned, as a serious rival to the cold bath as a systematic method of treatment.

Of the various antipyretic drugs which have been used in combination with the cold bath, sulphate of quinine is the only one which appears to merit any confidence. It has been extensively used by some continental authorities as an adjuvant in certain cases in which the pyrexia has proved refractory to the influence of cold bathing alone, and apparently with success. The tonic effect which quinine exerts on the circulation, an effect which, it should be mentioned, is not usually apparent during the first twenty-four hours of its administration, though

remarkably persistent, has led to its being employed in combination with a tepid bath in cases where the presence of either cardiac or pulmonary disease, or great circulatory enfeeblement, renders immersion in cold water inadmissible. In these circumstances a marked antipyretic effect may often be obtained in addition to the other benefits conferred by hydrotherapy. The liability of quinine, however, even when guarded by opium, to set up vomiting when given in large doses may prove an absolute bar to its employment.

III.—Next, with regard to antiseptic treatment. Originally, no doubt, antiseptic drugs were administered on the supposition that they were competent to exert a direct bactericidal effect on the specific organism present in the intestine. Murchison, in formulating rules for the treatment of enteric fever, gave as the first indication to neutralise the poison and improve the state of the blood, and he further stated that antiseptic agents might be expected to act directly on the poison in the intestinal canal. Niemeyer's teaching was in the same direction. Since the days of Murchison and Niemeyer our knowledge of the specific agent concerned in typhoid fever has been, to say the least, considerably advanced, and it is now recognised that any attempt to achieve the destruction of bacilli in the lower region of the intestinal canal by the administration of antiseptic drugs by the mouth is nothing short of futile, unless given in such strength or in such quantity as to be extremely prejudicial to the patient.

Without claiming for a moment that antiseptic drugs are competent to exert a direct germicidal effect on organisms present in the intestine, blood, or tissues, it is not unreasonable to expect that even when given in relatively small and harmless doses they might be capable of exerting some restricting influence on the multiplication of bacteria in the mucous membrane and contents of the bowel, whether specific or otherwise. That such is actually effected in respect to the various putrefactive organisms which, as a matter of fact, are generally more resistant than the pathogenic species to the action of antiseptic agents, is obvious from the marked diminution in the fœtor of the stools, which is usually soon apparent as the result of their administration. Further, recognising, as we do, the extent to which the vital activities of

micro-organisms are influenced by very slight changes in their environment, it is surely not too much to assume that, as the result of the presence of even very minute quantities of an antiseptic, typhoid bacilli present in the intestinal mucosa, and at a somewhat later stage in the blood and tissues, may be so influenced as to be rendered in some degree less capable of elaborating their particular toxin than would be the case were the fluids in which they were living free from any trace of such substance. That the virulence of a micro-organism could be artificially reduced by adding a small quantity of an antiseptic to the culture medium was clearly established by Pasteur, who for a time was in the habit of utilising this method exclusively for attenuating cultures of the bacillus anthracis in the preparation of his anthrax vaccine. That the blood may actually become impregnated with the antiseptic is proved by its appearance in the urine, as in the case of carbolic acid, urotropin, and others. And the fact that certain volatile oils, such as cinnamon and eucalyptus, which are known to possess antiseptic properties, may be readily detected in the breath and in the exhalations from the skin as a result of their continued internal administration, is additional evidence to the same effect.

That the antiseptic method, though frequently misunderstood, is founded on a scientific basis is undeniable. This was vigorously maintained by Dr. I. Burney Yeo, who has done so much to popularise its employment. We do not give antiseptics in the belief that they are competent either to slay the germ of typhoid fever or to neutralise its toxin, but in the confident anticipation that they will exert a restraining influence on the propagation of the specific bacillus and its congeners, and on the various putrefactive organisms which are associated with it in the alimentary canal. Moreover, even if antiseptic remedies are incompetent to exercise any inhibitory influence on the multiplication of bacilli which have already passed into the circulation and have been conveyed to distant organs, we are prepared to believe that some degree of attenuation of these organisms may be brought about by the presence of even minute quantities of an antiseptic in the blood and tissues of the body. In other words, we believe that the morbific agent may be rendered less capable of elaborating a viru-

lent toxin in consequence of the modification of its environment which the presence of an antiseptic implies.

To obtain the full benefit of the antiseptic method, its adherents not unnaturally insist that the remedies should be given from an early stage of the disease, and in adequate and sufficiently frequent doses. Under these favourable conditions it is claimed that the following clinical indications will be secured: first, that the duration of the attack will be curtailed and the intensity of the fever lessened; secondly, that the mouth and tongue will be kept more clean and moist, with the result that greater comfort will be insured and the appetite maintained; thirdly, that diarrhœa will be controlled, meteorism will be held in check, and the fœtor of the evacuations prevented; fourthly, that the incidence of the most serious complications—that is to say, hæmorrhage and perforation—will be rendered less frequent; and finally, that the duration of convalescence will be shortened. Some observers, moreover, believe that the chance of relapse is materially lessened if the treatment be continued throughout the earlier period of convalescence.

Now, if the antiseptic method of treatment is competent to effect all this it is deserving of no small measure of confidence. Of the various drugs which are known to possess antiseptic properties calomel is undoubtedly the one which has received the earliest and widest recognition. It has for many years been extensively used by continental physicians, and in this country has received the powerful advocacy, amongst others, of Sir Thomas Watson, Dr. Murchison, and Sir William Broadbent. But its employment, except in minute doses, is practically restricted to the earlier stage of the disease. Liebermeister prescribed it in large doses, that is to say, from eight to ten grains given several times during the first twenty-four hours, provided the case came under treatment before the ninth day of the fever, and he obtained excellent results in a series of 200 cases so treated in comparison with another series in which similar conditions existed, except that the patients received no calomel. Liebermeister believed that it exerted a specific influence on the course of the fever. Murchison gave one or two doses of from three to five grains during the first week of the attack, before there was much diarrhœa,

and believed that as a result the disease ran a milder course and was less protracted. The administration of calomel in this way has been widely practised both in this country and on the Continent, and as the result of my own experience of it, I am convinced that in suitable cases its effect is exceedingly beneficial.

It is not every case, however, that will derive benefit from the treatment. The fact, I think, is not sufficiently recognised that in exceptional instances a dose of 3 or 4 grains of calomel, even when given not later than the end of the first week, will directly induce an intestinal irritation, as evidenced by diarrhœa and colic, which tends to persist and may seriously prejudice the ultimate course of the attack. The diarrhœa, as perhaps is not unnatural, is then apt to be wrongly regarded as a symptom of the fever rather than an effect of the calomel. I have been so impressed with the reality of this risk in several instances, that I have given up the routine use of calomel in the early stages of typhoid fever, and now restrict its administration to cases in which there exists some special indication for its employment. It is interesting to note that Sir Thomas Watson, though quite unconscious of their antiseptic properties, was very favourably impressed by the action of the mercurial salts in typhoid fever. He stated that he was constantly struck by the fact that when a soreness of the mouth was observed in his patients, they showed marked signs of an improvement and but rarely died from the disease. It is during the early stage of the attack up to about the middle of the second week that the salts of mercury have usually been employed, and in respect to calomel, its use, except in very small doses, should be practically restricted to this period, since to give it in purgative doses after the establishment of ulceration is rarely admissible.

Of the numerous drugs of the antiseptic class which have been recommended by different physicians for administration at frequent intervals throughout the whole course of the disease, their names are legion. In addition to the perchloride and biniodide of mercury may be mentioned sulphate of quinine, chlorine, sulphurous acid, carbolic acid, boric acid, salicylic acid, and the salicylates of bismuth, sodium and quinine, beta-naphthol, salol, thymol, eucalyptol, turpentine, terebene, camphor, chloroform water, and many others. During the course of the

last fifteen years I have tried most of these remedies, and in the majority of instances have been disappointed with their action. Several of them I have tried very thoroughly, reverting to their use again and again in consequence of the remarkably favourable results which have been recorded at one time or another as having attended their employment. I refer more particularly to carbolic acid, salol, and turpentine. As the net result of my experience with these various agents in actual practice, I believe that some of them, when given in frequently repeated doses, are capable of exercising a distinctly favourable influence on the course of the attack, even when their administration is not commenced until after the end of the first week. I do not, however, believe they are competent either to cut short the attack or to lessen to any appreciable degree the risk of hæmorrhage, perforation, or relapse, as has been contended by the most ardent advocates of the antiseptic method.

Drugs of the antiseptic class vary very much in their value, some of them apparently being next to useless, and the same drug is not necessarily the most suitable in every case. I am of opinion, after a considerable experience of its use, that the administration of sulphurous acid in from 20 to 30 minim doses every two or three hours is capable of checking fermentative changes in the bowel, with the result that in most cases the tendency to diarrhœa and meteorism is lessened, the tongue remaining moist, and the stools being rendered less offensive. A good plan is to give the sulphurous acid in an ounce of chloroform water with the addition of 15 minims of syrup of lemons. Administered in this way the taste is not unpleasant and patients take it readily.

I am inclined to regard the oil of turpentine as a remedy of somewhat greater value. It should be given in frequent doses from as early a date as possible. Its value as an intestinal antiseptic and as a diffusible stimulant is highly spoken of by Sir John W. Moore, who is also impressed with its power of relieving respiratory complications; and in that opinion I am disposed to concur. The presence of marked albuminuria or of vesical catarrh, however, should preclude its employment. In the latter case, 10 grains of urotropine may with advantage be given three times daily, even though the urine be free from typhoid bacilli, but its influence in cystitis

associated with the bacillus coli is very slight. I have seen more than one instance in which the continued use of turpentine appeared to be responsible for the development of definite nephritis in a person whose urine previously contained but a slight amount of albumen.

To one of these agents, in my opinion, a somewhat higher value must be ascribed, and that is the combination of quinine and nascent chlorine. In its administration I have followed the formula advocated by Dr. Burney Yeo, *i.e.*, 40 minims of strong hydrochloric acid are poured on to 30 grains of powdered chlorate of potassium in a 12-ounce bottle which is filled up gradually with water, the mixture being frequently shaken as the water is being added so as to absorb the gas as it is evolved. To the solution when made 24 grains of sulphate of quinine are added, and of this an ounce is given every two or three hours until convalescence is reached. Care should be taken that an interval elapses between the administration of the medicine and the next feed of milk, which otherwise is liable to undergo some clotting in the stomach as a result of the admixture. Under this treatment the tendency to intestinal fermentation certainly appears to be lessened, and the strength of the circulation is usually well sustained, with corresponding benefit to the general aspect of the case. In some instances, it must be confessed, the result is disappointing, but in cases which come early under treatment the course of the disease is usually favourable.

During the last two years I have treated a series of cases with the essential oil of cinnamon. This agent was suggested to me by Dr. J. Carne Ross, of Withington, near Manchester, who had been much impressed with the exceptionally favourable course pursued by several attacks of enteric fever which he had treated with it. It was in view of his anxiety that its value should be tested on a more extensive scale that I was induced to give the cinnamon a trial. The results, as far as they go, have certainly been favourable, but the number of cases in which I have tried the drug is not yet sufficiently large to warrant a conclusion of very general application. Up to September 30th last the number of cases treated with the cinnamon has been 147, not counting a few patients in whom its use had to be discontinued after a few doses, in consequence of its having induced vomiting. Of these

147 cases 14 died, representing a mortality of 9·5 per cent.

It is far from my intention to urge the claims of any therapeutic agent merely because the death-rate in a particular series of 147 attacks happens to come out somewhat lower than the average under other methods of treatment. The drug would have to be tested in a far larger number of cases before any trustworthy inference as to its value could be drawn from a consideration of the death-rate alone. As an illustration of the fallacy of generalising from insufficient data, I may mention that of the first 50 cases treated with oil of cinnamon only 2 died, whereas, amongst the next 50 no less than 8 proved fatal. After careful observation of the progress of the individual cases comprising the series, I can only express my firm conviction that the influence it exerted in the large majority of attacks was a good one, and that a certain proportion of the patients who recovered would not have done so had the cinnamon been withheld and the treatment been conducted on purely expectant lines.

The favourable effects which were noted as attending the administration of the drug were :—

(1) The temperature in the majority of cases ran at a lower level than is customary in enteric fever, the mean of the daily records taken every four hours approximating 101° instead of 102° or more during the full development of the fever. This effect was a good deal more pronounced in cases brought under the treatment at a comparatively early stage of the disease.

(2) The patients remained for the most part drowsy throughout their illness, many of them evincing a constant tendency to sleep, as a result of which mental rest was secured and delirium was less frequent. Here, again, the good effect of early treatment was apparent.

(3) Intra-intestinal decomposition, as evidenced by abdominal pain, distension, and fœtor of the stools, was controlled to an extent which was really very striking. A considerable amount of success in this direction can usually be obtained with various other antiseptic agents when administered in adequate and sufficiently frequent doses, but that the oil of cinnamon is especially efficient as an intestinal antiseptic is evidenced by the fact that, with the exception of several patients in whom the condition was present at the time of their admission to the

hospital, no single instance of meteorism occurred among the 147 cases which were treated with it.

The soporific influence which cinnamon in full doses is seen to exert in so many patients is a factor of undoubted value in the progress of the attack. Despite the nausea, and even vomiting, which cinnamon occasionally induces when given in too large a dose at the outset, the remedy soon established itself in the favour of the nurses, who often remarked on the drowsy, restful condition of mind which resulted from its continued administration, a condition of mind so eminently desirable in a person suffering from enteric fever. To obtain the full effect of the cinnamon a dose of from $2\frac{1}{2}$ to 5 minims of the essential oil should be given every two hours from the time the case first comes under treatment until the temperature has fallen to the normal. I am in the habit of continuing its administration every four hours during the first week of convalescence, and then three times a day for a week longer. The patient, therefore, is kept to some extent under the influence of cinnamon for a period of a fortnight after the febrile stage has passed. It is well, however, to give the drug in smaller doses to begin with so as to accustom the patient gradually to its very pungent taste. By commencing with a dose of $2\frac{1}{2}$ minims and increasing it to 4 or 5 minims in the course of a few days, the likelihood of vomiting being induced by the cinnamon is materially diminished. Care should be taken that the quality of the drug is above reproach. The better quality oil is distilled from the cinnamon bark. It tends to become darker on keeping and its odour is by no means unpleasant. Cinnamon oil of an inferior quality is distilled from the leaves of the tree. It is usually lighter in colour than that prepared from the bark and it is very much less expensive. This inferior oil should never be used medicinally, as patients do not take it so well and its action is probably less efficient.

The nausea and consequent repugnance to the taste of cinnamon which some patients evince may usually be overcome by using some discrimination in respect to the dosage at the commencement, coupled with the exercise of a little tact and persuasion on the part of the nurse. Should, however, the pungent flavour of the drug still continue to be a source of complaint the difficulty can be obviated by giving the oil in gelatin capsules. Some

patients, however, do not swallow these cachets very readily and prefer to take it made up in the ordinary way as an emulsion. With a dose of from 3 to 5 minims administered every two hours, the system soon becomes fairly saturated with the cinnamon. Its characteristic odour is very noticeable in the breath, in the exhalation from the skin, and is readily detectable in the stools in most cases. In the urine, however, the odour of cinnamon can rarely, if ever, be detected.

Being desirous of estimating the antiseptic influence which cinnamon oil is capable of exerting on the growth of the typhoid bacillus, one of my colleagues, Dr. A. F. Cameron, kindly undertook an investigation into the question. Working with a 1 per cent. emulsion of cinnamon oil in distilled water containing the minimum necessary amount of mucilage and a twenty-four hours' broth culture of the bacillus, which agglutinated readily with a 1 in 200 dilution of typhoid serum, the procedure adopted by Dr. Cameron was as follows. A number of tubes containing five cubic centimetres of neutral peptone broth, after the addition of varying amounts of the cinnamon emulsion, were inoculated with a loopful of the culture and incubated at 37° C. These were examined both as regards the appearance of the broth and microscopically at the end of twenty-four, forty-eight, and seventy-two hours, and the number and motility of the typhoid organisms were compared with the appearances noted in several control broths which, though inoculated at the same time, contained no cinnamon. The results may be summarised as follows. Whereas the broth to which 0·1 cubic centimetre of the emulsion had been added showed no difference from the control at the end of three days in respect either to its appearance or the number or motility of its organism, that containing 0·2 cubic centimetre of the emulsion by the end of twenty-four hours was distinctly affected, the organisms being certainly less numerous and their motility less active. Growth was still more inhibited in the case of the tube which received 0·3 cubic centimetre, while the tube which contained 0·5 cubic centimetre of the emulsion at the end of three days showed no growth at all. From these observations it would appear that an appreciable, though slight, inhibitory influence on the growth of the typhoid bacillus begins to be exerted by cinnamon oil in a dilu-

tion of about 1 in 2,600, and that when its strength approaches 1 in 1,000 its antiseptic effect is complete.

Except in respect to the remarkable freedom from meteorism, the incidence under cinnamon of the more serious complications of typhoid fever presented nothing very striking. Amongst the 147 cases intestinal hæmorrhage was noted in 17, which is somewhat above the average. Perforation occurred in 3, an incidence, on the other hand, which is rather below the mean. As regards the proportionate incidence of relapse it is difficult to speak with certainty. Some recrudescence of pyrexia occurred in 39 cases, but in the majority of these the symptoms were not sufficiently distinctive to justify the reaction being regarded as a true relapse. On the whole, however, I am inclined to think that relapses were of more than average frequency. Of the 14 cases which proved fatal, the majority may be said to have died from cardiac failure. In 8 of the fatal cases the attack had been complicated by hæmorrhage. In view of the fact that in certainly three instances progressive cardiac enfeeblement developed where there was no special reason to anticipate its occurrence, I have recently adopted the practice of giving a grain of sulphate of quinine with each dose of the cinnamon in all cases where a careful daily physical examination reveals a suspicion of circulatory failure, and the result has so far been reassuring.

In the foregoing remarks I have endeavoured to present a brief summary of the general conception and application of certain recognised systems of treatment which are undertaken with the idea of exercising a direct control over the morbid processes concerned in an attack of enteric fever. It now remains to consider what may be termed the alternative method--namely, the treatment of the disease from a passive standpoint—a method which is commonly spoken of as expectant or symptomatic.

The treatment of enteric fever on "expectant" lines implies the recognition of our inability to exercise a direct control over the course of the disease. Having seen that the patient is properly nursed and suitably fed, we are content to adopt a waiting attitude, and while carefully watching for the appearance of any unfavourable symptoms, our efforts are confined to attempts at mitigating their severity, should any of them threaten to assume a dangerous proportion. To what extent we are justified

in adopting this attitude, having regard to the grave responsibility which devolves on us as medical adviser in charge of the case, is largely a matter of opinion. The very conflicting views which have been held upon this much-debated question have been arrived at partly as the result of practice, but to an even larger extent, I suspect, they are founded upon theory. For my own part, I hold strongly to the belief that the adoption of an entirely expectant treatment is not only fallacious in its conception but very mischievous in practice. It connotes a tendency towards *laissez faire* which can neither be in the interest of the medical attendant nor of his patient. The brilliant success which has been achieved by the cold-bath treatment when properly carried out, as instanced by the results I have already quoted, is in itself an overwhelming refutation of the claims of simple "expectancy." While we are forced to admit that at present we know of no remedy for enteric fever capable of neutralising the active infectious processes which are undermining the system and of thus curtailing the attack, as has been found possible in some other specific diseases, it by no means follows that we are powerless to influence the development of certain secondary results which experience has taught us are likely to arise during the course of the illness and materially to prejudice the prospects of a favourable issue. Experience, on the contrary, tends to show that by the intelligent employment of remedies which are theoretically sound we are not only enabled to relieve symptoms which are an actual menace to life, but in some instances we are able to anticipate their full development, if not prevent them altogether. When, then, I am asked on what general lines I would recommend the treatment of a case of enteric fever, my answer is, That in the absence of a specific I would treat the case on symptomatic lines, but that I would employ in addition from the earliest date possible such remedies of either an antipyretic or an antiseptic character, or both, as appeared to be specially suited to the character of the attack and the idiosyncrasy of the individual.

In a great many cases of enteric fever, doubtless, no medicine at all is required, but that, unfortunately, is a fact which can only be proved by the result. I cannot help feeling, in view of the remarkable success which has been achieved with the cold-bath treatment abroad,

that we who have charge of the treatment of enteric fever in hospitals are incurring some responsibility in withholding its use, save in the occasional instances I have already referred to, where the cold bath is clearly inadmissible. The method is attended with certain difficulties, it is true, but I really doubt whether one is justified in allowing such objections to weigh, and whether, on the contrary, it is not our duty to impress upon the patient and his relatives the extreme desirability of engaging upon that line of treatment from the onset. In private practice the objections must necessarily carry more weight, and I fear that as a routine method of treatment the cold bath is never likely to be regarded with favour.

We not infrequently encounter attacks in which toxæmia is very apparent, cases which, as Sir William Broadbent has pointed out, are characterised by the occurrence of dark, foul-smelling evacuations and fulness of the abdomen at quite an early stage of the attack, coupled with much nervous depression and a high temperature. In such cases antiseptics are especially indicated, and it is of first importance that their administration should be commenced as early as possible. It is always well, as a preliminary measure, to rid the lower bowel of its putrid and offensive contents, and thus assist in bringing the intestinal tract into as sanitary a condition as possible. To achieve this much-to-be-desired result there is nothing so effective as calomel, and in this class of attack I would recommend the administration at the outset of three or four grains of calomel in the case of an adult, followed in a couple of days by another dose of three grains more.

It is, of course, desirable to get this part of the treatment over by the time when it is assumed that ulceration has become established—that is to say, by the middle of the second week; but in view of the serious nature of the condition and the paramount importance of curtailing, where possible, the absorption of toxic products at the surface of the bowel, and having regard, moreover, to the remarkable degree of benefit which is usually secured, I would never hesitate in a case like this to give calomel at a somewhat later stage of the disease, if necessary. Should a free evacuation be not obtained, especially if the abdomen still remains tumid, an enema

of soap and water with the addition of an ounce of turpentine should be administered without delay. The improvement in the general aspect of the case brought about by these simple measures is often very striking, apart from the obvious relief to the abdominal condition which they usually afford. The antiseptic influence initiated by the calomel should be maintained by the regular administration every few hours of one of the antiseptic agents I have already referred to. It does not follow that the same drug is necessarily the best in all cases. In some, particularly where distension of the colon tends to persist, the continuous administration of turpentine in ten minim doses will prove especially useful, though it is well to substitute some other antiseptic for it in the presence of marked albuminuria. Taking all things into consideration, I am disposed to regard the oil of cinnamon as the most suitable antiseptic to employ in the large majority of such cases. It should be given in from three to five minim doses every two or three hours in the way I have already indicated.

Sir William Broadbent, whose views on the treatment of typhoid fever must always command respect, states that in this class of case he has been impressed with the value of perchloride of mercury given every three or four hours in conjunction with a grain or two of sulphate of quinine, the treatment being continued over a period of several days. I have tried the combination, in a limited number of cases it is true, but in my own hands it has not proved so effective as either the oil of cinnamon or the quinine and chlorine mixture.

There is another class of case in which the cinnamon treatment is especially serviceable—viz., that in which the patient evinces a constant tendency to mental perturbation. The source of his anxiety, perhaps, may be either his own physical condition, or the assumed insufficiency of his diet, or he may be unduly apprehensive as to the welfare of his family, or the conduct of his business during his absence. In circumstances such as these the sedative, and with some persons almost soporific, effect which the cinnamon exerts is frequently of the utmost value. Such patients when fully under its influence will often cease from worrying altogether, and pass the major portion of their time in quiet restful sleep. So important is the securing of mental rest to the victim of enteric

fever, that in a good many cases it is no exaggeration to say that treatment of the mind is the most cogent indication throughout. It is in these circumstances, too, that opium is so valuable, and in the event of a patient continuing to worry, despite the well-intentioned efforts of his attendants to distract him, I would never hesitate to give that person opium, and to keep him slightly under its influence until the cloud has passed. The objections which are usually urged against the use of opium in enteric fever—viz., its tendency to produce dryness of the mouth and constipation, and its liability to mask the early signs of perforation — are certainly not without force; but too much stress should not be laid upon them in view of the enormous gain to the patient which immunity from the fret of bodily pain or continued mental anxiety implies. More often than not the subjects to whom I refer are naturally neurotic, their temperaments being apprehensive, fussy, or hysterical; but not necessarily so, however. I have seen the most inordinate anxiety exhibited by men who in their ordinary health are the reverse of nervous. But whether this apprehensive attitude of mind be merely the exaggeration of a normal characteristic, or not, the good effect of opium will be equally patent. It is desirable, as a rule, to give the opium in small doses, frequently repeated. Five or six minims of the tincture administered every four hours will usually suffice for the purpose, or better still, the drug may be given in the crude form, a grain of the best Turkey opium being administered three or four times in the twenty-four hours. Needless to say, in the presence of pulmonary congestion or albuminuria the use of opium calls for the greatest caution.

Another well-recognised variety of enteric fever is that in which the brunt of the attack appears to fall upon the nervous system. Such cases are often spoken of as "ataxic," the most prominent features comprising general prostration, muscular tremor, and early mental involvement, without, perhaps, there being any obvious symptoms of abdominal disturbance. For the treatment of these cases I know of nothing better than, if indeed as good as, the administration of quinine and chlorine every two or three hours in accordance with the formula already quoted. I have frequently been impressed with the steadying effect of this combination, even without the

assistance of alcohol, of which, however, a small amount is usually called for in the circumstances. The marked nervous apprehension which such patients are prone to exhibit may usually be allayed by giving a little opium. This may take the form of an active distrust of their attendants, particularly in the case of highly neurotic children.

Whatever view one may hold as to the value of the cold bath or the wet pack as a routine method of treatment, there is a consensus of opinion as to the efficacy of direct refrigeration as a weapon against hyperpyrexia, and in those grave cases of acute rheumatism in which an unduly high temperature proves refractory to the influence of salicine or the salicylates there is no remedy to compare with the cold bath for its repression. Now, in enteric fever in this country, at any rate, it is certainly exceptional to meet with a temperature much exceeding 105°, though its occurrence is not by any means uncommon in the tropics. When, however, a patient's temperature approaches this level, the symptom pyrexia demands attention, and the need is emphasised in the presence of restlessness, stupor or delirium. It is especially in the later stage of the fever when there is likely to be some degree of cardiac dilatation that the continuance of a high degree of pyrexia is fraught with danger.

During the late period of the attack it is seldom wise to put a person into a cold bath unless he has been acclimatised to it by previous experience, but in the early stage there would not be the same objection. As a means of reducing hyperpyrexia in enteric fever, I much prefer the cold pack to the cold bath. When given with this object the whole surface of the body from the neck downwards, with the exception of the arms and feet, should be enveloped in a couple of draw-sheets wrung out of cold, or even ice-cold water. A mackintosh should previously be spread upon the bed, but there is no necessity to use a bed-cradle or further covering of any description. A blanket, however, may be thrown across the legs below the knees, and a hot water bottle encased in flannel applied to the soles of the feet—a provision which will materially lessen the patient's discomfort. The pack should be maintained for from fifteen to twenty, or even thirty minutes, its duration and the temperature of the water being regulated by the strength of the pulse

and the amount of shivering or cyanosis which it induces. Some degree of shivering, however, must always be expected. On removal of the pack the patient should immediately be wrapped in a warm, dry blanket, and as soon as the skin has obtained a comfortable degree of warmth he should be placed between the sheets and covered, preferably with a single blanket. It is always desirable to give an ounce or so of brandy before the application of the pack, since, apart from its primary effect in lessening shock and steadying the pulse, the antipyretic property of alcohol may be expected to supplement in some degree the action of the pack.

In occasional instances the reduction of temperature brought about by the bath or pack proves to be of a very temporary character, the pyrexia in the course of an hour or two attaining its former level. In these circumstances the bath or pack should be repeated, and a dose of from 15 to 20 grains of sulphate of quinine, combined with from 15 to 20 minims of laudanum, administered half an hour or so after the operation is completed. By the administration of quinine it is usually possible to prolong the effect of mechanical refrigeration, a fact well known to Brand and his followers. Liebermeister frequently employed the drug as an adjuvant to the regular cold bath treatment. The effect of the laudanum is to materially augment the capacity of quinine as a temperature depressant, the explanation of which appears to lie in the power possessed by opium as a vaso-dilator in stimulating the cutaneous circulation. In tropical regions where, partly owing to a difficulty in obtaining cold water, and in part owing to the frequent presence of a malarial taint, the treatment of hyperpyrexia largely consists in the administration of quinine, the peculiar value of this combination is well appreciated.

The employment of large doses of antipyrin, phenacetin, or acetanilid, though each more powerful than quinine in reducing temperature, is not to be recommended for the treatment of hyperpyrexia owing to their depressant effect on the heart. Acetanilid I regard as especially dangerous, having on two occasions seen the administration of 5 grains followed by very severe collapse.

Cold sponging of the surface, though capable of reducing pyrexia when properly carried out, is chiefly valuable on account of its sedative influence on the nervous

system. As an antipyretic it is inferior to the cold pack, and, unless the sponging be carried out with iced water, should not be relied upon in cases where the pyrexia is excessive. For the abatement of restlessness, however, and the promotion of sleep, cold sponging is admirably adapted, especially when associated with pyrexia of moderate degree. On account of its cooling and hypnotic effect it is well to have the patient sponged down every morning with cold or tepid water, to which a few drops of eau de Cologne or spirits of lavender have been added, as a routine procedure, and to continue the practice until the establishment of defervescence. Let me add a word of caution against the inefficient and perfunctory manner in which cold sponging is far too frequently carried out. To be of any use the sponge should be charged as full as it will hold, and the water effectively sopped or "soused" on to the skin, the necessity of having previously placed a mackintosh under the blanket on which the patient lies being all the while apparent. Merely to wipe the surface over with a well-wrung sponge, as is so often done, partakes more of the nature of a rite than a serious measure of treatment. As a refrigerant the proceeding is next to useless.

In cases where the restlessness fails to give way to cold sponging, properly applied, and sleep remains a stranger, a trial may be made of one of the numerous hypnotic drugs which are available for the purpose. In ordinary circumstances I prefer to give from 30 to 40 grains of chloralamid or half that weight of trional, the drug in each case to be repeated in lesser amount at the expiration of a couple of hours if necessary. In cases where insomnia exists in association with diarrhœa and abdominal pain the preparations of opium are especially useful, and from 15 to 20 drops of laudanum or 10 grains of Dover's powder are either of them likely to prove a successful hypnotic. Retention of urine is an occasional source of restlessness in men ; but this, of course, can be readily relieved by the passage of a catheter. The fact, too, that a condition of rectal discomfort, the result of an inefficient action of the bowels, is sometimes directly responsible for a sleepless night must not be overlooked. In these circumstances a simple enema will usually bring relief and nothing more be wanted.

Now, in respect to the treatment of diarrhœa, consider-

able difference of opinion exists as to the point at which the symptom calls for interference. If it be moderate in amount and unattended with abdominal pain the diarrhœa may well be left alone, provided, always, that the dietary be suitable and its quantity not excessive. It has been well and truly said that careful daily inspection of the stools supplies the key alike for regulating the diet and for the treatment of diarrhœa in a case of typhoid fever. If in any case the number of the stools exceed four or five in the course of the twenty-four hours, and the amount evacuated be considerable, I have no hesitation in saying that the diarrhœa should be controlled without delay, since the continued drain of fluid and consequent deprivation of nutriment which it involves may speedily prove a greater tax on the patient's strength than is consistent with ultimate recovery. The older view that the diarrhœa of typhoid fever is of eliminative value as representing a spontaneous effort on nature's part to get rid of the fever poison, and on that account should be allowed to go unchecked, is hardly deserving of serious consideration. It is a belief which has had its day, but by consensus of modern opinion is now regarded as unsound in theory, as it certainly is most mischievous in practice.

Having satisfied oneself from the character of the stools that the feeding is not at fault, the milk, if needs be, being either restricted in amount, or peptonised, or more diluted, the means of checking diarrhœa which I would recommend be employed first is the administration of a starch and opium enema. A couple of ounces of thin starch gruel, slightly warmed, and with the addition of half a drachm of laudanum, should be given by the rectum immediately after each loose stool. In my experience this treatment is rarely unsuccessful, and one or two injections will usually suffice. Should, however, the diarrhœa persist, an opiate may next be tried by the mouth, and both chlorodyne and Dover's powder are useful preparations. By their power of inhibiting peristalsis, apart from their anodyne properties, they are likely to control the flux, while relieving the colicky pain by which it is so often accompanied. Astringent mixtures containing bismuth, catechu, tannic acid, chalk, and opium have been widely used, as in the treatment of diarrhœa unconnected with typhoid fever, and their effect is often

beneficial. The mineral astringents, such as sulphuric acid, acetate of lead, and sulphate of copper, I confess I do not like, and have long since ceased to use them.

The application of an ice-bag to the abdomen is a method which has been employed a good deal of late. It is a remedy of undoubted value, especially when the diarrhœa is associated with distinct abdominal tenderness. Personally, I much prefer the use of a large wet compress made of from four to six layers of soft bath towelling frequently wrung out of cold or ice-cold water. This should be large enough to cover the whole of the abdomen, and the edges may with advantage be bound over with a strip of jaconet with the object of preventing the dampness from spreading to the bed. A light wicker cradle should be placed over the patient, and over this should be laid a single sheet; but a blanket, with the addition of a hot bottle, if desired, may be wrapped around the patient's feet in order to increase his comfort. By this arrangement the cooling effect of the compress is fairly well maintained, since the evaporation of the water is but little impeded. A lengthened experience of its use has led me to believe that of the various therapeutic measures which are employed in the treatment of enteric fever, there are few more valuable than the continued application of a cold compress to the abdomen in cases where definite tenderness can be elicited on slight pressure over some part of the surface, whether diarrhœa be actually present or not.

Such tenderness in the absence of marked distension would appear to denote the presence of local peritoneal irritation at the site of one or more of the affected Peyer's patches. The irritation is an indication of danger, pointing at an early stage of the fever to intensity of the inflammatory process at that particular spot, while at a later date it points to depth of ulceration. One is prepared to believe, therefore, that the continued application of cold to the surface of the abdomen might exert a sedative influence locally on the inflammatory foci in the bowel wall, and at the same time tend to control peristalsis, quite apart from the general antipyretic effect which must result from the continued abstraction of heat from a comparatively large portion of the bodily surface. Patients on being closely questioned will often admit that they are conscious of a constant feeling of

tenderness or "soreness," not amounting to actual pain, at some particular part of the abdomen, the situation to which it seems to be most often referred being either the hypogastrium or the neighbourhood of the umbilicus. It is in these circumstances that I have found the continuous application of an ice-bag, or better still, a cold compress, to exert such a favourable influence. For the relief of intermittent abdominal pain, which is usually of a more or less colicky nature, the preparations of opium are probably unsurpassed.

Now, although in the more severe attacks of enteric fever diarrhœa is certainly the rule, the condition which we are far more frequently called upon to treat is its converse, constipation. My own practice is to give a simple enema of soap and water, in quantity not exceeding a pint, in the morning of every third day in cases where the bowels fail to act spontaneously. If the quantity of milk allowed in the dietary be not in excess of the patient's digestive powers this interval is not too long, but the enema may with advantage be given every second day in the event of the stools produced being large or their character not entirely satisfactory. To obviate the constipation, which is an almost constant feature of early convalescence, one naturally turns to one of the many aperient waters which are so much in vogue at the present day. So long as it is necessary to keep the patient in bed, however, their action after the first day or two frequently proves disappointing, in which case a teaspoonful of castor oil combined with an equal quantity of glycerine may be given with advantage in the early morning, and the dose, if necessary, may be repeated once or twice at intervals of an hour with perfect safety.

Meteorism, if present in any marked degree, must always be regarded as a serious condition and its relief in every case should be attempted. Apart from the discomfort, or even distress, to which it usually gives rise, abdominal distension, by impeding the descent of the diaphragm, is conducive to pulmonary congestion and at the same time is liable to prove a source of serious embarrassment to the cardiac mechanism. Whether or not meteorism, by stretching the bowel wall, is capable of influencing to any extent the risk of intestinal perforation will necessarily depend upon whether the distended portion is the seat of ulceration. Considerable differences

are to be found in this respect in different cases, in some practically the whole length of the bowel being more or less involved, whereas in others the distension is almost limited to the large intestine. The former condition is the one more often present in those grave attacks in which a paralytic condition of the bowel at an early date results from the intensity of the typhoid poison, as also where tympanites rapidly develops as a result of general peritonitis. In cases, on the other hand, where the distension is practically limited to the colon, which appears to be more common, it would generally appear to originate in fermentative changes in the intestinal contents rather than a primary paralysis of the bowel wall. Rapid tympanites, however, coming on late in the attack is probably paralytic. In dealing with meteorism, therefore, it is always well to ascertain if possible which part of the bowel is distended, since, in view of such decision, not only may we be able to form some estimate of its immediate danger to life, but an indication may sometimes be obtained which may not be without some value in its treatment. That such differentiation is impossible in many cases I freely admit, but, on the other hand, as the result of critical observation of the abdominal contour, assisted by careful percussion, it is often possible to arrive at an opinion as to whether or not the colon is distended.

If the diet be carefully regulated in relation to the patient's digestive power, meteorism is not likely to be a frequent symptom. This is particularly true if an efficient antiseptic treatment has been instituted from an early stage of the illness, and the value of the oil of cinnamon in this respect I have already referred to. But should distension arise in spite of every care, and there be reason to believe that the small intestine is mainly concerned in its production, the administration of opium in moderate doses and the application of an ice-bag to the abdominal wall are the means most likely to prove successful. In severe cases where tympanites develops rapidly at an early stage of the attack a full dose of opium should be at once administered. In my experience the value of drugs of the antiseptic class—such as creasote, sulphurous acid, salol, sulphocarbolate of sodium, &c.—for the relief of tympanites when once it has arisen is almost *nil*, except in certain instances where the stomach is the seat of distension. Where, however, there is reason to believe the

meteorism to be mainly, if not entirely, due to flatulent distension of the colon, enemata of soap and water containing an ounce of turpentine are usually of the greatest value. In these circumstances the ice-bag had better be withheld and opium, too, except the pain continues. It is in these cases that the passage of a long tube through the sigmoid flexure may be expected to afford some relief, though the procedure is by no means always successful.

In the treatment of enteric fever the pulse should always be regarded as supplying an indication of the highest value, as, indeed, might be expected in view of the fact that in a large proportion of fatal cases, at least a half, death may be said to be directly due to circulatory failure. It is because of its power in reducing the mortality from what might be called "the pyrexial sources of death" that Hare and others who are strong in its support insist on the value of the cold bath treatment. Foremost among the causes which must be held to fall within this category is cardiac failure, though cerebral exhaustion and pneumonia must also be included. That the pulse should show some loss of strength as the fever progresses is only natural, and in the event of such loss being moderate no special treatment is required; but should the weakness become more pronounced, as evidenced by undue rapidity in relation to the temperature, dicrotism, or especially if a tendency to irregularity be noted either in force or rhythm, the cautious administration of stimulant is usually advisable. The form of alcohol best suited for the purpose, as a rule, is either brandy or whisky, of which, however, the quality as also the quantity should be regulated with discretion. In some cases the feebleness of pulse is associated with marked ventricular dilatation, in which case pulmonary congestion is very prone to arise and seriously to prejudice the issue. The good effect of digitalis in these circumstances is usually apparent, and it may with advantage be combined with strychnine. A certain amount of benefit, no doubt, would be derived from the administration of alcohol alone, but its influence often appears to be but temporary, and for producing a lasting effect it cannot compare in value with either strychnine, quinine, or digitalis.

Without for a moment desiring either to underrate the value of alcohol in cases where there is need of temporary cardiac reinforcement, or to question its power to exert

a steadying influence upon an exhausted nervous system, I rank myself with those who hold that in most cases of enteric fever not only is alcohol not required, but that its employment is occasionally distinctly harmful, even when given in quantities which would not be considered excessive. The administration of a few ounces of alcohol, for instance, will sometimes markedly increase the restlessness in the case of a delirous person whose pulse is good and whose circulation is well sustained, especially when the patient is young and unaccustomed to take stimulants. Its use in these circumstances would be clearly injudicious, and in the presence of intestinal hæmorrhage its employment, except the case be desperate, would of course be inadmissible. The special indications which, I think, legitimately demand the use of alcohol in typhoid fever may be enumerated as follows. Constant delirium and sleeplessness associated with muscular tremor, feeble circulation, and a dry brown tongue; undue weakness of the pulse without other sign, as already described; cardiac dilatation, cyanosis, pulmonary congestion, and pneumonia; hyperpyrexia, excessive diarrhœa, and intestinal perforation. Alcohol, moreover, may be given with advantage in the case of elderly persons and to patients who are taking their food badly, as also to those who are the victims of a persistent feeling of depression. In this latter instance the best form in which to administer the alcohol is a good champagne, though, as I have already said, either brandy or whisky is generally the most suitable stimulant in ordinary circumstances—at any rate, during the pyrexial stage of the illness.

Though I fear it is impracticable within the confines of a single lecture to treat of all the exigencies which are liable to arise in the course of typhoid fever, no review of its treatment, however brief, could be regarded as satisfactory which did not contain some allusion to those two most grave accidents which always threaten, viz., intestinal hæmorrhage and perforation. In respect to any power they may possess of arresting a hæmorrhage in the bowel, it must be confessed that drugs have proved to be but broken reeds in practice, and the dictum generally credited to a late very distinguished physician that "hæmorrhage from the bowels in typhoid fever must be allowed to cure itself," is as true to-day as when the

words were spoken ; but if, on the other hand, the saying be held to imply that by judicious management of the case we are powerless to assist in the attainment of this much-to-be-desired result, such inference cannot be too strongly contradicted.

The importance of absolute repose, alike of body, bowel, and mind, is universally acknowledged. For the attainment of physical and mental rest we must largely rely on the care and common sense of a competent nurse and obedience on the part of the patient ; whereas rest for the ulcerated and bleeding bowel can be secured by the prompt administration of a full dose of opium. I much prefer the use of opium in ordinary circumstances, but should the patient's state be really urgent the hypodermic injection of morphine may be substituted with advantage.

Since a state bordering on syncope must be held to provide the condition most favourable to the cessation of hæmorrhage, everything calculated to stimulate the circulation should for the time, of course, be studiously avoided. Absolute abstention from alcohol, beef-tea, and stimulant meat extracts should be rigorously enjoined, and for the like reason and in order to avoid exciting peristalsis the amount of nourishment should be reduced to the lowest possible point consistent with maintenance of the physical powers. The situation in severe cases is frequently a difficult one and we are apt to find ourselves in dangerous waters. We are confronted on the one hand by the "Scylla" of possibly fatal syncope, and on the other by the "Charybdis" of additional hæmorrhage, and to steer a safe course between them may call for the highest qualities of seamanship. The necessity for avoiding stimulation is universally recognised, but I think, perhaps, the influence which is exerted by the complete deprivation of fluids in keeping down the blood pressure and arresting hæmorrhage is hardly so well appreciated as its great importance warrants.

The practice of giving astringents by the mouth in the belief that they will exert a direct styptic effect on the bleeding vessel in the lower part of the ileum is obviously futile, but the use of physiological hæmostatics in order to attain this object indirectly has possibly more to recommend it. Ergot, ergotine, hamamelis, and hazeline have been widely employed, and still are, for the purpose. Extensive experience of their use, however, has led me

to regard them as almost, if not entirely, worthless. Adrenalin chloride in frequent doses, however, I still employ in cases where the pulse tension is particularly low, since its administration I have sometimes thought effective. But whether any drug of the vaso-constrictor class, such as ergot or adrenalin, really plays any part in checking intestinal hæmorrhage is exceedingly doubtful. Unfortunately, we have no opportunity of observing their direct effect, but having regard to the rise in the general blood pressure which follows their administration it is difficult to avoid the suspicion that if they produce any result on the bleeding at all it should be to increase it.

In virtue of its undoubted power of augmenting the coagulability of the blood, the administration of calcium chloride in 10 grain doses every three hours is deserving of a trial, particularly in cases where the hæmorrhage, though slight, appears to be continuous. The application of an ice-bag to the right iliac region is apparently of real benefit in persons whose abdominal wall is not unduly thick; and in proportion as the affected part of the bowel is near the surface its influence in controlling peristalsis and in constricting the intestinal vessels is likely to be of value.

Having seen that the patient receives a full dose of opium and that an ice-bag is carefully applied to the abdomen, our treatment of intestinal hæmorrhage may be summed up in the single word "precaution"; and of the various measures we adopt with this in view, I believe *the complete deprivation of fluids*, excepting an occasional fragment of ice, to be the most important.

Now, with regard to the treatment of that dread complication intestinal perforation, there are probably few physicians at the present day who would hesitate to advise operation as the only means of saving life. The only points on which some difference of opinion is likely to exist, are as to the cases which are suitable for operation and the time at which it should be performed. Personally, I am in complete agreement with those who hold with Finney that a moribund condition of the patient should be the only contra-indication. I have never yet come across the case in which recovery has ensued when once a diagnosis of perforation has been deliberately arrived at, although one knows that some instances of apparently undoubted perforation have been recorded in

which success has been attained as the result of purely medical treatment. I do not think it is fair to accept a *post hoc, ergo propter* explanation of these cases and question the accuracy of the diagnosis on the strength of eventual recovery. I prefer to believe that in very exceptional circumstances a more or less localised peritonitis of perforative origin may be recovered from, but that the occurrence is so exceedingly rare as to justify one in entirely ignoring its likelihood when called upon to decide as to the treatment.

Assuming the diagnosis of perforation to have been made and the necessity for operation admitted, the point of next importance to decide is the time most favourable to its performance. The answer to this question is supplied in the old adage, "There is no time like the present." The teaching of Keen in this respect—viz., that the second twelve hours after perforation represents the time most favourable to operation—has carried considerable weight, it being held that recovery from the primary shock had better be awaited. The accumulated experience of the last few years, however, has clearly shown that if surgical treatment be postponed until reaction shall have set in, not only may the chance of a favourable issue have been allowed to slip, but the only opportunity for operation also.

The high importance, then, of immediate operation once admitted, the value of early diagnosis in the attainment of the best results will be apparent. Of the various symptoms which are recognised as indicative of the onset of perforation the occurrence of sudden pain at some particular spot in the abdomen is properly regarded as the most suggestive, and if this be quickly followed by local tenderness and some degree of constitutional disturbance the suggestion is greatly strengthened. Unfortunately, in something like 20 per cent. of cases the access of definite pain is wanting, in which case perforation in its initial stage is far more likely to escape detection. In the absence of local pain, however, the presence of even slight muscular rigidity, which from previous examination is known to have newly arisen, must be regarded as an indication of the highest value, and its import is greatly strengthened in the event of any increase in the pulse-rate being detectable at the same time. The great value of this sign has been attested by Harte of Philadelphia,

who, when referring to the importance of individual symptoms in the recognition of perforation, speaks of muscular rigidity as the "keynote to diagnosis."

To those who have seen much of enteric fever the fact is well recognised that we may encounter cases of perforation in which every local symptom usually associated with the condition is conspicuous by its absence, while the general aspect of the case in other respects may be quite characteristic. Apart from the evidence which may usually be derived from a careful examination of the abdomen, I have come to regard the facies as perhaps the most valuable indication. To one who is familiar with the patient's usual appearance a slight but distinct change in the facies may be apparent which is exceedingly difficult to describe, but which, especially when occurring with a feeble running pulse, may serve to show the cloven hoof in a way which nothing else will. When in addition there is present, or has recently been noted, some degree of shivering the inference that perforation has occurred is very strong indeed. The frequency of shivering and its diagnostic importance as an early sign of perforation were strongly emphasised by Dr. E. W. Goodall in a very thoughtful and instructive paper on Intestinal Perforation which he read before the Hunterian Society last April. I confess that I had not previously appreciated the value of this sign. It is easy, however, to be wise after the event, and I can now recall the occurrence of shivering more than once in cases which had perforated but in which at the time no particular stress had been laid on its occurrence. As confirmatory evidence of perforation obliteration of the liver dulness and the presence of fluid in the peritoneum are, of course, unrivalled, but in neither case are they likely to be apparent until a fairly confident diagnosis has been attained from other signs.

It is a golden rule in the treatment of typhoid fever to make a careful examination of the abdomen daily, for in proportion as our last examination has been recent, so are we in a better position to appreciate the moment when any change in its condition may have occurred. Accuracy of diagnosis is always desirable, but in view of the greatly improved results which have been attained of late it is better to recommend an unnecessary laparotomy than to allow a patient who has perforated to die without receiving the chance which operation affords. Accord-

ing to the figures published by Harte in January last, referring to 332 recorded cases of laparotomy after perforation, the recovery rate has increased during the last twenty years from 10 to 31 per cent., that for the whole series being 26 per cent.; but whether the recovery rate for all cases in which the operation has been performed is really as high as this is certainly rather doubtful.

On bringing these remarks to a conclusion, I must express my regret at having been able to adduce so little that is new and still less that is original. We have arrived at a stage, it seems to me, beyond which any material advance in the treatment of enteric fever must be sought in biological sources, and when we regard the number of earnest workers in that particular field, and the success which has attended their efforts in other directions, the future for enteric fever appears to be not without promise. While fully alive to its many deficiencies, I venture to hope that a record of personal impressions as to the value of various therapeutic measures which I have had occasion to employ during the course of some sixteen years' close association with the disease may prove to be of some little assistance to others who are equally interested in its treatment.