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Contributors

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NEW SERUM-THERAPY

D. MONTGOMERIE PATON



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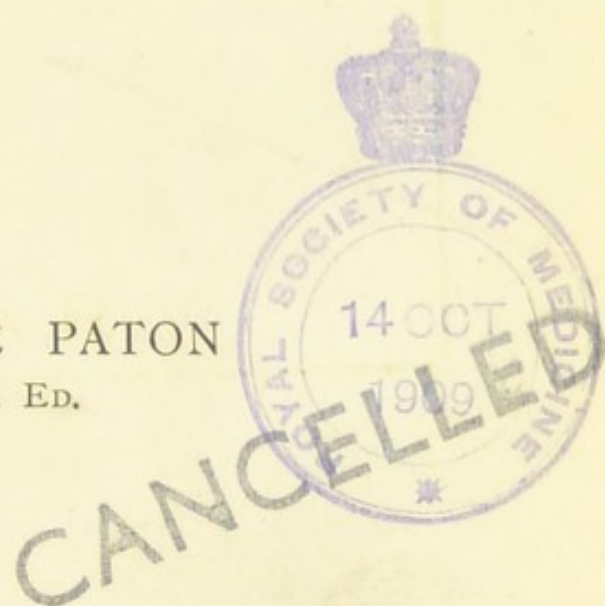
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NEW SERUM-THERAPY

BY

D. MONTGOMERIE PATON
L.R.C.S. & L.R.C.P. ED.



LONDON
BAILLIÈRE, TINDALL AND COX
8, HENRIETTA STREET, COVENT GARDEN

1906

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PREFACE

THE fuller recognition of the part played by tissue resistance in immunity, whether natural or acquired, and the transference of that tissue resistance to the patient, are sufficiently novel to require no apology for bringing them before the profession. The facts have been very carefully observed, and over a long series of years, and on them the case stands or falls. The theory advanced for their explanation is novel, but it so entirely meets the case and assists in elucidating other problems, that there is good ground for submitting it to the judgment of the profession.

The work has been mainly done in Australia, and I have to thank Dr. T. W. Bull, Bacteriological Laboratory, Melbourne, for his practical and persevering assistance in much work on the subject, only a little of which appears in these pages.

To Messrs. Parke, Davis and Co. thanks are due for their varied assistance, freely rendered, in the preparation of varieties of serum used in the course of the inquiries into the subject.

D. MONTGOMERIE PATON.

March, 1906.

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NEW SERUM-THERAPY

CHAPTER I

INTRODUCTORY

IN the February number (1902) of the *Therapeutic Gazette* and the *Australasian Medical Gazette* the author, in an article on 'The Solution of the Septic Problem,' claimed that the oral use of antidiphtheritic serum in septic disease was specific for septic infection. Time and further experience have only strengthened him in that opinion, and confirmed in further and fuller experience the result which had prompted him to claim such action for Behring's serum. The results, however, are not due to the antitoxin, nor is the serum antibacterial. His attention had been drawn to the subject by various articles, in which the serum was recommended for diseases other than those arising from the Klebs-Loeffler bacillus, and by the various methods in which it was said to have been successfully used in diphtheria. Amongst such may be mentioned an article by De Minicis (*Gazz. degl. Osped.*, July 19, 1896), in which he claimed to have been successful in five cases of diphtheria by the oral use of the same doses of the serum as he would have used hypodermically.

Another by Chantemesse (*Sem. Med.*, July 2, 1896) claimed that he had treated twenty cases of diphtheria by intestinal injection, and from substantially the same dosage obtained

results parallel with those obtained from hypodermic use of the serum.

Howard Lilienthal (*Medical News*, July 17, 1897) reported two cases of septic infection which had apparently yielded to the hypodermic use of Behring's serum.

McCallum (*Therapeutic Gazette*, January 15, 1898) in a preliminary report claimed to have good results from its hypodermic use in tubercle, lupus, and infective inflammation such as salpingitis, endometritis, nephritis, etc.

Thinking over these and other similar papers, the thought suggested itself that if antidiphtheritic serum was equally specific for diphtheria, whether it was given by the skin, the rectum, or the mouth, and that it was also specific for sepsis when given by the skin, it ought to be equally specific for sepsis, whether given orally or rectally.

It was resolved to test it orally, and before long a suitable case (No. 6) came to hand, and was successfully treated, and others which followed soon proved that a rich field for investigation had been entered.

The first case, which was treated in March, 1898, was distinctly streptococcic, and it was some time before its action on staphylococci became apparent. Then the next step was made, when a patient suffering from an acute traumatic synovitis had his pain relieved and slept well after one dose of 1 drachm, a result which was repeated in a similar case three months later. Thus the treatment evidently met both simple and septic inflammations. All later experience has gone to prove the soundness of this conclusion.

The serum was then tried on various diseases, so as to discover the limit of its action. In lobar pneumonia, so far from doing good, the cases in which it was tried ran the highest temperatures that the writer had seen in his experience, and appeared to be more than usually serious. In tubercle, where there was no septic accompaniment, it was useless as a bactericidal agent, and the same results were obtained in

gonorrhœa, syphilis, malaria, and locomotor ataxy. An injection of Haffkine's plague serum in my own arm and in that of a patient ran the usual course, in spite of the persistent concurrent use of the serum.

The following pages give a short account of some of the theories suggested and work done, and the clinical papers illustrate the practical working of the serum in disease. Hundreds of other cases have been treated successfully, but those given are fairly representative.

The clinical facts are first recorded, as it is on the facts of the case that it must stand or fall. The facts also were first seen, and the theory had to be found to explain them. It is discussed in the second half of the treatise.

The first criticism which will be suggested is that this must be the new 'cure-all' if it will do all that is claimed for it. If antidiphtheritic serum is what is claimed for it, then it must necessarily do all that is here recorded, and much more. There is no half-way house. It must either increase resistance to the septic infection, wherever it is found and by whatever name it is called, or fail altogether.

The use of simple plasmata by the same methods came later, and here all that may be said is that simple plasma of the sheep and horse are therapeutically interchangeable. Sheep, however, are killed when in the best of health and their resistance at its highest, while horses are killed only when they have ceased to be useful. Hence sheep plasma is much to be preferred. Both are resistant to tubercle, and their plasma is equally valuable in non-microbic conditions such as have been described. Ox plasma has been tested with good results in influenza, to which infection the ox is extremely resistant. The writer had 2 ounces of it in his last attack, and is satisfied that in that instance its effects were unmistakable. Further experience, however, will be necessary to enable much more to be said on this point.

Horse plasma has been tested in typhoid, in which its food-

value, apart from any specific action it may have, must be great. It forms an ideal food for such cases. Fourteen cases have been treated with it. Two only were seen in an early stage, and these, although very severe cases, seemed to have their general resistance materially increased, and both did well. In the other twelve none were seen till the end of the second week or later still, and although many were very severe, all recovered but one, who came in at the end of his second week in a precarious condition, and died of perforation a few days later. As a suitable food with a probable specific action, any of the plasmata should be valuable in enteric. Horse, sheep, and ox are all immune to it.

The simple plasma can be obtained from Messrs. Allen and Hanbury, who will supply it as byno-plasma, a very palatable method of exhibition, and free from any suggestion of blood.

CHAPTER II

A NEW METHOD OF SERUM-THERAPY*

FOR eight years the writer has been studying, clinically and experimentally, the use of serums exhibited by the mouth. During that time he has used over 3,333 ounces of antidiphtheritic serum and 40 gallons of simple plasma of the horse, sheep, and ox.

Among the clinical examples are some from the writer's own experience, as well as from others who have tested the treatment. The trouble has not been so much about the actual results as about a rational explanation of the phenomena observed. The theory which at present seems to most fully explain the results is indicated in the course of the article.

The antidiphtheritic serums used have been supplied by Messrs. Parke, Davis and Co., who stock a low-potency serum in 1-ounce bottles, containing 6,000 units, enough for eight doses—1 ounce serum in 4 ounces of water ($\frac{1}{2}$ -ounce dose). They have supplied it to my order for years, and have called it 'Paton's' serum. For chronic suppuration there is another serum with greater anti-proteolytic power. It has been called 'special,' and the dose is the same as the other serum.

For acute conditions, 1 drachm of serum at once and every half-hour or hour for three or four doses, then every two or four hours, as required. For less acute cases 1 drachm four times a day is generally sufficient.

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I. **The Use of Simple Plasma by the Mouth in Function deficient through Innutrition.**—The plasma is the food elaborated and fitted for direct tissue-feeding and energizing. In the animal its mission is to maintain nutrition and repair of tissue, and enable function to be carried on in a state of normal efficiency. When given to a suitable patient by the mouth in doses of 1 drachm four times a day, it does the same work in the patient for which it was elaborated in the animal. The writer has seen scores of cases during the last two years, and has used about 40 gallons of the material in his work. A typical case on which to test the value of the plasma is that of a post-partum patient who is making a poor recovery, whose tissues are flabby and soft, who has little appetite or digestion, little energy or capacity for walking, probably some subinvolution, and a deficiency in either quantity or quality of milk, or possibly both. The use of plasma in 1-drachm doses four times a day has proved a sovereign remedy, leading to restoration of tissue tone, and renewing the lactation, so that it becomes what is normal for the patient in quantity and quality. The reaction which produces this effect is all the more marked if there is present the tuberculous diathesis, a fact which indicates the unique character of its action. Not only is the milk restored, but preceding and accompanying it there is a restored appetite, digestion, and assimilation of food, a feeling of *bien être*, and capacity to get about and do household duties, and a freedom from the continuous feeling of weariness and exhaustion. When that is accomplished, reduced doses will maintain what has been gained.

In anæmias alone, or in conjunction with ordinary treatment, in convalescence from disease or operation, in the very old and debilitated and the very young, the oral use of plasma has the same effects as in the typical cases mentioned.

Now, the albumin in $\frac{1}{2}$ ounce of plasma is quite incapable of any such result; even if it were all absorbed unchanged, it never would produce a return of digestive function and all the

other tissue vigour, and there must be something else in it to account for the results. There are evidently in the serum the elements which the animal has elaborated for the energizing of the nerve centres which control the various tissues, and these, addressing themselves to the centres controlling the tissues requiring increased vigour, are able to produce results which are otherwise quite incapable of reasonable explanation. These elements are probably of glandular origin, and, like thyroid and suprarenal extracts, are readily absorbed, and produce their own physiological action. It is simply an increased tissue tone producing normal function, and ceasing when normal conditions have been attained.

II. Simple Plasma in Infection.—The horse and sheep are resistant to tubercle, but, the initial resistance overcome, they deteriorate as fast as any other animal. Thus it is their initial defence which is their resistance to the infection. The ox has less initial resistance to tubercle, but, on the other hand, is extremely resistant to influenza.

In the treatment of over fifty cases of tubercle of all kinds the oral use of the simple plasma of the horse and sheep has proved itself capable of transferring to the patient the resistance of the animal to the disease; that is, that the reaction which is seen in non-microbic cases, and which leads to restoration of tissue tone and normal function, is also obtained in the presence of the tuberculous infection, where it is not mixed with other infections or is not of such an intensity as would inhibit the reaction in the animal itself. The horse and sheep are susceptible to catarrh and influenza, and the advent of these in a case which is doing well on plasma is seen at once by the inhibition of the reaction, exactly as it would happen in the horse or sheep. Thus we obtain the reaction in the presence of those infections to which the animal is more than usually refractory, but in no others.

This action cannot be antitoxic, for antitoxin is not absorbed by the stomach. The action on the tissue tone is such as can

only be explained on the same grounds as the reaction in non-microbic cases, with the addition that the tissue tone which is produced is of such a character that it maintains the functions unimpaired in the presence of the infection, and is by so much a resistance to the disease.

Cases have been treated privately in my own and other practices, in Echuca Sanatorium in Victoria, Stobhill Hospital, Glasgow, and in the Bridge of Weir Sanatorium Dispensary in Glasgow. The net results have been that more than 75 per cent. of the patients have shown the reaction. Their resistance to the disease has been materially increased, and their symptoms, appetite, cough, expectoration, general strength, and frequently physical signs, have all shown a marked improvement. A week's treatment is generally sufficient to tell whether the patient is going to obtain benefit or not.

If for nothing else, the use of plasma in this disease would justify itself by its action on those troublesome dyspeptic symptoms which are so frequently seen in tubercle. No case so far has failed to yield to the plasma. Three tuberculous throats have all had their pain removed; bladder, surgical, and phthisis cases have all done well. It is not cure, but it is an essential in the cure of the disease, for its action is the restoration of the tone of the tissues, the lowering of which was the cause of the infection and subsequent deterioration of the patient.

Children do remarkably well, one who has had eight weeks' treatment being so much better in a colleague's practice that he examined her afresh to see if he had not made a mistake in diagnosis. Abdominal tubercle, unless in the last stages, has shown itself amenable by the removal of pain, diarrhoea, etc., and the return of appetite, digestion, and increased vigour. The keynote for the use of plasma is lowered 'tone' in the tissues, that intangible something which is nevertheless our defence against infection. Practically it means a lessened reaction, which in turn prevents the tissue from procuring

sufficient nutrition, and its capacity for resistance is correspondingly lowered.

An interesting result was seen in some cases which had been treated with plasma with benefit, and to which Jacob's sero-tuberculin was added hypodermically. As the dose of the tuberculin was increased, the effect of the plasma gradually lessened, and then ceased. It was clear that the one treatment was antagonizing the other. The plasma was then withdrawn, with the result that, although the tuberculin was given in doses of a half and a third of what was due, there followed in all the cases a marked reaction after the next dose of tuberculin. Some of the temperatures reached 104° and 105° , but all subsided, and with the reduced dose after that there was no undue reaction. The lessened tissue resistance was very evident in all the cases after the plasma was withdrawn, and with the reaction there was also a decided loss of weight.

The theory of the action of serum in the preceding paragraphs, as well as in the remainder of this article, may be summarized as follows :

1. Every tissue has a capacity for nutrition and repair and maintenance of function.
2. This capacity becomes resistance to infection when it is capable of carrying on the function unimpaired in the presence of the infection.
3. The oral use of the plasma (normal) of an animal conveys to the patient the elements elaborated by the animal to produce in its tissues the reactions necessary for nutrition, repair, and maintenance of normal function, and its oral exhibition produces in the patient the same reaction as in the animal.
4. When these normal reactions raise the tissue tone so that a natural refractoriness to any particular infection is produced in the animal, the same result is produced in the patient by the oral use of the plasma of the animal, such as the horse and sheep in tubercle and the ox in influenza.

5. Where an animal is artificially immunized to an infection, the elements in the serum producing the reaction for the nutrition, repair, and maintenance of function in the tissue pathologically affected by the toxic products of the organism used are all abnormally developed.

6. In antidiphtheritic serum the elements developed to maintain function unimpaired in the presence of the paralytic and muscle-depressing and the proteolytic and albumose-forming elements in the toxic culture used in the production of immunity are available to meet the action of the streptococcus and staphylococcus on the same tissues.

7. The same tissue-restoring elements are available in traumatism or tissue damage from any non-microbic cause. Hence they are tissue restoring and maintaining elements, and are not specific antitoxins.

8. The developed elements in antidiphtheritic serum are a muscle recuperative power to antagonize the muscle depressant and an antiproteolytic to meet the proteolytic action of the organism; also a hæmopoietic power leading to increased leucocyte production where required.

Antistreptococcic serum contains at least the first of these qualities.

That is, that immunity consists not only of antitoxins and antibacterial agents, but also of a resistance which in a drug-habit patient we call 'drug tolerance'—that is, that the tissue cell has so adapted itself to its environment that it is capable of carrying on its functions unimpaired in the presence of the poison. To do this it has to develop certain qualities, and the means for developing these qualities are in the serum, and can be transferred to the patient by oral exhibition, to produce in him exactly the same conditions as they were intended to produce in the animal originating them.

III. The Treatment of Inflammation by the Oral Use of Antidiphtheritic Serum.—In antidiphtheritic serum there are present along with antitoxin the properties in

the serum which the animal has elaborated for its defence against the proteolytic and albumose-producing and the paralytic and muscle-depressing elements in the toxic culture.

The writer has defined these properties as being an increased capacity for resisting proteolysis and an increased recuperative power in the muscle affected by the organism—the involuntary muscular system. These properties are in the serum, and their specific effects can be obtained by their oral exhibition, not only in diphtheria, when given in time, but also in inflammation due to the staphylococcus, streptococcus, and *Bacillus coli communis*, as well as that arising from simple traumatism. Along with the antitoxin they, with other properties as yet unrecognised, form the expression of the whole resistance of the animal to the injections of the diphtheritic culture. Unlike the antitoxin, they are absorbed and made available by the mouth, and are operative in the presence of other infections, as well as where no infection is present. These two properties are all that have been defined as yet, but there are probably others in the serum, as, both in experimental and clinical work, a decided leucocytosis has been clearly manifest where required. Whatever, in fact, has been necessary for the animal to produce for its own effective defence against the organism will be included in the serum. The fact that these properties, while available against the infection for which they were elaborated, are also potent in other infections and where no infection exists proves that they are entirely distinct from antitoxin, and the conclusion arrived at is that they are the elements in the serum intended for the maintenance of function and integrity of tissue unimpaired in the presence of the infection for which they were originally produced, and hence, being tissue resistances, they are available against all attacks on the integrity of these tissues by agents similar in their character and requiring the same defence as the original organism or toxic culture injected.

For inflammation we thus possess, in the antidiphtheritic

serum, three properties: (1) A muscular recuperative power, which is the agent mainly effective against the streptococcus; (2) an antiproteolytic power, which is effective against the staphylococcus (proteolytic in its action) along with the muscular recuperative; (3) a hæmopoietic reaction, leading to increased leucocytosis where required.

The essential vascular lesion in inflammation is in the blood-vessel wall, and in it the main element is in the unstripped muscle. In this there is loss of tone, varying according to the conditions producing it. Recovery is produced when this tone is restored, and this is Nature's own method. Anything, then, which will restore the normal tone, or directly assist in doing so, will be acting on parallel lines with normal recovery, and by so much increase the certainty, thoroughness, and rapidity of the results desired. Here the recuperative power of antidiphtheritic serum fulfils all the conditions required, and its use so strongly reinforces the normal effort that further extension is prevented, and recovery follows rapidly, insured by an increased tissue resistance of which the patient alone, unaided by serum, was totally incapable. The soil having been rendered unsuitable for the pathogenic action of the organism, it is readily overcome and eliminated if the tissue tone in the meantime is maintained. Should the serum be discontinued prematurely, the tissue tone at once falls below what is required to prevent the pathogenic action of the organism, and the inflammatory process very soon reappears, the organisms not being affected directly by the action of the serum, and sufficient time not having been given for the opsonic, agglutinative, antibacterial, or whatever agent is present to aid in their elimination, to completely remove the infection present.

In the same way the proteolytic action of the staphylococcus is inhibited by the action of the serum, making the soil an unsuitable field for the digestive action of that organism, and the antiproteolytic action of the serum being maintained by

the regular administration of the proper serum in sufficient dosage leads to exactly the same result as has already been described in the process as applied to the involuntary muscle. Hence, where there is an invasion involving both the muscular tissue and the digestion of tissues, there is present in the serum the necessary elements to enable the tissues involved to make an effective resistance.

Increased leucocytosis is not seen where the use of the serum rapidly overcomes the pathological conditions present, exactly as in normal conditions, when serum is not being used. Where, however, the resistance is greater or where there is loculated pus, then there is a greatly increased leucocyte count. This is seen both in animals experimentally and in man clinically under the use of serum orally. In the treated animal there is an increased reaction with a greater leucocytosis, a larger amount of pus, and a more rapid maturation is observed than in the control animal. In man, where the pus is contained in firm tissue, the patient will discontinue the serum, as it gives more pain with every dose from increased tension in the abscess. It is probable that this local condition is due to the increased vaso-motor tone, local and general. Locally the renewed tone of the vessel wall leads to a contraction of the congested area around the focus, and this, with the increased general vaso-motor tone, causes a concentration of effort on the focus itself more than would be possible in normal conditions, and thus leads to the more intense reaction seen in the lesion.

From the nature of the action of serum on the tissues it must be clear that the earlier in the pathological process its action is obtained, the less repair will be required and the more rapid and satisfactory the result. While its action offers hope to the practitioner who has come to the end of his resources in a case and is ready to grasp any straw, that is not its legitimate field, any more than it would be legitimate to leave our cases untreated till they became desperate. To

obtain all that it is capable of doing for the pathological conditions within its range of action, it must be used in the earliest possible stage of the disease, and depended upon to treat the case, instead of being something to fall back upon as a last resource when everything else has failed. Used thus it has, in the writer's hands, and in those of his friends who have tested it, proved itself even more reliable in the treatment of inflammation by its oral exhibition than it has done hypodermically for the infection for which it was originally produced. The capacity for tissue restoration is seen in the rapid healing of wounds, whether septic or non-septic.

In the septic condition, where drainage is good, the pus is rapidly lessened, the wounds take on a healthier look, and the healing processes are strongly reinforced. Where drainage is not good, or where a slough is present in a lesion such as a carbuncle, the rise in tissue tone shows itself by an increased reaction and the greater amount of pus discharge. This leads to separation of the slough rapidly, and below it is found a healthy, granulating surface, which under serum administration very quickly heals, while the patient's whole involuntary muscular system is raised in tone and the usual debility is materially decreased.

Serum treatment falls into line with present-day pathology in that it ignores the distinction which used to prevail between what was then called simple and septic inflammation.

The various phenomena of inflammation need not be enumerated here, but for the purposes of treatment the whole course of inflammation may be divided into three stages :

1. The initial stage, including all that precedes the death of tissue.

2. The death of tissue and formation of pus.

3. The rupture or incision of abscess and elimination of the products of the previous processes.

1. In the stage which precedes the death of tissue anti-diphtheritic serum, when used properly, is specific. The

acute pain is the first symptom to be affected, and the patient can soon be rid of that pain which will not give him rest. The following is a fair example :

(1) Miss M'C., aged forty-two, had been suffering from an acute bursitis of the left knee, and had been continuously fomenting and poulticing it for thirty hours, during which she had no rest, and when the prospect of another such night was before her she sought advice. She was at once given anti-diphtheritic serum—one dose every hour for the first three doses. At the time I said to her that she would probably be asleep before she had the third dose. The forecast was correct, as she fell asleep after the second dose, and had to be awakened for the third. She took eight doses, and felt so well that she stopped the treatment against advice, and in twenty-four hours the trouble had begun to return. Another eight doses cleared up all inflammation, and she had no further recurrence. The fluid was not touched, and it gradually became absorbed while she was about her work as a trained nurse. The case had just been seen in time to prevent the formation of pus.

So certain is its action in aborting inflammation which has not reached the second stage that when it fails within forty-eight hours to materially reduce the symptoms, I commit myself to the diagnosis of the presence of pus, and have no hesitation in saying so to the patient.

The following case of septic infection, seen in time to prevent pus formation, although the process had considerably extended, is interesting :

(2) Mrs. M., aged forty-seven, had received a wound in her third finger of the right hand three weeks before being seen. The wound refused to heal, and the inflammation began to extend. When seen, the inflammation was well marked on the dorsum of the hand ; there was a considerable area of it on the ulnar side of the arm just below the elbow ; above the elbow on the same side an abscess threatened ; the axillary

glands were inflamed, and pain was complained of on movement all down the right costal area. Cultures from the finger wound showed the presence of the staphylococcus *Pyogenes aureus* and *albus*.

The finger wound was dressed with an antiseptic, and anti-diphtheritic serum was administered—2 drachms every two hours for the first four doses, then 1 drachm every four hours. No other local treatment whatever was used, full dependence being placed on the serum. From the first there were decided signs of improvement, which became more and more marked day by day. In four days she was practically well, and the treatment was continued in a modified form for two days more, so as to confirm the result obtained. Seven days from the first dose she was dismissed absolutely well, all signs of inflammation having disappeared, and the finger wound having completely dried up. It need scarcely be added that the patient was something more than satisfied with the result.

The following teaches the lesson that it is false economy to discontinue the treatment too soon :

(3) Mr. B., aged thirty-seven, is subject to severe attacks of quinsy, one of which was aborted by serum treatment. When the next attack came on it was twenty-four hours before serum was begun. In three days, however, the attack was aborted by 2 ounces, and the patient was dismissed. Three days later the attack recurred, and went to pus formation, in spite of vigorous administration of anti-diphtheritic serum. The serum being continued, pain was much relieved, the abscess was rapidly matured, and it was incised on the third day. Another ounce at the first attendance would have saved the second attack.

Summary of Dr. Maclean's (Pollokshields, Glasgow) Case.

(4) Mrs. T., aged thirty-five, multipara ; normal labour ; placenta adherent and separated by hand ; uterus flushed out ;

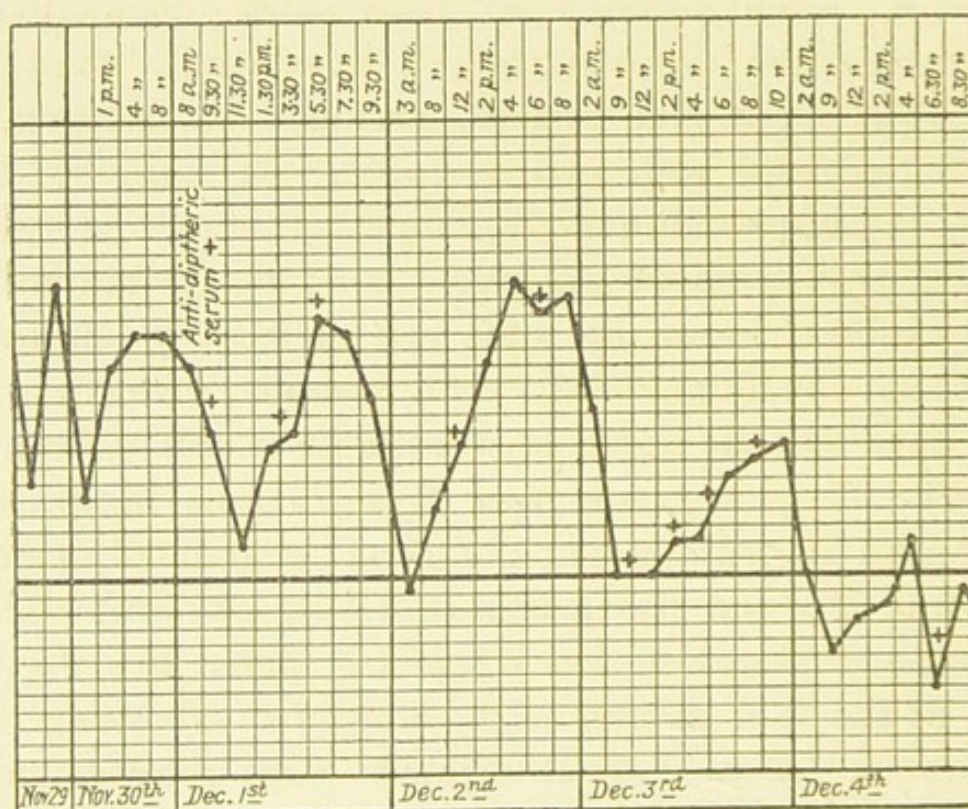
lochia scanty and sanious on third day, and ceased entirely on fifth day. Temperature was rising and respiration accelerated, and when lochia ceased there was abdominal distension without pain, but pain in left hypochondrium, and temperature was 102° . Four days later, there being dulness and friction at the left base, she had a collapse, and in reaction temperature reached 103° . Next day dulness at right base. Treatment: antiseptic douching, poultices, and 20 c.c. anti-streptococcic serum. Two days later condition was: dorsal decubitus, acute pleuritis in both sides, crepitation and broncho-vesicular breathing at left base, dusky complexion, respirations rapid and shallow, profound intoxication, with grave interference with vital functions. At this stage twelve days' post-partum oral use of antidiphtheritic serum ('special') was begun—1 drachm every four hours; also 10 minim doses of strychnine. From that time patient steadily improved in her general condition, and all her symptoms declined.

Six days later she began to menstruate normally, both as to quantity and quality, and two days from its inception she complained of pain in left groin. This gradually extended down the leg, and was accompanied by swelling. It gave very little trouble, and was completely cured in a fortnight. With it she had several slight attacks of vomiting. The temperature fell to normal eighteen days after serum was begun, and the pleural effusion, which consisted of a turbid serum, began to diminish three days later, and in a week had quite gone.

Dr. Maclean adds: 'The serum . . . apparently did what was expected of it—namely, it supplied the patient directly with a means of resistance to the proteolytic action of the staphylococci and the toxic effects of the albumoses produced by the organisms, rendering her system a less suitable host for the bacilli, and at the same time freeing, as it were, her tissues and organs to carry on their proper functions.'

Dr. William McLennan's Report (Glasgow).

(5) Mrs. K., aged thirty-seven, had abdominal section many years ago for recurrent attacks of localized peritonitis. The operation revealed extensive adhesions, which were separated as far as possible. Probably the seat of trouble was the appendix, which was so adherent that it was not removed. In October she complained of the onset of pain in the right side, almost 2 inches below the ribs (in nipple line). Pain



increased and fever followed. For the first three weeks it was—morning, 99°; evening, 100°. Then an acute rise took place, with great increase of pain and temperature—morning, 100°-101°; evening, 101°-102° and over. There were rigors and sweats, and it was clear that great septic absorption was going on, and probably pus formation. Operation was contemplated. Paton's serum was given at this stage; but the patient disliked the chloretone taste, and could only be induced to take two doses a day for two days, one or more of which she immediately rejected. On the third day serum was

given regularly, and in thirty-six hours temperature was normal, and the patient on the highroad to recovery. She has done well.

A few weeks later this patient showed symptoms of a recrudescence of her trouble, and was at once given serum—1 drachm four times a day. In twenty-four hours all symptoms had disappeared, and Dr. McLennan reports the result as 'very satisfactory.'

2. THE DEATH OF TISSUE AND THE FORMATION OF PUS.

When inflammation has reached the second stage, and we have broken down tissue with pus formation, the conditions for serum treatment are entirely altered. Antidiphtheritic serum will only act on living tissue, and hence it can only influence the collection of pus and débris by its action on the living tissues which are adjacent and affected by the extension of the inflammatory process. This process is limited in every case by the serum, and the usual foul condition is materially benefited and generally removed. According to the size of the abscess, the virulence of the infection, and the amount of tension in the cavity, will depend how much can be done for the case. Depending, then, upon the proportion of each of these elements, antidiphtheritic serum will do good work in removing the surrounding inflammation and lessening the pain and other constitutional symptoms, and by such work conserve the strength and comfort of the patient.

Pain here arises from two causes, one cause being tension outside, and the other tension inside, the abscess cavity. The first cause is removed by the serum, and where the tissues affected are loose in texture there is a very marked amelioration in this symptom. Mastitis is a very good example of this, for under antidiphtheritic serum this painful disease is robbed of most of its terrors, even when it has been seen too late, and pus has formed.

The pain of tension in an abscess cavity is one that is not

benefited by antidiphtheritic serum treatment, and it is probably increased by its use. The reason for this lies in the fact that where treatment has been begun too late to abort the attack, the serum increases the reaction, and raises the vasomotor tension, causing increased exudation into the cavity, greater tension, and more pain. Where the structure of the tissues involved is of a firm and unyielding character, such as in periosteum, and even a synovial membrane, the pain is increased by every dose shortly after it has been taken, and patients have of their own accord stopped taking it on account of this action.

There seems to be an exception to this rule, and that is in cellulitis of streptococcal origin. This was the character of the first case treated, and its success started me out on this investigation.

(6) Mr. B., aged sixty-one, had been bitten on the hand by a cat, and had a superficial erysipelas, which easily yielded to treatment (bathing with *spt. vini meth.*). A week later he returned with a most acute cellulitis of hand and arm. The hand was swollen immensely, and the dorsum was tense, bright, and shining, while the arm was in a similar condition up to half-way between the elbow and the shoulder. He had all the symptoms of toxic resorption—headache, malaise, temperature over 100° , anorexia, etc. The first impulse was to incise the dorsum and give him an injection of antistreptococcic serum, but to test the oral use of antidiphtheritic serum he was given $\frac{1}{6}$ ounce in four doses, one dose every hour. Next day he had lost all his constitutional symptoms, temperature was 97° , head clear, a visible improvement in his hand, less pain, and able to move his fingers, which he could not do the previous day. After this, he would not allow me to use the knife on it, but demanded more of the same treatment. He had no other treatment except bathing it with *spt. vini meth.* He had the same dosage every day. The arm and hand steadily mended, and he was discharged on the thirteenth day perfectly well.

For some time he had stiffened fingers from tendons being fixed in remains of inflammatory processes. He still carries an exostosis on one of his metacarpals as a memento of the occasion. This was in March, 1898, and now he would get three times the quantity of the serum and be cured so much the more quickly.

As an example of the benefits to be derived from antidiphtheritic serum treatment where pus is present, and before incision, the following case of empyema is interesting. It is also a good example of the next stage.

(7) Mr. C., aged thirty-seven, had pleurisy with effusion, which became empyematous. Antidiphtheritic serum had been given too late to prevent the formation of pus, but in this case it so modified the constitutional symptoms that temperature was reduced to 100.4° and pulse to 84, while the patient ate and slept well. So well was he that a colleague, called in to chloroform for me while the tube was being put in, would not believe that pus of such recent origin was present in the case until convinced by aspiration. With the tube in, the treatment was continued, and he progressed steadily until it was thought that he was sufficiently well to do without it, and it was then stopped. In a day or two he began to show signs of relapse, and soon he had hectic, night-sweats, and increased discharge, which also gained an odour which became more pronounced day by day. His appetite and general health failed steadily, and he was rapidly going downhill. The treatment was resumed, and the patient at once began to improve, and continued to do so, until in a short time the discharge had become so small that the tube could be removed, and he made an uninterrupted recovery.

In this case, even before the operation the symptoms were so ameliorated that it was difficult to believe that such a condition existed, and after it the recovery was due to the serum without any doubt whatever. In all, he used $7\frac{2}{3}$ ounces of antidiphtheritic serum.

The following case illustrates the use and the value of serum treatment in this stage :

(8) Mr. S., aged forty-nine, had an acute septic attack around a cicatrix left from hydatid in his right lung some years before. From this there were metastases till at least six loculations of pus formed. He had all the usual septic symptoms—sweats, fever, loss of appetite, foul tongue, etc. Consultant gave a hopeless prognosis. Frequent cultures gave only staphylococci, and he was put on antidiphtheritic serum (Paton's), 1 drachm four times a day. On this he improved ; sweats lessened, sleep was better, appetite was maintained, and he became very comfortable. Thinking to lessen the expense, he was put on simple plasma for three days. During that time he rapidly lost ground : sweats became profuse, strength waned, weight was lost, and he was rapidly failing. On the resumption of antidiphtheritic serum he regained all that he had lost. No further metastases took place ; the pus loculations ruptured into the bronchi one by one, and did not refill, and he went back to work heavier than when he left. In all, he had 25 ounces of serum during his illness.

3. STAGE OF CONTINUED SUPPURATION AFTER PUS HAS BEEN DRAINED.

Generally, when free drainage is established, the recovery proceeds normally ; but there are cases, as in the examples given, in which the patient's resistance has become so enfeebled that his tissues are unable to resist the action of the organism even under the most favourable conditions, and the process is continued indefinitely. The addition to such cases of the tissue resistance supplied by the appropriate serum enables normal condition to be attained and normal results to be seen. In this condition the following case illustrates the difference between simple plasma and the antidiphtheritic serum.

(9) A. T., aged fifty-three, had been suffering from acute cellu-

litis above and below the elbow for several weeks. There were six incisions, all discharging pus freely, while from his temperature and appearance there was considerable absorption. Under antidiphtheritic serum the whole condition rapidly improved, temperature fell, pus discharge rapidly lessened, sleep and appetite with clean tongue returned, and he was doing well. Before the case was quite right, simple plasma was substituted for the antidiphtheritic, with the result that the case promptly relapsed, pus discharge increased, temperature rose, absorption again showed itself—all within a week. On resuming antidiphtheritic serum, the whole of the symptoms rapidly disappeared, and in three days all but one sinus had ceased discharging. Further treatment on the same lines led to recovery. It was clear that in antidiphtheritic serum there were elements and capacities not found in normal serum.

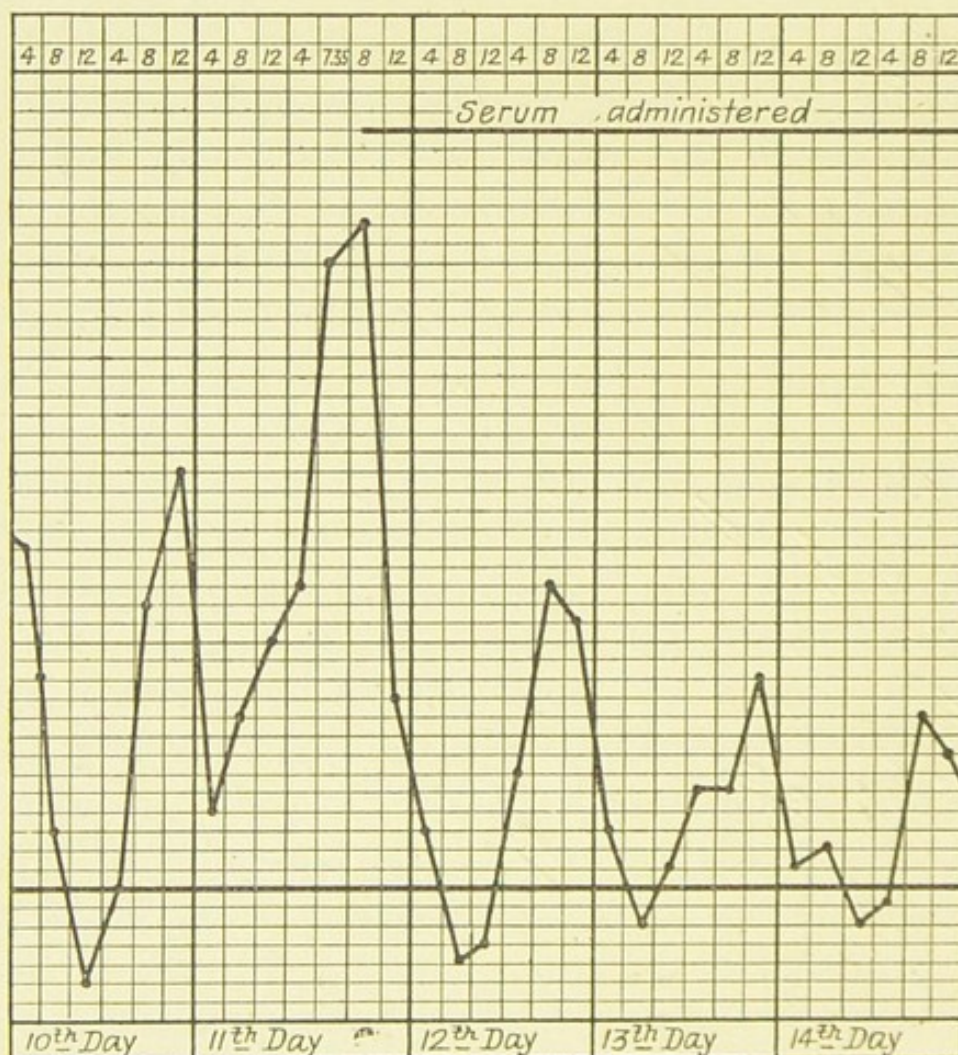
Dr. Alex. McLennan's Cases (Glasgow).

(10) M. M. was operated upon for an empyema on October 23, 1905. The previous condition had been pneumonia(?) without a crisis. From October 3, before the operation, temperature had varied from 99° F. to 104.4° F. For three and a half days it had been between 99.2° F. and 100° F. After operation it ranged daily between 99.2° F., 103° F., and 103.8° F. Serum was begun on November 2. Previous evening temperature was 103° F.; on November 2, 101.4° F. November 2 to November 6, temperature ranged from normal to 99° F. November 6, serum stopped; November 6, 8 p.m., temperature 100.4° F. November 7, temperature 101.4° F. Serum begun after this on November 7. Since then temperature ranged from normal to 100.4° F. The pulse, which had been rapid, varied with the temperature. There were obscure abdominal symptoms. A cover-glass preparation of the pus from the empyema showed numerous cocci in groups and few in short chains; no culture was made.

The general condition improved with the decline in tem-

perature and pulse rate. This patient went on to perfect recovery under reduced dosage.

(11) Dr. McLennan also reports a case of pyelitis. The temperature, ranging to 105° F. the night before serum was begun, fell as shown in the chart while it was being administered. This gave an opportunity for nephrectomy, which was successfully performed, and the patient did well. The operation was necessary for causes extraneous to the kidney.



CHAPTER III

POINTS IN TREATMENT

At present the test applied to most treatments is that of the temperature chart. By this method of serum-therapy the temperature rapidly falls when all the resistance to its action is overcome and the tissues have resumed their normal insusceptibility to the organisms present. It must be evident, however, that in many cases the complete tissue resistance may not be attained, but only an increased resistance to the infection present. This would mean an increased reaction, and possibly an increased temperature. Hence the temperature is an unreliable index of the success or otherwise of the serum.

In such a protean disease as sepsis many conditions are to be found in which serum can be only of partial benefit, and yet by its use much information may be gained and much good may be done. Thus, if doubtful, the use of antidiphtheritic serum for two days will often show clearly whether the case is septic or not by its effect on the patient. Pain relieved or removed means that inflammation of septic origin is present and benefited. Pain left after it has been administered means either some mechanical condition, as obstruction or tightly-bound pus loculation, or nerve pain of neuralgic character, or another infection.

Temperature, and with it the pulse, never falls to normal, and continues so, while loculated pus is present. Both may be reduced to normal and pain largely relieved, but the pain

persists in the modified form, and sometimes almost without modification.

When temperature and pulse have reached normal, leaving pain of an irregular type and recurring at irregular intervals, the probabilities are that it is neuralgic in character.

In the conditions just enumerated the systemic reaction is present in greater or less degree; but when the infection is other than sepsis, the reaction is obtained very feebly, if at all. In pneumococcic infection the use of antidiphtheritic serum seems to aggravate the symptoms. Whether that is due to increased reaction is not clear, but it has no effect in shortening the usual period of the infection. Its action in tubercle, typhoid, etc., can easily be differentiated from that in sepsis. It is comparatively inert, and any value that it may have in those diseases is due to the animal's natural immunity to them, an immunity which is not comparable to that artificially produced to diphtheria and sepsis.

Where pus discharge is present the action of the serum will depend on the cause which is maintaining it. If of an inflammatory character, the serum ought to rapidly lessen it if drainage is at all reasonable. If it is due to elimination of dead tissues, as bone, etc., then serum has no influence on the symptoms. It deals with causes, and not with symptoms.

Where there is a pus discharge arising from inflammation in the presence of dead tissue, the result of serum administration is an increased reaction, with a greatly increased pus discharge. This is well illustrated in carbuncle, but the slough in it is thereby more rapidly separated, and as soon as it is gone there is an immediate cessation of the pus discharge.

All the cases treated with antidiphtheritic serum can easily be brought within the limits of the therapeutic action of the three main elements in the serum. They may be here recapitulated:

1. A recuperative power acting on the involuntary muscular system in septic and non-microbic conditions.

2. An antiproteolytic element resisting the digestive action of septic organisms.

3. An increased phagocytic efficiency.

All combine to produce in suitable cases a most pronounced antiphlogistic effect, which is quickly evident.

The three stages in *inflammation*, already discussed in Chapter II., are applicable in all inflammations, by whatever name they are recognised.

Dosage generally in both simple plasma and antidiphtheritic serum is 1 drachm four times a day. In acute inflammation 2 or 3 drachms may be given at once and 1 drachm every four hours afterwards. In enteric 2 drachms may be given of the plasma every four hours. Otherwise 1 drachm four times a day is generally sufficient, but the dose may be increased to 2 drachms if found advisable. In children the dosage has been relatively higher than the usual proportionate amounts.

CHAPTER IV

CAUSES OF IRREGULAR RESULTS DUE TO THE SERUM, THE PATIENT, THE PRACTITIONER

IN all serum-therapy there is a percentage of cases which resist treatment. No reason for this failure is apparent, but there is no doubt about the fact. In diphtheria, the most successfully serum-treated infection, such cases recur again and again—this, too, in the use of a serum the therapeutic power of which can be accurately tested before being sent out for use. To those who have used large quantities there seems to be a marked difference in the value of successive lots of serum. All this applies equally to the use of serum orally for the various pathological conditions for which its use is recommended here. There is no method yet devised for estimating the value of the serum from this standpoint, and after using a large quantity of different makes and potencies, the writer feels that all serums, however equal in antitoxic power, are not equal in increasing tissue resistance. Nor is it surprising that such should be the case, for if horses vary so extensively in their capacity to produce antitoxin, it follows that there will be the same variability in the other constituents of the serum produced. Hence the variability of the dosage in the cases given; hence also at times unsatisfactory results. The writer endeavours to meet these conditions by giving the serum till it does what is required, whether much or little is used. It is well, however,

for a beginner in the use of the treatment not to run across an unsatisfactory sample, and be discouraged accordingly.

Another cause of failure partially arising out of the variability of the serum, but partly also independent of it, is the virulence of the attack and the constitutional inability of the patient to offer adequate resistance. This is a condition which rarely arises unless in conjunction with the next cause of failure.

Exhibition of serum too late in a case is the most prolific source of failure. After using everything else without benefit, after the infection has become general and the patient's own resistance is exhausted, the use of serum may succeed, but it is no fault of the treatment if it fails. By that time the nerve centres have become so devitalized that they are scarcely capable of resuscitation, and, while using serum in such a case, it is only because there is no better treatment which can be suggested.

Individual and family idiosyncrasy also materially affects results. Some have a good reaction of their own, and only require a little help to turn the scale in their favour. In others the resistance to the infection is practically nil, and serum has to do all the work, with little help from the patient's tissues. Between these two extremes all cases lie, and according as they approximate to one or other, so will be the quantity of serum required to give satisfactory results.

These are the causes producing unsatisfactory results so far as the serum and the patient are concerned, but other reasons are found in the practitioner using it.

Faulty diagnosis is one of the most prolific sources of failure. The presence of loculated pus will at once limit the benefits to be obtained; the presence of another infection than that suspected will give negative results; and to be successful in its use care must be taken to exclude those conditions which are beyond the reach of the treatment. A good method of raising a healthy prejudice against it is to do as one practitioner did, who treated a case of suppurating glands for three weeks with-

out benefit, and was strongly against its value in suppuration. Inquiry showed that he had not taken the trouble to make even a smear to see what organism he was dealing with, and he himself said he was beginning to think that it was tubercular.

Another method is to try the serum for something or another which is troubling the practitioner at the time, whether the condition comes within the range of serum-treatment or not. Failure here discourages him, and prevents him giving it a fair test in its proper field of action. There are probably further uses for antidiphtheritic serum, but it is as well to postpone the search for them till the practitioner is expert in its use in conditions in which it has proved itself.

CLINICAL PAPERS

CHAPTER V

APPENDICITIS

THE application of the principles already laid down to the treatment of appendicitis give results parallel with those obtained in any other inflammation. The same three stages are present—viz., before pus formation, during pus formation, and after perforation or incision. In the first stage the prompt and vigorous use of the serum in almost all cases so raises the resistance that the process is quickly moderated, and recovery follows. In the first stage there are two classes—the acute and the chronic—and experience has suggested the appropriate treatment for each. In the acute the symptoms require much more vigorous treatment than in the chronic, hence the more frequent exhibition of the serum.

I. Acute Cases.—In acute cases non-recurrence cannot be promised, but in chronic cases it may be said to the patient that there is every probability that the condition will not recur. There are *recurrences*, but when the serum is given properly there are no *relapses*. In the acute cases a large dose is given at once, and followed up as the case requires. The symptoms as a rule rapidly respond; pain and vomiting are soon relieved, and the patient is comfortable in a short time. The following two cases illustrate this. More acute

cases are not given, as they are all open to the objection that the patient would have recovered in any case.

(12) M. I., male, aged twenty-five, had been under treatment (in other hands) for appendicitis for over three weeks, during which he had had several relapses. He was seen in one in which he had been vomiting for twenty-four hours, and he vomited while being seen. Pain over the appendix was elicited on slight palpation, and he was weak from the previous illness. He was given 3 drachms on the spot, and 1 drachm was ordered every four hours. After the dose was given he was advised to put his basin away, as he would not require it any more for vomit. The forecast was absolutely correct, and the treatment being kept up till he had taken 3 ounces, he recovered entirely without any further hitch whatever.

(13) J. T., male, aged twenty-three, acute appendicitis; seen in the rigor, which had then lasted for an hour, and showed no signs of lessening. The pain was most acute all the time. He was at once given 3 drachms, and by the watch in fifteen minutes all signs of the rigor had gone, and patient was able to lie comfortably so long as he did not move. He had a fairly good night, and slept for some time. In thirty-six hours he could lie on his side without increasing his discomfort. On the fourth day he was much exercised as to the quantity of liquid he could drink at one time, as he was so hungry that $\frac{1}{2}$ pint of soup or milk was of little use to him. He was absolutely free from pain on the sixth day, and was allowed up and dismissed on the seventh. There was practically no convalescence. Antidiphtheritic serum was administered every four hours for the first few days, then at longer intervals, and he took in all 5 ounces.

In both of these cases the recuperative effect of the serum was well marked long before the local symptoms had shown much sign of improvement. In all acute cases it is my rule to point out to the patient that if pus is present or any foreign body, an operation will be required; but if not, then, unless

some extraordinary condition is present, a complete recovery can be expected within seven days, but that no promise can be made of non-recurrence.

The following case illustrates the use of antidiphtheric serum as a diagnostic agent in acute appendicitis after confidence has been acquired in its use :

(14) H. B., aged thirty-seven, had an acute attack of appendicitis in May, 1901, which was promptly cleared up by serum treatment. He had no sign of a recurrence since that time. On November 13, 1903, he was suddenly seized with pain in the abdomen. The pain was diffused, but severe, and when seen four hours later, the spot most tender to palpation was just above Poupart's ligament on the right side. He was given four 2-drachm doses, one every hour, as symptoms of impending rigor were beginning to show themselves. Rigor was prevented, and his temperature did not quite reach 101° . After the fourth dose his temperature was normal and pulse was 66, but, although the diffused pain had quite gone, there was still pain and tenderness over the original focus. Serum, 1 drachm every four hours, was continued till the evening of the next day ; but the pain persisted, although pulse and temperature were normal or subnormal for the whole day. There were little cramp pains now and again, but no vomiting. Bowels were constipated and enemata only brought away hard scybala, so that a partial obstruction from adhesions was at first suggested as a diagnosis. Thirty-four hours after the initial attack a consultant was called in, who, seeing a patient with no temperature or pulse above normal, no vomiting, and a pain which might be much or little according to the temperament of the patient, gave it as his opinion that operation was quite unnecessary—at least, at that juncture. The writer's view was that the serum having been pushed for thirty hours, and this pain being left while all the other pain had gone, and there being no suspicion of abscess, the pain left must be of a mechanical origin, and required a mechanical remedy. Opera-

tion, therefore, was the remedy to see what the condition was, and, if possible, remove it. If section was done, the appendix was to be removed in any case. This was done, and the cause of the trouble was found in the appendix in a fæcal concretion the size of a horse-bean, which would have ulcerated through in a very short time. The diagnosis of a mechanical cause was therefore confirmed by the condition found. There was absolutely no shock after the operation, and the pulse was the same in rate and character after it as before. The serum was continued every four hours for a few days, then at longer intervals, and the recovery was of the most rapid and satisfactory character. In twelve days he was dressed and downstairs, as though nothing had happened to him. The patient was a very catarrhal subject, and although he had neither nausea nor vomiting for five hours after the operation, he then vomited a considerable quantity of bile. He had a gastric catarrh, and for a day or two the serum was administered *per rectum*, while the catarrh, which was outside the range of serum treatment, was quickly improved by appropriate drug treatment. The catarrh afterwards spread to larynx and pharynx, but finally disappeared about eight days after operation. The details are given more fully, as this is the first case in which the serum was more fitly given rectally than orally.

II. Chronic or Relapsing Cases.—Here antidiphtheritic serum has been uniformly successful. Not that every chronic is completely restored to his original conditions, for to do this would require that the treatment should remove long-standing adhesions, which no medicine is capable of doing. But what is meant is that these old catarrhal cases, which never quite lose the appendicular pain and discomfort, and which have frequently recurring more acute attacks, may have the pain entirely removed and the whole condition cleared up. Their future comfort depends on what adhesions have been formed during the course of the appendicular affection. It is surprising to find amongst such cases how few there are who,

after treatment with serum, have much trouble with adhesions ; and if they have, they are in a better position for operation than before treatment.

The following case is interesting from its origin, as the streptococcus seems to have transferred its energies from the skin to the appendix :

(15) Mr. T., railway porter, aged fifty, had had a severe facial erysipelas eight years before being seen. It did not recur, but from that time he began to have recurring attacks of abdominal pain, which became more severe as the years went by, until for the last two years he was never free from pain, and the acute attacks were recurring every fortnight. He had consulted many surgeons, had lately spent eleven weeks in bed under treatment, and in the last two years had lost six months' work from his illness. He dieted himself very carefully. The pain during the intervals was often so great that he could not bear the weight of the bed-clothes.

When seen there was no difficulty in diagnosis, as both appendix and a fair surrounding area of peritoneum were very painful and tender to palpation. So tender was it that, although the examination was very carefully made, it gave so much pain that he could not sleep that night.

Treatment was begun on November 12, 1900, and he was given 3 drachms per diem, had his bowels opened, was put on liquid diet, and confined to bed. On the morning of November 21 he was dismissed free from all his symptoms, and he has had no recurrence. He mended from the very first, and before being dismissed was very severely tested, but without eliciting the slightest sign of pain.

He was warned that he might have occasional pains from adhesions, and those he had, but they were nothing to speak of and have disappeared long ago. A month later he was strong enough to work twenty-two hours per diem for several days at a stretch. September 3, 1904 : Seen to-day and found him perfectly well, and has been so ever since.

The next case is of similar character, but in it we have the staphylococcus.

(16) Mr. W., miner, aged forty-seven, had repeated crops of boils between two and three years ago, and soon after they ceased he had a smart attack of appendicitis. He was under treatment for it for six months, during which he had five relapses, each due to some slight exertion. Since then they had been recurring, and he had been unfit for any heavy work, as the exertion brought on the pain.

When seen there was tenderness on palpation over the appendix and surrounding area, which reached to the umbilicus.

He had the same treatment as the last case, and on the sixth day a colleague saw him. He got his history, carefully examined him, and said that the case was undeniable, but he could not understand how antidiphtheritic serum could do it. That is now two and a half years ago, and the patient has ever since been in the most robust health, and has been hard at work since being dismissed.

The following case may be called one of appendicular colic from the extremely acute character of the attacks. Between them the patient was never free from dyspeptic and nervous troubles, and the tenderness in the appendix could always be felt on palpation.

(17) Mr. C., stenographer, aged twenty-eight, was sent to me by a colleague for treatment, as he considered him a bad subject for operation, and thought it better to try everything before operating. He had had ten attacks during the last nine months, and from one who worked along with him I learned that he was like a maniac when the attack came on. Another surgeon during an attack diagnosed appendicitis, and wished to operate, but patient would not consent. He was one of my earliest cases of chronic appendicitis (about six years ago), and in those days a compromise in treatment was sometimes allowed. He had just had an attack, and for three days he

was given 2 drachms per diem, and allowed to go to business, but to do as little walking as possible. Then he laid up from Friday till Monday, the same dose being given. He had just $1\frac{1}{2}$ ounces in the six days he was under treatment, and on the seventh night he travelled 200 miles and went straight on with his work. He had a slight return a month or two later, but a renewal of the same treatment finally cured him. While under treatment he said he felt he was getting better in a different way from his previous experience, that his digestion and abdominal discomfort were clearing up, and he was encouraged to go on. No further recurrence since (five and a half years).

(18) Mr. M'K., farmer, aged thirty-seven, treated in April, 1901. He gave the usual history of recurring attacks of pain over appendix, with digestive disturbance and abdominal discomfort extending over a period of eighteen months.

There was pain on palpation over the appendix, and he was put on the usual course of treatment. By the sixth day he was entirely free from all pain, even on firmest pressure, and was dismissed at the end of the usual seven days. He left for his home in the country next day. He has had no recurrence, and instead of being afraid of exerting himself, and so bringing on an attack, he has gone about his work as he did when well, and he has been up-country shearing, and living on salt pork and other food of a like character without the slightest inconvenience.

(19) Mr. P., aged twenty-eight, hotel-keeper, has had five attacks during the last five months. His first attack was four years ago, and they have been recurring at intervals ever since. Examination showed pain in appendix, but no peritonitic extension. He was given the usual treatment for seven days and dismissed well. The pain in this case was gone on the fifth day, and two years later he had had no recurrence.

The next case is one of the few chronic cases which have

shown any sign of recurrence, and then there was no absolute proof of it.

(20) Mr. J., aged fifty, was one of the first cases dealt with, and he was only treated for five days, and in all had only 10 drachms of the antidiphtheritic serum. He was then carefully examined by a colleague and myself, and found to be quite free from all sign of pain, even on deepest pressure. He was also tested in lacing up his boots, bending double, stepping up a height quickly, etc., all of which he could not do before without pain, but now were done easily. The acute attack had happened a year before, and as he was not a good subject for operation he had been forced to suffer.

About a year later he came to town for the Commonwealth celebrations, and after seeing the whole thing through for a week he came to see me just before he left for home. He said that the week's running around had done him good, and examination suggested that any tenderness arose more from adhesions than anything else. For precaution's sake he was given another course at home, and has since done well. Even if such a case had to lay up for a week every year to insure comfort for the rest of the time, it would be a good investment.

The course of treatment recommended for such cases is as follows: Absolute rest in bed for seven days; fluid diet all the time; bowels opened well the first day; 1 drachm four times daily till pain has quite gone, but not less than eight days. Sometimes the pain and discomfort seems to be increased for the first day or two, probably from the aperient, but it soon passes off and by the fourth to the sixth day the pain has all gone, and the patient is clamouring for solid food.

To give more cases would be to repeat what has already been said, but the same can be said for the chronic as for the acute cases, that no case has been seen which has resisted the treatment, and the patients have received no other.

The following case of chronic relapsing appendicitis of five years' duration seems worth recording :

(21) Miss L., aged thirty-five, has been suffering from recurring attacks of appendicitis for the last five years, during which time she has never been quite free from pain. She has had to lie up for several days every two or three weeks, and each attack left her very weak. Her diet had to be regulated very carefully, and at best had to be of the lightest. Any exertion brought on an attack. She also had a chronic inflammatory condition of the tarsus of the right foot.

When seen, considerable tenderness over the appendix was complained of on light palpation, and there was no doubt of the diagnosis. Her own advisers had strongly urged operation as the only possible treatment for the condition. As her mother had died under operation, she naturally refused the advice. She was put on 4 drachms per diem of antidiphtheritic serum in four doses of 1 drachm, and this was kept up for eight days. In all she had 4 ounces, and the extra quantity was given to make sure of such a long-standing case. At the end of that time all difference in tenderness of both sides had gone, and the patient herself after the sixth day could not, by the most careful examination of herself, find a trace of her old enemy. The tarsal condition had similarly improved.

Her own attendant, who wrote and received particulars of the treatment, in his next letter wrote : 'You certainly seem to have wrought a good work on Miss L., and I feel tempted to try the serum on a patient of mine.'

When the appendicular pain had gone there was still pain in the right rectus muscle, but the elimination of the appendicular pain by the treatment and its failure to touch the rectus pain led to the diagnosis of myalgia, and appropriate treatment was rapidly successful.

Two months later she wrote saying that there had been no return either in appendix or foot, and the latter had been very thoroughly tested without the least sign of recurrence.

Twelve months later she wrote to the same effect.

The following report is from a surgeon, and speaks for itself :

(22) '*January 23, 1904.*—Patient has now had three acute attacks of appendicitis, the second one being very severe, and the last occurring only last week. There is considerable thickening about the region of the appendix and pain on deep pressure, which can also be elicited on rectal examination. I have advised operation as soon as possible, for from my own experience and that of others I think it essential. Parents, however, are very averse to operation, and have heard that you could cure him in a week's time if I were willing to carry out your instructions. I am willing to do so.

'*March 12.*—I thought it better to wait till I examined him again before writing. He came in to see me a few days ago, and looked in splendid health. His appetite is good, and he has gained in weight. I carried out your instructions as to treatment, and the patient rapidly improved. The induration and tenderness soon disappeared. On examination the other day I found a normal condition. I feel satisfied that the serum did its work well, and I must thank you for your courtesy in directing me in the case.

'*December 1.*—Report to-day that patient has kept in splendid health ever since.'

III. Cases with Pus.—In each stage of the disease antidiphtheritic serum has its sphere well marked, and in each it can do solid work. Where the pus is loculated, and there is no immediate danger of its rupture, then antidiphtheritic serum should be given freely before operation, so as to reduce the surrounding inflammation, increase tissue resistance, and generally prepare the patient for operation. In doing so it must always be remembered that antidiphtheritic serum in many cases seems to hasten the maturation of pus collections, and ordinary calculations may thus be upset. But in any case the administration of antidiphtheritic serum should go hand in

hand with the necessary operative measures, for if it is specific for raising the tissue resistance to the infection it will do work that the surgeon cannot do, and by thus supplementing his work help to save his patient and enable him to reap the reward of his surgical skill. And the benefits by no means cease after the operation is over. What surgeon is there who has not wished with all his heart for a remedy which would enable him to overcome the peritonitic attack which has so often snatched from him the legitimate fruits of his work? Next time let him give antidiphtheritic serum as for acute peritonitis as soon as he sees the first signs of the attack, and see what it will do for him. But in any case operated on in the acute stage it would be better to give it both before and after, and so prevent much trouble. But, besides peritonitis, there are other post-operative troubles which are lessened or overcome by antidiphtheritic serum. The recuperative power of the patient is increased in a remarkable way, so that he rallies and heals in half the time he would usually take. One more result is the hypnotic effect of the treatment in all cases where its action is otherwise specific, and in such as we are now considering it is well marked. This effect is a perfectly natural one, and is the result of its specific action on the infection and the relief of pain, etc. This alone is no slight boon.

(23) Mr. S., aged thirty-five, has had occasional abdominal pain for the last month or two. Three days before being seen the pain returned, increasing steadily in intensity, and localized over McBurney's point. The pain prevented him from sleeping, and he vomited everything he took. When seen (January 21, 1903) at 9 p.m. his temperature was 99.8 and pulse 66. Pain on palpation was not very great, and did not extend over any distance around, and he lay with his knees drawn up. It was felt more below McBurney's point. He was given 1 drachm every hour for three doses and then every four hours.

January 22.—Mid-day temperature 100, pulse 66, pain less, and patient had his legs down. He had been able to extend them after a few hours' treatment, and vomiting had gone after the first dose. At 3 p.m. he had a sharp rigor, and by 8 p.m. pain around the appendix had become extremely acute, and it was evident that perforation had taken place. Antidiphtheritic serum was then given: one dose ($\frac{1}{2}$ drachm) at once, another in ten minutes, then thirty minutes' interval, then forty, while arrangements for operation were made, for patient lived three miles out.

January 23.—Seen at 1 a.m., and found him easier, with a fine reaction, good pulse, and able to be moved into hospital. He had only vomited once since the perforation occurred.

Operation was done at 4.45 a.m., and appendix was removed. It was found to contain a cherry-stone, which had sloughed through, causing the perforation and free escape of fæces on to the peritoneum. It was very foul, and was cleared up as well as possible by swabbing. The wound was half-closed, and three packing-plugs left in. By a misunderstanding, he had no antidiphtheritic serum for twelve hours after operation, and in that time he had a sharp rigor, and his temperature had run up to 103. It was rapidly falling again when antidiphtheritic serum was begun. He was given a dose every hour for three doses, then every four hours. No other untoward symptom followed; the pain which had begun to radiate above the wound and round the back was very quickly overcome, and in forty-eight hours his case had become so uninteresting that notes on it were discontinued. He made an uninterrupted recovery.

There was no doubt as to the part played by antidiphtheritic serum in limiting the trouble to such an extent and in so rapidly clearing up the whole condition. What was given before operation prepared the patient by relieving the actual inflammation present, by preventing the further spread of the

infection, by the relief of pain, and the minimizing of shock. Afterwards it continued the same good work.

The cases given are only what are required to illustrate the points discussed. The writer's own practice is to give all cases of appendicitis serum treatment from the first, but in each stage of the disease for a different purpose. In the first stage to clear up the attack ; in the second to mitigate the symptoms, increase the patient's resistance, localize inflammation, and fit him for operation ; and in the third to so maintain his strength and specific resistance to septic infection that his recovery will be assured.

In a case in which it is doubtful as to whether pus has formed or not, the temperature and pulse are the guide. If they do not improve, or if the pulse does not lessen, even though the temperature falls, then pus is probably present. In the cases mentioned, one with faecal concretion and the other with a cherry-stone, the first lost all temperature and pulse, and only had an occasional pain, with little or none on palpation. His case was seen early, and no ulceration had taken place, hence relief to all symptoms. The other, seen at a much later stage, while being relieved of his pains very largely, did not lose his temperature or pulse, and in his case perforation was almost complete before the serum was begun. Where loculated pus is present the local symptoms generally become more marked day by day, but this largely depends on the amount of tension in the loculation. Where tension is slight the relief of symptoms rather masks the gravity of the case, and this is sometimes a real difficulty which has to be carefully watched.

CHAPTER VI

ASTHENIA IN CHRONIC DISEASE

SINCE the action of antidiphtheritic serum on the unstriped muscle was understood several cases of asthenia of varied ætiology have been under treatment, and as they all presented a picture of exhaustion of the plain muscle it was resolved to test them with the serum, and see what results could be obtained. In doing this the writer was encouraged by notes on a case of malignant disease of the œsophagus and stomach, which he had treated in the early days of serum treatment, with results as detailed below. The first case of the new series was as follows :

(24) J. B., aged sixty-two, had been suffering from malignant disease of the stomach for some months, during which he had run the usual course, and all the more rapidly as he had refused all medical advice. When seen his general condition was desperate, his red corpuscles had fallen to 2,400,000, and what were present were in varying stages of disintegration, and the serum was full of the débris of broken-down cells. The leucocytes were in a like condition and proportionate in number (about 4,000), and the whole blood-picture was that of a system which had given up the struggle and was flickering out. His plain muscular system was in the same condition ; his cardiac dyspnœa prevented him from lying down and threatened a fatal termination at any moment ;

his stomach was so irritable that little or nothing could be retained ; and his bladder had so lost its tone that it was only after long-continued effort that he could relieve himself, while its irritability demanded micturition very frequently. With it all there was continuous pain, which had for months made his life a burden to him. Cardiac tonics and other appropriate treatment were tried for a week, but the condition was not in the least improved, and then it was resolved to cease all other treatment and see what the serum would do for him. During the six weeks which followed before his death he took about 4 drachms every day. All this was not required, but he had obtained so much relief that he insisted on having it up to the very last. The result of the serum was seen in forty-eight hours. The cardiac distress was about the first to be affected, and he was soon able to lie down and sleep peacefully, and all the attacks of dyspnoea disappeared, vomiting and gastric irritability were rapidly relieved, and only a very occasional vomiting was seen. His bladder recovered tone, so that he could micturate with ease, and the irritability was very much improved and gave him rest at night. A fortnight after the treatment was begun a blood examination gave a red count of 2,700,000 and a leucocyte count of 15,000, while the red cells were much improved in their quality, and the serum was free of the *débris* which was so marked a feature in the first examination. He had occasional intestinal hæmorrhages both before and after being seen, and a fortnight later, after one of these, his leucocyte count had risen to 32,800 and his red-cell count had again fallen to 2,400,000 with a corresponding deterioration in quality. All pain had gone after three days' treatment, and it did not recur, nor did he require anything else for it. His strength gradually failed, and he literally fell asleep after six weeks' treatment.

(25) T. R., aged sixty, secondary anæmia and exhaustion from malignant disease in the epigastrium. The red-blood count was 3,600,000, the white 9,000, and the hæmoglobin

45 per cent. There was occasional vomiting, and sometimes it was of the characteristic 'coffee-ground' colour. Pain was beginning to prevent sleep, cardiac debility was increasing, and the patient's strength was failing when antidiphtheritic serum was administered. For the first two days he had plain horse serum, 1 ounce per diem, and his leucocyte count was then taken. The serum had made no difference in the leucocytes nor in his condition, and he was then given during the next four days 2 ounces of antidiphtheritic serum. At the end of that time his white-cell count had risen to 15,000, with other decided evidences of vigorous reaction. He felt better, slept better, his cardiac condition was improved, and he had much less gastric discomfort. The test being successful, it was resolved to discontinue the treatment for a little till the patient was in more urgent need of help. Ten days later he had marked melæna, after which he fainted. Severe vomiting then set in, and the patient became much exhausted. He was at once put on antidiphtheritic serum orally, and in twelve hours he had materially rallied, and during the next few days all his symptoms, except his weakness, disappeared, and he was free from pain which the vomiting had greatly aggravated. He slept like a child, and was better all round. Two days later he had a cerebral hæmorrhage, to which he succumbed.

The following case was one treated early in serum treatment, and the success which was obtained in it suggested that the serum might possibly have a curative effect on the disease itself. Such has been proved by careful tests not to be the case, and it is evident that what action the serum had on the disease was due to its capacity to influence the involuntary muscle which was affected by the carcinoma.

(26) J. H., aged seventy-two, malignant disease of the œsophagus and stomach. The œsophagus was obstructed in the middle third, so that there was considerable difficulty in passing even liquids down. Pain was a marked feature of the case, and patient could not rest day or night for it. There

was also vomiting, or rather attempts at vomiting, for the vomit came up to the obstruction and could not pass it, and was returned to the stomach. Patient had been a very strong, healthy man, and there was no cardiac debility, but micturition was difficult and took a long time. For three months he had a morning and evening dose of 1 drachm. He entirely lost his pain in a few days, the œsophageal obstruction gradually yielded, and he was able to swallow much better, and his bladder recovered its tone so well that his wife said that he micturated as easily and quickly as he used to do thirty years before. Towards the end of the three months a fresh obstruction arose at the cardiac end of the stomach, and for this a few hypodermic injections of the serum were tried. He complained greatly of the pain, both in the injection and in the affected parts, and refused to allow any more to be given. From this onwards he had no further treatment. He lived for four months free from pain, and gradually faded out, with only one small dose of morphia on the day he died.

(27) W. B., aged fifty-nine, in failing health for two years, without at first any definite anatomical lesion. Latterly loss of power in the lower limbs was noted, and this slowly increased until the patient had considerable difficulty in getting about. He had a history of specific disease over thirty years before, and his symptoms were much improved by a treatment directed to this until he developed an intolerance to all iodine or mercurial compounds, and they had to be discontinued. His general debility increased and he became anæmic, had cardiac dyspnœa, irritable stomach, pain after food, could not lie down at night, and his feet became œdematous. A cough of cardiac origin gave him a good deal of trouble, and it was much relieved by suitable cardiac stimulants. He became irritable in himself, and altogether he looked as hopeless a case as possible. There was nothing to suggest that serum would be of any benefit to him until he went to the seaside for a change, where his symptoms became worse. As

there was plainly present an involuntary muscular exhaustion, similar to that arising secondarily from malignant disease, it was resolved to interrogate the case with antidiphtheritic serum, and see if it would meet the conditions present. The report was favourable from the very first. He was able to lie down and sleep all night, the gastric pain completely disappeared, and the other dyspeptic symptoms were materially alleviated, the œdema of the feet rapidly improved, and altogether the patient showed a reaction which had been unobtainable from any of the previous varied treatments. No blood count was taken before the treatment, so that comparisons cannot be made, but if general appearances can be trusted the change must have been well marked. The serum was discontinued after he had taken 3 ounces.

CHAPTER VII

ARTHRITIS DEFORMANS

THE writer was led to test antidiphtheritic serum in the treatment of this refractory disease by the results of the use of the serum in a case of it which he had diagnosed as chronic rheumatism. The improvement was apparent. Then the correct diagnosis was made, and it was seen that this disease, which is generally incurable, could be benefited by the action of the serum. The cases treated soon showed that it was only in those in which inflammation was present that the serum was of any value. This was invariably removed, but the rheumatic or neuritic part of the disease was untouched. However, the removal of the inflammation before the joints had entirely ankylosed enabled the patient to retain movement, and its prevention of the extension of the inflammation to other joints prevented the patient from further progress downhill—at least, with the same rapidity as before. The case, free from inflammation, was capable of medicinal and massage treatment, which in its previous condition were quite useless, and, in the case of massage, positively harmful. Relapses occurred, but seldom within six months of the last treatment.

The three pains found in this disease are : (1) a constant pain, movement or no movement, and on palpation of the joint ; (2) a shooting pain in the joint ; (3) pain on movement and stiffness, with paresis.

The first two are inflammatory, and are the pains which are benefited by serum treatment; the other is what is left after serum has done its work. Twelve to fourteen days' treatment (1 drachm four times a day) is generally required to thoroughly clear up the inflammation.

The following was one of the first cases treated, and it is a good example of the tendency of the disease to recur even after antidiphtheritic serum has cleared up all inflammatory trouble.

(28) Mrs. B., aged thirty, had suffered from rheumatoid arthritis for two years, during which she had been under various practitioners privately, had been three weeks in hospital, and had attended another hospital for nine months as an out-patient, and from all she had been discharged as incurable. She was run down in health, depressed in spirits, and unable to do anything for herself, as her feet, ankles, elbows, and wrists were all affected. The joints were swollen, hot, and tender to touch; the pains kept her awake at night, and she was going from bad to worse. All three varieties of pain were present. There was very scanty menstruation, amounting practically to amenorrhœa, and menstruation always affected the symptoms adversely. Sexual desire was entirely lost, and disinclination caused trouble in the family. She had had a severe financial loss just before the symptoms were first seen. She was given antidiphtheritic serum—2 drachms per diem for ten days—and at the end of that time she was practically free from pain. She had a little tonic treatment, and was then dismissed.

Six months later she came with a recurrence, had the same treatment, and again recovered.

Eighteen months later she attended her own 'lodge' doctor, and was treated for some time without effect. She then had another course of antidiphtheritic serum for twelve days, which gave her complete relief from all her inflammatory pain. The night pains which she dreaded were completely removed. She was sent back to her own attendant, who candidly admitted the

result to be as stated, but why antidiphtheritic serum should do such a thing was beyond his comprehension.

An attempt to influence the scanty menstruation was made with ovarian substance, but it did not agree with her, and did no good. She found that when she had recovered after the use of antidiphtheritic serum her menstrual flow was increased in quantity. She has recently borne a child.

In taking up a case, it is customary with me to make clear to the patient what may be done for her, pointing out that she will not be free from pain when the treatment is over, but that she may reasonably hope for relief from the continuous pain which prevents sleep, and be able to get a reasonable amount of rest at night, broken only now and then by having to move the limbs affected, which have become stiff with lying in one position for a length of time. It is also well to differentiate sharply between the neuritic and the inflammatory pains, and to keep the patient up to it all the time, for a pain that is gone is swallowed up by one that is present, and the patient having lost the inflammatory, but still having the neuritic, is apt to turn round and say that she has as much pain as ever. If she has never been allowed to forget the inflammatory pain, she will not be so well able to do this.

(29) Mrs. J., aged sixty, lost her husband about two years ago, and afterwards had a fracture of the lower third of the left femur, which was so badly put up that the leg was quite 3 inches short. This led to more weight being laid on the other leg, and the knee began to give her trouble by swelling and pain. With this, however, she had rheumatoid arthritis, well marked on her hands, which she could use but little, and which were very tender on palpation. The inflammatory pain and the neuritic were present, and it was pointed out to her that the first could be removed, but that no promises could be made about the other more than that it would probably be more easily treated after the removal of the inflammatory than it would be while the two were there together.

She was given in all 6 ounces, of which 2 ounces were given at a period subsequent to the first course of 4 ounces. She thought that the pain was returning, and as she could afford it, the extra quantity was given. The effect of the treatment was seen in a few days, when she began to have better nights, and palpation of the joints gave much less pain. When it was finished, all the inflammatory pain had gone, and she was much better in every way, except that she was inclined to make much of the pains which remained, and to ignore those which had gone. She was then put on syr. acidi hydriodici (Gardner) $1\frac{1}{2}$ drachms three times a day before meals. This she took for some time, and it did her good, so that, in spite of the maimed condition of the other leg, she was able to get about much better than she had been doing for a long time. Her general health was much improved, as would naturally result from getting sleep and freedom from the constant pain, and her spirits and mental outlook were much brightened. She has retained all the benefits.

In some cases the inflammatory pain is of so severe a character that it quite shuts out all other pain till it has been removed, and then the patient has so much relief that she is not at first ready to grumble at what is left. The following case is an example :

(30) Mrs. C., aged sixty, has been suffering from rheumatism (?) for the last year in her hands, elbows, and knees. She has now (June 12, 1902) been in bed for six weeks with her left knee, which has been so painful that she could get no sleep with it, but during that time her fingers and elbow improved. Before being first attacked she had lost her husband, and had knocked herself up nursing him through his last illness, which was of a protracted character.

All three pains were present, and the case was one of rheumatoid and osteo-arthritis. The joint was swollen and painful to touch, and the internal aspect of the head of the tibia was extremely painful—'like a boil,' the patient said—

and it was this pain which had kept her awake for so many nights.

She was given a saline to open the bowels, and antidiphtheritic serum 1 drachm three times a day.

She improved from the very first; she slept the second night; the pain steadily lessened, the joint gradually reduced, and she was dismissed on June 21.

The constant pain, the shooting pain, and the enlargement of the joint were all removed; but the neuritic pains in the limbs were only improved, and she was very weak on her legs. With it all she was thankful for so much relief. She took 3 ounces.

Massage has been much used by the profession for this disease, but the writer has yet to see a case which has benefited in any way from massage given while the inflammatory condition is still present in the joints. It is, to say the least, unusual to suggest massage in inflammation of any other part, and why this disease should be an exception is as yet unknown to me. All that it has ever done to the patients who have afterwards fallen into my hands is to aggravate a condition well-nigh intolerable already, with no compensating benefit. The case is entirely altered when the inflammation has been removed, and only the stiffness and neuritic pain is left, and much good can then be done by a skilful masseuse. In the more recent cases syr. acidi hydriodici (Gardner) in my hands has given further benefit to the neuritic conditions after antidiphtheritic serum has reached the limit of its action on the process. The dose used is $1\frac{1}{2}$ drachms t. d. s. half an hour before meals. When the cases have gone on to ankylosis, etc., no treatment seems to be of any use, and antidiphtheritic serum fails with all other treatment.

The next two are cases which had progressed considerably before being seen, and which did very well under the treatment, regaining a good deal of movement by the use of massage after the antidiphtheritic serum had done its work, but which did not

retain all the benefit obtained after all treatment was stopped. Of course, if they could have continuous massage they might improve, and retain the improvement ; but few can afford such prolonged attention, and as soon as the masseuse leaves they cannot bring themselves to do the exercises which she insisted on, and the result is that the old stiffness returns, and gradually they relapse into a condition little better than that from which they had just emerged. As a rule, however, such cases do not so readily have a recurrence of the inflammatory element, as in them we have only anticipated its voluntary departure, which is usual after the case has been of some years' duration.

(31) Mrs. O., aged fifty-six, widow, lost her husband, and had severe financial trouble seven years ago, when she was just past the menopause, and she first noticed the arthritis at that time. Now it affects both knees, right elbow and right hand. The pain is not very great, but weakness in the legs troubles her most. The constant pain is present, and the joints are tender to palpation. Crackling in joints on movement, and evidently bare bone. At the climacteric she had menorrhagia for six or seven months, with sudden cessation on her bereavement.

She was given 2 drachms per diem and a mixture containing strychnine and cinchona. In all she had 3 ounces, and at the end of a fortnight the report was that there was no pain in the joints, which could be handled freely, and that she could get about with little or no help. The best evidence of improvement was in the way she could rise from a chair, a feat which was next to impossible to her before she had the treatment. She then had a course of massage by the same masseuse who treated her some years before when inflammation was present, but which only aggravated the existing misery and did no good. Now, however, the massage was of great benefit to her, and she was soon able to go out for a walk for a short distance. Her general health also greatly improved, and she looked years younger. A year later she had lost a great deal of the benefit

she had obtained, and had become stiffer and less able to move herself, but the inflammatory pain had not returned, and she was thankful to be able to sleep at night.

(32) Mrs. T., aged fifty-one, a sister of the last patient, who had suffered in the same way for the last six years. The symptoms were first felt when the menopause was beginning to show itself, and during this time she had profuse hæmorrhages. Since then she has gone from bad to worse, and more especially during the last three years, since the catamenia entirely ceased. All three pains were present, and the inflammatory was very marked, and prevented sleep or rest. All treatment—hot-air, massage, etc.—had failed to benefit her in any way, and she was a difficult case. She looked a delicate woman, and had left England for recurring attacks of quinsy. Depression was caused by grief and loss. Both feet, ankles, knees, wrists, and elbows were affected, and also the cervical vertebræ. The right elbow was ankylosed. Synovial pain was very acute, and there were some painful spots on the bones, more especially of the knees, and some creaking of the joints. She was put on 2 drachms per diem, and was also given a strychnine and cinchona mixture. For ten days she did very well, and then for ten more she seemed to make no further progress, and finally it was only after a month's treatment that massage could be given. By that time she was sleeping much better, and expressed her relief at being rid of the night pains and being able to lie at peace when not moving. She could also stand firm pressure on the joints, at which at first she would scarcely let me look. Her general health also much improved, and she was able to get around the garden. Massage then helped her greatly, and a fortnight later it was noted that she was moving much more freely and with greater comfort to herself.

This case also lost a great part of the benefit obtained from the massage, but I have not heard whether the inflammatory pain had returned.

One more case may be added to show the influence of menstruation on the disease.

(33) Miss S., aged thirty-two, had arthritis deformans for eighteen months, had various treatments, but all without avail, and had become despondent about it.

Right hand was almost powerless, the right wrist was hot and swollen, the swelling extending up the thumb, and all very painful, also on the joints of the next two fingers and on both feet. She was put on antidiphtheritic serum (2 drachms per diem) on July 5, 1900, but not only did not improve, but became worse for the next few days. On the 11th she reported the catamenia present and improvement all round, and she was also better in her general health. On the 13th antidiphtheritic serum was reduced to 1 drachm per diem, and on the 23rd, as she was practically well, it was stopped, and she was put on syr. acidi hydriodici 1 drachm three times a day. From the 27th she began, at first slightly, then on the 31st more plainly, to retrograde, and continued to do so till August 4, when the catamenia came on, and once more she improved as soon as it was past. As she had very scanty menstruation, she was given the negative pole of the galvanic current in the uterus, but she would not persevere, and after two or three applications she gave up all treatment and passed out of my hands.

Antidiphtheritic serum is now given in this disease four times per diem until some marked effect is seen, then reduced as may seem fit.

The writer does not advocate the serum as a specific for a disease which is the despair of the profession, but by its use he has been able to do for it more than is claimed for any other treatment, or that he has been able to get by any other means. The results obtained go a long way to elucidate the pathology of the disease, and show plainly that in it we have a complex problem, and not a single pathological entity.

CHAPTER VIII

BRONCHO-PNEUMONIA

BRONCHO-PNEUMONIA is not often a primary disease, but seems to stand in the same relation to bronchitis as a septic addition to what is called simple inflammation. The writer's usual treatment for bronchial catarrh with fever is guaiacol carbonate in doses of 8 to 10 grains every three hours for an adult and in proportion for children, and it seems as specific for the condition as any antitoxin could be. When, however, the ratio between pulse and respiration alters, and is three or two to one instead of the normal condition, then, even although the temperature has not risen, the writer treats the case as a broncho-pneumonia, and gives antidiphtheritic serum. When the case has been seen early and treated through the bronchitic condition with guaiacol, the result of the antidiphtheritic serum treatment is very satisfactory. When the case is not seen till the infection has obtained a good hold, the result is a much longer course of treatment and a much more gradual declension of the symptoms. In any case, whether late or early, antidiphtheritic serum in the writer's hands has proved a sovereign remedy, and since adopting it he has not lost a single case.

In some of the cases the cerebral conditions were well marked, as in the following :

(34) Baby C., twelve months, female, had a feverish

bronchial catarrh, with a temperature of 102° . Next day temperature was still the same, and she did not look so well. She was ordered guaiacol, but six hours later she developed most acute symptoms of broncho-pneumonia, with râles all over both lungs. Temperature 104.5° , pulse 156, and respirations, 120. She was like a dog panting after a long run. Antidiphtheritic serum 20 minims every four hours for three doses, then $\frac{1}{2}$ drachm in six hours. Eighteen hours from first dose temperature was 99.2° , and child was taking notice. Antidiphtheritic serum was continued, and it was noticed that if the interval between the doses was made too long the patient began to fail, but immediately revived when the dose was given. Next day temperature was normal, and patient was dismissed.

(35) Mrs. A.'s child, aged three years, had had broncho-pneumonia for five months, and his life was despaired of; but he made a partial recovery, and then had an acute attack. He was first seen by me in this last attack, and he then had a temperature of 103.4° , and was given 1 drachm night and morning. In three days he was normal, and made a perfect recovery. His previous medical attendants all agreed that he would never do well, but since that attack and treatment he has never had a relapse and has grown into a fine strong child.

The foregoing are examples of cases seen in the earliest stages. The following may be added as a further example of the same :

(36) H. M'B., aged three years, had a feverish cold for a few days. He had post-nasal conditions and enlarged tonsils, and was a child of delicate constitution. One morning he was found much worse, temperature 102.4° , and all the symptoms of the septic infection. He lay like a log, taking no notice of anything. He was given 1 drachm night and morning. Next morning he was much brighter, and responded freely, and his temperature was 101° . Treatment was continued, and the

next day his temperature was normal and his trouble had shrunk to a common cold. He had had a smart attack of broncho-pneumonia some time previously, which had lasted for weeks.

One of the most prolific sources of broncho-pneumonia is measles. The writer treats measles from the first with guaiacol carbonate which has no effect on the measles itself, but which has complete control of the catarrhal symptoms. The consequence is that as soon as the actual measles attack is over the patient is well, and the convalescence is of the shortest. The treatment anticipates and prevents the catarrhal sequelæ, and thus robs the disease of most of its malignancy. Shortly, the patient has measles and nothing else. The dosage is 8 to 10 grains every three hours for adults, and in proportion for children.

(37) Baby B., sixteen months, at all times a bronchial subject, and just recovering from measles. Patient's cough was constant, short, and dry; temperature was 101.6° , respiration 60, pulse 174, and the diagnosis was broncho-pneumonia. Antidiphtheritic serum 1 drachm twice a day.

Two days later (June 21, 1900) patient was a trifle better; temperature 101° , pulse 145, respiration 64; cough was not so frequent, and pulse stronger, but the child looked very ill.

June 24.—Patient improved, temperature 99.8° ; too cross to get pulse; slept for some hours last night very peacefully, and taking food better. She has something like a furuncle on her thigh, but no inflammation in it.

June 27.—Patient rapidly improving, temperature 98.4° , cough still troublesome at night; stopped antidiphtheritic serum, and gave guaiacol carbonate 1 grain every two hours.

June 30, 1900.—Dismissed in ordinary health.

The following case did not come to hand till it had made some considerable headway.

(38) Baby A., eight months, male, had a cold for some days, and had been treated by a chemist until he had become too ill for him to risk it any longer. Broncho-pneumonia all over the right lung; temperature 102.2° , pulse 180, respiration 90. Patient lay practically unconscious, rolling his head from side to side, and moaning with the cerebral pain. This was on August 26, 1902.

Antidiphtheritic serum, $\frac{1}{2}$ drachm every four hours, was given regularly night and day, and patient's condition improved from the very first. The temperature gradually fell; he began to take notice of those around him, and on August 31, his temperature was normal. Next day it was 100.4° , but treatment being continued for another day, it fell to normal, and continued so. No other treatment, either internal or external, was given until the patient was on the way to perfect recovery. He then had a few guaiacol powders, which were followed by cod-liver oil and hypophosphites.

In the following case the patient had all the symptoms of broncho-pneumonia, but the respirations were much slower than usual in such cases.

(39) Doris M., aged ten years, a pale, delicate child who has had otorrhœa since she was nine months old, along with which has been associated a bronchial condition which has given her frequent trouble. Two years ago the writer gave her 3 ounces of antidiphtheritic serum to try and clear up the otorrhœa; but although it removed the odour and generally improved it, the otorrhœa remained. From that time until now the bronchial attacks ceased.

For some time before this last attack the ears had been giving more than the usual trouble, and to it was added a bronchial attack, which soon developed into an acute broncho-pneumonia.

Examination showed a patch of consolidation in the apex of the right lung, and crepitation all down that side, also fine crepitation at the base of the left lung. She was completely

prostrated, and took no notice of anybody. Temperature 104.2° , pulse 144; respirations could not be counted for the incessant hacking cough. Her ears were full of pus, and she was put on antidiphtheritic serum, 1 drachm at once and $\frac{1}{2}$ drachm every four hours. In the evening temperature was 101.6° , cough much less, respirations 36, and pulse 124.

Next day (June 5, 1902) temperature was 103.2° , pulse 140, respirations 21, and patient looked bright and cheerful, and was evidently much better in herself.

June 6.—Temperature 103° , pulse 132, respirations 20. Patient breathes easily and deeply; the cough is troublesome at times, but she is now having a good night's rest, with only occasional disturbances from the cough.

June 7.—Temperature 100.4° .

June 8.—Temperature 101.6° .

June 9.—Temperature 99.8° .

June 10.—Temperature 98.6° .

June 11.—Temperature 98.1° .

Patient's general condition continued to improve: her appetite returned, her tongue cleaned, and the lung steadily cleared up. On the fifth day the otorrhœa had practically ceased, and the mother left off the usual douching, and by the next day it had entirely gone. Towards the last the antidiphtheritic serum was given in 1-drachm doses, but not so frequently, as her mother, who nursed her, noticed that the larger dose had a better effect than two small doses.

In all the cases treated by myself antidiphtheritic serum is given at once, and full dependence is placed in the treatment, the whole case being treated exclusively with it. They never get out of hand, and go on for weeks at a time, as in the following case, treated by a colleague who reports it.

(40) Eva S., aged nine years, had been suffering from whooping-cough for six weeks prior to my seeing her. On examination, the physical signs were those of acute lobar

pneumonia of left lung. After seven days the temperature became normal, and patient made a fair recovery. I ceased attendance on the tenth day, the patient thereafter getting about.

Fourteen days after I was again asked to see her, and found her suffering from broncho-pneumonia. The course of the attack was marked by great malaise, temperature in the morning 104° , and at night varying from 101° to 102° . There was complete loss of appetite, great weakness, flushed cheeks, and gradual wasting. The cough was frequent and paroxysmal. This condition continued for four weeks, and during this period all ordinary treatment was exhausted. Antidiphtheritic serum treatment was then used; the range of temperature dropped to 102° in the mornings and 100° at night. After four days there was improvement in the child's general condition, the child eating and sleeping better, and able to sit up in bed and play with toys. After nine days the temperature fell to 99.4° morning and evening. In fourteen days' time the temperature became normal and remained so, the improvement continuing.

The dosage recommended is, for adults, $\frac{1}{4}$ ounce at once and 1 drachm every four, six, eight, or twelve hours, according to the severity of the symptoms. Beginning with an interval of four hours till marked improvement is seen, the dose may be given every six or eight hours, or as required to clear up the remainder. For children 1 drachm at first, and 1 drachm at six to eight hours.

All the cases given have been acute, but the following two cases illustrate the chronic condition:

(41) M. T., aged eight years, weight $41\frac{3}{4}$ pounds, fair height for her age, but thin, wasted, and anæmic. The illness followed scarlatina. Appetite had been good, but wasting continued, and she was languid and weak. She had hectic fever, night-sweats, incessant cough, and profuse expectoration. The last was so profuse that at night she had to sit up suddenly

to prevent choking. Sputum had been examined and no tubercle found, but plenty of other organisms, and in a sample taken by myself and examined by Dr. Mollison only staphylococci were found. She had been under various treatments, but all to no avail. Lungs were dull at both apices, and râles in upper halves of both. The first diagnosis was tubercle until the sputum settled that. On inquiring into the family history it was found that her father had chronic furunculosis, and that her mother had a leucorrhœa which suggested the same infection. She was put on antidiphtheritic serum, 1 drachm twice a day, with calc. sulphidi $\frac{1}{2}$ grain three times a day.

She improved from the first, all the symptoms steadily diminishing until, at the end of a week, she was a new creature. She had scarcely a trace of her former illness: could sleep quietly all night, had lost all her cough, hectic sweats, and languor, and was finally dismissed perfectly well ten days from beginning treatment. During the next ten days she gained 5 pounds weight. Two months later she had a slight relapse, but 6 drachms put her right, and since then she has been in perfect health, and that was over three years ago.

(42) Mr. M., aged thirty, had a feverish cold for some days, which proved refractory to guaiacol carbonate in 10-grain doses every three hours. His temperature rose every evening to 100° or 101° , and his morning temperature was never below 99.6° . He began to have sweats, his cough became hard, and his appetite was variable and fickle. On the upper half of the right lung there was bronchial breathing, and it was resolved to interrogate the case with antidiphtheritic serum and have the sputum examined. He immediately improved on the antidiphtheritic serum, and by the time the result of the sputum examination came to hand, saying only staphylococci were present, he was almost well. He took in all $3\frac{1}{2}$ ounces. The lung condition cleared up, and he went for a fortnight's

holiday, from which he returned looking strong and well. All other treatment was stopped when he was put on serum.

Such cases are very interesting, and are a fair test of the specific character of the treatment. They also show the necessity of a bacteriological examination before committing one's self to a diagnosis. It is quite probable that such conditions open the door to tubercle and other infections.

CHAPTER IX

CHOLECYSTITIS

AMONGST the cases of peritonitis which are given under the heading of that disease there is one which, beginning as a cholecystitis, developed peritonitis, and finally suppuration, for which she was operated upon. Getting the cases in an early stage antidiphtheritic serum has done good work in relieving the pain, limiting the attack to the bladder, and preventing peritonitis. Here, as elsewhere, the inflammation has been rapidly overcome and the case cut short.

(43) Mr. W., aged sixty-five, first took ill on January 1, 1902, with diarrhoea, which had moderated by January 3, on which day he had what he called a 'sore hard pain,' with some vomiting. He remained in bed till January 6, the pain in the meantime being a little easier in the intervening days. On the 6th it became much worse, and he had a very severe rigor, which lasted for fifteen or twenty minutes, and which was accompanied by a great deal of vomiting. Temperature rose at the same time, but had fallen to 99.4° in the evening when I first saw him. On examination, there was found considerable tenderness in the right lobe of the liver, and over the gall-bladder he was extremely sensitive. The pain extended downwards to the appendix, and was probably peritonitic. Patient was exhausted after his day's experiences; there was no jaundice. Antidiphtheritic serum every six hours with a laxative.

January 7.—Not much better to-day, and ordered him a

dose of calomel. Seen in the evening and found him improved, and that he had had a very large loose motion.

January 8.—Area of pain contracted to gall-bladder alone. From this time he steadily improved; pain in the bladder lessened daily, and my last professional visit was on the 12th, when he was up and dressed. No recurrence.

The next is a typical case.

(44) Mrs. B., aged forty-eight, has been out of sorts for a week, which she ascribed to extra household work. On November 11, 1902, she took to her bed with shiverings, although it was a fairly warm day (96.5° in the shade). The chills and shiverings persisted all that night and next day till seen in the evening by me. Temperature was 102° , pulse 120. Pain that day had extended to the abdomen, and patient felt extremely ill. There was diarrhoea, vomiting, severe headache, and great malaise. Diagnosis was cholecystitis with localized peritonitis, and at 8 p.m. she began antidiphtheritic serum treatment. She had one dose every hour for three doses, then every four hours. After the first three doses the chills had gone and did not return, vomiting ceased, headache eased, and patient felt better all round. She had had cascara before being seen, and tenesmus kept her restless during the night.

November 14.—Morning temperature 99.2° , pulse 88, and much better all round. Evening temperature 102° , but there was no relapse in constitutional symptoms to account for it.

November 15.—Temperature 98.4° , pulse 81. Pain to-day is confined to gall-bladder, and all other pain, even on firm pressure, has gone. Evening temperature 99.5° .

November 16.—Temperature 98° , pulse 84, still improving, and now looks almost herself again. Evening temperature 99.1° . Antidiphtheritic serum every six hours.

November 17.—Afternoon temperature 97.6° , pulse 79, no trace of pain anywhere. She has 2 ounces of the serum mixture left, which she was to take every eight hours. Dismissed. Three ounces of antidiphtheritic serum used.

The following case was one of the first treated, and my inexperience is well seen in first treating the case in the ordinary way for the vomiting and diarrhoea, instead of striking straight at the disease with the serum.

(45) Mrs. S., aged fifty-six, a thin, anæmic woman, who has suffered for years from attacks of vomiting with pain in the liver and stomach, during which attacks she has always had rigors and sweats. She has also a chronic, thin, yellow diarrhoea, which is passed without straining, and varies in intensity from time to time.

On examination the gall-bladder was tender, and there was further tenderness below the umbilicus over a uterine fibroid about the size of a goose's egg. The cystic pain radiated until the two pains almost met. The diagnosis was chronic cholecystitis with recurrent acute attacks.

The vomiting and diarrhoea were first treated, and then she was given a course of antidiphtheritic serum (3 ounces) a dose three times a day. In a few days all the uterine pain had gone. The cystic pain steadily declined, her general health improved, and she noticed with alarm that she was actually getting hungry, and feared the worst from a symptom from which she had not 'suffered' for many a year. She was dismissed well three weeks from first visit. During her convalescence she passed a gall-stone!

She had a slight return fourteen months later, which quickly yielded to the same treatment.

Others have been treated with equally good results, but these are the only cases of which notes were taken.

(46) Mrs. S., aged seventy-six, has had repeated attacks of cholecystitis at intervals of about six months; latterly they have been ushered in by a severe rigor. These attacks have all been met and cleared up by the oral use of antidiphtheritic serum. The rigor ceases in from six to ten minutes after a 3-drachm dose, and the whole attack rapidly fades by the continued use of 1 drachm every four hours. Peritonitic

extension is prevented, and the attack aborted. The old lady insists on having a bottle of the serum at hand for emergencies.

(47) Mrs. P. has been twice operated on for gall-bladder trouble, gall-stones the first time, and has recurring attacks of cholecystitis, with perihepatitis and localized peritonitis. The last attack was her first experience of serum treatment, and it at once relieved her pain and rapidly cleared up all the other symptoms. She has had no recurrence for six months.

CHAPTER X

DIPHTHERIA

THE oral use of antidiphtheritic serum has been reported from time to time. Cases and series of cases continue to be seen in the journals. Not much notice has been taken of them, for it is recognised that antitoxin is not absorbed in quantities sufficient to exert any marked effect on the infection. If antitoxin was the only element in the antiserum, and dependence had to be placed on it alone, then the objection would be quite justified. But if the elements in the toxic products of the organism are varied in their character and in the incidence of their attack, it is quite possible that the oral use of antidiphtheritic serum may antagonize the other elements, while failing to meet the toxin. The paralytic and muscle-depressing element in the toxin has, if possible, more to say in the death-rate than the toxin itself. And it is on this phase of the disease that the oral use of the serum is most efficient in its action. By this method there is obtained the antiparalytic and antiproteolytic power of the serum, and the tissues reinforced by these are capable of a much more effectual resistance to the toxic products of the organism than would normally be the case, and hence the favourable results. The antitoxin acts by neutralizing the toxin, and thus protecting the tissues from its action. The other elements act by rendering the tissues unsuitable soil for the toxic action of the other elements

in the toxic products of the action of the organisms. The complete defence produced in the immune animal includes all these elements, and hence to obtain the full force of its resistance it is better to give the serum orally and regularly, to maintain the tissue tone and resistance, and hypodermically to obtain the antitoxic effect.

In the cases treated those who received the serum only by the mouth, quickly recovered their tissue tone and became bright and cheerful, although their temperature, pulse, and membrane were being very slowly improved. Glandular inflammation was reduced materially and the patient's strength conserved. In many of the cases relapse followed the stoppage of the treatment. This is due to the fact that the serum orally used only produced a passive tissue resistance, which ceased as soon as the serum was discontinued, and which at no time was antimicrobial. Hence the organisms, while having their pathogenic action inhibited, were not otherwise prejudicially affected, and being present in the mouth after recovery had nothing to prevent them from reinfesting the patient. The hypodermic injection, on the other hand, more directly affected the local conditions; the membrane more especially, and through it the temperature and pulse, and its action seemed to render the tissues resistant to the organism and maintain it, so that reinfection did not take place. But it did not have the recuperative power of the oral use of the serum. Possibly this may be accounted for by the method of administration; the hypodermic being given in one large dose and rarely repeated, while the other is given in smaller doses and frequently and regularly exhibited.

The cases treated in the early stages by the dual method have shown very rapid and thorough results, no paralysis following. In those taken at a later date paralysis has been seen, but it is still a question as to whether the oral use of the serum has been maintained for a length of time sufficient to show what it is capable of doing in preventing and relieving

paralysis. Further experience is required in this matter. The theory advanced in a later part of this treatise would suggest that a lengthened oral use of serum in cases where paralysis is present, or may be expected, would be the rational treatment of such a condition. Where diphtheria is complicated by concurrent septic infection the oral use of the serum is imperatively demanded, and its use maintains the patient's resistance against the combined microbic invasion. By its oral use in increasing the tissue resistance many of the sequelæ of this disease may be obviated, and broncho-pneumonia may be prevented or successfully treated by a persistent use of the serum given by the mouth.

(48) C. W., male, aged eight years, diphtheria, pharyngeal, found with a temperature of 101.5° , pulse 132. The tonsils were swollen, with membrane on both sides; he was stupid with toxæmia, delirious, and almost deaf. He had previously been operated on for post-nasal adenoids, and his tonsils, with the adjacent glands, were usually larger than normal. The glands were now very much enlarged, and painful to touch. It was the third day of the disease. He was given 1 drachm orally at 7 and 9 p.m., and 1 and 6 a.m., and seen early next morning.

May 24, 1902.—Boy looked bright and fresh, and, when asked in an ordinary tone of voice how he was doing, said, 'Quite well, thank you.' The mother said that the change was quite apparent by the third dose. Temperature was 101.7° , pulse 112. The throat looked much the same, but the glands were not so painful. Evening temperature 102° , pulse 116; still feeling bright and well. He wanted to get up and have some dinner, and took freely whatever was given him. Antidiphtheritic serum every six hours.

May 25.—Temperature 100.9° , pulse 100. The membrane had increased, and was now much thicker on both tonsils than ever. He was then given 1,500 units hypodermically, and the oral treatment discontinued. Evening temperature

99.9°, pulse 93. The membrane is looser, and there is less inflammation in the tonsils. Resumed the oral use of serum every six hours.

May 26.—Temperature 98.1°, pulse 92. Membranes rapidly fading, and patient still keeping well in himself.

Two days later he was up, dressed, and playing about the room, looking well, and showing no signs of debility, and was then dismissed.

In several cases treated in the early days of the oral use of the serum the same results were obtained, and in every case a hypodermic dose had to be given to clear up the local condition. In the following two cases the infection was sufficiently mild to be entirely cleared up by the oral use of the serum.

(49) E. F., aged six years, female. When first seen the case was suspicious, and a swab was taken and sent to the University for examination. In my hurry I did not put my name on it, and consequently got no answer till later. It was the second day of the disease, and there was membrane on the tonsil. Temperature was 102°. She was given 1 drachm orally at once, and $\frac{1}{2}$ drachm every six hours until she had taken 4 drachms, when she was given an iron and mercurial mixture, and made a perfect recovery. From this it was concluded that the attack had been only septic in its nature, until her sister was found to be suffering from a similar throat. I then inquired, and found that the first had been diphtheria, and the second was pronounced the same.

The sister, aged four years, had the same treatment, and, after 4 drachms, the membrane was practically gone, and she was given the remainder of her sister's other medicine. In forty-eight hours the membrane had grown up again, and spread to both sides. The mother had objections to the use of the needle, so the oral use of the serum was continued till she recovered. It took 2 ounces to clear up the case, which lasted longer than it would have done with hypodermic

medication. In both cases the tissue tone was restored, and it was only with the greatest difficulty that they could be kept in their room, to say nothing of their beds. The temperatures ran up to 102° in each case, and the first child was sharply ill with toxic resorption when first seen.

The following are three sample cases of the dual use of the serum :

(50) A. L., aged ten years, male, a stinking case of pharyngeal diphtheria in the third day of the disease. Tonsils were much swollen, and covered with a dirty gray membrane, more prominent on the left side. The glands were much swollen and tender, and there was considerable nasal obstruction. He complained of pains all over his body, headache, and was stupid with toxæmia. His breath was extremely foul and offensive. Temperature 102.4° , antidiphtheritic serum every four hours, 1,500 units hypodermically on the spot.

Next day (*August 23, 1900*), headache, pains in stomach and body all gone, looking much better and brighter, breath much less offensive, throat less swollen and painful. Morning temperature, 101.6° , pulse 108; evening temperature 102.4° , pulse 108.

August 24.—Morning: temperature 100.6° , pulse 104. Evening: temperature 101.2° , pulse 104.

August 25.—Morning: temperature 99.2° , pulse 96. Evening: temperature and pulse normal.

August 26.—Morning: temperature 97.6° . Dismissed.

Throat and nose cleared up as temperature fell, and patient did well.

(51) M. L., aged eight years, female, pharyngeal diphtheria, fifth day, evening temperature 102° , usual symptoms, antidiphtheritic serum hypodermically, 1,500 units, and orally 1 drachm every eight hours. Temperature every twelve hours ran as follows: 103.1° , 100.5° , 98.8° , and twenty-four hours later 98.6° and membrane gone. Case lasted from Friday night till Monday morning.

The records of some other cases have been lost, but the results were the same, for in every case it was found necessary to use the serum hypodermically to thoroughly clear up the disease, and in one case, having dismissed the boy after oral use only, and having been again called in, there was found a new growth of membrane on his throat, which finally gave way to the hypodermic use of the remedy. One dose of 2,000 units hypodermically has always been found sufficient along with the oral use of the serum, and the writer has never had to repeat the dose.

The following is one of the last cases treated with the oral and hypodermic use of antidiphtheritic serum. The infection on culture showed the Klebs-Loeffler and staphylococci.

(52) M. A., aged eight years, has had a sore throat for several days, and has had ordinary household treatment for it. On April 27, 1903, I found both tonsils inflamed, swollen, and covered with typical diphtheritic membrane, and the external glands very much enlarged and painful. The case was in the third day, and temperature was 102° . She was given $2\frac{1}{2}$ drachms hypodermically at once, and $\frac{1}{2}$ drachm orally every four hours.

April 28.—Temperature 99.6° , and quite a different child. Instead of the toxæmic condition which prostrated her, she is now bright and lively, clear in her intellect, the throat is wonderfully better, the membrane is loose and ready to come off, and the pain has lessened so much that she can swallow readily.

April 29.—Temperature 98° , patient is well, and hungry as a hawk. All trace of membrane has gone except one little speck, and all tonsillar swelling has quite gone. For precaution's sake she was seen next day and dismissed. The rapid improvement of the constitutional symptoms following the oral use of the serum is very marked, and when the two are given together each does better work than either would do alone—that is, that the local action of the hypodermic

injection is greater when the serum is being used orally at the same time than it would be if it was not, and the constitutional effects are greater when the two are used than they would be if the serum was only used orally. My usual treatment is to give 2,000 units at once hypodermically, and for an adult 1 drachm orally every four hours, and the same for a child if the toxæmia is very severe; but if not so marked $\frac{1}{2}$ drachm every four hours is usually sufficient.

The following experiments were carried out to see if the oral use of serum would save an animal from a lethal dose of the toxin. Hewlitt had tested it on rabbits and guinea-pigs, but the writer has not been able to find the dosage used in the experiments. The writer's experience is that a great deal more serum is required for effective treatment of the injection when given orally than would be required when used hypodermically.

Experiment 1.—Two dogs of equal weight were given a hypodermic injection of 1 c.c. each of diphtheria toxin. One dog was kept as control, and the other received orally $1\frac{1}{2}$ ounces of antitoxin. In both dogs a considerable area around the injection showed tumefaction, and finally sloughed. Except that the wound of the dog which was treated cleaned up more quickly and his general health recovered more rapidly, there was little to choose between them. Clinically the antitoxin used in this experiment was found to be almost inert. Hence the comparative failure.

Experiment 2.—Two dogs received hypodermically double the quantity of the same toxin (2 c.c. each). The dog treated received orally 2 ounces during the next two days. Another antitoxin was used, and the result was that he had no constitutional symptoms, there was neither tumefaction nor sloughing, and he appeared little the worse for his experiences. The skin around the site of injection became dry and itchy, and, getting at it with his hind-feet, he scraped some of it off superficially. The control had the tumefaction and

sloughing much more severely than in the first experiment. His condition went from bad to worse till on the tenth day he had to be destroyed.

Experiment 3.—Two dogs received intravenously 2 c.c. of the same toxin. Unfortunately the treated dog met with an accident, to which he succumbed on the fifth day. The control died on the fourth day.

Experiment 4.—Two dogs received intravenously 2 c.c. of the same toxin. The dog treated received orally 2 ounces during the course of the next two days, and made a very fine recovery. The control died in four days and a half.

Experiment 5.—The lethal dose having been ascertained, another dog was given intravenously 2.5 c.c. of the same toxine. This was a small dog, and, from its weight and the increased dosage, it was calculated that, untreated, it would die in about two days. It was given 2 ounces orally during the next two days. It did very well, getting up and running about for several days after treatment was discontinued; but gradually its strength failed, and it died from asthenia nine days after injection.

Experiment 6.—Another dog received intravenously 3 c.c. of the same toxin, which was calculated to kill him in three days. Treatment was not begun till twenty-four hours after the injection. He then received orally 2 ounces in the course of the next two days. Two days after the treatment had been discontinued he was found to be suffering from hæmatogenous jaundice, from which he died eight days after the injection. The hæmolytic action of the serum in this experiment seems to be parallel to similar results obtained with tetanus toxin by Ehrlich and Madsen.

From these experiments it is evident that in dogs, at least, antidiphtheritic serum is absorbed in the alimentary canal in a condition to maintain the systemic defence, and to prevent the local caustic action of the toxin on the tissues following hypodermic injection. It is also clear that very much larger

doses of antidiphtheritic serum are required when administered orally than when injected hypodermically.

The serum, for the two days during which it was given, protected the animals, but in Experiment 5 evidently it had not been used long enough for the animal to eliminate the toxin, sufficient being left to gradually kill the animal after the use of serum was discontinued. In Experiment 6 the serum was evidently too late in being administered, the damage being done before the serum was begun.

The number of cases treated do not give room for any opinion, but the dual use of the serum in early stages of the disease gives extremely rapid and thorough recoveries, and from its action in other diseases its continued use in the later stages of diphtheria suggests its further value in such conditions.

CHAPTER XI

ERYSIPELAS

ERYSIPELAS is a lymphatic disease, so much so that even when it is present in a granulating wound it heals well, as there are no cocci in the capillaries of the granulating tissue. Whether for this reason or not the results of treatment by antidiphtheritic serum, while they show an increased resistance to the toxic effects of the organism on the vaso-motor system, do not go further. This may be accounted for by the fact that streptococci are never found in the leucocytes in this disease. Hence increased phagocytic power will not be able to influence the course of the infection. But whatever may be the methods of defence the maintenance of the vaso-motor tone ensures the cardiac action, and the patient's vital functions are conserved while his lymphatics fight out the battle, while the reaction which maintains the cardiac tone will by so much increase the constitutional capacity for defence—a capacity which, under ordinary conditions, would decline with the cardiac tone.

The well-known erratic character of the course of this disease forbids any claim for any treatment which has not been tested on a large number of cases, but to the writer the use of antidiphtheritic serum freely in his cases has seemed to be able to mitigate the severity of the symptoms, to maintain the patient's strength, and to materially shorten the duration of the case, while relapses after the use of serum have been decidedly

lessened, and chronic erythemata following erysipelas have been quite cleared up.

(53) Baby K., aged four months, female, was first seen five days after the onset of severe erysipelas. Temperature had been ranging up to 105.4° , and all the left side of the head and well up over the vertex was affected, while the left eye was completely closed. The whole area affected had been covered with a paint, but the erysipelas was rapidly passing beyond it. There was also present a recent otorrhœa, the infection in it being the *Staphylococcus pyogenes aureus*. There were evidences of cerebral irritation in involuntary movements and twitchings. Later it was noted that the child failed to move the left hand. She had been given 10 c.c. antistreptococcic serum hypodermically the day before being seen, but although it had a temporary beneficial effect in the reduction of the temperature that had again risen, and the patient was not generally benefited. She was then put on antidiphtheritic serum, and in the first twenty-four hours she took 6 drachms. The effect of this quantity was to soothe and relieve her, so that for the first time for several days she slept soundly. The serum, 1 drachm every four hours, was kept up, and in another day it was clear that the virulence of the attack was materially lessened. At first the extension of the infection seemed to be checked, but it soon began to extend, although now it was more like a severe erythema, and there were no bullæ as before. The patient had been ordered brandy, but this was discontinued as soon as the serum was begun. The result was that the patient visibly improved, and the reaction which resulted was well maintained. During the next fortnight the erysipelas steadily progressed till it had entirely covered her, not a square inch of her body escaping. The serum was used regularly, and the patient took the breast well and slept as though nothing was wrong. To try and influence the infection she was given 10 c.c. antistreptococcic serum hypodermically, but with no apparent benefit, as erythematous patches were occurring all over the body

and head, while the temperature kept at 103° day by day. Seventeen days after my first visit the supply of antidiphtheritic serum running short, it was resolved to substitute antistreptococcic serum. For six days she had 10 c.c. daily in doses of 1.25 c.c. (orally) every three hours. She soon began to improve, and at the end of that time was convalescent. The temperature came down day by day, the œdematous feet and legs and skin generally gradually lost their firmness, and the skin all over began to pucker. A boggy patch on the crown of her head still persisted, but gradually it gave way, and the otorrhœa had practically gone before the serum was changed, so that only the streptococcic infection was left to deal with.

The cases are spread over a number of years, and the doses varied with the dosage experiments which have been carried on since the treatment was first begun. The first three cases are the latest methods adopted.

(54) Mr. B., aged thirty-two, has been out of sorts for a week or two, and came for the treatment with a patch of erysipelas on his left cheek. Next day it had spread all over his nose—which was much swollen, red, and shining, and so blocked that he could neither smell nor breathe through it. He was at once put on antidiphtheritic serum—1 drachm every hour for three doses, and then every four hours. The headache, malaise, etc., were almost gone after the three first doses, and when seen twenty-four hours later there was a very marked improvement. He could breathe and smell freely, and the heat, pain, and swelling had very largely gone. The treatment was continued for another day, when the patient was discharged thoroughly clear of the whole infection, and there has been no relapse. He was under treatment for forty-eight hours altogether, and took in all $1\frac{1}{2}$ ounces.

(55) Mrs. M'G., aged thirty-seven, facial erysipelas. Her face was much swollen with the usual pain, heat, malaise, headache, and she had had no sleep all the previous night. She was given 1 drachm every hour for three doses, then the

same every two hours, and then every four hours. Next day all the symptoms had gone except the œdema, which was much reduced, and the patient had had a splendid night's sleep. She was given eight more doses, one every four hours, which thoroughly cleared up the face, and she has had no sign of return. In all she had $1\frac{1}{2}$ ounces.

In this and in all the cases the parts were bathed at intervals with spt. vini meth., but no other treatment was used or required.

(56) Olive P., aged twenty-two, had been ill for a week with sore throat and glands and swollen face, but did not send until she was compelled to do so. Found her with a very severe attack of facial erysipelas, involving both cheeks and nose, and beginning to close the eyes. Temperature was 103° and pulse 138. The left cheek was very hard and board-like, and purple-red in colour. The nose was quite closed, and she could neither breathe through it nor smell. She had a very bad headache, frontal and occipital, and was evidently very ill. Treatment was 1 drachm every hour for three doses, then every two hours, and then every four hours, with sponging as required with spt. vini meth.

Next day she was again seen, and the left cheek had lost its hardness and the whole area of inflammation was much improved. She could see better, and could easily breathe through her nose. Her frontal headache had almost gone, and she felt much better in herself. She also had had a very much better night, and had a fair amount of sleep. Treatment was continued as before, every four hours. There were some bullæ on the right cheek containing serous fluid, which were punctured, and a culture from the fluid showed that it contained the *Staphylococcus pyogenes albus*.

The second day the improvement was still more marked, and the patient had had a good night's rest. The bullæ were quite dry, and the skin was beginning to scale. All the fire had gone out of the area involved, and the œdema was rapidly

lessening, so that she could open her eyes as well as ever she did.

On the third day the whole trouble was practically gone, only a trace of œdema being left on the right side. During this day a slight extension was reported along the lower jaw on the right side, but, as the patient lived four miles away, instructions to give three doses at an hour's interval were given by telephone, and the patient was seen the next day. If such a condition had arisen, then it had practically cleared up in the twenty-four hours, for there was only the slightest trace to be seen.

On the fifth day antidiphtheritic serum was discontinued, and not required again.

She had in all $4\frac{1}{2}$ ounces during the five days in which it was administered. Owing to a concurrent intestinal condition, the temperature did not fall in this case as the erysipelas declined. On the fourth day, when it was seen that the erysipelas was practically gone and the temperature still over 102° , it was evident that some other condition was present along with it. As the abdominal condition resembled typhoid, and any septic peritonitic condition would have been dealt with by the antidiphtheritic serum, it was resolved to treat the intestinal canal. Patient was given 2 grains each of quinine valerianate, guaiacol carbonate, and thymol every three hours, and a sedative for some little vomiting. Both were successful, as the temperature dropped to normal. A few days after antidiphtheritic serum was discontinued the patient was well.

The following case was treated with antidiphtheritic serum every eight hours :

(57) Mr. C., aged thirty-six, had a severe attack of erysipelas on both arms, with vesicles 3 inches by 3 inches on one arm, and 6 inches by 6 inches on the other. The arms were much swollen, and the lymphatics could be traced into the axilla, where the glands could be felt affected. In forty-eight hours

the attack was quite broken up, and he was back at work in six days from the beginning of the treatment.

The next case gives a recurrence of erysipelas in the same patient, the same limb, and under the same circumstances, but in a much more virulent form than when treated without serum.

(58) Mr. L., aged sixty-five, an old engine-driver, with varicose ulceration on his legs and many scars of a similar origin. In his first attack he had a mild erysipelas, which, under ordinary treatment, lasted for three or four weeks ere he could be dismissed with safety. Practically nothing could be done for the toxæmia, which improved *pari passu* with the other symptoms.

His second attack was much more severe, and his constitutional symptoms were rather serious. His wife reported that he had been ill all day, and had gradually become more and more stupid, until, when seen in the evening, he was in a semi-comatose condition, and was passing his secretions in bed. Temperature was 102° , and the leg was one patch of erysipelas up to and beyond the knee. He was given 1 drachm every six hours, and in nineteen hours his temperature was 99° , his head was clear, he had complete control of his secretions, and took his food readily. The leg also had much improved. The treatment was kept up every eight hours. He steadily improved, and was finally dismissed well in about as many days as it took weeks with his first and milder attack.

The danger of streptococcal infection, either before or during the puerperium, is well known and much dreaded, and the two following examples are interesting:

(59) Mrs. S., aged thirty-six, multipara, eight months pregnant, had just recovered from a severe attack of facial erysipelas, which was accompanied by high fever, delirium, threatened suppuration of glands, etc., and had come to town for confinement. On her arms, legs, and body there was still a well-

marked erythema. Her previous medical attendant, from her septic condition, had given her husband a very gloomy prognosis for the coming accouchement.

When seen she was threatened with another attack, beginning in her nose, as the last attack did. The case was seen early, and she was given 1 drachm every eight hours for a day or two and then twice a day. The flush spread across her face a little, but more like a little sunburn than erysipelas, and when it had cleared up the erythema had also quite disappeared. She took 2 ounces 6 drachms in all. A few weeks later she went through her puerperium as only an aseptic patient could.

She had had several previous attacks of erysipelas, but, although that was five years ago, she has not had the slightest sign of a return.

(60) Mrs. B., aged thirty-seven, primipara, on seventh day postpartum had a chill, and developed an erythema, which rapidly spread over face and neck and down to mammæ in front, while down the back it reached the gluteal region. Temperature rose to over 100° , and patient complained of a great headache and burning in her face. The lochia also became foul; she went off her food, and felt ill all over. This was her condition when seen twenty-four hours after the attack developed. She was at once put on antidiphtheritic serum, and the first dose cleared up her headache, and the second reduced the temperature to normal.

Next morning temperature was normal and the erythema rapidly fading, and serum was almost stopped. That afternoon she had a chill, which lasted for fifteen minutes, and her temperature rose to over 101° , while she began to feel abdominal discomfort and headache, and general malaise returned. There was tenderness on palpation over the appendix, and also over another spot on the left side of the abdomen. She was given a dose at once, and another in two and a half hours. The temperature fell to 99.4° . She had her

evening and morning doses, and her temperature in the morning was normal. Antidiphtheritic serum twice a day was kept up for two days longer, but there was no return, and the patient did well.

For erysipelatous conditions arising from insect bites, the treatment has made short work of every case in which it has been used. The convalescence is short and satisfactory.

The following case was the most virulent infection which I have ever seen :

(61) Mrs. B., aged thirty-eight, washerwoman, had been ill for some days, and on May 25, 1903, she developed erysipelas. The day was bitterly cold and wet, and, not recognising what was her trouble, she went out to wash as usual. At noon she became ill, and had a rigor, which lasted for two hours. She ached in every limb, while her headache was unbearable. That night, when first seen, her temperature was over 100° , and her face had well-marked erysipelas. She was put on antidiphtheritic serum, 1 drachm every four hours, and by morning temperature had risen to 103° , and the erysipelas was fast spreading. Treatment was continued, and next morning she had lost her headache, the bullæ were drying up, and the extension of the inflammation had been checked. There had been delirium for the first two nights. Temperature 101.4° .

Next morning a great deal of the fire had gone, but the œdema was still sufficient to completely close both of her eyes, and patches of normal-coloured skin were beginning to appear here and there. Temperature 100.4° .

Third morning the left eye had lost the œdema sufficiently to enable her to open the eye, and face generally was much improved. Temperature 100° .

Fourth morning temperature was normal, and the whole appearance showed that the attack was practically over. Could see very well out of the right eye.

From this onward it was merely a matter of clearing up the broken skin where the bullæ had been, and the patient rapidly recovered appetite, health, and strength.

The serum alone was used (except for bathing with spt. vini rect.), for the first four days every four hours, and then at longer intervals, and it was continued for seven days, during which she took in all $4\frac{1}{2}$ ounces.

The following case is interesting for various reasons. It was one of the cases in which antidiphtheritic serum failed, and proved that antitoxin itself had nothing to do with the treatment of septic infections.

(62) Miss D., aged eighteen, had a severe attack of facial erysipelas, involving at first the left side of the face, and latterly spreading all over the face, ears, and scalp. The temperature, when seen on the first day of the disease, was 102° , and during the first three days it gradually rose to 105.4° on the third night. During this period she was given 1 ounce of antidiphtheritic serum every twenty-four hours, but it failed to touch either the local or the constitutional symptoms, and she threatened to succumb to cardiac failure. The reason for this complete failure of the serum was at last found to lie in a change which had been made in it, probably to increase its suitability for hypodermic use in diphtheria. Some of an older type was then procured, and given at the same rate as the other had been, and the result was at once apparent. The temperature dropped from 105.4° at night to 101° in the morning, and there was a great improvement of the constitutional symptoms. The cardiac weakness had gone, and patient was much brighter in herself, and this feature of the case gave no further trouble. The new serum was too late to prevent an extension of the local process within twelve hours of its being begun, and both ears became affected. The temperature rose to 104° for two nights further, but in forty-eight hours more it had fallen to normal, and the patient was convalescent. Once again the temperature rose, one day to 103° , but a renewal of

the serum brought it to normal in twenty-four hours. This relapse was a mystery to me until a closer examination revealed the fact that there were two abscesses present, one behind each ear, and each containing $\frac{1}{2}$ ounce of pus. The abscesses were incised, and they at once closed up and healed.

CHAPTER XII

GYNÆCOLOGY—DYSMENORRHŒA —ENDOMETRITIS—MENORRHAGIA—SUB- INVOLUTION—SALPINGITIS

THE use of antidiphtheritic serum in gynæcology was suggested by its antiphlogistic effects on inflammation, and to that alone it was at first confined ; but as its special action on involuntary muscle was gradually elucidated the range of its action was gradually extended. First it was found practically specific in menorrhagia, but the results were credited to its antiphlogistic action on metritic or parametritic congestion or inflammation. Probably this is still the main element in the cure of such conditions, but there is undoubtedly another factor in the case, and that is the restorative and contracting effect of the serum on the uterine wall. The action of the serum is therefore a combined one, and by the combination the case is entirely met. The case which really suggested to me the specific action of the serum on the uterine walls was the one detailed later on, in which the treatment of a recurring mastitis was the means of removing entirely an aggravated subinvolution. Then followed the idea to give the serum at the period, so as to relieve the congestion which is so common at that time, and also to take advantage of the change of mucosa, to insure that the new endometrium should be healthy by the increased tissue tone under the administration of antidiphtheritic serum. Its

action on the uterus ante-partum and post-partum is considered under puerperal infection.

One valuable use of antidiphtheritic serum in the treatment of pelvic congestions and inflammations is in differentiating between pain of a neuralgic character and that arising from congestive conditions. After giving the serum till all temperature has gone, or where none is present giving it till constant pain has gone, the case for purposes of treatment may be considered to be free from congestion, and the treatment directed to the nervous mechanism. Antirheumatics or antineuralgics may then be used for irregular pains, and after the removal of the congestion the results obtained from them are frequently very striking. What is then left is therefore neither congestive nor neuralgic, and whatever it is its diagnosis and treatment are materially facilitated by the removal of the other complicating factors. All pelvic congestions and inflammations, except those arising from the gonococcus, tubercular bacillus, and malignant disease, seem to come within reach of serum treatment. It will not here remove abscess any more than anywhere else, nor will it clear up cysts, displacements, adhesions, etc. ; but the writer has yet to see the case of pelvic congestion or inflammation, with those restrictions as to cause, which will not rapidly yield to serum treatment alone, without the use of any other means whatever. The patient may, if she pleases, douche or poultice herself, but, except to see that the excretions are right, complete trust is placed in the serum and in nothing else.

Menstruation.—In menstruation, menorrhagia and congestive dysmenorrhœa are the disorders which come within the reach of the remedy. With them may be included endometritis, as the three are treated in the same way and at the same time. The aim of the treatment is to give the serum at the time when it will do most good, and this is found to be during the period, and in some cases for a day or two before its onset. By giving it a day or two before the period commences in menorrhagia any congestion of the uterus is reduced

before the flow begins, and the conditions which go to cause menorrhagia are thereby made less favourable for its occurrence. The restoration of the muscular tone of the uterus also contributes to the same result. In congestive dysmenorrhœa the congestive prodromata are very effectually cleared up, thus removing that bearing and dragging down which is so characteristic, and along with it there is removed all pain and tenderness in the mammæ and abdomen, unless arising from causes beyond the limits of serum treatment. Congestion being removed, the catamenia are generally free from pain, and the patient has a feeling of lightness and *bien-être*, which is as pleasant as it is novel. If there is much pain present when the treatment has been given a fair chance, then it may be concluded that it is probably of a neuralgic character, and will yield to appropriate treatment. Spasmodic dysmenorrhœa does not come within the range of serum treatment.

The endometrium at this time is being disintegrated and passed out, and the theory of the action of the serum on it is as follows : When the endometrium is unhealthy, it is as a rule succeeded by another of a similar character ; but when antidiphtheritic serum is being administered during the menstruation the tissue tone is so improved that when the old and foul endometrium is removed, the interior of the uterus is like an open wound, which is rendered aseptic by the serum, and the new mucosa arising under such circumstances is clean and healthy in character. Uterine congestion is removed by the restoration of the vaso-motor tone in the bloodvessels, and hypertrophy or subinvolution by its action on the unstriated muscular tone. Thus is obtained with no trouble all, and more than all, the benefits which are usually received from curetting. That this is so is proved by the many cases of pregnancy following the treatment, thus giving the physiological proof of the work accomplished. The removal of uterine leucorrhœa is also suggestive of the same result.

These results are permanent except when they are secondary

to mechanical causes, which, unless removed, will inevitably cause recurrences.

That the uterine mucosa is attacked in acute infectious disease is shown by Stravoskiados (*Zentralblatt für Gyn.*, 1903, No. 20), who, after a series of post-mortem examinations of the uterine mucosa following pneumonia, typhoid, and other infectious diseases, came to the following conclusions :

1. Such diseases cause acute endometritis, sometimes hæmorrhagic.

2. The endometritis is caused by the same organism as the infection, or in complications by the organism originating the complication.

3. Infection is by the blood, and is rapid in the pregnant or puerperal organ.

4. Abortion or premature delivery during these diseases is often due to such an infective endometritis.

It is evident that acute infections are more far-reaching than would be expected from clinical observation. Immunity must include protection to all the structures affected by the infection, so that the action of the serum on the uterine mucosa falls into line with ascertained pathological facts.

Its action in every case has been as thorough as the most careful curetting could have been, and its advantages over that mode of treatment are so great that one need not begin to enumerate them.

Menorrhagia.—Any case of menorrhagia arising from endometritis would be benefited by the antiseptic action of the serum on the mucosa, but for menorrhagia arising from any inflammatory cause external to the endometrium the antiphlogistic action of the treatment is also available. By this all local or general pelvic congestion, so prevalent at the period, is promptly relieved and removed, so that menorrhagia secondary to that cause is quite within the control of the treatment. The following was the first case which was treated for menorrhagia :

(63) Mrs. G., aged thirty-five. Patient had had a vesico-vaginal fistula, which had been closed by stitching the cervix into the vaginal wound. She has had to menstruate through the bladder, and very rarely does the cervix open of its own accord. The only treatment which has been successful in forcing it open after being closed for several months is a strong faradic current, and latterly the hæmorrhage following this procedure has been too free. For the hæmorrhage she has been given a variety of treatments—ergot, hydrastis, cannabis indica, etc.—but without obtaining any benefit. As a trial, at her own request she was given two full doses of antidiphtheritic serum, and the result, to my surprise, was prompt lessening of the flow. This was put down at first to the removal of surrounding inflammation, but further experience has shown that, while that may be one of the causes, there is more than that.

Given when the uterus, containing three to five months menstrual fluid, is making violent efforts to force an opening through the closed cervix, it increases in a marked manner the uterine contractions, and the patient refuses to use it at such times.

At the last period, after an interval of three months, the violent uterine contractions caused an escape of menstrual fluid through the right tube, and set up a smart peritonitis. This was promptly met by a free use of antidiphtheritic serum, which had the double effect of relieving the peritonitis and so increasing the strength of the uterine contractions that they forced the cervix. The serum being kept up controlled the quantity of the discharge, and kept it within reasonable limits.

There is no doubt that in these cases, as in post-partum, antidiphtheritic serum has a distinct contracting effect on the uterus, and antistreptococcic serum is practically exchangeable with it, especially for its action on the uterine muscle, although it fails in infections other than streptococcic.

The following case and its sequel are interesting, as they go far to prove the hypothesis on which the treatment is based:

(64) Mrs. F., aged forty-three ; second marriage three years ago ; family to first husband, none to second. There have been menstrual troubles since before this marriage, and for the last two years she has had severe menorrhagia, with blinding headache and continuous vomiting. Various treatments were tried, but without success. Between the periods she was in good health, and complained of nothing. She was asked to let me know when she felt the prodromal symptoms of the next period. Two days before the period she was given antidiphtheritic serum three times a day until the flow began, when it was given every four hours. The result was a brilliant success, as the headache and vomiting were entirely aborted, and after a preliminary gush the flow fell to a normal quantity, and continued so.

The sequel was interesting, as she has seen nothing since that time, and was booked for confinement in a month or two. The physiological proof in a case such as this is fairly strong. Accouchement came in due course, and another child twenty-one months later.

(65) Mrs. M'A., aged thirty-seven, had suffered for a considerable time from menorrhagia, with a good deal of dysmenorrhœa, the flow being profuse, and prolonged over seven days. She had had a cervical laceration repaired, a perineorrhaphy, and some tubal trouble. Various remedies were tried, but with no benefit, and she was then given antidiphtheritic serum. She began the treatment a few days before the expected period, and had nearly finished the 2 ounces given her before the flow came on. The result was very good, as the profuse flow ceased on the third day, and she had a much better time. Next period without any further treatment the heavy loss was restricted to two days, and the prodromal and other symptoms of dysmenorrhœa were entirely absent.

(66) Miss P., aged thirty-five, during a course of antidiphtheric serum treatment for rheumatism found that a menorrhagia with dysmenorrhœa which had troubled her for

some considerable time was completely removed, and the period rendered perfectly normal. She has been permanently benefited in health.

One seldom sees present in a case only one of the diseases under discussion, and in the cases given under endometritis menorrhagia will also be seen.

Endometritis.—The following is a typical case :

(67) Mrs. C., aged thirty-two, six years ago, at the birth of her only child, had a cervical laceration, which was not repaired. For the last five years she has suffered from endometritis, menorrhagia, and dysmenorrhœa. The menstrual period lasts for seven to fourteen days. The menstrual discharge is of a dirty brown colour, has a very offensive odour, and is followed by a leucorrhœa of a similar character. Before and during the period there is pain in the left ovary, with considerable bearing down and dragging. Her general condition is in accord with the other symptoms.

She was given in all 2 ounces, beginning with the flow, and the result was in every way satisfactory. The flow was at once brought under control, and was normal in quantity for four days, then very slight for two days more. The quality was improved, as it was unaltered blood, for the first time for years. The odour at first was offensive, but the ovarian pain was entirely absent, and she had no bearing down nor dragging. Her friends at once recognised the change in her without knowing what had been done. A little leucorrhœa persisted. That the uterus was rendered physiologically healthy is proved by the fact that she immediately became pregnant, although by her own carelessness she aborted at two months. After having the uterus curetted to thoroughly remove all the placenta, she menstruated once, and then conception again followed. The treatment, abortion, and full-time pregnancy all took place within twelve months. This is the physiological proof that the serum treatment renders the blood an effective antiseptic, and consequently insures a healthy mucosa.

The next case probably arose from some miscarriage, and had very much lowered the patient's health, although she had evidently been a very strong girl.

(68) M. B., aged twenty-three, has suffered from menorrhagia for the last six months, the menstruation sometimes coming fortnightly. The flow lasted for seven days; it was copious with clots, had a foul odour, and soon became a dirty brown discharge, which gradually became leucorrhœa. There was considerable pain before, with tenderness all over the abdomen, the right side being worse. The pain was not relieved when the flow came on. Both before and during the period there was dragging and bearing down, and frequently during the month this would recur, while leucorrhœa was always present.

Menstruation had just finished, and she was put on elix. aletris co. (Parke, Davis and Co.) 1 drachm three times a day for three weeks. Under this treatment she did not improve in any way, but seemed to lose strength. When the flow came on she was away from home, and it was twenty-four hours after it started before she began the use of antidiphtheritic serum. The flow was foul as before for the first day, but under the serum it lost its odour, and the patient rapidly recovered. Menstruation lasted for four days and went clean off without changing to brown, and then into leucorrhœa, as before. The quantity was reduced to normal. Her health was much improved, and she said that she felt better than she had done for over six months.

It need not be said that where these conditions are secondary to some mechanical cause the treatment will have no influence whatever in removing it, but at the same time the mechanical cause is no hindrance to the action of the serum. Thus, where mechanical causes are present their effects may be removed, but the causes remaining, there will be a recurrence sooner or later. The following is an example :

(69) Mrs. H., aged forty-four, had a cervical laceration at her last confinement, five years ago, since which she has suffered from menorrhagia at every period. She has fairly

large loss the first two days, and on the third day a severe hæmorrhage with clots, which leaves her faint and ill. For this she has been curetted without benefit, but nothing was done for the cervix, and she has since refused further operation.

She was first seen a week before her period for an acute metritis with a secondary cystitis. The uterus was much enlarged, and was about the size of a four months' pregnancy. It was prolapsed and retroverted, fixed by adhesions and painful to touch; but there was no ovarian tenderness, and the inflammation was confined to the uterus and bladder. Three days' treatment with antidiphtheric serum cleared up the whole trouble so thoroughly that when she put on her clothes she noticed at once the reduction in the size of the uterus, while all trace of inflammation had gone.

When the period came on she was again treated with antidiphtheric serum, and the discharge was reduced to what would be normal for her, as she always did lose freely. She was quite a new woman after this treatment, feeling light and capable of getting about, and all her old dragging and weight had gone, while the reduction in the size of the uterus was still more marked. In two months she relapsed, probably partly from the uterine condition and partly from an approaching menopause. The mechanical conditions were sufficient to account for relapse.

Dysmenorrhœa.—Amongst the varieties of this disease the congestive is the only one which naturally would be expected to be within the reach of such a remedy as antidiphtheric serum. In practice this expectation is abundantly fulfilled, for the serum meets the disease in all its phases. Where obstruction or other mechanical causes are present there will probably be a return of the trouble, but otherwise the treatment has never failed me yet. It is quite possible that where no such mechanical cause is present, but where the disease has been of long standing, the habit will have been formed, and treatment will have to be continued over several

periods before we get complete recovery from the regularly recurring misery. This is now under investigation.

Many of these cases have a mixture of congestive and neuralgic conditions present, and it is now my practice if pain persists or recurs after serum treatment, to treat them next time for the neuralgia, and this is generally successful.

Most of the cases treated have been those of girls who naturally object very strongly to digital examination, and many of those who have taken the treatment have done so because that was not required before giving it. I have, however, always pointed out to such patients that if the treatment fails it will be due to some cause which no medicine can touch, and that examination and possibly other treatment will be required. When they recognise that everything has been done which medicine can do, then there is rarely any difficulty in inducing them to do what is required. And the same obtains when there is a recurrence.

The following case had completely baffled me, and had been practically given up as hopeless, until *faute de mieux*, she was given a trial of antidiphtheritic serum.

(70) Miss R., aged twenty-six, has suffered from congestive dysmenorrhœa for the last eight years, and has been under various treatments by different practitioners, without benefit. The interval is four weeks; the prodromata last for two days, during which she has mammary pain and congestion, bearing and dragging down, and pain all across the abdomen, but worse at the left side. The pain is at once intensified when the flow begins, and continues for five hours without cessation in great waves of pain, during which she has nausea and vomiting. No treatment has ever given her any relief for this part. The pain will go off for an hour and then return for two hours, and *da capo* for twenty-four hours. She must lie down all the time, and she cannot walk for several days. The flow, which lasts for about a week, is at first bright red, but in twenty-four hours it becomes brown, with a foul odour, and

after it has gone it is succeeded by a leucorrhœa, which lasts for a week longer.

She was put on antidiphtheritic serum the day before it came on, and of the usual prodromata she had no mammary congestion nor pain, no dragging or bearing down, and only a little suprapubic pain, such as any woman might have for half an hour before the flow began. The pain began with the flow, but it was so slight that no heat or any other treatment was required for it. She went to bed for the first day, but was up and walking about the next day without any dragging, and walked well. The flow was free; there was no odour, and the brown change came on only at the last, and very slight, and there was no subsequent leucorrhœa. It lasted three days, but in that time she had lost as much as was usual at her periods. She said that the pain was relieved with every dose. Her general health, which had been anything but good, and which was lowered every month by the dysmenorrhœa, was much improved by the relief given. She had had antidiphtheritic serum before, but between the periods. It lessened a menorrhagia, but failed to benefit the dysmenorrhœa. Next period she had no treatment, and all the prodromal symptoms were absent; but she had a return of the dysmenorrhœa, although not so prolonged as before treatment, and it did not begin, as usual, with the flow, but came on some hours after. One would be inclined to call the part which recurred spasmodic but she could not walk after it for the feeling of dragging, and had to keep lying down. The period later she again had antidiphtheritic serum, but the pain beginning with the flow was not benefited, although otherwise she was well. She has since married, and is in splendid health.

The following case had previously been in my own hands, and after trying all that could be done without operation, she was finally advised that curetting would be necessary. While discussing this proposition, she left the district, and returned eighteen months after, no better than when she left.

(71) Miss B., aged twenty-five, congestive dysmenorrhœa for the last two years. There was severe abdominal pain before menstruation, which forced her to lie down. The abdomen was tender right across, but the left side was the more acute, and there was great bearing down. The pain was relieved by the flow, which had a foul odour from the very first.

Antidiphtheritic serum was given for thirty-six hours before the flow three times a day, and when it came on every four hours, till she had taken 2 ounces. The result was absolute relief from all prodromata, the quantity was right, and the odour was absent till the very last, and then was only slight. Previously it had lost its colour, and had become brown, and then shaded off into a leucorrhœa. This time the flow went clean off without changing its colour, and there was no leucorrhœa.

Previously she felt ill for a week after, as the pain seemed to take such a lot out of her, but this time she felt quite well and able to take long walks. Some months later she reported that she had been quite right every time since the treatment, and was in splendid health. Two years later she still retained the improvement.

The following case was clearly secondary to a retroflexion, which did not prevent the serum doing its work most satisfactorily, but led to a recurrence from overexertion afterwards. She felt so well and was so delighted that she overexerted herself.

(72) Mrs. M., aged twenty-nine, nullipara, had a retroflexion, and had suffered from congestive dysmenorrhœa for a long time. Ten days before the period she began to have dragging and bearing down, and this was followed by mammary and abdominal pain, the latter being relieved by lying down. Externally she had tenderness all across. The pains were not relieved by the flow, and the dysmenorrhœa lasted all the time. It was accompanied by headaches occipital and through the temples. The flow lasted only two days, was light in colour at first, then shaded off into a brown, offensive discharge, and

then into 'whites.' For a fortnight she had elix. aletris co., a drachm three times a day, and was given antidiphtheritic serum two days before menses appeared.

Three days later she reported that bearing down gradually lessened from the beginning of the serum, and was gone before the menses appeared; she had no mammary pain or congestion, only a trace of abdominal pain, but that also had gone before the flow began. The occipital headache had not come, and the temple headache was much less than usual. Formerly she had to lay up for the first day, but this time she went out to spend the evening. There was no dysmenorrhœa, and the flow was light in colour as usual. None of the usual hysteria, although she was slightly nervous one day.

Five days later she reported that menstruation lasted for four days—the latter two very scanty—and it went off with a very little dark discharge, which had a slight odour, which was not increased at the end, as before. After four or five hours of slight discomfort at the first she had no pain absolutely. Her usual backache was materially lessened this time—in short, she had a normal menstruation.

As she felt herself so much better and so light on her feet, she proceeded to overwork herself in a way she had been quite unable to do before, and soon she had a uterine congestion, with leucorrhœa and down-bearing.

Her next period was a recurrence of her old experience, and she was again given serum, to see whether the treatment would relieve her a second time.

The next two periods did not come properly, and the explanation came later on in an abortion. She had never been pregnant before, and had been married for five years.

(73) Miss M'G., aged twenty-six, had dragging and bearing down for a week before menstruation, and shooting pain from the uterus at night, which went in the morning. The day before the menses appeared there was pain on palpation over the abdomen, left side worse, but relieved by the flow, which

was pale at first, darker after, then it sometimes became brown, and was always succeeded by leucorrhœa for several days, and recurring during the month. There was a tendency to nausea, but no odour. Period lasted for four or five days, but came on again in a day or so, and lasted for another day. Elix. aletris co. for a fortnight.

March 21, 1903.—Reported bearing down and dragging begun, with shooting pain in the uterus. Leucorrhœa with other prodromata present. Antidiphtheritic serum 1 drachm three times a day.

March 23.—Great improvement: dragging practically gone, no pain except an occasional shoot in the left side, slight mammary congestion, but no pain, leucorrhœa much less, feels well, menses not yet begun.

March 27.—Menses lasted three days; had a chill the first day, and the flow did not come properly; after that all right, went clean off without change to brown or leucorrhœa.

Patient's health was very materially benefited by the treatment.

Such cases, being as common as any disease we have to treat, could be indefinitely extended, but it may be sufficient to say that no case has as yet come to hand without receiving all the benefits claimed for the treatment.

Here let me suggest this method as a means of preparing the uterus with its adnexa for operation, with every benefit to the patient's health.

In the following case the reduction of the uterus by serum treatment was confirmed by measurements taken before, during, and after treatment.

(74) Mrs. A., aged thirty-eight, multipara, last child six years old, had difficult labours, and suffered for long after from subinvolution. She suffered from congestive dysmenorrhœa, had bearing and dragging down on the slightest exertion; there was considerable bladder irritability, and, above all, she com-

plained of a pain across the sacrum. Examination showed the uterus enlarged and heavy, anteverted and lying on the bladder, the uterine canal being an inch longer than normal.

She had the serum as usual during the period, during which the quantity lost was much less than usual, but still quite enough, while all the other symptoms were much improved. The uterus on examination was found to be much lighter than before, and measurement showed that it had decreased by $\frac{1}{2}$ inch. The treatment was administered during the next period, during which she had quite a normal menstruation, and after it was over, measurement of the uterus showed that it had been reduced to its normal size. All the symptoms she had suffered from had entirely gone, except a little pain in the back; but that was entirely altered in character, and was probably due to a rheumatic condition which was in evidence elsewhere.

The next case was one of membranous dysmenorrhœa, and while the treatment relieved the concurrent symptoms, it failed to remove the membranous part of the trouble, as it recurred at the next period.

(75) M. B., aged fourteen. First menses at eleven, always profuse, and lasted eight to ten days, with considerable pain, more like spasmodic dysmenorrhœa. The prodromata, usually leucorrhœa, merge into the menstrual flow, which is always offensive from first to last, and is of a dirty brown colour.

Treatment was begun three days before the menses appeared, and she had her usual leucorrhœa. There was a dirty brown offensive discharge on the first day, but it cleared up next day, and was a good colour till just before it ceased. The quantity lost was about half of the usual, and she felt better, brighter, and lighter than usual after menstruation.

At later periods the pain returned for the first few hours (evidently of a spasmodic character), and the pieces of mem-

brane, 2 inches by 1 inch, were present, as in former menstruations, but she retained the other improvements.

The following case is an example of the use of the serum in the preparation of a case for operation, and also of its use in securing firm healing :

(76) Mrs. D., aged thirty-five, had a cervical laceration after her first child, which was repaired by an Emmet's operation, but which gave way once more at the next childbirth. She had considerable subinvolution, but after treatment with anti-diphtheritic serum was sufficiently well to refuse operation ; but, after becoming pregnant and aborting at three months, she consented to the necessary repair being done. She was a patient who naturally healed very slowly, and who seemed to have an open door for any septic organism within reach. To reduce the subinvolution and prepare her for operation she was treated with the serum through a period, and as soon as it was over the repair was done. No curetting was required after the treatment ; the patient made an uninterrupted recovery, had a much firmer cicatrix than on the former occasion, had little or nothing of the pain she then suffered, and was up and about in ten days. She is most emphatic about the improvement in the methods of treatment.

The endometritis and menorrhagia from which she was suffering were both cleared up by the serum during the period.

In two cases which were curetted on the operating-table preliminary to laparotomy—one for cystic ovaries and the other for double tubo-ovarian abscess—the uterus was found to be absolutely normal, although the patients had suffered from endometritis and dysmenorrhœa before operation. They had each been treated with serum for these conditions, and the curette showed with what results.

One of the commonest causes of dysmenorrhœa which resists serum treatment is cystic ovary. The pain and discomfort recurs again and again, although the serum is administered for

some periods in succession. The following two cases are examples :

(77) Miss F., aged twenty-three, had suffered from dysmenorrhœa for some months. She was a neurotic and catarrhal subject. There was pain, especially on the right side, before and during menstruation, and a feeling of dragging pain between the periods. She had one attack of inflammation around the right ovary, which, under antidiphtheritic serum, cleared up in a week. She was treated with serum for several periods, but without effect. Examination was refused till all treatment failed. On examination there was a fulness in the right fornix, and a feeling of resistance suggesting adhesions. Laparotomy was done, and the left ovary was found cystic all over, but still functionally active. The cysts were punctured, and the ovary left. The right ovary was simply a few cysts, and all function had ceased, and it was removed. The patient made a good recovery.

(78) Mrs. T., aged thirty-two, nullipara, had had dysmenorrhœa for some years, which had resisted all treatment. She also had had repeated attacks of inflammation, some of which seemed to be appendicular, while others were evidently ovarian. For all of these of late years she was treated with antidiphtheritic serum. After serum treatment had begun she, for the first time after seven years of married life, became pregnant, but aborted twice. She was carefully treated in the third pregnancy and went to term, but the child only lived forty hours. The inflammatory attacks continuing with the dysmenorrhœa, it was resolved to remove the appendix, and at the same time see what the right ovary was like. The appendix was found adherent in its whole length and was removed. The right ovary was found to be cystic, and all trace of glandular structure had gone, and it was removed. She made a splendid recovery.

Six months later she again became pregnant, and has borne a healthy living child.

Both of these cases resisted serum treatment for the dysmenorrhœa, although the latter had the uterus rendered so physiologically clean that repeated pregnancies followed.

Metrorrhagia.—Only one case has been treated, and that was in a multipara who had had an abortion, metrorrhagia setting in some time after. In her case the success was brought about by the treatment of the subinvolution, and the congestion being removed, the hæmorrhage ceased.

(79) Mrs. M., aged twenty-six, three months before had an abortion (twelve weeks), from which she made a poor recovery. Previous to it she had been in a low condition of health for some time. She took a holiday, but it did her little good, and when her periods came on they were profuse and exhausting. For the last two months the loss had been almost continuous, and she had in consequence become very much run down and almost totally unfit for her household duties. In this condition she was put on antidiphtheritic serum three times a day. After taking the four doses left she felt the benefit, and in three days the discharge, which had immediately begun to improve, had completely gone. She was given eight more doses, and was a new woman when they were finished. She has since been confined at full time.

That antidiphtheritic serum is able to treat subinvolution was suggested to me by a case in which the patient was waiting to regain strength for the necessary surgical treatment for a cervical laceration with secondary subinvolution.

(80) Mrs. D., aged thirty-five, multipara, had a cervical laceration from her first confinement, which was repaired, but gave way again at the next. This caused subinvolution, and the weight and dragging of the uterus made her unable to walk any distance. She was waiting till she had regained sufficient strength to have it repaired when, to add to her troubles, she had three recurring attacks of mastitis, which were all aborted by a prompt and fearless use of antidiphtheritic serum. While under this treatment she felt her uterine condition improved,

and after finishing the treatment of the third attack, she was so well and could walk so easily, without any weight or dragging, that she refused to have anything done to repair the laceration.

Six months later she was well enough to become pregnant, but aborted at three months. She had all the symptoms of abortion at two months, but twelve doses of antidiphtheritic serum took all the weight, dragging, and backache out of her, and were doing the same at three months, when a sudden violent exertion precipitated the abortion.

In all cases of sub-involution no other treatment is required.

If possible get the patient at the period, but if suckling, then a few days in bed and 2 ounces of antidiphtheritic serum will work wonders. Dosage : 1 drachm three times a day.

Another case of metrorrhagia has come to hand :

(81) Miss H., aged sixteen years, had been suffering from metrorrhagia for the last two months, and was given antidiphtheritic serum at once. In all she had $1\frac{1}{2}$ ounces, but it failed entirely to help the case, which afterwards was materially benefited by ordinary drug treatment. Whatever the cause, it was evidently not within the reach of the serum.

Salpingitis.—The following case of pyosalpingitis was one which, from its character, lent itself readily to treatment with antidiphtheritic serum. It was treated just as an abscess anywhere else would be treated which was discharging its contents, and only required that the suppurative process be stopped to clear up the whole trouble. Had it been still intact incision would first have been required.

(82) Mrs. P., aged thirty-two, had been suffering from a vaginal discharge of pus and blood for the last nine months, and for the last four months had been under treatment by another practitioner, who, after consultation with examination under chloroform, recommended her to the Women's Hospital for operation. She refused. When seen it was found that there was a large mass in the left fornix, which was extremely painful to touch, and which was interfering with the bladder

and the left ureter. There was a constant discharge of pus from the vagina, which patient informed me had been continuous for the last nine months. This was in the early days of the treatment, and she was given 2 drachms per diem until she had taken 3 ounces. The case improved from the very first; the mass steadily diminished in size and tenderness, and by the time she had finished the serum there was no trace of it to be found. She had no further treatment, and when I last heard of her she was pregnant.

The following case was one which came to operation, the necessity for which was shown by the pulse and temperature resisting the treatment, although in every other way her symptoms were ameliorated :

(83) M. S., aged twenty-five, had had an abortion some time before being seen. When seen she was suffering from an acute peritonitis, with symptoms of intestinal obstruction. For this she was in a few days sent into hospital, but the serum had so materially reduced the symptoms that, after getting the bowels to work, they sent her home as not requiring operation. As soon as she came home temperature and pulse were found to be above normal, and soon she had another attack the same as before, but the obstructive symptoms were not so marked. Antidiphtheritic serum again relieved all pain except that on palpation on each side of the uterus, but the temperature and pulse did not fall to normal. From these symptoms the presence of pus was inferred, and the patient was sent to another hospital for treatment. On operating there was found a double tubo-ovarian abscess, with several smaller collections of pus. The whole uterine adnexa were matted together, and the intestine on both sides was firmly adherent to the mass. The tubes and ovaries were removed, and the patient did well.

In this case the symptoms were so materially relieved that none but those familiar with the use of the serum would ever have suspected that such conditions existed. At the

same time, by removing all inflammation, it assisted in no small degree to lessen the dangers of operation by enabling it to be done in what was practically the cold stage.

In these cases, and in all cases which come to operation, there is a great field for serum treatment when its therapeutics are more thoroughly understood.

CHAPTER XIII

KIDNEY AFFECTIONS—ACUTE NEPHRITIS —SUPPURATION

AMONG the aggravations of research in private practice is the lack of cases of the particular disease which it is desired to investigate, and often one has to wait years for the necessary material. This has been my experience in diseases of the kidney; but the cases which have come to hand have been satisfactory to the last degree, and indicate the diseases of the kidney as a field in which antidiphtheritic serum will win many laurels.

Before entering on the subject, one may refer for a moment to the general action of antidiphtheritic serum, orally administered, on the kidney itself. My experience of its use in the last six years enables me to say that only in one or two cases which were being treated for something else, but which seemed to have an idiosyncrasy, was there the least lessening of secretion or sign of pain in the kidney. This was easily remedied by a cessation of antidiphtheritic serum and the use of some simple treatment. On the other hand, it has been given in considerable quantities and for some time to patients with chronic albuminuria, without influencing it in the least for good or evil. It has also been given successfully for neuritis during the course of severe albuminuria with blood and casts, without affecting the concurrent disease in any way.

One of the last cases treated was a nephritis in an early

stage, and the result was parallel with that obtained in acute mastitis with the same initial symptoms.

(84) Mrs. H., aged fifty, had a very severe rigor during the night, with sweating and vomiting, and when seen at 9 a.m. had a temperature of 103° and pulse 99. She complained of great pain in the left side from the axilla to the iliac crest, and an examination showed the left kidney swollen and extremely painful to palpation. The patient had headache, great malaise, and looked and felt ill. The diagnosis was acute nephritis, and she was given 1 drachm every hour for three doses, and then every four hours. From the second dose she felt the benefit, and when seen at 9 p.m. temperature was 99° and pulse 68. The headache still persisted, and so did the side pains, but with less severity, and on palpation the kidney could be freely handled without pain. The only other treatment was the application of moist heat, and she was ordered a spinal poultice in the evening for the neuralgic pains.

Next morning temperature was 98.2° and pulse 71, and patient was very well. Headache and all other pain had gone except the intercostal, which was shifting and evidently neuralgic, and which yielded to appropriate neuralgic treatment. To make sure, she was given antidiphtheritic serum every six hours for another day or two, but she had no sign of recurrence, and was finally dismissed four days from the first visit.

The following case, arising as it did from the twisted pedicle of a movable kidney, had gone much further before being treated with antidiphtheritic serum, but the result was equally decisive :

(85) Mrs. A., aged thirty-five, had had abdominal pain with fever and vomiting for some days before being seen. She was found to have had several severe rigors, with great sweating, and her third change of underclothing in a few hours was soaked with sweat. The right kidney was found to be twice the normal size and extremely tender on palpation. Antidiphtheritic serum was at once given, and she had 6 drachms in

two days. From the first dose of the remedy rigors and sweats ceased, the kidney steadily lessened in size and lost its tenderness, and in two days it had shrunk almost to normal, and could be moved freely around.

She had nephropexy performed later on.

The following case is typical of a class of which the writer has had a good many examples, and all with the same result :

(86) J. G., aged eight, male, seen for a colleague. Temperature was 101° , and there was a history of similar attacks, although this was the worst he had yet had. The right kidney was found displaced downward, and there was probably twisting of pedicle. It was very tender on palpation, and evidently the *fons et origo mali*. Antidiphtheritic serum, 2 drachms daily, in two days reduced the temperature to normal, removed the pain, cleared up the constitutional symptoms, and brought the kidney almost to its natural size. He made an uninterrupted recovery.

In every case of the kind the serum has done the same good work.

Pyelonephritis is a disease in which, even with antidiphtheritic serum, one has to exercise patience and common-sense. As an example, a colleague who tried it on an old-standing case gave up the treatment after using a few doses because it did not cure the case. What he expected one does not know, but that any treatment is going to get rid of such an intractable disease with a few doses is scarcely common-sense.

When a kidney has been the seat of septic inflammation for some years the suppurative processes are often present in various stages, from freshly-infected foci to abscesses ready to rupture. Under the treatment the constitutional symptoms rapidly subside, and the patient recovers health, although the pyuria may continue to resist treatment for weeks after they have disappeared. This is probably due to the state of the ureter and bladder after long contact with septic fluids. Another condition in the kidney itself which antidiphtheritic

serum fails to relieve is that of calculus, and this in itself will keep up the pyuria in spite of any treatment. Abscess coming to maturity will cause a rise of temperature even under antidiphtheritic serum, but if the treatment is carried on steadily the discharge of pus will cease in a day or two after rupture. The treatment not only prevents the further formation of abscess, but it also hastens the maturation of those already formed. Hence in a case which has lasted for any length of time it is to be expected that recurrence of constitutional symptoms will occur until all the abscesses present have discharged themselves, when the case should clear up. As an example of this, my last case is instructive.

(87) Mr. G., aged forty, acute pyelonephritis. Patient had been in ill-health for some time, but for a few days he had been unfit for business. He was suffering from headache, vomiting, dysuria, insomnia, night-sweats, neuralgic pains, and abdominal discomfort. Temperature was 102° , both kidneys were extremely tender to palpation, and he had a history of previous cystic trouble. He was seen late at night, and no sample of urine could be obtained till next visit. It was then seen that there was a large quantity of pus in it, and that the patient was suffering from resorption of toxins. Local symptoms were eased at first by poultices and the free use of milk and sodium carbonate, but as soon as the diagnosis was made he was put on antidiphtheritic serum. He was given 1 drachm every hour for the first three doses, then every four hours.

For the first twenty-four hours there was little improvement, except that his mind was clear, although there had been delirium at night up till then.

Next morning he reported having slept all night, and he looked and felt a new man. All his symptoms had gone except occasional neuralgic pains. Temperature was normal morning and evening. His evening temperatures had run— 102° , 101° , 100.6° , 99.6° , 98.4° . The pus was also reduced in quantity, although still plentiful, but there were no casts.

At the end of a week antidiphtheritic serum, which had been gradually reduced, was stopped altogether, and attention was given to the bladder. In a few days the bladder treatment had to be stopped and serum resumed, as the temperature had again risen, and he was not so well. He was given it as at first, and in a day he had recovered all that he had lost. After his temperature had again fallen to normal, serum was kept up twice a day, until in another week he had another attack, and this time his temperature rose to 103° , and it was several days before it returned to normal. This it did suddenly, as though by rupture of an abscess, although the urine showed little trace of extra pus. After that he was kept on antidiphtheritic serum three times a day for a fortnight, by which time all trace of pus had entirely gone, and patient went off for a holiday, from which he returned a month later in first-class health, and he has had no recurrence.

By culture the organism was ascertained to be the colon bacillus.

The first case treated was as follows :

(88) Mrs. G., aged thirty-five, had been under continuous treatment for pyelonephritis of right kidney for three years, with no benefit, and at last the writer recommended nephrectomy as the only course left, as the other kidney was showing signs of the same affection.

Before doing so it was resolved to give antidiphtheritic serum a chance, and she took 2 drachms daily for twelve days. By the third day all pus had disappeared, and by the end of the twelve days she was well enough to be dismissed. In that time the swollen kidney was reduced in size, pain of an acute character had quite gone, and only tenderness on palpation remained.

Owing to uterine complications which have reflexly influenced the kidneys, she has had occasional return of pain in both, but there has never been the least return of pyuria. That

pain should return is not to be wondered at when the condition to which the kidney had been reduced is taken into account, but when it does come on a few doses of antidiphtheritic serum quickly relieves it.

(89) Mrs. A., aged thirty, had suffered from pyelonephritis for five years, had nephrotomy performed, which left a fistula, and was finally advised to have nephrectomy done. Being much against operation, she had refused, until, when seen by the writer, she was a feeble invalid, able to walk only with assistance. The fistula would close for a time, then an accumulation would set up inflammation, and it would open and discharge. When seen there was pus in quantity of a dark colour and extremely offensive in the urine from both the fistula and the urethra, but no casts. The left kidney, which was the seat of disease, was swollen, but not very painful, and the right less enlarged, but sensitive to touch.

She was put on antidiphtheritic serum (2 drachms daily), and this was continued for six weeks, by which time she had taken $10\frac{1}{2}$ ounces. When she came she was leaning on the arm of an attendant, but at the end of a fortnight the attendant was dismissed. The constitutional symptoms rapidly improved, and she gained a fair amount of health, which was still further improved by a change after the treatment. The pyuria began to lessen from the very first, and quickly lost its offensive character. Four times the sinus closed and reopened, but at the end of the course of treatment even the microscope could find no trace of pus in the urine.

As the fistula continued to open and close, and gave great pain and trouble, and as she was now in a better state of health, she consented to have nephrectomy done. This showed that the kidney was practically destroyed, and consisted mainly of a single sac. The cause of the opening and closing of the fistula was the condition of the ureter, the lumen of which had become contracted and closed altogether every now and then. That antidiphtheritic serum could do so much for a

case in such a condition is no slight testimony to its specific character.

The following case was taken early in the disease, and gave little trouble :

(90) Mrs. P., aged forty-nine, had been suffering for some time with nephritic pains. She had exacerbations at times, with discharge of pus. She was given a course of 3 ounces, and completely lost all her nephritic symptoms. That was over two years ago, and she has had no return.

She was evidently taken early in the course of the disease.

Dosage.—For acute nephritis 1 drachm every hour for two or three doses, then every four hours.

For acute suppurative conditions, the same dosage ; but when acute stage has gone, 1 drachm three times a day.

The following case was interesting as a case of the pyelitis of pregnancy :

(91) Mrs. M'E., aged twenty-three, primipara, three months pregnant, had acute nephritis first in the left kidney, from which she recovered mainly under treatment by urotropin. From the beginning of pregnancy the urine had been extremely offensive. After an interval of ten days the right kidney began to show the same symptoms, while the patient had become extremely anæmic from repeated epistaxis, as well as from the effects of the previous attack. The attack in the right kidney was of a much more acute character than the first, and what with renewed epistaxis and the exhaustion due to the disease itself, the patient was soon in a very serious condition. All the cardinal symptoms were fully in evidence. The previous treatment proved of no avail, and recourse was made to anti-diphtheritic serum. The dosage was 1 drachm every four hours, and this was maintained till she had taken 13 ounces in all. The benefits of the serum treatment were early apparent : the epistaxis ceased, and did not reappear ; all the other symptoms of the resorption of toxins were rapidly alleviated, and the patient made steady recovery of her strength. Com-

plete removal of the pus could not be expected, due as it was to mechanical causes, but the maintenance of tissue tone conserved her strength, enabled her to take and digest food, promoted sleep, largely prevented the sweating, and generally toned up the whole vaso-motor system. Thus, when the obstruction yielded, the convalescence was short and satisfactory. The organism was the *Bacillus coli communis*. She was confined of a healthy child at full time, and has done well.

The following case of pyelonephritis arising from stone in the kidney was promptly relieved of the inflammatory symptoms by serum treatment. The treatment failed, however, in clearing up the discharge of pus, as the stone, as a cause of the trouble, was beyond its reach.

(92) Mrs. D., aged fifty, for some time had not been in very good health, having periodical attacks of pain in the right side, which generally had gone by the time she could be seen. Thus, up to this attack, although she had various advice, no one had been able to make a satisfactory diagnosis.

On November 20, 1902, she had an acute attack of pain in the right kidney, with fever and vomiting. For this she was given a sedative, which was promptly returned by the stomach. The pain was relieved by the next morning.

November 21.—Temperature 101° , pulse 105. Examination of urine showed pus in large quantities, which on culture gave a growth of the colon bacillus. She was given antidi-phtheritic serum (1 drachm) every hour for three doses, and then every four hours.

November 22.—Temperature 102° , pulse 120. Patient had been delirious through the night, but felt better in herself in the morning, although both temperature and pulse were higher. Headache and vomiting were gone, and she looked and felt clearer in her intellect than before.

November 23.—Temperature 100° , pulse 96. Better all round, and less pus in the urine.

November 24.—Temperature 99·6°, pulse 92. Constitutional symptoms quite gone, head clear, and felt practically well.

Two days later temperature and pulse were normal. The supply of serum ran out, and she had another attack without it. This attack was not so severe in itself as the first, but the prostration was much greater, and the patient understood the difference of an attack with and without antidiphtheritic serum. With the serum all constitutional symptoms were rapidly and effectively dealt with, and she recovered, feeling little the worse for her experience; but without the serum these symptoms had full play, and she recovered much more slowly and with an amount of debility which took her some time to overcome.

Antidiphtheritic serum was continued for some time, but the pus persisted, and it was evident that some cause outside the range of the serum was present, and to it was due the failure of the treatment. All along stone had been suspected, so she was put on urotropin (10 grains three times a day). This cleared up the urine of all but the pus, and she took it for about two months. By this time there was little doubt of the diagnosis of stone, and she was then put on a mixture which has done good work in such cases for me:

℞ Urea	}	āā ℥iv.
Calcii carb.			
Sodii carb.			

Sig.: ℥ss. t. i. d.

This she took for about two months, and kept very well till the other day, when she had another inflammatory attack. I advised operation, and she is now considering the matter.

CHAPTER XIV

CEREBRAL, CEREBRO-SPINAL, AND SPINAL MENINGITIS

THE bacteriology of these diseases is of a most varied character, but so far as experience goes antidiphtheritic serum is effective only for the staphylococcus or streptococcus and the *Bacillus coli communis*, either alone or complicating other infections. The cases given are not very numerous, but they are all that have come to hand since the treatment has been recognised as being suitable for them. They have all done well, and the fact that there has been no failure says a good deal for the treatment, and gives a hint that tubercular cases are not quite so common as one would have expected, or that the serum does more for them than has hitherto been suspected.

If even a small percentage of the cases of meningitis could be reached and so promptly relieved as those which are given here, the treatment would be no mean addition to our therapeutic resources, and would come as a blessing to many a case which under present conditions would receive little help.

(93) P. R., aged twenty-eight, male, had been suffering from pains in the head for more than twelve months, but of late they had been increasing in intensity, and when seen they had become overpowering.

March 20, 1900.—Occipital headache, percussion of which was painful. Some intolerance of light, but none to sound; pupils normal, insomnia, anorexia. Temperature 102° , pulse 54. Antidiphtheritic serum twice a day.

March 21.—Temperature, morning, 98.6° , pulse 54; headache practically gone; percussion elicits little or no tenderness; slept well and looks better; evening temperature 101° .

March 22.—Morning temperature 98.4° , pulse 56; still improving, but finds that he cannot read yet without affecting his head; evening temperature 100° .

March 23.—Morning normal temperature and evening 100° ; still improving and begins to desire food.

March 24.—Morning temperature normal, pulse 60; good sleep every night now; evening temperature 99.9° .

March 25.—Temperature normal, pulse 56; intolerance of light nearly gone; evening temperature 99.2° .

March 26.—Temperature normal morning and evening; morning pulse 60.

From this onwards the patient was normal night and morning; ability to read without headache rapidly returned; his general health and strength improved, and he went back to business, much against my advice, on April 3. After the cessation of antidiphtheritic serum treatment he was given syr. acidi hydriodici, 1 drachm three times a day.

April 7.—Reported himself to-night. He feels his work (salesman) very hard, and fears he will have to take a rest, but has no pain and sleeps well.

April 12.—Good report; better able for work; not so good as before illness, but much better than on last visit.

April 19.—Reports himself as perfectly well, and finally dismissed.

Altogether he had $2\frac{1}{4}$ ounces, and no other treatment whatever until he was put on hydrogen iodide.

That was three years ago, and he has had no recurrence.

(94) Mr. G., aged thirty-five, had been suffering from headaches and insomnia for some months, but of late they had become worse, and were unbearable. He had just had some hæmoptysis, but no lung lesion could be discovered. Two days later he had a severe rigor, and temperature rose to 102° , and he had severe occipital headache and intolerance of light. For two days he was treated in various ways, but without avail, for he had a rigor each day, with rise of temperature and exacerbation of all his symptoms. After the third rigor he began to show more severe cerebral symptoms; he became intolerant of light and sound, duller and more difficult to rouse, foul tongue, anorexia, and feeling and looking ill. Antidiphtheritic serum was given, and all other treatment stopped. It was very irregularly given for the first twenty-four hours, and next day the patient felt out of sorts, and his temperature rose, but he did not have a rigor. Serum was now given regularly, and his symptoms steadily gave way; no further rigors occurred, and in four days he was well enough to sit up, and, in spite of all protests, he went to business and kept at it. In all he had $1\frac{1}{2}$ ounces.

A few months later he had an attack of pleurisy with effusion, and had to be aspirated three times before it cleared up. His sputum was then examined, and tubercle found, and when the temperature had fallen to normal he was put on Maragliano's serum, and did well. He has been in good health ever since.

(95) Miss H., aged thirty-one, belongs to a neurotic family, several members of which have shown cerebral symptoms, one sister having *grand mal* attacks. For a year or two the patient had been having severe headaches, but of late they had become overpowering, and she had to go to bed. Pain was excruciating all over the head, and she was most intolerant of light and sound. The weather was hot at the time, and that seemed to aggravate the symptoms, and ice was applied with benefit. Temperature did not rise much, but kept about 99° ,

and pulse was very slow, and fell at last to 48, and feeble and uncertain at that. Tache cerebrale and Koenig's sign present. When all other treatment had failed she was put on antidiphtheritic serum as a last resort. In all she took 4 ounces. For the first three days there was no perceptible effect, and it was about to be discontinued, but it was resolved to give it a trial for a day or two more, and then improvement began and continued. After the symptoms had much abated serum was stopped, but the patient at once felt the difference, and asked that it be resumed. After the serum was finally stopped syr. acidi hydriodici, 1 drachm three times a day, was administered for some time, and with considerable benefit.

She made a very good recovery, but has never been able to do so much mental work as she did before the attack.

The following case is an interesting one, as a subsequent operation clearly showed what the case had been while under treatment. The writer does not claim that the treatment beneficially affected the sarcoma, but that the inflammation surrounding it was removed for the time at least, and thus relief was obtained, which no other means that the writer knows of could possibly have given.

(96) *February 1, 1900.*—Mrs. S., aged thirty-eight, has had four children, the last being twelve months old. There were septic complications during the last two confinements and a miscarriage. Last confinement the attack yielded to $1\frac{1}{2}$ ounces of antidiphtheritic serum, and that during the miscarriage to an injection of antistreptococcic serum, which cleared up a sharp attack of septic peritonitis. Family history is not good—one brother has epilepsy, another is in a lunatic asylum, and a sister died post-partum of peritonitis. She has not been very well since the last confinement, has had headaches, and lately she has become strange in her manner, and feels inclined to injure her children. She cannot find words to express herself, has loss of power in her right arm and leg, intolerance

of light, bad headache on the left side anteriorly, and looks unfit to be at large. Temperature 99° , pulse 90; antidiphtheritic serum twice a day for twelve days.

February 2.—Mental condition better; complains bitterly of her head; cut off her hair and applied ice.

February 3.—General all-round improvement; hand and leg stronger.

February 5.—Better; says she feels as if she had been asleep and dreamed it all.

February 7.—Improvement continues; clear in her senses, and headache is forgotten till mentioned.

February 9.—Head clear; no pain in left side anteriorly; no giddiness; walks better; complains of weakness, but looks fresh and well. Temperature normal, pulse 96.

February 10.—Severe occipital headache for some hours; gave more antidiphtheritic serum, and headache gradually improved during the day.

February 12.—Headache gone, but relapse has left the side much weaker, and there is slight mental weakness; all intolerance of light gone.

February 14.—Patient well; all symptoms gone; hand much stronger; eats and sleeps well and walks much better. There is the natural nervous debility after such an illness.

March 1.—Paralysis recurred, but no headache or inflammation.

The patient continued to lose power, and six months later she was trephined. Gliosarcoma was found at the seat of pain, and she died a few days after the operation.

(97) M. G., aged nine years, female, had been complaining of headaches for a fortnight, and her mother said she was asleep and could not be wakened. Found her unconscious, with very foul breath and dirty tongue; otherwise she was normal. For want of something better, gave her antidiphtheritic serum twice a day. This was on a Monday, and serum was kept up till she had taken $2\frac{1}{4}$ ounces. She became

conscious every day for a short time, and each day the waking period was longer, till the following Sunday, when she was wide awake and perfectly well. At first when she did wake she complained of her head, but each day it was better, until on the Sunday the headache was all gone. Three days later she was dismissed well, and had no recurrence. No notes were taken of this case.

(98) H. C., aged thirty-one, male, had been having headaches for months, and had great pain in occiput and base of brain. He had a smart rigor, had intolerance of light and sound, and temperature was 101° .

Antidiphtheritic serum was given steadily for a few days; the temperature and other symptoms rapidly cleared up, and patient was fit for duty in ten days. He took $1\frac{3}{4}$ ounces in all.

In the following case of cerebro-spinal meningitis the treatment was complicated by the administration of a serum which was afterwards found to be practically inert, and it was impossible to trace how much of it had been given along with the other.

(99) W. P., aged eight years, male, had been in failing health for some weeks with headache, vomiting, and other digestive troubles, which resisted all treatment. He gradually became worse, and could keep nothing down, the vomiting being of a violent expulsive character. The headache was at times of a very violent type, and he emitted short, sharp cries from time to time. His temperature rose to over 102° , and his pulse to over 120. He lost flesh very rapidly, and soon began to assume the characteristic attitude, and lay with his knees drawn up and his head retracted, while he complained of his neck whenever it was moved. Percussion of the head and neck caused him pain. There was more intolerance for sound than for light. He was put on antidiphtheritic serum every six hours when his headache, cries, temperature, and vomiting were at their worst, and he improved from that

time. By the time he had taken eight doses his vomiting had entirely gone, and did not return. His temperature did not again reach 102° during the whole course of the illness. The acute pains which had caused him to cry out had eased so that he very seldom emitted a cry, and he could stand percussion better on his head, but not on his neck. The involuntary muscular movements in the face gradually eased off, and he became much quieter, and slept for hours at a time, although he always woke up clear in his intellect. After the vomiting was overcome he became very hungry, and had to be fed at short intervals; but in a week he had lost the appetite, and did not recover it until his convalescence. The temperature ranged from 99° to 101° during the course of the case, and it fell to normal after eighteen days' treatment, and remained so. After the temperature had fallen, the boy made a very rapid recovery, and there have been no sequelæ. Altogether he had 8 ounces, but the actual value therapeutically would not be more than 2 to $2\frac{1}{2}$ ounces. At the same time, there was no doubt whatever of the moderating action of the serum on the case.

The following is the only case of spinal meningitis which has come into my hands since the adoption of serum treatment, but it had been treated for three weeks in a hospital, with no benefit, before antidiphtheritic serum was given, so that the treatment had no easy case to deal with:

(100) Miss P., aged twenty-five, had been laid up in hospital for three weeks, and had come home. She described her symptoms during that time as great pain in left leg and right arm, with headache and pain all over her spine. There was also stiffness in the muscles of the neck. When seen she had a temperature of 101° , and complained of pain over the whole length of her spine and right up into the occiput. She had pains in the limbs, which varied very much—now unbearable, and then succeeded by relief or anæsthesia in the part. The area, as well as the locality, altered from

time to time. An examination of the limbs showed no articular rheumatism, nor any sign of inflammation. The diagnosis was spinal meningitis, and she was given antidiphtheritic serum every eight hours. The action of the serum was rather peculiar, for, however severe the pains were, as soon as she had a dose a feeling of numbness came all over the affected area, and continued for some time. At first the numbness lasted for fifteen minutes, but as the case progressed the intervals became longer, the numbness less marked, and the severity of the symptoms lessened, until at the end of five days the patient was very comfortable, had good nights, had lost almost all pain, and had only occasional patches of anæsthesia. By the time she had taken 4 ounces she was convalescent. She was then given syr. acidi hydriodici (1 drachm three times a day), and made an excellent recovery. She has had occasional twinges of nerve-pain at long intervals, but has never required any further treatment.

In all the cases complete dependence was placed in antidiphtheritic serum, to the exclusion of all other treatment. In this class of disease my present treatment would be prompt, and antidiphtheritic serum would be given every hour for three doses, then every four hours.

(101) E. R., male, aged eight years, had an influenza attack, from which he was just recovering when he had an acute attack of otitis media. As the other members of the family had had septic throats with their influenza, in which both the staphylococcus and streptococcus were found on culture, he was at once put on antidiphtheritic serum. At first he had relief, but for two or three nights afterwards he was in great pain. His leucocytes, which were 13,000 when first examined, rose in two days under serum treatment to over 22,000. There was no abscess, but now and then a little serous fluid exuded from his ear. Waiting for it to come more freely, it abruptly ceased, and none could be obtained for culture. In

four days the attack was practically over, and he was soon after dismissed. Three weeks later he was again seen, and his symptoms were distinctly meningeal. During the interval he had repeatedly complained of headache. He had been easily tired, was very irritable and quarrelsome, and his temperature had at times been over 100° . He had had no sleep the night before being seen with the severe headache from which he suffered. His temperature was 102° and pulse 132. The pain was extremely acute, and he was throwing himself about and screaming with it. The pain was located on the left temple, and radiated to the other side, and there was intolerance of light and sound. The ear was absolutely normal, although the cerebral pain was on the side which had previously been affected. Blood examination showed no leucocytosis. He was put on antidiphtheritic serum, 1 drachm every two hours for three doses, then every four hours. Leeching gave him no relief, and he had another very restless night. Next day (October 21) his temperature rose to 103.6° in the afternoon, pulse 132, and respirations 32. In the evening it again fell to 100.6° , and for the first time he perspired a little. A consultation was held, and my colleague, in view of the fact that there was still no leucocytosis, agreed with the possibility of tubercle; but, as there was no other symptom of it present in the lungs or elsewhere, even that was very doubtful. It was resolved to go on with the treatment. The patient had one more restless night, and on the 23rd the temperature rose to 100.6° only as the maximum, but after that it only once reached 99.2° , and the patient was absolutely well in a week from the first visit. At the height of the attack there was some well-marked twitching of the limbs corresponding to the area of the brain affected.

The absence of a leucocytosis suggested, although it did not prove, that the case was not of septic origin; also that it might be either from tubercle or influenza. My own opinion

was that it had a septic origin, although there was no leucocytosis, and that the treatment was the means of practically aborting it. Whatever was the cause of the attack and of the cure, the case ran a most abnormal course—three days altogether—and made a complete recovery, without leaving any sequelæ.

CHAPTER XV

MIDWIFERY: SEPTIC AND NON-SEPTIC

MIDWIFERY, like a traumatism, may be septic or not. In either case it lends itself peculiarly to the action of antidiphtheritic serum or the simple plasma. For clearness, it will be better to consider these conditions separately.

Non-microbic.

In the early months of pregnancy, and, indeed, all through the puerperium, antidiphtheritic serum may be administered freely without in any way affecting a normal condition.

Given for threatened abortion, it has seemed to restore the uterine tone and prevent the further progress of the premature parturition. Given for the pyonephrosis of pregnancy, it has not in the least interfered with the course of the pregnancy, even when its administration was continued over three weeks at a time.

During labour a dose or two of antidiphtheritic serum, by its recuperative action on the uterine muscle, has, in the majority of the cases in which it was tested, given very satisfactory results. It can only restore the muscle-tone to what is normal for the patient, and that is sometimes quite insufficient to complete labour, but in a great many it is sufficient, and the patient is saved the instrumental interference. The following are a few illustrations of the recuperative action on the uterine

muscle. The relief of the uterine muscular pain is very marked.

(102) Mrs. D. G., aged thirty-one, second child. Patient and all her sisters suffered from menorrhagia before marriage, and she herself had a very severe hæmorrhage some hours after the birth of her first child. The labour had been long, and had been completed with forceps. The patient had never been in robust health. Labour began during the afternoon, and when seen at 9 p.m. the head was on the perineum and the pains were frequent and severe on the patient, but on palpation were found to have little or no force. Patient said that the last labour was just the same, and that the pains were felt between the waist and thigh. At 9 p.m. she was given 1 drachm, and in ten minutes the whole aspect of the case was changed. The interval between the pains became much longer, the pains were strong and forcible, and there had only been six of them when the child was born. The patient then explained the action of the serum on her, and said that the character of the pains changed immediately after taking the serum. The pain around the waist and down the thigh disappeared, and she felt only the down-bearing forcibly and the stretching of the soft tissues. She was given another dose just before the child was born. The uterus contracted splendidly on the placenta, and after it was removed even a little pressure on the firmly contracted uterus showed how readily she would bleed. There was absolutely no loss at the birth, but she had a fairly free loss for six hours after it. She had two more doses of the serum, and after the fourth dose the lochia became quite natural in quantity and remained so. The uterus did not relax all the time. She made a very fine recovery, and had no more treatment.

(103) Mrs. M'A., aged thirty-two, third child. Her first was an instrumental case, the next was a rather prolonged labour, and this was going the same way. There was little force in the pains, and they were giving her more pain than

help. The cervix was not quite dilated, nor were the membranes ruptured. To test the antidiphtheritic serum, she was given $\frac{1}{6}$ ounce at once, and ordered the same in an hour. The pains almost immediately strengthened and became more effectual, so that by the time the next dose was due the child was born. The patient herself had no doubt about the action of the medicine. Another $\frac{1}{6}$ ounce did good work in relieving the after-pains.

(104) Mrs. D., aged thirty-five, fourth child. Labour had been on for some hours, and the pains were fairly severe. When seen, the second stage was nearly complete, but the pains then seemed to be doing little good. She was then given $\frac{1}{6}$ ounce, and in about fifteen minutes the pains became more severe and effective, and continued so until the child was born, an hour after the dose was given. When first seen, the labour was dry and the vagina hot and dry, but half an hour after the dose was given the vagina became moist and relaxed and favourable for the child's progress. The post-partum contraction was normal. The child's fist was under his chin, and that, with his rather large size, was probably the cause of the apparent failure of the uterine contraction.

The following case suggests that the restorative action of antistreptococcic serum on the exhausted uterine muscle is quite equal to that of antidiphtheritic serum in the same cases.

(105) Mrs. M., aged twenty, primipara. Normal presentation, and the head was well down in the vagina when the uterus began to show signs of exhaustion. The pains became more frequent, but had little or no force in them, and they were accompanied by increased uterine pain, which radiated all round the waist and down the thighs. It appeared a clear case for forceps, but, as a trial, she was given 2 drachms of Parke, Davis and Co.'s preparation of antistreptococcic serum for oral use only. The action of the serum was plainly apparent within ten minutes of its ingestion. The pain which had extended down the thighs disappeared, the uterine contractions

came with much longer intervals but with great power in them, and all that the patient complained of was the stretching of the perineum. The child was born without the slightest interference, although it was found that the cord was very tightly round its neck and the fist was under the chin. The restoration of tone and the renewed vigour of the uterus were immediate and decided, and it was abundantly evident that antistreptococcic serum was perfectly interchangeable with antidiphtheritic serum as a restorative to the exhausted uterine muscle. The lying-in was perfectly uneventful.

(106) Mrs. D., primipara. After five hours' labour had become exhausted, cold, and cyanotic, and the labour was not progressing, although pains were abundant. The cervix had not quite dilated, and membranes were intact. Two drachms of antidiphtheritic serum were given, and within ten minutes the nurse remarked on the change in the patient's colour. The cyanosis had quite gone, she soon got into a good perspiration, labour became more forcible and effective, and in an hour and three quarters she delivered herself without instrumental help. The down-bearing was the main discomfort. There was a slight tendency to hæmorrhage, but the uterus rallied promptly and she made an uninterrupted recovery.

After parturition antidiphtheritic serum may be used with benefit for :

1. Shock and loss of blood.
2. To remove after-pains in a normal manner.
3. To insure involution.
4. To generally maintain a debilitated patient's tone, so as to make the puerperum normal for such a case.

1. *Shock and Loss of Blood*.—The serum may be given freely enough before parturition, as there will be full time for it to have its characteristic effect on uterine contraction, but post-partum care has to be exercised in this particular. Post-partum, the vaso-motor reaction to the serum is much more

rapid than that of a heavy, sluggish uterus, and the consequence of giving the serum before the uterus is thoroughly contracted is that with a heightened vaso-motor tension there is generally an increased hæmorrhage, although, owing to the increased vaso-motor tension, the patient is not aware of the loss being sustained. Hence, my own practice, where there has been hæmorrhage, is to use ergot and all other necessary means to insure effective uterine contraction before giving serum to restore the patient's lost tone. Then, every dose of serum, besides maintaining the vaso-motor tone, also maintains the uterine tone and prevents subinvolution. It has also seemed to me that ergot was much more effective if the patient had had serum ante-partum.

2. *After-pains*. — When after-pains are severe enough to call for interference and the patient can afford the treatment, then antidiphtheritic serum will give quick relief, and at the same time improve the involution and general condition of the patient. The clonic contraction of the uterus is replaced by the tonic action of the serum, and the latter soon overcomes the former troublesome condition. Where the pains are due to uterine contractions on a clot which has not been detected, the uterus soon expels it, and the continued involution generally prevents a recurrence.

3. *Involution*. — From the very first cases treated post-partum the action of the serum in facilitating involution has been recognised. No matter how unpromising the case, how large and heavy the uterus, the continued use of the serum has caused a most satisfactory involution. This is shown, not only by the diminution of the uterus ascertained by examination, but also by the patient when she gets on to her feet, having no sense of weight or dragging. As showing also the toning action of the serum on the vaso-motor condition, the patients who have had the treatment for any cause during the puerperum have none of that faintness or giddiness so common on first getting out after parturition.

Where any membrane or placental tissue has been retained, the uterus contracts all the same; but when the treatment is discontinued, if the retained tissues have not come away, their presence causes a relaxation of the uterus, and a subinvolution ensues.

In ordinary cases, without anything abnormal the use of 1 ounce during the first two days usually causes such rapid contraction that the lochia becomes a lochia serosa within forty-eight hours, and the patients get an impetus towards recovery which they are not slow to recognise.

(107) A fine example of the recuperative effects of the serum treatment was seen in a post-partum case which had barely escaped an attack of eclampsia.

After parturition the patient was very exhausted, and next morning looked like a living corpse. She was then put on antidiphtheritic serum, and it was kept up for a week. She rallied immediately, although for a night or two there was a little delirium, and at the end of the puerperium she had made a splendid recovery, and was astonished and delighted to find herself better than after her previous confinements. The anæmia was still present, although improving, but it was months before she recovered her normal blood condition. Good involution was secured, and when she got up the vaso-motor tone had been so improved that there was neither giddiness nor faintness.

This action of the serum confirms the previous conclusion that it is a suitable treatment post-partum for such cases as from their general health would not be expected to make a good recovery, and also for those who in previous confinements have made protracted and unsatisfactory recoveries.

4. *General Healing and Recovery.* — Take a number of women haphazard, all suffering from traumatism, and there will be found amongst them a recuperative power varying from nil to perfectly normal. Recovery from parturition has the same variation, and my own practice has been to give antidiph-

theritic serum as long as may be needed to those cases who show symptoms of making a poor recovery or whose history shows this to be the usual course post-partum. The following case illustrates nearly all the points mentioned. The leaving of the membranes is bad practice under ordinary circumstances, but with steady use of serum it can be done with little or no risk to the patient.

(108) Mrs. S., aged thirty-nine, fourth child. In every previous confinement she had considerable loss, as lochia were too free all the time. She took a long time to recover her strength, and dreaded the birth for that reason. Possibly this was partly due to being left too long in labour before being relieved, with consequent uterine exhaustion. This time the head came quickly down to the perineum, and seeing that the pubic arch was the hindrance, forceps were applied, and she was delivered without trouble. Antidiphtheritic serum was then given until she had taken $1\frac{1}{2}$ ounces, with the result that, after two days, the lochia became a lochia serosa and continued so. As she herself expressed it, she felt every morning when waking that she had made strides in her sleep. She recovered as only the most healthy and robust would, which was altogether unusual with her.

The following is a fairly good example of the value of the treatment, as in it we have all the factors which call for antidiphtheritic serum. She was a patient who always made a poor recovery, there was present just immediately ante-partum a pelvic inflammation, and she had a considerable hæmorrhage during labour :

(109) Mrs. W., aged thirty-five, fourth child, had gone five weeks over her expected time, and was very nervous about it. The day before confinement pelvic pain, which had been present for some time, became much worse, and she developed a temperature of 102° and a pulse of 120. She had several chills, and complained of pains all over the pelvis. Varix was present in both legs, and she had suffered considerably from

phlebitic inflammation. After consultation, it was resolved to leave her alone and not precipitate labour, but give her anti-diphtheritic serum, of which she had two doses in three hours before parturition, which came on suddenly, and might well be called precipitate. Labour was ushered in with great pain and free hæmorrhage, which was only stopped by the rapid descent of the head. This probably saved her, as partial placenta prævia had been diagnosed before, and the child was born ten minutes before I could see her. Patient was weakened by the hæmorrhage, and she then had a rigor which lasted for an hour. Placenta was expressed twenty minutes after birth, but came away leaving all the membranes behind. In her exhausted condition it was deemed inadvisable to further interfere with her, and the membranes were left *in situ*. Anti-diphtheritic serum was kept up mainly every six hours till she had had 4 ounces. After two doses temperature had fallen to 99.6° , and by the evening of the same day it had fallen to 97.6 . Patient had some after-pains, which quickly died away, and the pains which had been all over the pelvis had practically gone within thirty-six hours. She felt the latter only when she moved too freely. Patient said that she had a feeling of well-being to which in former and easier confinements she had been a stranger.

The membranes were passed on the fifth day, and were practically free from odour. The temperature never exceeded 99° till the first piece of membrane was passed, and the nurse, without asking, syringed her. After the vaginal douche the temperature rose to 101° , but it fell to normal within twenty-four hours without further interference or change in the treatment. The following are some of the advantages obtained in this case :

1. Rapid and complete removal of pelvic inflammation.
2. Early freedom from after-pains.
3. Immediate and continued improvement in varix of both legs.

4. Lochia in forty-eight hours was reduced to a lochia serosa, and loss of blood was prevented.

5. Patient had a feeling of well-being all through, and on the ninth day, when she got up, she had none of her usual feeling of giddiness or faintness, but felt well and strong.

6. Milk came freely and without pain or temperature, and for the first time in her life she asked that the baby be wakened and suckled to relieve her breasts.

7. Involution was splendid, as the uterus post-partum was large and heavy, and reached to between the xiphoid and the umbilicus. By the ninth day it was level with the pubis, and when she sat up there was none of her old trouble of down-bearing.

8. The patient was a very neurotic and irritable woman, and the treatment soothed her nervous system wonderfully, and made the puerperium a pleasant time for all concerned. As a consequence the baby, after the first day or two, was a perfect model in behaviour.

9. The membranes were kept sweet, and she was spared their forcible removal at the confinement when she was in a state of collapse.

If they were read as exactly opposite they would give a fair example of what she used to be in former confinements, of which I had anything but pleasant memories. To complete the story, the baby took erysipelas a few days after the treatment was stopped. It spread all over the hips, thighs, shoulders, and dorsum, but was checked, and all inflammation removed from it by a free use of the same treatment.

Cases of Exhausting Labours or of Severe Hæmorrhages.

The following case was the first one tested, and the success in it led to further investigation.

(110) Mrs. M'D., aged thirty-six, seventh child, a weak,

delicate woman who had had continuous uterine pain for the last three months of pregnancy with chills and cold sweats. She was in a debilitated condition and looked ill.

Owing to the condition of the pubis both my own and my colleague's axis traction forceps failed to deliver, and turning was resorted to. By this time all fluid was gone, the head was fairly well down, and the turning proved very difficult. The child was born alive, but the mother had hæmorrhage, collapsed, and required careful and prolonged efforts to bring her round. She complained greatly of pelvic pain, and the uterine contractions made her cry out. As a trial she was given antidiphtheritic serum every eight hours, and from the first dose it helped her. The child was born late on Saturday night, and she did not sleep that night, but next day the pain was much less, and she slept well on Sunday night. When seen on Monday she had no pain, and had made a wonderful rally, at which no one was more surprised than herself. She was given 1 ounce in all during the first three days, and at the end of ten days, when dismissed, she had made a fine recovery, and was better than she had been for three months. The lochia became foul the day after the birth, but rapidly cleared up under the treatment without any other measures being required. This was not to be wondered at considering the nature of the confinement.

There was no sepsis in the case, but what was equal to a severe traumatism was kept aseptic, and recovery was all that could be desired.

Where hæmorrhages have been severe there is always a great risk of septic complications following, and for this, if for nothing else, the use of antidiphtheritic serum is indicated in such cases. But there is also the recuperative action of the serum so much needed when patients are so much reduced in strength, and also the relief of pain which would otherwise keep them from obtaining needed rest. In fact, it meets the whole case from the beginning to the end.

The following is a fair example of some of these points :

(111) Mrs. C., primipara, aged thirty-two, had an extremely severe hæmorrhage post-partum, which taxed my every effort to see her through. She was pulseless for fifteen minutes. The labour had been a normal one till the head had reached the perineum, and then she had had a little chloroform, and had been quickly delivered. There was a perineal laceration of the first degree, but the patient was not exhausted, and was an unusually healthy woman. Uterine hot douching twice, coffee and brandy enemata twice, hot water and brandy once, strychnine and ergotinine hypodermically, and 2 drachms ext. ergotæ liq. orally were some of the measures used to meet the case.

She had rallied only in the very slightest seven hours after, and lay groaning with absolute weakness.

At that time she was put on antidiphtheritic serum, and given $\frac{1}{2}$ drachm every hour for three doses. The report was that in a very short time after the first the patient ceased throwing her arms about and the restlessness began to lessen, and after the three doses she rallied in a splendid way, and when seen three hours later it was difficult to realize that it was the same patient that had been left so far through in the morning. The pulse had quite altered, and was now about 100 instead of 120 to 135, and the volume was full and good. Antidiphtheritic serum was kept up from the beginning to the end of the puerperium. In all she had 8 ounces of the serum before she was fit to dismiss.

She had one of the worst 'caked' mammæ that I have ever seen, but the use of the serum kept down inflammation and the tension was reduced by ordinary treatment, and she suckled the child normally.

The effect of the serum in producing the normal milk secretion in patients who are so completely exhausted, and in maintaining it as long as the serum is being exhibited, shows the general recuperative power of the treatment; but in non-

septic cases the simple serum is capable of doing this, although its recuperative power on the involuntary muscle is nothing to that developed in both antidiphtheritic serum and antistreptococcic serum. The feeling of *bien être* is very marked, and the patient's nervous system, soothed by relief of pain and good sleep, leads to comfort all round.

(112) Mrs. D., multipara, had severe and exhausting hæmorrhage on second and third day post-partum, and was reduced to an alarming condition of exhaustion. Antidiphtheritic serum was at once administered and maintained every four hours. She was so rallied that she was quite unaware that she had been so ill. Every dose given made her feel so bright that, if she was going to sleep, it stimulated her so that she did not sleep, as she was a very excitable patient. Half antidiphtheritic serum and half normal horse plasma were then administered. Milk came at the usual time, normal in quantity and quality, although the patient's appearance affirmed the impossibility of such a secretion. She was up in ten days, and made a fine recovery. Normal horse plasma was continued for her lactation, and she suckled her child well.

Puerperal Sepsis.

On inquiring into the ætiology of cases of puerperal infection some are found to have been infected ante-partum. My three last cases of phlegmasia had all suffered from suppurating teeth for months, and their resistance had thereby been materially lessened. Where such conditions obtain it is clear that they should be attended to ante-partum. Unfortunately, most women think that it is the correct thing to lose one or more teeth with every pregnancy, and so the facts are generally not reported to the attendant. Post-partum, my own practice is to begin the serum whenever the patient shows any temperature which cannot be explained by the usual post-partum conditions.

If a false alarm, the serum can only do good ; if otherwise, the defence has been begun at the most favourable moment.

A few examples of the use of the treatment in the early stages may be given.

(113) A colleague who reported Case 121 had another case immediately after the first, and evidently the infection had been carried from the other. The temperature was over 103° , and the case presented the same serious features in the early stages as the other had done, but the whole case was cleared up by the use of $\frac{1}{2}$ ounce in forty-eight hours.

Another colleague reported the following case :

(114) A patient of his had an abortion at three months, which had done well till the fourth day. He thought that everything had come away, and was much surprised when his patient had a sharp rigor and a temperature of over 104° . He immediately gave her antidiphtheritic serum every six hours, and when seen next morning her temperature was normal, and she made an uninterrupted recovery.

The following is the second case treated with antidiphtheritic serum in March, 1898 :

(115) Mrs. P., aged thirty-three, multipara. Found her on the fourth day with a racking headache, pulse 130, temperature 103° . She had had a bad night, and the lochia were foul, while there was a suspicion of pain in the left fornix. She was given $1\frac{1}{4}$ drachms that day, had a good night, and next morning she had temperature and pulse normal, and did well.

(116) Mrs. D., aged thirty, abortion at three months. The foetus came away, but the placenta was adherent. After waiting for a few days the temperature began to rise, and she was curetted. The placenta was so adherent that a sharp curette could not thoroughly clear it out. After the curetting, she had a violent rigor, and her temperature rose to $103\cdot4^{\circ}$. She was at once given antidiphtheritic serum, and had two doses that night, and next morning her temperature was 99° . As serum was very scarce at that time, she was given no more ;

but at noon she had another severe rigor, and when seen at 6 p.m. her temperature was 103° . One dose reduced it to 99° in a few hours, and a further dose night and morning for four days cleared up the whole infection. The temperature did not rise above 99° , and she was dismissed on the tenth day, having used in all $1\frac{1}{2}$ ounces.

These are merely examples, and by themselves prove nothing, but they are only odd cases in eight years' use of the treatment in this class of disease, an experience in which it has never failed me, and they also agree with the results obtained in similar infections in other structures.

As an example of a septic case which had gone further before it was taken in hand the following is interesting :

(117) Mrs. B., aged thirty, second child. Before and during pregnancy she had considerable pain in the left ovary, with flushings of heat, chills, giddiness, headache, and sweats, etc. This had materially affected her health, which was most unsatisfactory at the confinement, as patient was thin, anæmic, and weak.

On the second day temperature was found to be 102° , and she was put on antidiphtheritic serum, 2 drachms per diem, and this was kept up for five days. The temperature each day on visiting her ran 102° , 99.8° , 99.2° , 98.4° , at which it remained, and she made a good recovery. Whatever was the cause was also cleared up, as she suffered no more from the ovarian trouble.

The next few cases are examples of the thrombo-phlebitic method of infection, and of all the varieties it is the most difficult to treat. All that can be done is to increase the patient's tissue resistance, thus preventing the extension of the infection and assisting Nature to successfully resist the attack. That this can be done the following cases strongly suggest, for in every case the process, although in the blood-stream, was checked on the spot, and the infection receded from the beginning of the administration of the serum.

(118) Mrs. P., aged thirty-four, multipara, normal labour, a thin, delicate woman, who made a fair recovery, but did not seem very strong when dismissed at the usual time. A week later she was again seen, and it was found that her temperature was 103° , and that she had just had a severe rigor. She had steadily retrograded from the time she had been dismissed, and complained of pain in the right leg and pelvis. When seen after the rigor, the uterus was much enlarged and painful, and the whole of the right side of the pelvis was extremely tender to palpation. The most sensitive spot was just above Poupart's ligament, on the course of the femoral vein. Here a mass could be felt which extended for 2 inches below the ligament, and the pain extended all down the course of the vein. Varix had been present in the femoral vein during pregnancy, and during the lying-in this spot had been tender, but the patient did not mention it, and so nothing was done for it. Antidiphtheritic serum was given every eight hours, and no other treatment. On the third day she had a chill, and then it was given every six hours. With that exception, the course of the temperature and all other symptoms steadily declined. The temperatures at each daily visit ran as follows: 103° , 101.6° , 100.8° , 101.8° (chill), 100.9° , 99.9° , 100.4° , 99.8° , 99.8° , 99.8° , 98° , 98.6° , 98° ; the pulse 120, 105, 108, 108, 120 (chill), 100, 100, 100, 100, 108, 80. The limb did not swell as much as usual, nor would it ever 'pit.' From the beginning of the treatment there was an immediate halt in the extension of the process. Beginning at the uterus on the one side and the calf of the leg on the other, the area of inflammation steadily contracted till nothing but the part under Poupart's ligament gave trouble. In a fortnight all trace of the mass had gone. After she got round the leg swelled up considerably, but it gradually lessened, and now it is in every respect normal. It took $5\frac{3}{4}$ ounces to master this case, and it is a good example of the difference between preventive treatment and what is required after the case has got out of hand.

It was afterwards found that the patient had been suffering for some time with suppurating teeth.

As an example of the milder cases of this disease the following is interesting :

(119) Mrs. S., aged thirty-nine, multipara. Normal confinement ; good recovery. Twenty-five days post-partum she was again seen, and found to be suffering from phlegmasia in the left femoral vein and extending to the pelvis. She had had the pain for some days, and had only sent for me when it became so severe that she could not sleep with it. Temperature was over 100° , but there had been no chills or rigors. The vein was very tender to palpation, both in the pelvis and the thigh. She was at once put on antidiphtheritic serum every four hours, and no other treatment. This quickly relieved the pain, and the patient slept soundly the very first night. As my supply of antidiphtheritic serum had almost run out, the intervals between the doses were lengthened to eight and twelve hours, and immediately the pain began to return and give trouble. A further supply having been obtained, the attack was renewed with vigour, and the patient was dismissed in a week from the first visit.

This patient was also found to be suffering from suppurating teeth.

The following case was probably thrombo-phlebitic in its origin :

(120) Mrs. A., aged thirty-nine, multipara. Normal confinement, but during pregnancy she had had considerable pain in the right side of the pelvis, and with it she had frequent heats, chills, and sweats. After the birth she complained of a great pain in the same place, for which she was given some morphia and belladonna, but with little benefit. About an hour later she had a serious hæmorrhage, which was only stopped in time by a hot-water uterine douche. Two days later she developed abdominal pain, with temperature and great weakness, in addition to the exhaustion due to the hæmorrhage.

The patient suffered from varix in both legs, and the right leg showed areas of inflammation in the veins in sympathy with the abdominal condition, and subsided with it. In all she took 3 ounces, and was dismissed well in a fortnight. The improvement was continuous from the first.

A month later I had again to see her, and found her temperature 103° , with drenching sweats and severe pain in the right pelvis. This time it took 5 ounces to clear up the case, but by that time all pain, sweats, temperature, and illness were quite gone, and she looked bright and fresh.

The second attack was evidently a recrudescence of the first, in which the treatment had been discontinued too soon. She has had a good time in her next confinement.

This shows that in thrombo-phlebitic cases it is necessary to keep up the treatment for some time after the relief of all symptoms.

As this was a charity case, the serum was discontinued as soon as possible in the first attack; but time, trouble, and serum would have been saved had I been a little more liberal with the treatment at first.

The following case reported by a colleague is an example of antidiphtheritic serum clearing up the trouble after almost everything else had been done without avail. I have to get this class of case outside my own practice, as since using antidiphtheritic serum no case has been allowed to get out of hand.

(121) Mrs. B., aged thirty-two, multipara, confined June 6, 1900, normal labour, and she did well till June 12, when she had a rigor, and temperature rose to 103° , and in the evening to 104.2° . Two days later, when temperature morning and evening was 104.6° , she was curetted, some placental tissue removed, and the uterus packed with iodoform gauze. The morning after the temperature was 104° , and gauze was removed. Evening temperature, 102.2° .

June 6.—At 4 p.m. temperature was 104.6° , and patient was

given 20 c.c. antistreptococcic serum hypodermically, and by midnight temperature had fallen to 103.2° .

June 17.—At 7.30 a.m. temperature was 104.2° , and patient showed no signs of improvement. She was then put on anti-diphtheritic serum every six hours, and by the morning of the 19th temperature had fallen to normal, and remained so. Her milk, which had quite gone, returned next day. She had only forty-eight hours' treatment, and made a good recovery.

While under ordinary treatment appropriate medicine had also been given.

One cannot always expect such a rapid recovery in cases which have been allowed to go so far before serum treatment has been begun, but a good estimate of what work has had to be done to save the case may be made from the quantity of the serum required to clear up all the symptoms.

(122) Mrs. R., aged eighteen, primipara, confined October 19, 1905; neither doctor nor nurse present, and no history of placenta. She had a rigor on the 20th, and was seen on October 23. Lochia was scanty; there was considerable abdominal distension, with tenderness to palpation all over; the fundus reached the umbilicus, and the condition indicated acute metritis and perimetritis. The general condition of the patient was one of decided septic intoxication, and her temperature was 104.4° . Treatment: uterine douche four times daily, and 'Paton's' serum—at first 1 drachm every two hours, then, later, 1 drachm every four hours. The douche showed nothing abnormal. Within twenty-four hours of admission diarrhoea set in, and was treated with an astringent.

By next morning her pain was much better, and, the treatment being continued, her temperature fell to normal on the third day. By the morning of the fourth day all pain in abdomen had gone, and the intestinal movements, which had given her great pain, were free of any discomfort.

On the third day the supply of serum ran out, and on the fourth her temperature again began to rise, although there was

no recrudescence of the abdominal conditions. The explanation was found in a gluteal metastasis, which was incised on October 31. No pus was seen till November 2. This steadily cleared up, and there was no further extension. Serum was continued for another ten days, by which time she was sufficiently well to require no more. The patient has made a good recovery. A smear showed the infection to be staphylococcic.

Ruptured Tubal Pregnancy.

If ordinary full-time parturition may be classed as a traumatism, much more may the following case of tubal pregnancy. Here we have a case with shock, extreme loss of blood, subsequent peritonitis, and all its attendants, and antidiphtheritic serum met the whole process from the beginning to the end. There was first the removal of the peritonitis, then the prevention of septic complications, and finally the complete resorption of the clot, without any other treatment whatever.

(123) Mrs. S., aged thirty-three, multipara, eight weeks pregnant, became suddenly very ill, and, when seen, was found to be collapsed, with great abdominal pain. Consultant agreed with the diagnosis of ruptured tubal pregnancy. Patient was judged to be too exhausted to bear operation with any chance of success, so she was given a little opiate, and left, in the hope that the hæmorrhage would cease. This it did before it was too late, but it left her scarcely sensible. This was before the recuperative action of the serum on such cases had been recognised. Peritonitis supervened two days later, and, what with effused blood, flatus, and peritonic distension, she found respiration much hindered. Three days from the rupture she was put on antidiphtheritic serum every six hours, which very quickly disposed of the peritonitis and distension. The day after it was begun, while the nurse was

resting, the patient was given by mistake 2 drachms of phenyl disinfectant, which caused vomiting for six hours. The temperature had risen to 101° , and this kept it at that for two evenings ; but, as soon as its effects had passed off, the temperature fell to 100° , and then steadily lowered to 99° , but not to normal till all the clot had been absorbed.

On the fifth day my colleague again saw her, found the abdomen perfectly flaccid, and could easily map out the blood-clot, which filled the left side of the pelvis, and reached almost to the umbilicus. The result rather surprised him, and he said it was wonderful.

The temperature fell steadily to normal, which point it reached on the thirteenth day of serum treatment, and on the twentieth from the rupture she was up and dressed. By that time all clot had disappeared, and the uterus was as freely movable as before the illness. She was dismissed a few days later, and has since been in first-class health.

Twelve months later I had an opportunity of examining her, and found the scar in the left tube, almost an inch from the uterus.

Mastitis.

In this disease we have one of the most painful and troublesome complications of lactation. In face of all treatment, attacks will occur, and go on to pus formation. With antidiphtheritic serum the disease may be aborted if the case be seen in time, and its action is prompt and decisive. If taken in hand too late, then the continued administration of the serum will practically abolish the pain except to palpation, will lessen the constitutional symptoms by neutralizing the toxins, will prevent metastasis, will hasten maturation, and, after incision will rapidly clear up what remains.

The first cases dealt with are those which have been seen in time to abort the attacks.

(124) Mrs. D., aged thirty-six, second child, three months old, had been having pain in the left mamma for a day or so, but was wakened up during the night by a sharp rigor, accompanied by nausea, pains in the limbs, headache, and an intense pain in the mamma. The rigor and chill lasted for an hour, and at 3 a.m. she was given antidiphtheritic serum, and afterwards every four hours. She had taken 6 drachms—almost double doses—when seen at noon. By that time all nausea, headache, and pains in the limbs had gone, and the mammary pain was also much better. Temperature was 99° . She slept well that night, and the day after her temperature was 98.7° , and she was practically well. She was seen again for precaution's sake, and dismissed, having used in all $1\frac{1}{4}$ ounces. She had no other treatment whatever, such as moist heat, etc., and lactation was not interfered with.

Two months later she had another attack. The pain had been in the mamma for a day and a night before she sent for the serum. She had the first dose at 8 a.m., and the rigor came on at the same time, and the chill lasted till she had her second dose at 10 a.m. When seen at 3.30 p.m., after the third dose, the temperature was 99.9° , and constitutional symptoms had abated. She kept the treatment up every four hours, and next morning reported a good night—temperature 97.6° , all inflammation gone from the mamma—and she did not require further attendance. She had a few doses more for the next two days, and in all had $1\frac{1}{2}$ ounces.

Six weeks later she had another attack, but, instead of waiting till the rigor had come, she sent at once, and the whole attack was aborted. She finished lactation without further trouble.

(125) Mrs. B., aged thirty-six, primipara, parenchymatous mastitis, baby eight months old, complained of great pain in the right mamma and inability of the child to get anything out of it. The upper part of the mamma was red and angry, and the ducts were enlarged, hard, and painful to touch. As the

pain prevented sleep and suppuration threatened, she was put on antidiphtheritic serum every eight hours, and under it, without any other treatment, the gland steadily lessened, and grew softer. After taking $2\frac{1}{2}$ ounces the treatment was discontinued and another substituted; but within forty-eight hours the gland was as painful as before, and antidiphtheritic serum had to be resumed. The third dose removed the pain and gave sleep, and further treatment again brought the gland to normal. Massage was then used successfully to prevent recurrence.

In attacks of mastitis under ordinary circumstances the most prominent symptom is the intense pain, and it is just here that antidiphtheritic serum scores its best results.

(126) Mrs. O., aged twenty-six, primipara, recently confined; prolonged and exhausting labour; a delicate woman. She was treated with the serum post-partum, and made a splendid recovery, although she was the first case of perineal laceration which did not heal under the treatment. She had a great flow of milk, enough for three children. Two days after dismissal she had a sharp attack of mastitis, with a temperature of 102° and the usual severe pain. This was entirely aborted by $\frac{1}{2}$ ounce in 1-drachm doses every six hours.

Subsequently, with a month's interval between each attack, she had two more, and in each case the same quantity of antidiphtheritic serum was completely successful in aborting the trouble.

(127) Mrs. F., aged thirty-five, multipara, child seven months old, had an attack of mastitis in the left mamma, with great pain, steadily increasing, and hard and painful swelling. Half an ounce entirely removed the whole condition.

A month later she had a recrudescence, and thinking that the first attack yielded too readily for the serum to have been the effectual agent in the recovery, she waited this time until the mamma was half as big again as in the first attack, and suppuration threatened, while the pain was intense. Half an

ounce again was effectual in clearing up the inflammation—'like a miracle,' the patient said.

(128) Mrs. C., aged twenty-four, primipara; baby a month old. On May 30, 1903, she began to feel pain in the left breast, which gradually increased till I was called in the next night. Temperature was then 100° , and there was considerable tenderness to touch on the internal aspect of the breast. No enlarged ducts could be made out, and interstitial inflammation was suspected. She was at once put on antidiphtheritic serum (1 drachm every four hours). No other treatment whatever.

May 31.—Temperature 100.8° , and she had had a bad night, the pain radiating down the left arm, and preventing sleep entirely, while the headache had been very severe. The pain which had kept her awake had now gone, and with it had also gone the headache. She felt better in herself.

June 1.—Temperature 98° . Patient had had a splendid night, and was practically all right. Pain on palpation had almost gone.

June 2.—Perfectly well and dismissed. She had had in all 2 ounces, and had suckled her baby all the time.

In the following case a piece of membrane had been retained, so that but for serum treatment the case would have given trouble. To that possibly was due the attacks of mastitis.

(129) Mrs. B., aged twenty-six, primipara, baby a fortnight old, had a sharp pain in her left breast, which persisted, and it was accompanied by headache and malaise, although when seen the temperature was only 99° . The pain was on the internal aspect of the breast, and from its character suggested an interstitial inflammation. She was just beginning to have the chill, and was put on antidiphtheritic serum (1 drachm) at once, the same in two hours, and then every four hours. An hour and a half later her temperature had risen to 101.4° , but from that it gradually fell, till at bedtime it was 99.6° . By the morning it was normal. The headache gradually lessened, but

it was four or five hours after taking her first dose of medicine before the pain was relieved. The whole process was aborted, and so was another similar attack which occurred a week later.

A colleague who is learning to use the treatment supplies the following case :

(130) A woman who had had a mammary abscess with the first child was showing all the symptoms of a repetition of the same at the next birth. The same breast was affected, the upper quadrant being hard and painful. She had 1 ounce altogether, and his report is that three doses took the pain out of it, and the whole thing was 'resolved' in three days. Baby was ten days old. He adds that he can endorse my observation that patients who are having the treatment almost invariably express themselves as having a feeling of well-being.

(131) Mrs. B., aged thirty-two ; baby six weeks old. Shortly after the birth of the child she had an axillary abscess, for which her medical attendant stopped lactation. She was not in very good health, and came to town for a change. Here she had an attack of pain in the same breast, with a temperature of 101.8° , for which her husband came for serum. She had about $\frac{1}{2}$ ounce in fifteen hours, by which time temperature had fallen to 97° . Pain was relieved completely, and she went to sleep after the third dose and slept soundly. There was a hard mass in the breast, but free from all pain, and it was evidently due to the condition of the gland in the process of stopping the secretion. The pain did not recur.

What pleased her and her friends more than even the rapid relief of the inflammation was the great improvement in her general health and in the uterine condition. Uterine weight and dragging were relieved, and she felt able to get around with her old freedom and vivacity. She had $1\frac{1}{2}$ ounces in all. She had no other treatment whatever.

Later, when she returned home, inflammation recurred. She had no serum treatment, and abscess followed, which had to be incised.

Mammary Abscess.

(132) Mrs. E., aged twenty-five, primipara. Called in consultation, and found temperature 102° , suppurating perineal laceration, with resorption of toxins, and a metastasis in the right mamma. Antidiphtheritic serum had been begun too late to prevent formation of pus in the mamma, but during the whole course of it she had no pain nor other constitutional disturbance except temperature. When it was incised the temperature at once fell to normal, and the whole thing rapidly cleared up.

As this patient lived in an out-of-the-way place, I did not see her after the consultation, and the subsequent conduct of the case was in other hands. My colleague waited for signs of inflammation, but none appeared till the supply of antidiphtheritic serum ran out, and then, the symptoms becoming acute, he relieved it by incision. Had it been in my own hands, it would have been incised as soon as pus could be made out.

(133) Mrs. M., aged twenty-eight, primipara, fourteen days post-partum had a mild attack of subcutaneous mastitis, which was not relieved by home remedies, and a week later I was called in to see her. Antidiphtheritic serum was at once given, but it was too late to prevent the formation of pus. She had no pain except when the abscess was incised. A wound about $\frac{1}{4}$ inch served to relieve her of an ounce of pus, and in twelve hours it had ceased discharging, and healed immediately after.

This patient had made a rather poor recovery, and was in a lachrymose and depressed condition before the serum was begun; but after the mammary trouble was over she expressed her surprise to me that, while clearing up the mamma, the treatment had also materially benefited her general health, and that her strength and spirits were altogether different from what they were when she first got up.

On inquiry it was found that the patient had been suffering from suppurating teeth for some months prior to the confinement.

Another case, which was seen too late to abort, was as follows :

(134) Mrs. D., aged thirty-three ; baby six months old. For a week before being seen she had been having pain in her right breast, which had steadily become worse, and the upper external quadrant of the gland had become indurated and painful. When seen this was the condition of the gland, while the surface was inflamed and angry. She was at once put on antidiphtheritic serum, 1 drachm every four hours, and the prognosis given that abscess would probably ensue. Two days later she was again seen, and it was found that the treatment had relieved all pain, and that the external signs of inflammation had largely disappeared. No sign of softening could be made out in the mass, and she was kept on the treatment, to see whether it would resolve or go on to abscess. Six days later the patient said that, as all pain had gone, and she could suckle her baby and eat and sleep well, there was no need for further treatment of the lump, which was not going down. That day the beginning of superficial softening was found, and from an incision nearly 2 ounces of pus was evacuated. The pus was post-mammary and interstitial, and in a week it had quite cleared up. Lactation was preserved intact, and the general health of the patient was most wonderfully improved. No other treatment whatever was used.

On looking over the cases which have already been given of mammary inflammation one fact stands out, and that is that in almost every case, from various causes, subinvolution was present. The uterine conditions favoured resorption, and from the persistent coincidence of the symptoms there seems good ground for thinking that subinvolution is a great predisposing cause of mammary trouble. The thoroughness of the recoveries under serum treatment is due not only to its local antiphlogistic action on the mamma, but quite as much

to its reduction of the uterine congestion found present in such conditions, and the cases where antidiphtheritic serum has been used for uterine troubles are not afterwards under treatment for mammary inflammation. The lightness and capacity to walk, with the removal of the dragging and bearing down, give the patients a feeling of *bien-d'être*, to which they have long been strangers. As in menstruation, this improvement is permanent if there are no mechanical conditions present to cause a recurrence.

CHAPTER XVI

MISCELLANEOUS CASES

THE two first cases herein are examples of general septic infection, but how the infection found an entrance and where was its focus were two questions which could not be answered. All that I know is that they presented the classical symptoms of sepsis, and that the diagnosis was confirmed by their yielding to antidiphtheritic serum treatment.

(135) Mrs. H., aged seventy, had been ailing for several weeks. On December 5, 1902, she had a rigor, with vomiting, and had been ill ever since.

December 10.—Patient had another rigor, not quite so bad as her last, and went to bed. I saw her for the first time at 9 p.m., and found her temperature 104° . A careful examination disclosed only a little abdominal discomfort, and she was given some household remedies till morning.

December 11.—Patient had a bad night, and did not remember my having been there. She had very profuse sweating during the night, and her temperature at noon was 99° . Another examination was made, with the same result. She was then put on antidiphtheritic serum, 1 drachm every four hours. Evening temperature 100° .

December 12.—Patient had a better night, slept for several hours, and was much better, while her headache had almost

entirely gone. Evening temperature 99° . Treatment continued.

December 13.—Still better; had a good night's rest, much less sweating. Temperature 98° ; evening temperature 98.8° .

December 14.—Temperature morning and evening normal; all other symptoms improving. From this time onward the progress was rapid; appetite and strength returned, and she made a thorough and complete recovery. In all she had $2\frac{1}{2}$ ounces in the ten days' attendance.

The next case was somewhat similar, but it had been allowed to go much further before being seen.

(136) Mrs. S., aged seventy-two, had been ill for two weeks, and was steadily becoming worse. When seen she was dull and stupid with toxæmia, had a temperature of 103° in the evening and 104° in the morning. For about a week before being seen she had had chills and rigors from time to time, with great heat and drenching sweats. Her strength had steadily failed, and her mental faculties became more and more blunted. She had had some cystitis, but it had all gone when I first saw her, and no focus could be found of the undoubted sepsis which was present. Antidiphtheritic serum was begun in the morning, when the temperature was 104° , and she was given a dose every hour for three doses, and then every four hours. Next day temperature was 100.4° , and patient was distinctly improved. She had had a fairly good night, and the improvement, according to her daughter, was manifest after the second dose. The following day temperature was 99.4° , and there was improvement all round. Patient had lost her deafness, answered all questions put to her clearly, and in every other respect was much better.

From this on the improvement was continuous and rapid, so that she was well, and dismissed seven days from the first dose of the serum. In all she had $2\frac{1}{2}$ ounces.

The two cases happened within a week of one another, but there was no connection between the patients. The more

rapid treatment of the second case at first gave it a good start, and probably shortened it.

(137) Miss W., aged nineteen, had an attack of measles two years before coming into my hands, and since then she had found great difficulty in keeping herself warm. Her hands were always cold and clammy, and she used to torment her friends by putting her cold hands suddenly on them, and to them they felt like the hands of the dead. She had four pairs of blankets and a quilt on her bed, and that could not keep her warm, even in Australia, in summer. She would get up cold, and remain so till the afternoon, when she would become what she called painfully warm, face burning, and hot all over, and her eyes and eyelids felt as if scalded. This died away during the evening. She could not wash her hands in cold water nor take a tepid bath for the tingling which they caused. Her sleep did not refresh her, as she kept waking up during the night, and her brain went on working all night at whatever she had been doing during the day. She had a feeling of weariness and languor always, and trembled on any exertion. To test the case she was given five doses anti-diphtheritic serum one every six hours, which made a marked change in her. When she returned (April 15, 1902) her hands were a natural heat, although still clammy, and her sleep at night was now continuous : 2 drachms per diem.

April 18.—Reports steady improvement ; washed her hands in cold water to-day and had a tepid bath, without any tingling, as before. She is better all round ; the afternoon flushings have gone ; she has had to take two blankets and the quilt off her bed.

The serum was continued till she had taken 2 ounces, when she was dismissed well, and when seen some time after she had retained all the benefit. Amongst the cases of rheumatic neuritis are two in which this frigidity was a marked feature. One, a man, could not bathe in cold water, and the other, a woman, could not get warm at night ; and both lost these

symptoms, as well as their neuritis, under serum treatment, the woman, however, requiring some antineuralgic treatment in addition to the serum.

The following case falls into line with the preceding :

(138) W. S., aged twenty-five, had had several chills, followed by heat and sweating. These had gone on for some days before professional help was called in, and when first seen his temperature had risen to 102° , although it had been 103° just a little before. He was given quin. sulph. 2 grains and phenacetin 6 grains every four hours, but the following day he had another chill about the same time, and his temperature rose to 104.7° . Next day this was repeated, and his temperature reached 104° . There was no pain anywhere, nor could any be elicited by palpation ; his tongue was foul, although he had been thoroughly cleared out with salines, and he took freely the plain milk food which was ordered. The chills, heats, and sweats continuing, a blood-count was taken, and a leucocytosis of 15,000 was found present. A differential count of the leucocytes gave 78 per cent. of the neutrophile polynuclears and 18 per cent. of lymphocytes, large and small. Careful examination at the same time showed just a trace of a mitral systolic murmur. He also had in various parts a roseola-like rash, which waxed and waned with the temperature. The blood showed no sign of the plasmodium malaria. As the leucocytosis suggested septic conditions, it was resolved to interrogate the case with antidiphtheritic serum. The patient had 1 drachm every hour for the first three doses, then every four hours.

The serum was begun just before the chill was expected, and it did not prevent the rise of temperature to 103.6° ; but the defervescence was rapid, and temperature fell to 100.8° in three hours. Next morning his temperature was subnormal, and his highest during the day was 98.8° . Next day temperature did not rise above normal all day, and the day following he was dismissed absolutely well.

CHAPTER XVII

NERVOUS DISEASES—EPILEPSY —GRAVES' DISEASE—NEURASTHENIA

Epilepsy.

THE first case which suggested its use to me in nervous disease was that of a woman with a feeble heart. She had a smart attack of influenza, which was aggravated by a feeble heart and a cough, both of which had been present some time before the influenza, and resisted all the treatment given for their relief. The influenza cleared up, but the cough and the cardiac condition persisted. A month or two later she was given antidiphtheritic serum for a nasal suppuration—left from a 'cure' by a cancer-healer, but which afterwards yielded to specific treatment. The serum did little good to the suppuration, but it completely cleared up the cough and the cardiac condition, and from that time she has been quite clear of both troubles.

This result in her case led her to recommend a friend who was supposed to be suffering from the same disease, and whose case had baffled all medical skill. The case is as follows:

(139) Mr. S., aged sixty-four, for fourteen years had suffered from epilepsy, having the *petit mal* attacks frequently and the *grand mal* about once in two months. For the last two years he had suffered from nervous heart, and could not lie on his left side. About once a fortnight he would have an attack of threatened cardiac failure with palpitation, during

which he could not lie down for a whole night at a time. He was much run down in general health, and had various gastric and other neurotic troubles, all apparently due to the nervous depression produced by the frequent fits. He had been under treatment for this condition for some time, but nothing seemed to touch the trouble. There were no mental symptoms present in the case. He was given antidiphtheritic serum twice a day until he had taken 3 ounces. Along with it he was also given a pill three times a day, consisting of *zinci valer. gr. i., asafetida gr. i.ss., ferri. arsen. gr. $\frac{1}{20}$, strych. sulph. gr. $\frac{1}{30}$* . The pills were continued for a month after antidiphtheritic serum was stopped.

From the first he improved in general health ; the number of the fits was lessened, and they did not have the same depressing effect upon him. His cardiac condition ceased to trouble him, and he could lie on his left side with impunity. He has retained all the benefits obtained, and three years later he was still well and quite a different man from his previous condition.

In both cases the restoration of muscle tone was what was required.

Following my success in this case a good many cases of epilepsy were taken in hand and treated on the same lines ; but it soon became evident that, whatever else antidiphtheritic serum was good for, epilepsy pure and simple was not included.

For the purposes of treatment the cases soon separated themselves into two classes, one of which was amenable to treatment and the other was not. The class which received benefit was like the last case and the next two, in that their health, mental or physical, was impaired by the disease ; and the more it was lowered the more frequent became the fits, and the more profound the constitutional depression preceding and following them.

The other class, which may be called the sthenic, on the other hand, had the attacks regularly or irregularly, but after

the temporary mental confusion was past they were as bright and active as ever.

In short, the serum really did not deal with the epilepsy itself at all, but with the deterioration which in some cases follows a long course of epileptic attacks.

That the active agent in the improvement was not the drug treatment is seen in the following case, which had been in my own hands for five years, and had in that time swallowed a few gross of the same pills, but with little benefit.

(140) Miss H., aged thirty-two, has had *grand mal* attacks at intervals of never more than three months for the last five years. At first they did not leave any lengthened depression behind them, but of late they have begun to show more serious symptoms. The fits are more frequent, and are now preceded by depressed nervous conditions; the patient becomes moody and her head is easily tired and confused, and the same symptoms persist after the attack has gone. Her memory is badly affected, and she has shown signs of mental deterioration. She talks in an irresponsible way to strangers—talk silly in itself, but with her it passes for smartness and wit. Her moods vary, and she is at one time depressed and disagreeable to all around, saying the most bitter things and then going to the other extreme. All treatment had failed; bromides only made her worse, and they had to be put aside, except for an occasional dose when she became excited.

In this condition she was given a course of antidiphtheritic serum, 2 drachms per diem, and the result was never in doubt. Her mental condition was markedly improved and her memory returned. She obtained complete control of herself and her feelings, could sit in any company, and even play her music before others. All round the improvement was great. The epilepsy itself was benefited to the extent that the fits came on much the same as at first, and not so frequently as of late; but their constitutional effects were materially lessened, and the

patient suffered comparatively little of the previous effects, either before or after the attacks.

The improvement has continued till the present time, and that is now nearly three years ago, and she is as bright and well in her general health as ever she was. The fits still continue, but not so frequently as when she was treated with antidiphtheritic serum.

In short, the patient has been restored to the same physical and mental health which she enjoyed at first when the attacks were only beginning.

The third case was the worst mentally of the three, and he was only undertaken as a last chance of saving him from entire loss of reason. This was done temporarily, but the case was too far gone for the treatment to obtain a lasting result.

(141) W. W., aged eighteen, male, has been suffering from epilepsy for the last eight years, and the attacks were both *grand* and *petit mal*. Of late he has been having a number of the *grand mal* type in rapid succession, and their effects on him mentally and physically have been disastrous. After such a succession of fits he takes a long time to recover consciousness, and, for several days he is extremely feeble. He has also shown marked signs of mental deterioration by talking foolishly, by sitting gazing vacantly up into the sky, and by an almost total loss of memory. He is irritable and quarrelsome, and looks stupid, vacant, and dull.

He was given 2 drachms of antidiphtheritic serum daily for twelve days, and returned at the end of a fortnight, looking much better and brighter in himself. He had also largely lost his stupid and vacant appearance. His mother reported that as soon as the treatment had been begun the patient had had a series of four severe fits in rapid succession, and, as before, a great many of the *petit mal* along with them. He had also had a single fit since then. He recovered from the series much more rapidly than before, and the single fit left no ill effects. He did not now sit about and gaze up into the sky or vacantly

about him, was less quarrelsome and a good deal brighter in himself. His father confirmed the report.

He was given six days' more treatment, and reported still further improvement. He was then given a tonic, and three weeks later he reported that he was still keeping better, that his memory was much improved, and he answered correctly questions on a history which he had been reading. He had had two fits in the three weeks, but they had little constitutional effect on him, and he was then put on cerebrin for a month and to report.

At the end of a month he reported himself as still doing well, had a fit about once a week, but with no constitutional effect from it. He looked bright and well, and while not an intellectual giant, he was quite a different lad compared with what he was when he was first put under treatment. He used $4\frac{1}{2}$ ounces.

In the next twelve months he had two relapses, both of which were cleared up by a repetition of the treatment; but at the end of fifteen months he had a very severe relapse, had no treatment, completely lost his reason, and had to be put under restraint.

The importance of a treatment which gives promise of being able to stay the downward progress of such cases is so self-evident that it need scarcely be mentioned, and the writer can only hope that both himself and others may be able in the future to obtain equally good results.

Dosage.—One drachm three times a day while benefit is being obtained.

After a series of convulsions it is evident that the whole muscular system, with its controlling nerve-centres, must be in a condition of profound exhaustion. This is shown in the prolonged unconsciousness, the muscular relaxation, the confused mental condition, and afterwards the general debility of mind and body during convalescence. The very weakness and debility, the results of the repeated attacks, become in their turn the causes of further attacks by the increased irritability

of the exhausted nerves and muscles, rendering them much more susceptible to the epileptic attack. This loss of tone after the first convulsion leads to a repetition, so that in such cases there is frequently a whole series, ending at last in some cases in the status epilepticus.

It is in this relaxed and exhausted condition of the muscular system and its nerve-centres, with its complete loss of tone, that the specific action of the serum is obtained, as the cases already detailed have shown. The restoration of tone to the nerve-centres, and through them to the vaso-motor and muscular conditions, brings their resisting power up to normal, and puts them into the same position to resist attack as they had when the epileptic convulsions first began.

What have been called sthenic cases are those in which the convulsions have not yet impaired the nerve and muscular tone, and which therefore recover rapidly.

The use of bromides is perfectly legitimate in the sthenic cases, where the nerve and muscular tone is unimpaired ; but in the asthenic it is only adding fuel to the fire, and further depressing and exhausting the centres, which are already sufficiently debilitated. The writer recognised this difference clinically before the serum was thought of, and he well remembers a patient whom he had been treating with nerve tonics, who, being on a visit to England, was put on bromides, which had such a disastrous effect that he could not recognise his own family when he returned, but who speedily improved when the bromides were withdrawn and the previous treatment resumed.

Naturally, the older the patient the more readily will nerve and muscular exhaustion follow in epilepsy. The following is a case in point :

(142) Mrs. C., aged sixty-three. This patient had been having occasional epileptic attacks nocturnally for some time, and probably longer than suspected. Lately her health had begun to fail, and the debility had become more marked after every

attack. Iodine in the form of syrupus acidi hydriodici was tried, but she had a series of four attacks during one night, which seriously debilitated her. As nothing seemed to help her, she was given a course of $2\frac{1}{2}$ ounces of antidiphtheritic serum. The doses were $\frac{1}{2}$ drachm three to four times a day, and by the time she had finished with it she was much improved in every way, and expressed herself as delighted with the result of the treatment. Whilst taking the serum she had another attack, but the after-effects of it were very mild, and in no way interfered with her recovery. Since then she has not required further attendance, and has gone on improving in her general health.

This case did not retain the benefit obtained to any great extent, and took 20 grains of potassium bromide two nights out of three at bedtime, and for the time did not lose ground. This course was taken on consultation with another practitioner, but the results were so disastrous to her nervous condition generally that it had to be discontinued. The attacks have recurred at the usual intervals, and the serum has always had the usual restorative effect.

Twice when the aching of the *voluntary* muscle was very severe antitetanic serum was given orally, with immediate relief to the muscle.

Exophthalmic Goitre.

Three cases of this disease have been treated with antidiphtheritic serum, and as they comprise three different stages in the progress of the disease, they give more light on the subject than usual for such a small number.

That this disease, so intractable to treatment, might come within the range of antidiphtheritic serum was suggested to me by its action in cardiac neuroses, as in the first case of epilepsy treated. The three cases treated consist of one recent acute case, one of eighteen months' standing, and an old-standing

case practically at a standstill, with only the tachycardia left as an active symptom of the disease. Here one may say that during the development of my ideas on the use of antidiphtheritic serum many stages were passed through before the present views came finally to be adopted, and at the time the first two cases were treated my idea of antidiphtheritic serum was that if 3 ounces did not do the work there was no use giving more. That, of course, is not my present opinion, but it was so then, and the result was that only that quantity was given in each case. In the recent case it proved enough to do the work required, but in the second it only carried the patient a long way towards recovery, and its withdrawal led to relapse. Whether it would have secured a permanent recovery had it been given for a longer period is more than one can say, but should such a case again come into my hands there will be no hesitation on my part in giving antidiphtheritic serum until satisfied that it has ceased to have any beneficial effect.

Further experience of the treatment in this intractable disease will be necessary to define the extent, if any, of the therapeutic effect of antidiphtheritic serum.

(143) Miss M., aged twenty-one, a thin, anæmic, excitable girl who belongs to a very neurotic family. Her father had epilepsy, and died of cardiac failure in a fit, and her elder sister is the third case of this disease given. Patient has an excitable manner; exophthalmos is well marked; the thyroid is enlarged and of a fibrous character, the right side more than the left; there is no pulsation in it. Patient has tachycardia, pulse 144, dyspnœa, irritability, anorexia, etc. She was treated for a fortnight with a pill containing zinci val., asafetida, ferri arsen., and strychn. sulph., but by that time she had made no improvement.

February 12, 1900.—Pulse 130, but no better otherwise; added antidiphtheritic serum 1 drachm twice a day.

February 14.—Pulse 105; sleeps better; improvement plainly showing.

February 17.—Pulse 90. Had just got up when seen, and was much more self-contained; there is a marked absence of former excitability. Antidiphtheritic serum $1\frac{1}{2}$ drachms per diem.

All the symptoms kept steadily improving, till ten days later the record was:

February 27.—Health steadily improving. Pulse, taken daily, shows a continual decline, and now runs between 80 and 90, and once was 78. The fluctuations are slight compared with earlier records. There is complete self-possession, with an absence of blushing, etc.

March 5.—Patient very well. Pulse now between 70 and 80, and practically normal. It was taken last night after a musical party, and found to be 72. Exophthalmos has steadily diminished, and has now quite disappeared. The thyroid is much the same as when first seen, but as it was fibrous then nothing else could be expected. Her health is entirely restored, and the anæmia quite gone. She was dismissed well.

Four years later this patient relapsed, and did not seek treatment for over three months from the first sign of recurrence. The thyroid was firm and much enlarged, with some pulsation in it. This pulsation antidiphtheritic serum removed and lessened the pulse, but otherwise it failed to benefit the case.

Seeing the result in the previous case, the following was much more closely observed:

(144) Mrs. W., aged thirty-two, married woman, two children, had a great shock over the death of her mother eighteen months ago, and has grieved over her loss ever since. This was aggravated by seeing her husband thrown from his trap, with which his horse had bolted. The symptoms are as follows: Exophthalmos well marked, but neither tachycardia nor thyroid hypertrophy. Graefe's, Stellwag's, and Moebius' symptoms present. There is anæmia, tremor in the limbs and body, and she is very irritable and must be doing and restless.

There is also present headache, diarrhœa, vertigo, nocturnal heats and sweats, insomnia, polydipsia, cough, leucorrhœa, anorexia, palpitation, and other vascular disturbances. She is losing weight, and has lost 14 pounds in the last three months. She has itching of the skin on the dorsum, and also on the extensor surfaces of both arms. Polyuria is present, $5\frac{1}{2}$ pints per diem, specific gravity 1005, no albumin. She has had dyspepsia, with vomiting, and as a girl had acute rheumatic arthritis, which returned every year for some years. The lungs are sound; there is no cardiac valvular lesion, but the left ventricle is dilated. She has dyspnœa on slight exertion, and her mother died of cardiac disease.

She was put on the same pill as the last patient, and at the end of a fortnight had lost the heats and sweats at night, was not so irritable, and for the last two days her appetite had been better. She was now given antidiphtheritic serum twice a day in addition.

Two days later (July 28, 1900) she had lost the polydipsia, vertigo, diarrhœa, and insomnia, and the exophthalmos and Stellwag's symptoms showed signs of improvement.

July 30.—Exophthalmos better; Stellwag's symptoms practically gone; palpitation less, and does not waken her at night as it used to do; headache gone; appetite now regular and good, but not excessive; hands are steadier when grasped at the wrist, and fingers extended and separated. Slight diarrhœa present, but no return of other symptoms.

August 2.—Exophthalmos only noticeable on examination. She has not slept so well for the last two nights, but the appearance shows marked improvement.

August 4.—Still better, and has gained 4 pounds in the last ten days. Up till now have been unable to get her to rest, but she promises to do so now.

August 11.—Most of her symptoms gone, but she is still restless, and has the muscular twitchings at times. Stopped antidiphtheritic serum.

Patient went away for a rest, and improved, but on returning home she relapsed considerably, and, refusing a renewal of the treatment, went into a private hospital, from which she returned later on as bad as she was at the beginning.

That this woman should have received such benefit when she gave the treatment no help by resting—for she worked about eighteen hours daily—is rather an unusual result, and strongly suggests the further use of antidiphtheritic serum in this disease.

(145) Mrs. H., aged thirty-one, the elder sister of the first case. She had drug treatment for a period of eighteen months some years ago, but received no benefit. Exophthalmos, goitre, and tachycardia all present; but the first is slight, and the goitre is fibrous. In all she took 5 ounces, but with no benefit to the cardinal symptoms, although her general nervous health and appearance were considerably improved.

Whatever the pathogenesis, the changes had become organic, for she had been in the same condition for years, and hence antidiphtheritic serum failed to touch it.

It is recognised that cases of this disease frequently recover almost of their own accord; but, allowing for all such chances, the results even in the first case suggest that antidiphtheritic serum had a large share in the recovery obtained. Two considerations may be urged in favour of this, viz. :

1. The patient got no benefit from rest and other treatment given for a fortnight, but the disease at once began to yield, and continued to yield, to antidiphtheritic serum until recovery.

2. The family history generally, and her sister's case in particular, did not encourage the hope that spontaneous recovery was probable.

The second case speaks for itself on this point.

In any case success will probably be obtained more readily in the earlier stages of the disease, when the pathological conditions are more functional, than later, when they have had time to make structural changes and have become organic.

Dosage.—As this is usually a chronic disease, 1 drachm three times a day should be sufficient. If benefit is obtained, it should be continued till it is seen that it is doing no further good.

The specific action of the serum in giving tone to the vaso-motor centres seems to have found in Graves' disease a suitable field for the exercise of its peculiar function. Whatever the cause or causes, the essential feature of exophthalmic goitre is a vaso-motor disturbance, and as in the serum we have an element which restores the tone of the vaso-motor centres, it is reasonable to suppose that by its use the centres may be so influenced, unless organic changes have taken place in them, that their toning power may overcome the pathological conditions present. More cannot be said, as the cases treated are so few, but the results are sufficiently encouraging to justify a more extended trial.

The cardiac cases mentioned were probably due to some lowered condition of the vaso-motor centres, and the specific action of the serum rapidly brought their condition to normal.

Neurasthenia.

Occasionally cases are seen in which the septic element is the underlying cause of all the symptoms which obtrude themselves. Sometimes it is possible to trace their method of entrance, and more frequently this cannot be done. The writer, when all other means have failed, interrogates the case with $\frac{1}{2}$ to 1 ounce of antidiphtheritic serum, and on the result is often able to say definitely whether the septic infection is present or not.

The following case was seen some years ago when the treatment was in its early stages, and the facts could only be noted at the time, leaving the explanation for a future period.

(146) Miss A., aged twenty-five. Patient gave her age as twenty-five, but she certainly looked forty. She was suffering

from almost every possible symptom of hystero-neurasthenia, following the lunacy of a sister. She was tried with a variety of treatments for some weeks, but with no benefit. The last was a pill containing zinci valer., asafetida, ferri arsen., and strychnine sulphate. She had taken this for some weeks and was not improving when antidiphtheritic serum (1 drachm) was added twice daily till she had taken 3 ounces. The improvement from this onwards was continuous, and after it was finished the pill was continued, then ferri arsen. and strych. sulph. gr. $\frac{1}{20}$ was substituted. Three weeks after antidiphtheritic serum was finished the report was as follows: 'Depression, debility, anæmia, faintness, fear of crowd, pain and numbness in head, arm, and neck, restlessness, anorexia, insomnia, all gone. Appetite, memory, sleep, and general strength of body and mind all well.' Five months later she called to report, and it was found that she had retained all the improvement. Later on the septic cause was traced to suppurating teeth, which had given her a great deal of trouble. With it there had also been severe septic gingivitis.

The following case is the last one of this disease which has come into my hands :

(147) Mr. G., aged thirty-nine, warehouseman, has been under treatment for twelve months, and was unfit for work for ten weeks before being seen. He is a typical neurasthenic, being unable to concentrate his thoughts; feels unfit for work of any kind, although usually he is a very active business man. He has such digestive trouble that he has been unable to eat enough to keep up his strength, and from what he has eaten he has had great pain and discomfort, with eructations, etc. Nausea is continuous. He gave a history of previous furuncular attacks, which later gave way to tonsillar abscesses, and when they left the present condition of ill-health began. His urine, blood, and sputum were taken for examination, and in the meantime he was put on a mixture of strychnine, tinct. valer. and mist. pepsin co. cum bismuth.

Three days later he was not so well, and the medicine did not seem to agree with him. The urine was normal, the sputum gave a culture of the *Staphylococcus pyogenes aureus*, while his blood showed a leucocytosis of 15,000. From this it was suspected that the septic element was at the bottom of the trouble. He was ordered $\frac{1}{2}$ ounce daily in doses of 1 drachm, all other treatment being discontinued. From the first the improvement was distinct and continuous.

In five days he took to writing letters of his own volition, and on the fifth day he had his breakfast for the first time for some months. After six days' treatment he said he felt that he could now easily do some light work, and that he had taken a good long walk with no permanent feeling of weariness.

He took 6 ounces during the first fortnight's treatment, then he was given calci et sodii, glycono-phos., and to that was added a pill: ferri arsen. and strychn. sulph. $\bar{a}\bar{a}$ $\frac{1}{20}$ gr. three times a day.

In three weeks from first visit he was back at business, and rapidly and steadily improved to complete recovery.

When the serum was discontinued his white-cell count had fallen to a little over 6,000. He has had no relapse.

CHAPTER XVIII

OSTEITIS AND PERIOSTITIS

THE treatment of inflammation of bone or periosteum is at best of a most indirect character, and from its structure nothing else could be expected. With antidiphtheritic serum all this is changed, for in it we have an agent which acts directly on the process through the circulation, and thus is independent of the hindrances offered to ordinary measures. To this treatment it matters little whether the process originated deep down in the bone itself or secondarily from some superficial or external lesion.

In this more than in any other disease one has to be careful to distinguish between a pus discharge arising from inflammation and one which is of a purely eliminative character. If the discharge arises from the first alone, then the treatment will remove the inflammation and clear up the discharge, but over the other it will have power only to keep the discharge sweet and to lessen the constitutional effects of a continued drain.

In the following cases the infection came from external conditions :

(148) Miss B., aged twenty, had had osteitis of left tibia for seven years, during which she had had necrosed bone removed three times, and about three months before she had the tibia curetted. The wound from this had not healed, and was now

an unhealthy ulcer, with the bone for a basis, on which were slight granulations covered with dirty gray pus. Around the ulcer the tissues were closely adherent, and a mild chronic inflammation extended up and down the tibia. She had been attending the hospital since the curretting, but the ulcer showed no sign of healing.

Absolute rest in bed, with boracic foment, were tried for a week, but did no good, and she was then put on antidiphtheritic serum. She had 2 drachms daily until she had taken 5 ounces. The unhealthy condition steadily improved; the inflammation surrounding the ulcer died right out, and at the end of the course of medicine the wound was practically healed and was of the most healthy appearance. Rest in bed was insisted on all the time.

The difficulty of healing an ulcer with bone as a basis is well known, and that accounted for the length of time occupied in getting the result.

That was fifteen months ago, and she has had full use of the limb and has had no sign of a recurrence.

(149) Mrs. C. has had a varicose ulcer (a recurrence) on the left shin just above the internal malleolus, which has become so bad that she could not walk about any longer with it. The ulcer is unhealthy, with a dirty pus discharge, and there is osteitis beneath, as the bone is tender on palpation right up the tibia, and she cannot sleep for the severe night-pains, which cause her to sit up and cry, although she is a very plucky little woman. She was kept in bed, had antidiphtheritic serum every eight hours, and the ulcer dressed with boracic dressing.

Three days later (November 21, 1901) she reported that she had slept well the first night; the bone tenderness was much circumscribed; the pains shooting up the tibia are now few and far between, and very much lessened in intensity. The ulcer is still tender on palpation, but looks cleaner and better; all discharge has ceased, and inflammation has practically gone.

Eight days later she called on me. The ulcer was quite healed, and the leg looked well ; but as there was a little pain on walking she was asked to rest it for a few days longer. She has had no further recurrence.

(150) Mrs. R., aged fifty, varicose ulcer on left internal malleolus. For a fortnight she had been treated with complete rest and boracic foment, but the pain increased and prevented sleep, the ulcer spread and deepened, and the bone beneath became inflamed and caused great night-pain. The area of surrounding inflammation steadily widened, and an unhealthy slough filled the wound. Cultures from the pus showed the infection to be the *Staphylococcus pyogenes aureus*.

Antidiphtheritic serum was begun on October 3, 1902, and continued till she had taken 4 ounces, and on the 20th the wound was almost healed, and soon after was so entirely.

Pain was relieved from the first dose, and she slept soundly from the very first night, when she had taken only two doses. The area of inflammation rapidly contracted, the process of healing going on from below up ; the slough was thrown off, and the whole condition altered for the better from the earliest stage of the treatment. Boracic dressings were continued all through. The patient's general health was also much better after her recovery than it had been for months.

(151) Mrs. S., aged thirty-seven, had had varicose ulceration over the tibia for three years with great pain, which was much worse at nights, and heavy opiate doses scarcely relieved her. Pain was evidently from the bone and periosteum. She was given complete rest, boracic foment, and antidiphtheritic serum twice a day till she had taken $1\frac{1}{2}$ ounces. The pain lessened from the first, and before the serum was stopped it had gone altogether. The ulceration quickly healed, and she was dismissed in a fortnight from being first seen, and has had no recurrence.

The following was a case of acute periostitis in an old rheumatic subject :

(152) Mr. B., aged seventy-one, has acute periostitis of the internal edge of the lower third of right tibia. Pain is very acute, preventing sleep, and he would scarcely let me look at it. His ankle is swollen, and he has headache, anorexia, foul tongue, etc. Antidiphtheritic serum internally, and an ichthyol and mercurial ointment externally.

Next day (June 17, 1900) found he had had only one dose of antidiphtheritic serum, and had had a bad night. He had kept the ointment going all night, but had no sleep, and pain and tenderness on palpation were just as bad as ever. Antidiphtheritic serum every eight hours.

June 18.—Slept all night, with one small break, and much better in himself. Leg still tender to touch. Continue treatment.

June 19.—Almost well, pain practically gone; allowed freest examination and good pressure over the inflammatory focus. Had a good night. Antidiphtheritic serum twice a day.

June 20.—Patient very well, but as another part of the tibia threatened kept him on the treatment for another day.

June 21.—Perfectly well, and dismissed. Has had no recurrence.

The following was a severe case seen in time, and cleared up by antidiphtheritic serum treatment.

(153) Miss B., aged thirty-five, had been suddenly seized with very severe pain in head of tibia. The pain was also great all over the joint. She sat up poulticing it for two nights, and got no sleep. She cried with the pain all night. She was seen on the third day, and the knee was found to be very tender, with an area of periostitis on the internal aspect of the head of the tibia, and pain radiating through the joint and the head of the tibia from side to side. Antidiphtheritic serum every eight hours. She slept the first night after taking two doses; the pain steadily lessened under the treatment, and nothing else was used for it. She had in all $4\frac{1}{8}$ ounces, and it was sixteen days before she could bear her weight on it,

although there was improvement every time it was seen. Later, when she had gone for a holiday, she overtaxed the limb, and had a recurrence, which was cleared up by 2 ounces.

The serious nature of such a case is obvious, and antidiphtheritic serum did good work in cutting it short.

The following case was one of clearing up an intractable chronic condition left from an acute attack :

(154) Mr. W., aged thirty-five, had a very acute attack of what was diagnosed as arthritis three months ago, in which he was confined to bed for a month, and ever since he has had pain more or less in the joint, which has laid him up now and again for a day or two at a time, and when he came to see me he walked with very great difficulty. On examination, pain on palpation was elicited on the bone just above the external condyle of the left femur, and the pain on walking was caused by the pull of the muscles attached to the inflamed bone. He was put to bed and given antidiphtheritic serum four times a day. Unfortunately, the serum which he was given for the first three days was found to be inert for inflammation, and he only made such progress as would be expected from rest alone ; but after four days' treatment with other serum he could stand the firmest pressure, and could walk without the least pain. He was given 1 ounce more, making 3 ounces in all, and made a perfect recovery.

Let it be understood that in all the cases treated with antidiphtheritic serum where the disease was non-tubercular there has been no such thing as a failure, and also that entire confidence has been placed in the remedy, to the exclusion of all other treatment.

The following two cases are interesting, although by a failure to diagnose the first case properly the patient died :

(155) R. S., aged four years, had complained of pains in his left leg and foot for some days, and finally he developed a rash like measles. Temperature was 101° , and he was evidently ill. As an epidemic of influenza was about which exhibited

various rashes, the symptoms were ascribed to that disease, and the case treated accordingly. Next day he was so well that he was practically dismissed. The day after an urgent call was sent, and he was found in a collapsed state, and his condition was desperate. He had had convulsions during the night, and since then he had been cold and cyanosed, with dilated pupils, slow, laboured breathing, etc. On examining the tibia, irregularities were detected which gave pain on palpation, and from several incisions an oily serous fluid flowed freely. He was also given one small dose of antidiphtheritic serum, but a few hours later he had further convulsions, and died in them. Diagnosis was acute septic osteitis, and cultures from the fluid showed the infection to be the *Staphylococcus pyogenes aureus*.

Two days later his sister, three years older, complained of pain in her foot, and examination showed two painful blue spots on the shaft of the fifth metatarsal bone. Pain was also present in both epiphyses of the tibia of the same side. Temperature was 99.6° , and pulse 120. She had very bad nights—restless and wakeful—and when she did sleep she frequently called out. The same affection as her brother was diagnosed, and she was given antidiphtheritic serum—1 drachm every eight hours. In two days the pains in the metatarsal bones were gone, and in two more all other pain had also gone; but it was not till she had been treated for seven days and had taken $2\frac{1}{6}$ ounces that pulse and temperature had become normal, the pulse being the last to yield. No other treatment was used.

Inquiring into the cause of the disease, it was elicited that, out of a large family, the two who were attacked were great playmates. They were both subject to tonsillar inflammation, and had chronic tonsillar hypertrophy. A few days before the boy was attacked they got hold of a dead bird, and fondled it for some time before it was seen and taken from them. The suspicion is strong that this was the origin of the infection, as only those two handled it, and only those two had the disease.

The following cases of spinal lesions are suggestive, and encourage further trials of the treatment in this class of case. The pathology of Pott's disease includes tubercle, syphilis, and trauma. Antidiphtheritic serum is of not so much use for the first two, but is all-powerful for the third. Any septic condition added to any of the three would be promptly dealt with by the serum if the case had not gone to abscess, and, the septic removed, would give the patient a much better chance of combating the remaining infections.

(156) F. C., aged 12, belongs to a family which is prone to bone affections, from which her father and brother have suffered. She has been complaining for some months of a pain in her back, which is eased by lying down, but which is so severe that it hurts badly if the bed is shaken, and, in consequence, she has to sleep alone. There is insomnia, hectic and night sweats, and her temperature was over 100° when she came to see me. She complains of continued weariness, has lost weight, and looks white and ill. Her feet feel like lead, and she can hardly lift them along. Several times her legs have given way under her and she has fallen on the road. She has anorexia, etc. The seat of the disease is in the lower dorsals, and is very tender to pressure, the tenderness shading off for some distance above and below.

Treatment.—She was laid up entirely for about three weeks, and given suitable food and medicine without any benefit. She was then put on antidiphtheritic serum (2 drachms per diem), which was continued for thirteen days. She improved from the first day, and slept well the very first night. The temperature quickly fell, the sweats left, appetite returned, and she put on flesh rapidly. The pain in the spine on movement and on pressure steadily improved, and, after keeping her for about another fortnight in bed after discontinuing antidiphtheritic serum to make sure of recovery, she was dismissed perfectly well, and has since been in such health as she never before enjoyed. That is now about five years ago, and she

has had no sign of recurrence. All other treatment was discontinued when antidiphtheritic serum was given.

(157) Miss L., aged twenty-five, school-teacher, a cousin of the last case, had been suffering from spinal pain and weakness for some time, and was finally compelled to give up work and come home. The symptoms were the same as in last case. In this case, yielding to custom, she was put in plaster, and given antidiphtheritic serum. She very rapidly improved, and a week after beginning treatment she presumed on this and went out walking and standing for a long time, which caused a relapse. A renewal of the treatment rapidly relieved the pain, which had recurred, and, after she had taken $3\frac{2}{3}$ ounces in all she was so well that she required no further attention, and made a good recovery. She has had no recurrence, and is now in better health than she has had for a long time.

(158) Miss V., aged 23 (April 24, 1902), belonged to a delicate family, three of whom, including the patient, had suffered from bone disease. She had been in indifferent health for some years, and had been treated for anæmia, etc. She complained of general weakness, headaches, backaches, fatigue on exertion, could not walk any distance, her feet felt like lead, and, when very tired, she became hysterical. She had fever at night, with sweats, did not feel able to sit up straight, and had girdle sensations for weeks at a time. Her skin was muddy and unhealthy-looking, with acne vulgaris on the face. Cuts and scratches took a long time to heal and 'festered,' and she had one such on her hand at the time.

Examination showed great tenderness in the fourth and fifth dorsal vertebræ on percussion or firm palpation, the pain shading off above and below. Temperature was 100.4° when seen in the morning, but, after three doses of antidiphtheritic serum it had fallen to 99.8° in the evening. This had been ordered for two days to interrogate the case.

April 25.—Morning temperature 99° .

April 26.—General all-round improvement. Patient looks and feels much better; the vertebrae are less painful, and backache is almost gone. She had slept well, and her headache and lumbago pain are much better. Temperature normal morning and evening. Continue the treatment.

April 29.—Much better; can stand firm manipulation on the vertebrae.

From this onwards the progress of the patient was of the most rapid and satisfactory character, and she was dismissed well on the fifteenth day. In all she had $3\frac{1}{4}$ ounces. The effect on her general health was quite as satisfactory as on the spine, and she herself declared that she felt quite a new girl. She has required no further attendance, has since married, and borne a healthy child.

When the inflammatory process has progressed to formation of pus, and destruction of tissue in bone more especially, the difficulties of treatment are greatly increased. In the following two cases one is an example of a recent case which was entirely cleared up, and the other an old standing case in which the inflammatory condition was eliminated and the dead bone left.

(159) Mr. G., aged thirty-seven, has been suffering for some months with suppurating teeth, and a sinus discharging from them on to the left cheek. On February 21, 1902, he had the teeth extracted (two left lower molars and the wisdom), and inflammation at once set in, and extended down the pharynx. He was first seen late at night on February 22, when temperature was 100.4° ; throat inflamed and painful; sites of teeth extracted foul and dirty with pus discharge; sinus discharging; constitutional condition very miserable, and evident resorption of toxins present. Antidiphtheric serum 1 drachm every four hours.

February 23.—Temperature 98.4° , pulse 70. The last twelve hours have worked a transformation. He was relieved by the first dose, and slept all night. Throat still very sore, for which

he was given an iron and mercurial mixture. Antidiphtheritic serum every eight hours.

February 24.—Pulse and temperature normal; sinus discharging only a little serous fluid; much better in himself, but throat still fairly severe.

February 25.—Pulse and temperature normal; sinus closed; throat much improved, and able to swallow much better. He is now practically well, and his mouth is looking cleaner and healthier.

February 27.—Patient is quite well, is able to swallow anything. Dismissed.

This case was a nasty one, as the infection was spreading from the teeth to the softer tissues down the throat, probably from lacerations in extraction giving an opening for infection. The sinus has opened once or twice since then to throw off necrosed bone.

(160) Mr. L., aged fifty-five, four years before my seeing him had a carbuncle on the back of his neck, which took a long time to heal. Following that he had crops of furuncles and abscesses here and there, until finally the process settled down in his leg, and he had abscess after abscess all round the tibia and ankle. A colleague had had him in hand for six months, had operated several times, had opened up and relieved pus; but the process had gone on in spite of all that could be done. When seen there were five or six sinuses, from which pus flowed freely, and the lower half of the leg was in a brawny, inflamed, and angry condition. Had my colleague not been heartily sick of the case he would not have allowed antidiphtheritic serum a trial, as he was absolutely sceptical on the subject, but he consented, as he was willing to try anything. Antidiphtheritic serum three times a day was given for the first few days, then twice a day. At the end of a fortnight we again saw him together, and the change in the brawny, red, and angry tissues and the absence of the previous inflammation was so marked that my friend said, 'This is good-bye to all our old

teaching and training. This is a new departure.' The sinuses were still discharging, although much cleaner looking, and the pain was almost entirely gone. Antidiphtheric serum was kept up till he had taken 5 ounces and then stopped, as it was found that there was necrosed bone present, and that the action going on shown by the pus discharge was purely eliminative in its character, and consequently outside the range of action of the treatment. The local and constitutional septic infection was entirely removed, and he has had no recurrence.

(161) The writer, seven months after receiving an injury by a fall on the external surface of the femur just below the trochanter, had a sharp attack of osteitis and periostitis in the site of the injury, which came on during the night, and was present when he awoke in the morning. The pain and exudation increased steadily, and at 10 a.m. a dose of antidiphtheric serum, 2 drachms, was taken before starting the morning round. It was with considerable difficulty that the round was completed, and at 2 p.m. another similar dose was taken. An hour's rest was obtained before the afternoon round, which enabled him to do the work with less pain, both in driving and in getting in and out of the vehicle. The mid-day meal passed almost untasted, but the evening one was enjoyed. The symptoms were relieved with every dose, but at night they again began to give trouble, when the third dose entirely relieved them and procured a good night's rest. The same dosage was maintained for two days more, during which the ordinary work was done, and the third day, that consisted of thirteen hours' continuous work. After the three days' treatment all serum was stopped, as all symptoms had gone and the limb had been reduced to its normal condition. Temperature was only taken once, and that was an hour after the second dose, when it was found to be 99.6° . No other treatment whatever was used, and considerable satisfaction was felt at the rapid and thorough recovery from what promised to be a severe and protracted illness.

CHAPTER XIX

OTITIS MEDIA AND OTORRHŒA

INFLAMMATION in the ear treated with antidiphtheritic serum is subject to the same conditions and runs the same course as inflammation anywhere else ; that is, if an attack of inflammation is seen early enough, the further progress may be arrested, and the whole infection, when it is septic, rapidly cleared up. Acting as it does through the circulation, it is quite independent of the anatomical difficulties which hinder ordinary treatment. No acute case seen before pus has formed has failed to yield rapidly, and pain is frequently relieved by the first few doses even when pus is already present, and before it begins to discharge.

(162) A. K., aged five years, had been suffering for a day or two with otitis acute, and had given his parents no rest all the night before being seen.

When examined his ear was extremely tender, and his temperature was 103° . He was at once put on antidiphtheritic serum, and next morning his temperature had fallen to 100.6° , and his pulse from 125 to 120. He had slept soundly all night, and had given no trouble. His ear was less tender to touch.

The morning after (October 28, 1901) temperature had again risen to 102.6° , pulse 117, $^{\circ}$ and he complained of his other ear. Antidiphtheritic serum was continued, and his evening temperature was 101.4° , pulse 108.

October 29. — Patient much better; temperature 99.2° , pulse 92.

October 30. — Temperature 97.5° . Perfectly well. Dismissed. He slept soundly from the first night.

(163) T. D., aged two years, had had otitis media with every lot of teeth he cut, and the first time he was seen the case had gone too far to prevent pus formation, although the continuance of the antidiphtheritic serum cleared it up in three days.

From that time his mother learned how to diagnose the early symptoms, and when he had headache, vomiting, temperature, and other signs of an attack, he was promptly put on the treatment, and in every case it alone put him right in twenty-four hours. Half-ounce generally was sufficient for an attack. The boy was weakly and delicate, but after antidiphtheritic serum had seen him through, and had kept his system clear of infection, he grew into a fine healthy child. His father said, 'We don't grudge the price of that medicine.'

(164) M. H., aged five years, a delicate boy, had an attack of otitis media, with fever, headache, vomiting, great tenderness around the ear, and insomnia from the pain. After two doses he slept soundly all night, and in three days he was quite himself again. He was given 1 drachm three times a day, and improvement was seen from the very first.

(165) Baby S., nine months, male, a well-grown and well-nourished child of his age, had been suffering from his teeth, and latterly his ear gave trouble.

His mother gave him household remedies until seen by me, and then he was quite unconscious. There were no convulsions, and temperature was 100° . A previous child had died in the same way. Diagnosis was teething, otitis, and cerebral pressure.

Antidiphtheritic serum (1 drachm twice a day) was given and next morning he was sensible, although not quite himself; but another day's treatment completed the cure, and he did well.

When the process has come to otorrhœa before being seen it is still well within the range of the treatment ; but when the otorrhœa has been of long standing the results are of more doubtful character, and it is well to make no rash promises of recovery. What may be promised with every prospect of being fulfilled is that the offensive odour which is so frequently present will be removed. The putrefactive organisms affected by antidiphtheritic serum have not yet been defined, but in every case of pus discharge with foul odour yet treated the odour has been quickly removed. Another thing which can be promised is that all inflammatory conditions of septic origin will be removed if the pus has an opening to discharge. But what cannot be promised, although it may be obtained, is that the aural discharge will entirely cease. Two main reasons account for this :

1. The presence as a cause of the pus of other organisms than those for which antidiphtheritic serum is specific.
2. When the discharge is of an eliminative character and not inflammatory.

For pain and inflammation in an old-standing case the treatment is reliable, but when that is gone, and the discharge still persists, then antidiphtheritic serum in my hands has failed to further benefit.

(166) Mrs. T., aged thirty-six, three years ago had a long and serious attack of otitis, with frequent recurrences, which left her after three months in a very low condition of health. Recently she had another attack, and when seen at 8 p.m. she had had pain in the left ear for twenty-four hours, which had become extremely acute. The ear was very tender to touch, and she could not rest quietly, but was calling out with the pain. A dose at once was given, and another at bedtime. The second dose relieved her so much that she slept all night, had another dose in the morning, and when seen all pain except on pressure had gone.

Antidiphtheritic serum every six hours was ordered, and that

afternoon she had a discharge of pus from her ear, and for a time lost all pain. The dose was then reduced to twice a day, and in two days she was dismissed, all pus having disappeared.

Two days after dismissal she had a very sharp recrudescence of the trouble, and in a more acute form than the first attack. The pain radiated into the pharynx and down the neck, and the ear was extremely tender to touch. Antidiphtheritic serum every six hours was again given, and once more all symptoms steadily yielded, until at the end of five days all pain had quite gone, even on pressure. She was quite deaf in the ear for some time, but it gradually cleared up and made a perfect recovery. There were no further relapses. In the second attack pus formation was prevented.

In the following the otorrhœa had lasted for a month before being treated.

(167) Baby G., nine months, cutting teeth, and has had otorrhœa, with very offensive discharge, for a month. Antidiphtheritic serum (1 drachm per diem), with cleanliness.

The treatment soon showed results; the pus lost its odour, became less in quantity, and finally cleared up after he had taken $1\frac{1}{2}$ ounces. His general health also very much improved while under the treatment.

Further records have been mislaid.

Dosage.—One drachm at once and in an hour, then every four hours, and after all symptoms have gone a dose night and morning for a day or two, to make sure that the inflammation, which cannot be inspected, is completely removed.

CHAPTER XX

PERITONITIS.

SOME time ago a member of our profession in consultation said to a patient suffering from peritonitis, 'Science knows of no remedy which will act directly on peritonitis'; but for seven years the writer has not been able to agree with such a statement.

Although the bacteriology of the disease includes tubercle, pneumococcus, gonococcus, and malignant disease, the great majority of the cases seen are infections of the staphylococcus, streptococcus, or colon bacillus, either separately or in combination with one another or complicating the other infections.

Antidiphtheritic serum is specific for the three, whether alone or in combination. Where they complicate the other infections antidiphtheritic serum is still effective in their removal, leaving the other behind.

The danger of the disease lies principally in the great area of serous membrane, which so readily absorbs the products of micro-organic action, but this very danger is the cause of the extremely rapid action of the serum in dealing with the infection. The peritoneum has a perfect network of blood-vessels, which quickly carries the serum to the locality, more especially where inflammation is present, and this explains why in such a formidable disease, usually so difficult to treat, such

extremely rapid results are obtained. Granted that antidiphtheritic serum raises the tissue resistance, then the results are only such as could reasonably be expected. At any rate, in the writer's own practice all other treatment has been discarded, except such necessary attention to the secretions as may be required. Where seen in reasonable time no further treatment is required, but in cases at a later stage hot applications have generally been applied, and they are not discontinued until relief from pain has been obtained; but no dependence is placed on anything but the serum, which could easily do the work without their help.

To treat peritonitis successfully requires the prompt and liberal use of antidiphtheritic serum. It must be prompt, as it is a disease which extends rapidly and is of a very fatal character, and the more quickly it is taken in hand the more easily is it overcome. The prevention of the extension of peritonitis also prevents the adhesions which are such a source of trouble after the disease has gone. The acute symptoms which are of such a distressing character loudly call for relief, and for this, if for nothing else, the treatment should be pushed to its utmost limit. To accomplish this it is now usual with me to give 3 drachms at once and to follow it up by 1-drachm doses at intervals of two or four hours, as the exigencies of the case may demand. The interval is lengthened to six, eight, or twelve hours as the case progresses towards convalescence.

The first symptom to yield is the vomiting, which generally yields to the first dose, even when it has been going on for hours. Should it persist in spite of the treatment, then obstruction may be suspected, although even then the pain and vomiting will be materially relieved and distension lessened. The next relief noted is the lessening of the acute pain, which is still further relieved by every successive dose. First and most quickly to yield is the aggressive pain, which will give the patient no rest, and afterwards and more slowly

the pain felt on palpation, which should gradually give way as the case progresses to recovery.

Along with the pain relief the patient begins to show a general all-round improvement, due to the increased tissue tone, and his face loses the drawn expression and becomes more natural.

Pulse and temperature usually decline *pari passu* with the other symptoms, but they sometimes vary for the first day or two.

One of the strongest arguments for the prompt treatment of peritonitis is that pus formation may be prevented; and its presence, if not otherwise capable of being diagnosed, may be more than suspected if the pulse and temperature do not fall absolutely to normal, although all other symptoms may appear to be right.

Another marked feature of the treatment is the immediate limitation of the inflammatory process, and this result has been obtained in every case without exception. In short, anti-diphtheritic serum is specific for peritonitis caused by either the staphylococcus or streptococcus or colon bacillus, and is able promptly to stop the vomiting, limit the process, relieve the pain, and vigorously to help the patient in his fight with the disease.

Some of the conditions which prevent satisfactory results may be summarized as follows:

1. Where the infection is other than the three micro-organisms mentioned. In this case it will remove the septic infection and leave the other, and it has often seemed to me that what was left was materially lessened in virulence.

2. The use of the remedy too late. Here, as elsewhere in serum therapeutics, the earlier the use of the serum the less required and the more prompt the result.

As an example of how not to do it the following is worth relating:

A surgeon sent over to me for some serum for a case of peritonitis. The messenger (the husband of the patient) said

that the patient was past recognising him before he left. The information given was, 'General peritonitis, six days ; temperature 103° , pulse 130.' Patient died that night. Antidiphtheritic serum is the only treatment worthy of the name of treatment, short of operation where required, for any stage of the disease, but the writer does not advocate its use as a resurrection agent.

3. Where a collection of pus has formed. Such a case requires operation, and the sooner the better. Antidiphtheritic serum should be given both before and after operation. Before the operation it should be given to clear up peritonitic extensions, raise tissue tone, relieve pain, and put the patient in the most favourable condition possible for operation. After operation it should be given at once to prevent vomiting, to bring the septic process to an end, to energize his recuperative faculties, and thus to materially shorten his convalescence. An ambitious programme truly, but one capable of accomplishment.

So uniform has been the action of antidiphtheritic serum in peritonitis that the writer now uses it as a means of diagnosis, and the following are examples of its use as a diagnostic agent :

(168) Mrs. K., aged thirty-five, six weeks' post-partum, complained of abdominal pain, with nausea and vomiting. The vomiting was easy, and required little effort. As several members of the family were suffering similarly, all were treated alike. The others recovered rapidly, but her illness resisted their treatment. The patient was again examined, and although her temperature was only 99 , subacute peritonitis was suspected, and antidiphtheritic serum was given, 1 drachm every eight hours. She was seen after having three doses, and it was found that vomiting was quite gone, nausea much improved, and pain scarcely perceptible. Two days' further treatment cleared up everything.

(169) W. J., male, aged five years, had been ailing for a

week, complaining of vomiting, pain in side, and later all over the abdomen. Temperature 101.4° . Careful palpation of the abdomen gave him great pain, and he cried bitterly after the examination. He was given 1 drachm, and seen about an hour afterwards. By that time he had been eased, and when seen next day both temperature and pulse were normal; he was sitting up in bed, and quite lively. A few days later he was found to have broncho-pneumonia in both lungs, was sent home, and so passed out of my hands.

Both of these cases were evidently peritonitis, and antidiphtheritic serum aided the diagnosis and worked the cure. Thus one can use it to differentiate between neuralgia, tension or obstruction, and inflammation. The first is not affected, the second only partially and temporarily, and the third materially and permanently.

From the constant success following the use of antidiphtheritic serum in peritonitis it was shrewdly suspected that the colon bacillus came within the range of the remedy, but it was some time before that suspicion was turned into certainty.

(170) Mrs. McC., aged thirty-four, was suddenly seized with great abdominal pain and vomiting, which resisted all treatment and induced considerable exhaustion. After it had lasted for eight hours antidiphtheritic serum was given, 1 drachm every hour for three doses, with the result that the vomiting ceased after the first dose, and after the three her whole condition was changed for the better. Patient complained of pain in her groin (right), and from the inguinal canal on towards the pubes there was a painful tumour, which on palpation suggested pus. Examination *per vaginam* disclosed a similar mass protruding from the pelvic side of the inguinal canal into the pelvis for $1\frac{1}{2}$ inches. Bimanual examination easily mapped it out, and it evidently was of the same character as the external condition. The patient was given nothing but antidiphtheritic serum, and under it the nausea, pain, temperature, and pulse

quickly gave way. The internal mass daily lessened like an abscess cavity which had discharged and was contracting. The external tumour at first lessened, but after two days it began to fill, and pus was plainly present. On the eighth day it was incised, and an ounce of foul-smelling pus was evacuated, which on culture gave a pure growth of the colon bacillus. The action of the antidiphtheritic serum was very rapid, and in two days the discharge had dwindled to about 10 drops, and in three days it had entirely gone.

Late the next day the patient was seized with severe pain and vomiting, which was only partially relieved by a free use of the serum. The pain was in paroxysms, and the temperature rose to 100° . Symptoms were materially relieved by the treatment, but it was evident that the main trouble was not being reached. In thirty-six hours a diagnosis of obstruction was made, and she was promptly sent into hospital for operation.

First, the external focus was incised, but it was found free of pus, which had evidently come through the inguinal canal. The abdomen was then opened up, and the diagnosis of obstruction was at once seen to be correct. The obstruction was caused by the intestine being drawn into the inguinal canal.

The first attack had evidently been caused by a leakage from the internal end of the abscess, and the inflammation had been overcome by the treatment. The treatment had not been able to prevent local adhesions, and thus the intestine had become closely adherent to the abscess wall, which was drawn into the canal as soon as the external pus had been removed by my external incision. So firmly adherent was it that careful removal left a great part of the intestinal peritoneum behind, and actually tore a hole in the intestine, through which the contents freely flowed and soiled the peritoneum. The intestine being damaged beyond repair, the damaged portion was resected (about 2 inches), Lembert sutures being used. As

the case had been so septic and the peritoneum so soiled, it was feared that septic complications might follow. The patient had been well prepared by having about $1\frac{2}{3}$ ounces in the two days' preceding operation. She stood the operation fairly well, and had scarcely a sign of sickness after. The next day her temperature rose to 101° and pulse to 120; but after $2\frac{2}{3}$ drachms, given in three doses with an hour's interval, they gradually fell, and by next morning were normal. She made a good recovery.

When seen on operation, it was plainly evident that there had been a very sharp local peritonitis, which had been entirely cleared up by the treatment. Considering that the obstruction had been complete for at least two days, the intestine was in a wonderfully good condition, only one small scrap of lymph being seen—a fine example of the action of antidiphtheritic serum on involuntary muscle.

The following is an example of a prolific source of peritonitic attacks:

(171) Mrs. L., aged thirty-three, had a sharp attack of pain (ushered in by a rigor) on the right side of the abdomen between the edge of the liver and McBurney's point. Pain was severe all over the liver right through to the back and up between the shoulders. Peritonitis was diagnosed, but whether of appendicular or hepatic origin could not be made out owing to pain and distension. Was not seen till fourth day of illness, during which she had not been able to sleep for pain. Morning temperature 99.2° , pulse 120, respirations 40. Antidiphtheritic serum was given, 1 drachm every two hours for four doses. Evening temperature 101° , pulse 102. Patient could lie quietly without so much pain.

Second Day.—Temperature 101.6° , pulse 96. Patient has had a good quiet night, and slept for some time. Pain less over peritonitic area. Evening: Pain steadily reducing. Temperature 100.9° , pulse 96.

Third Day.—Temperature 99° , pulse 83. Still improving.

Pain so much reduced that examination can now be made, by which a swollen and painful gall-bladder can be made out.

Fourth Day.—Temperature 98.1° , pulse 100. All peritonitic pain gone, and gall-bladder can now be easily reached, and is found to be enlarged, tense, and very painful.

Consultant agreed with diagnosis, and operation was decided upon.

Operation disclosed peritonitic adhesions all round. There had been almost complete perihepatitis, and the bladder was found full of pus, cultures from which gave pure growths of *Staphylococcus pyogenes albus*. The pus was siphoned off and the wound packed with gauze. Antidiphtheritic serum was continued, and pus discharge was quickly checked. Patient vomited till she got first dose of serum, but not after. It was then found that the cystic duct had been closed by inflammatory adhesions, as no bile was passed, and after being drained for eight days the tube was removed, and all discharge ceased in a few days.

The fact that pus was present was suggested at the first by the temperature and the pulse, especially the latter, failing to yield with the other symptoms. In any case it was proved that antidiphtheritic serum at once checked the inflammation, relieved the pain, gave the patient rest, and improved her general condition.

The following case was the first serious peritonitis treated with antidiphtheritic serum, and the result was all that could be desired. The cause of the attack is open to doubt, but the peritonitis and the results of serum treatment are beyond dispute :

(172) Mrs. H., aged fifty, had been complaining for some years of pain in pyloric region, sometimes very severe, and never wholly absent. There were digestive troubles, and she was under treatment for them when the attack came on.

In the early morning of March 23, 1899, patient had a slight rigor, but when seen at 9 a.m. temperature was normal. Anti-

diphtheritic serum was not given so freely then as now, but she was given 1 drachm at once to guard against possibilities. At noon she had a prolonged and severe rigor, with almost complete collapse. Pain in abdomen was extremely severe, and there was vomiting. Consulting physician and surgeon both diagnosed appendicitis, with rupture of the sac, and gave a very guarded and rather hopeless prognosis. Antidiphtheritic serum was at once given and kept up every eight hours. The patient improved from the very first, and the improvement was kept up without relapse, until at the end of six days the consultant pronounced her out of danger. By that time temperature had fallen to normal, and she could bear firm pressure all over the abdomen.

Six weeks later, having recovered from the attack and gained a fair amount of strength, she had her appendix removed. The patient stood the operation well. The appendix was healthy; there was no sign of sac, but the whole of the abdominal contents were firmly matted together, and plainly showed how general and severe the peritonitis had been.

Six months later she had another peritonitic attack, with pain mainly on her right side near the old spot. This attack was characterized more by excessive weakness than either pain or temperature, although both were present. A few doses of serum quickly removed all trouble.

Looking at the case after it was all over, the writer is of opinion that the cause of the peritonitis was rupture of a duodenal ulcer. Whether correct or not does not matter, as we are now discussing peritonitis, and there was no doubt as to its presence, severity, or extent.

That such an attack should be conquered absolutely in six days is unusual, to put it very mildly. As antidiphtheric serum was the only treatment, except poulticing, it must receive the credit of the success.

Subsequent peritonitic attacks, arising from the extensive

adhesions, have been immediately controlled by the same agent.

The following case has, from its very nature, proved a veritable mine of experimental research in the use of antidiphtheritic serum, and with the happiest results to the patient. Other phases of the case are discussed under Pyelonephritis and Gynæcology.

(173) Mrs. G., aged thirty-five; vesico-vaginal fistula post partum, which was repaired by stitching the cervix into the bladder. Menstruation was per bladder, and irregular. As the cicatrix contracted it began to block the cervix, and it was found necessary to use the faradic current per vaginam to force the retained fluid through the cervix. This was done successfully several times, but, of course, it was painful, and the patient allowed longer intervals to elapse before seeking relief. After a nine months' interval the current was being applied when the patient was seized with a rigor on the table. There was great pain on the left side, and it was clear that the fluid had found it easier to pass along the left tube than through the cervix. Septic peritonitis was thus set up, but was rapidly removed by antidiphtheritic serum treatment begun on the spot.

This experience was repeated four times, but, treating the peritonitis too lightly, a collection of pus was formed at the distal end of the tube, which discharged itself per rectum. It refilled and discharged several times, until, on discharging, it was treated with serum, 2 drachms per diem for twelve days, since which it has ceased to trouble. That the cicatrix had closed the tube seemed proved by a renewal of the current being given without the usual sequelæ.

A few weeks ago, after an interval of some months, the uterus was making violent efforts of its own accord to empty itself, and the same thing occurred on the other side. On this occasion patient was not seen till nine hours after the attack came on. During that time she was vomiting and retching

with chills and cold sweats. Temperature was 101° , and patient was much exhausted. Antidiphtheritic serum, 2 drachms for the first dose and 1 drachm every hour for the next two hours, soon worked a change. The first dose brought the vomiting to a summary conclusion, and the next two relieved the pain and pulled her together. The treatment was kept up at lengthening intervals for five days, and patient was up and about on the seventh day.

The rational treatment for a case like this was hysterectomy, but the patient would not hear of it, and so the best had to be done for her without operation. Besides, she had had pyelonephritis for three years before having it cleared up with antidiphtheritic serum, and this made it undesirable to operate if it could be avoided.

In the preceding cases the presence of pus in the peritoneal cavity was clearly proved, and the action of antidiphtheritic serum on it was just as decided.

The methods by which infection enters the peritoneum are endless in their variety, and no two cases given are alike. The following are interesting :

(174) Mrs. S., aged thirty-six. Tubal pregnancy was diagnosed. Operation was done per vaginam, and diagnosis found correct. There was some inflammation, with pain and temperature ; but antidiphtheritic serum failed to bring pulse and temperature to normal, although it removed the pain and other constitutional symptoms. This indicated pus, and it showed its presence by a loculation rupturing on to the peritoneum, with collapse of the patient, excruciating pain, pulse uncountable, and a temperature of 105° . As she was taking serum regularly she was prepared for this attack, and an extra dose given at once made her comfortable in half an hour.

Next evening her temperature was 100° , and, after being under treatment for ten days altogether, she made a good recovery. No cultures were made, but, from the odour of the pus from the vagina, the infection was probably the colon bacillus.

The following case was clearly of appendicular origin, and as it is one treated by the latest dosage, it shows the more rapid results obtained by more liberal use of serum.

(175) Mr. H. B., aged thirty-five, had had twinges of abdominal pain the day before being seen. These steadily increased in intensity, and kept him awake all night. Bowels were moved in the evening, but he took pills and had two further motions in the morning. Nausea and vomiting came on during the night, and the pain not only increased in intensity, but also in area. It rapidly spread until it affected the whole abdomen below the umbilicus.

When seen his headache was severe, and he could not lie still with the pain. Examination showed the most painful spots were to the left and below the umbilicus, above Poupart's ligament on both sides, and less over McBurney's point. Temperature at 10.30 a.m. was 99° . He was given 1 drachm at once, the same in an hour, and again in two hours. He was then much relieved, could lie quietly, and while he did so was comparatively comfortable. Flatus gave him occasional pain, but he passed very little. Temperature was then 101.4° and pulse 92.

Four hours later he had another dose, and when seen shortly after his temperature had fallen to 100.4° and pulse to 81.

He had a good quiet night—antidiphtheritic serum every six hours—and when seen in the morning temperature was 98.1° , pulse 60. He usually has a slow pulse. Pain on palpation was still fairly severe, but it steadily lessened day by day, and as it lessened the area contracted, until only the appendix was painful. Four days from the first dose of serum firmest pressure failed to elicit the slightest sign of pain, and there has been no return.

Another case of the same kind, treated some time before the last with the longer intervals between the doses, did well, but with more liberal dosage would probably have done much better.

(176) Mr. C., aged twenty-nine; severe pain over appendix,

with vomiting and diarrhoea. The pain rapidly spread over the pelvis until all below the umbilicus was affected, the worst points being over the rectum and sigmoid flexure.

The inflammation was rapidly spreading when he was first seen, and he was given 1 drachm at once and then every eight hours. The first dose cut short the vomiting and diarrhoea, and in forty-eight hours there was complete remission of all his symptoms. The extension of the inflammation was prevented from the very first, and in two days he was hungry. This led to his taking some solid food, which promptly caused a relapse of the diarrhoea and peritonitis. He took two half-doses of the serum, which failed to relieve him, and then, twelve hours after the relapse began, he took a full dose, which gave complete relief. Dover's powder and bismuth salicylate was added for his diarrhoea, and when it was stopped the diarrhoea returned, but without peritonitis. The temperature ran about 101° and under during the case. He was up and about in ten days, and had a very short and satisfactory convalescence. The adhesions left around the rectum and sigmoid flexure, being added to a previously existing costive habit, gave him a great deal of trouble for some time afterwards. Three years later this patient had a recurrence, with the same symptoms. He was given 2 ounces in three days; the whole process was completely aborted, and he was dismissed at the end of that time.

Here one may draw attention to the completeness of the recovery, which is the cause of the short and satisfactory convalescence. The same thing happens in diphtheria when it has been seen in time and properly handled with antidiphtheritic serum.

The following cases, although really puerperal, were so frankly peritonic that they are given here as examples of another method of peritoneal infection :

(177) Mrs. B., aged forty, primipara; a severe forceps case, with considerable post-partum hæmorrhage. Patient's tem-

perature was never quite normal during the first nine days, and on the tenth she had a sharp rigor, and her temperature rose to 104.3° . There was abdominal pain and the usual symptoms of puerperal sepsis. Antidiphtheritic serum was given every six hours, and next day her temperature was 100° and other symptoms improved. The day after temperature was 99° , and the following day it was normal. The serum was then ordered at longer intervals, and that night she had a relapse. When seen next morning her temperature was 102.8° , and she had well-marked symptoms of peritonitis, especially on the right side near the appendix. Antidiphtheritic serum was resumed every six hours, and by next morning she was almost well, and was finally dismissed the morning after. There has been no recurrence.

(178) Mrs. S., aged thirty-two, multipara, in a colleague's practice. She had had a temperature post-partum, which was treated with antidiphtheritic serum, which reduced it to normal, and patient was dismissed. Three days later my colleague was again called to see her (Thursday), and found her with well-marked peritonitis and a temperature of 104.5° . She was given anti-diphtheritic serum at once and then every six hours.

Next morning (Friday) temperature was 102.6° , and peritonitis was very much improved.

Saturday.—Temperature was normal, and all signs of peritonitis gone.

Sunday.—She was up on a couch, weak but well. My colleague was as much astonished as relieved, for he had given a very gloomy prognosis of the case.

There is little use in lengthening the list of cases, for the result has always been the same, and the writer would wonder what had happened should he find a case of peritonitis not amenable to the treatment, except pus or mechanical conditions were present.

The following is the only example seen of peritonitis supervening upon gonorrhœa, but it is suggestive of what may be done.

(179) Mr. B., aged twenty-eight, contracted gonorrhœa about a fortnight ago, which was running a rather severe course, when he began to suffer from abdominal pain and came to me for treatment. Abdomen was very painful to palpation, and there was considerable distension. Temperature was about 99° , and he was barely able to walk. He had a dose of antidiphtheritic serum every hour for three doses just before going to bed, and another first thing in the morning. When seen during the day he was very well and free from pain, all distension gone, and he had had a very good night's rest.

He returned to business, and a week later came back with an acute epididymitis and a return of his abdominal symptoms. He was given appropriate treatment for his epididymitis and antidiphtheritic serum for any septic accompaniment. He had not sent until he was very ill, so that although he was taking antidiphtheritic serum he had several chills, and his temperature rose to over 104° . On the seventh day his temperature fell to normal as by crisis, and his convalescence was rapid and complete.

He was very emphatic about the relief obtained from the serum, and took it readily when it was given him.

No evidence was discovered of any action of the antidiphtheritic serum on the gonococcus during the case, and the benefit obtained was sufficiently explained by its action on the septic accompaniment.

CHAPTER XXI

SECONDARY INFECTION IN PHTHISIS

IN cases of phthisis presenting symptoms of septic complications the use of antidiphtheritic serum has been tried, mainly in the first stage or early second. Those which seemed to be more largely septic than tubercular were naturally more benefited by the treatment. Here, as in the use of simple plasma, a concurrent influenza infection at once inhibited all the reactions which were being obtained. The medicine being expensive, it was only in exceptional cases that a long-continued administration of the serum could be maintained; but, when possible, it was kept up till temperature had fallen to normal. Naturally the earlier the stage the greater the chance of benefit.

Probably a good deal of the general improvement which took place was due to the transference to the patient of the normal resistance to tubercle of the horse. However, it did not seem to be so capable of dealing with the dyspeptic symptoms as the simple plasma has lately done, and its recuperative power from clinical observation did not seem to exceed greatly that produced by the use of the simple plasma.

Briefly, it might be used with advantage for septic complications; but, when those have been mitigated or removed, the simple plasma offers even greater benefits at a fraction of the cost.

The first case given here illustrates what has been said, first, about the improvement which follows the elimination of the septic element; and, second, the absolute failure of the same treatment when the complicating factor is the influenza infection.

(180) H. E., aged eighteen, male, acute phthisis. The family history is not good. His brother died of phthisis, and the whole family are in delicate health and predisposed to follow in the same way. Twelve months ago he was not very strong, although there was nothing really wrong with him, and he was sent to a sheep station in New South Wales for his health. There he had a severe attack of furunculosis, which compelled him to come home, and altogether he had twenty-three boils on his neck, face, and arms. Shortly after they had gone he began to have trouble with his lungs, and he had several hæmorrhages. This was followed by hectic fever—evening temperature 103° , very profuse night-sweats, rapid loss of weight and strength, so that in a few months he could scarcely walk across the room without support. The cough was very severe, and the sputum copious, and contained tubercle bacilli plentifully. A fortnight before coming to me otorrhœa set in, and the discharge had become very offensive, and altogether he looked as discouraging a case as possible. He had had a variety of treatment, but all without avail.

Examination showed râles in both apices and upper half of both lungs, with some dulness, but it was evident that the general symptoms were much more acute than the physical signs alone would account for—shortly, that while tuberculosis was undoubtedly present, there was a large element of sepsis in the case, and it was resolved to test it with antidiphtheritic serum. Weight 129 pounds. He was given 1 drachm night and morning regularly till he had taken $6\frac{2}{3}$ ounces, and by that time his temperature had fallen to normal night and morning. The night-sweats had also gone long before, and his otorrhœa had shrunk to a very small odourless, ceruminous

exudation. His general health was much improved. Then he was given five weeks' treatment with Maragliano's anti-tubercular serum (1 c.c. hypodermically three times a week). During the latter part of this treatment hydrogen iodide (Gardner's syrup 1 drachm three times a day) was added, and it seemed to help, probably by its action on some associated infection of a catarrhal nature. Finally, as a tonic when the antitubercular serum was stopped, he was given Hoff's mixture of arsenious and cinnamic acids.

The weight was stationary under antidiphtheritic serum, which is the usual condition. It increased under Maragliano's serum, which is also the rule; and finally, under the other treatment, he went to 141 pounds, which is probably his usual weight. At first there was considerable difficulty with anorexia and stomach irritability, but they were gradually overcome, and as his temperature fell his appetite returned, and he began to eat like a man recovering from an acute illness. He then ceased all treatment, and went travelling over the country with his father, and those who had not seen him when he was ill laughed at the very idea of his having tubercle. His father, however, had an attack of influenza, and the son, sleeping in the same bed with him, caught the infection, and had to come home ill with it. He recovered from the influenza, but his tubercular disease had been already stirred into activity, and, in spite of antidiphtheritic serum, Maragliano's serum, and everything that could be done for him, he steadily sank, and died in about three months after the influenza attack.

This case was at first a typical one for the use of antidiphtheritic serum, as the septic element was so clearly traceable, and formed so large a part of the processes at work. Before he was first dismissed he was four months in hand.

The following case shows a similar infection preceding the more acute development of the tubercular element:

(181) H. L., aged twenty-four, male. Over two years ago he

had frequent attacks of furuncles, and when they ceased his lungs began to give him trouble, and his health began to deteriorate.

Cough was frequent and troublesome both by day and night, expectoration was copious, and there was some hawking of mucus, with complete aphonia. There was heavy night sweating with hectic in the evening, otorrhœa of some months' standing, diarrhœa, with abdominal pain, for the last month, rapid loss of weight and strength, and he had been steadily going downhill for the last year. Appetite and digestion good.

Examination showed the right apex to be consolidated and the remainder of the lung dull, as though from thickened pleura, while respiration was harsh all over the left side. Sputum examined, and report was 'bacilli plentiful.' He was put on antidiphtheritic serum night and morning, to get as much fresh air as possible, and to eat for his life.

The result was that in two days the sweats disappeared, diarrhœa went in four days, and abdominal pain was gone within a week. Cough and expectoration steadily lessened, until at the end of a fortnight sputum for a further examination could not be obtained. His voice had also improved and his otorrhœa had gone, while his weight had remained stationary. He was then given a graduated course of Maragliano's serum for six weeks, during which he gained 7 pounds weight. Otherwise the tubercular symptoms did not improve in the same ratio as the septic; indeed, there was little improvement in them when he ceased treatment.

Three months later he was again seen and examined, and it was then found that he had retained all the improvement which he had gained. He continued to live and work at his trade in the same closely-populated part of the city, took no further treatment nor care of himself, and died suddenly of cardiac failure fifteen months after the course of treatment for sepsis. The septic condition did not return, but his tubercular disease had progressed considerably when seen a month before his death.

The next case also has the history of a furuncular attack, and it was the precursor of an acute rheumatism, which would probably have finished the patient but for the use of antidiphtheritic serum. The recurrence of the septic attack at a later date is also interesting.

(182) Mr. B., aged thirty-five, belonged to a family which had frequently septic diseases, so much so that it is my rule to treat them for that first in almost every case, and see what remains after that element has been eliminated. Some months before he had had to give up a situation at £500 per annum, and go away into the country for tubercle of the left lung. He had an attack of furuncles just before being seen, and that was succeeded by an acute rheumatic polyarthrititis. He was treated with antidiphtheritic serum, which rapidly and effectually cleared up the rheumatic attack. It did more, for it also cleared his system of the septic element, and from that he began to improve, and finally he became too heavy for his height, and enjoyed splendid health. His lungs improved so much that the most careful examination disclosed nothing wrong, and he could have passed for insurance but for his history. This happy condition lasted for a little over two years, when he had a return of his septic condition, which was characterized by an attack of acute rheumatism and followed by an acute appendicitis. Along with these and preceding them he had hectic fever for some time, his cough returned, his sputum altered, and he began to expectorate a muco-purulent material in considerable quantity. He also had night-sweats, and ran down badly in general health. After the treatment for the appendicitis and the rheumatic condition with antidiphtheritic serum, his lung condition again began to improve, the sputum lessened in quantity, and his general health was once more put on the upgrade. That was over two years ago, and he has continued to keep in good health ever since.

His facilities for the treatment of the remaining tubercular

infection were much better than the other two previous cases, for he gave himself up to live the life of a sanatorium patient in a most favourable situation, until he was fit for light outdoor work.

The following case was one of those in which the acute septic condition quite overshadowed the tubercular, which was only discovered by sputum examination.

(183) Mr. G., aged sixty-four, a feeble man for his age, who had had one attack of hæmoptysis and recovered. There was no lung lesion discoverable by auscultation. Immediately afterwards he had an attack of cardiac syncope of a fairly severe character, and again recovered. A month or two later he had another threatened cardiac failure, and with it he developed a cough. Sputum on examination showed tubercle. The case in a few days became a septic pleuro-pneumonia, with hæmoptysis and profuse sweating. The temperature was characteristic, and a consultant gave no hope of recovery, and with every reason for his opinion. It was the early days of the treatment; and with no hope of affecting the case, but only with the desire to lessen the heavy sweats, he was given antidiphtheritic serum twice a day for two days, and once daily for two more. By the end of the fourth day his temperature had fallen to normal night and morning, his sweats had gone, hæmoptysis was rapidly disappearing, and his whole condition was wonderfully improved. In a week he was out of all danger, and he made a splendid recovery. His cardiac trouble went along with the other, and it became evident that the whole illness had been an acute septic infection superadded to his tubercle.

That is now four years ago, and the tubercle has given no further sign of its presence, nor has he had to be treated for his heart or lungs. The tubercle was evidently in an early stage, and his system, freed from the septic infection, has freed itself from the tubercle.

CHAPTER XXII

ACUTE RHEUMATIC POLYARTHRITIS, NEURITIS, AND IRITIS

IN this disease the cases which are within the range of treatment with antidiphtheritic serum are those which may be called inflammatory. The cases then seem to have a septic complication, and the addition of antidiphtheritic serum to the usual salicylate treatment leads, as a rule, to a very prompt and thorough recovery.

The inflammatory cases are differentiated by the synovitis, with effusion in the joint. The others have little fluid in the joint, and are not so painful to palpation as the joints which are inflamed. There may be temperature and increased pulse, with cardiac conditions, but the joints do not swell; and although the patient complains of pain, he can generally stand fair handling. Most of these cases are recurrences after previous attacks. There will be no need to give cases of this kind. The writer considers them as cases of uncomplicated rheumatism, and in every case tested antidiphtheritic serum has been of no value whatever.

Where there is any doubt, two days' serum treatment will settle the uncertainty.

To show that even in subacute cases the septic infection may be present, the following case is interesting:

(184) G. F., aged thirty-five, first seen January 13, 1902,

with subacute rheumatism affecting both ankles, left forefinger, and left great-toe metacarpal joint, which had been injured at one time. There was swelling in all the joints affected. He was treated with salicylates and iodides for four weeks, improving and relapsing, but making no steady progress. Then his elbow became affected much more severely than the other joints, and the pain of it kept him awake all night for several nights. To interrogate the case he was given antidiphtheritic serum (3 drachms per diem) for three days, all other treatment being stopped. The answer was so plain that it was continued till he had taken $2\frac{1}{2}$ ounces in all, when he was dismissed as requiring no further attention. The antidiphtheritic serum was begun on February 10, 1902, and on February 20 the report was 'All pain quite gone; joints have lost all swelling, and he can move them freely. He cannot quite straighten out his elbow, but he has no pain in it; twitchings gone; he can walk around more easily, and is fast losing his stiffness. He reports himself as well as he ever was in every other way. His appetite and digestion are good, and he sleeps well. All treatment discontinued.'

This case, being subacute, has been rather an exception to the general run of cases requiring antidiphtheritic serum; but its intractability suggested its septic character, and the interrogation confirmed the suspicion.

Here the antidiphtheritic serum had been given *after* the salicylates, so that it looked as if they had removed the rheumatic element and failed to touch the septic, for when the septic was removed there remained no rheumatism requiring further treatment.

In this case ordinary treatment benefited, but failed to cure, and antidiphtheritic serum cleared up what was left.

The following is an example of an acute case of the same class:

(185) F. B., aged fifteen, has had otitis media, otorrhœa, and other septic conditions. He was at the seaside when he

had an attack of rheumatic arthritis, and his father wired asking for some medicine to be sent, as he had seen its effects in another case in his own house. He did not say that he had called in another practitioner, hence the medicine was sent, and I learned subsequently that they gave it *sub rosa*. When it reached him he had been four days under salicylates, and the affection, which had begun in one ankle, had extended to the other and then to his knee. Antidiphtheritic serum at once checked the process, and in two days he was up and about. On the doctor expressing his surprise at the rapid and satisfactory character of the recovery, he was told what they had done.

(186) M. H. B., aged thirty-eight, a delicate man with tubercular consolidation of the upper half of the left lung. He had an attack of acute rheumatic polyarthrititis, for which he was given salicylates for two days. He then had suppression of urine, which yielded to treatment in twenty-four hours. The arthritis spread from joint to joint, until only hip and shoulder joints were free, and even the shoulder joint was becoming affected, and was hindering respiration. There was also acute neuritis of the right calf. At the end of a week all treatment had failed to stem the disease, and the patient was beginning to show marked signs of exhaustion from pain, insomnia, and previous illness, and it was evident that something radical had to be done if he was to be pulled through. He was given 1 drachm of serum night and morning, and next day he reported pain gone from shoulder in which it had last appeared. He felt a bit easier in himself, and could move the leg with neuritis, which he could not do before. He had had little sleep. The second morning he reported a splendid night's rest, and all pain gone from his joints, only stiffness being left. His temperature, which had been ranging up to 102° , had fallen, and he looked clearer and brighter. There was no cardiac lesion. The third morning he reported all pain, temperature, and stiffness gone, and he was looking and feeling much better.

He made a rapid recovery, and although he had an occasional touch of rheumatic pain for a short time, it was only simple rheumatism, and readily yielded to the same remedies which had failed before using antidiphtheritic serum.

The following reasons induced me to make this experiment:

1. The desperate condition of the patient.
2. The suggestion of pathologists that the disease was frequently pyæmic.
3. The patient had had an attack of boils just previous to the arthritis.
4. Members of his family were subject to septic conditions. The previous case was his nephew, his sister had died of pernicious anæmia, and I had treated other relatives for septic infections.

The little rheumatic attacks without temperature were probably due to rheumatic infection left after the septic had been removed.

The neuritis cleared up with the arthritis, but it was some time before he fully recovered the use of the limb in which it appeared.

His tubercular condition rapidly improved from that time, and he increased in weight, until within twelve months he weighed 170 pounds.

Two years and a half later the same patient again came into my hands, and his history is as follows:

He had been out of health for some weeks, with evening temperatures ranging up to 101° and over, and he had a cough, with a dirty muco-purulent expectoration, about a dozen mouthfuls of which he would put up in a day. His tongue was dirty and there was vomiting, and he had rheumatic pains in his shoulder and knee, the shoulder being very severe. Antidiphtheritic serum alone was given every six hours.

February 4, 1902.—After four doses he reported this morning that his rheumatism was better, and he could swing his arm round his head. As he was constipated and vomiting con-

tinued, he was given a good dose of calomel, which duly cleared out his bowels, after which he felt much better. Abdomen was examined for cause of the vomiting, but none was found. Treatment continued.

February 5.—Morning temperature 100° , and although he felt better he did not look right. During the day he had a small piece of fish, and soon after he had great pain over his appendix, and his temperature rose to 102° and his pulse to 96. Serum was not pushed as it ought to have been, and he had a bad night. He had a great desire to defæcate, and passed six small motions.

February 6.—Morning temperature was 99.6° , and patient was chilly and exhausted from pain and loss of sleep, but was restored by a stimulant. Serum was then given every four hours, and he steadily improved until, in the evening, his temperature was 99° and his pulse 84. Flatus passed all day and gave him great relief when passed, but sharp pain in passing over the appendix.

February 7.—Reported a good night, and he looked and felt much better. Temperature 98.6° , pulse 79. He can now allow free handling of the appendicular region and is becoming hungry.

By February 11 all trace of pain had gone, even on firmest pressure, and two days later he was dismissed, a new man. The expectoration was also much improved, both in quantity and quality. The only other drugs given consisted of a dozen pills, each containing 1 grain of thymol, quin. valer., and guaiacol carbonate, which had been given as an intestinal antiseptic.

The combination of rheumatism and appendicitis has been seen before, but the cure of both by antidiphtheritic serum is rather a novelty.

His pulmonary condition had been going downhill for some time before this illness, but since his recovery he has made steady progress, and has regained all that he lost. The effect of the

removal of the septic factor from cases of tubercle is more fully dealt with under that head.

The following case shows how septic infection was diagnosed and treated successfully after ordinary treatment had failed.

(187) Miss P., aged thirty-five, a chronic rheumatic case, with subacute attack in hands, knees, and ankles. She had had every variety of treatment, which relieved her for a time, only to recur as badly as ever. For several winters she had had recurrences, but last winter she had no rheumatism, but a bronchial condition, which alarmed her friends. In both bronchial and rheumatic attacks she had hectic fever in the evenings and heavy night-sweats. At her periods she had dysmenorrhœa, with congestive menorrhagia.

At first she was treated with hydriodic acid and a lithia salt, but it did her no good; then the hectic and sweats were discovered, and antidiphtheritic serum was substituted.

She at once began to improve, and the night-sweats steadily lessened, until at the end of sixteen days' treatment (4 ounces) they had entirely gone, and with them had gone her rheumatism. Her general health and catamenia also improved in proportion, and the improvement dated from the first dose.

Later on she had a slight return of her rheumatism, but it was nothing to her previous attacks, and she has since done well.

Rheumatoid arthritis in an early stage was suspected in this case, and if so relapse is only a matter of time.

The next case is interesting as showing by an accident how the action of the antidiphtheritic serum was differentiated from the salicylates with which it was being given simultaneously.

(188) J. M., aged twenty-one, male; acute rheumatic arthritis, in which only a few joints were affected, but the patient seemed ill. There was no cardiac lesion. Temperature 101.3°. Gave him antidiphtheritic serum with salicylates. He had two doses

of serum given him for the day, but next day he was overlooked, and not seen till the day after. His story was that as soon as he began the medicine on the first day he began to improve, and he had a good night; but when antidiphtheritic serum gave out he steadily relapsed, had a bad night, and when seen was just as he was when first visited, although he had been taking the salicylates all the time. On resuming serum he again began to improve, and very quickly he lost all his constitutional symptoms and gained in general health, appetite, and strength. He had 1 ounce in all, and after it was stopped he had some occasional pains in his wrists, but they had quite gone a fortnight after being first seen. They were purely rheumatic, and did not affect his general health.

In this case there was a good deal more rheumatism than in some of the other cases given, but with the septic removed it was more easily treated, and its constitutional effects were reduced to nil.

The most difficult class of rheumatic cases to deal with, from the antidiphtheritic serum standpoint, is the recurring attacks in old people, probably because they are almost entirely rheumatic, and only occasionally have the septic infection associated with them.

That the septic infection sometimes complicates these cases is suggested by the following cases:

(189) T. B., aged sixty-three, a chronic rheumatic subject who has been treated at intervals for the last eight years.

August 31, 1901.—Usual attack and usual treatment.

September 2.—Ordinary treatment failed, and patient is suffering severely. The dorsum of the right hand is swollen and inflamed from the wrist to the knuckles, and he has had no sleep for the last three nights. Antidiphtheritic serum every eight hours, and stopped all other treatment.

September 3.—There is a great improvement in the hand, and swelling is much reduced.

September 4.—All swelling gone, and pain only on one or two points.

September 5.—Only stiffness left, and the hand otherwise is quite well. He slept the whole night, for the first time since the attack came on. He was dismissed well, having used in all 1 ounce.

The following case is something similar, but the attack was more general in its incidence, and the patient was older and more feeble.

(190) R. S., aged seventy-three, and feeble for his years. He was a chronic rheumatic, and was now suffering from an acute attack during an epidemic of influenza. Eight years ago he had a similar attack, which lasted for eighteen weeks. With this memory in view, patient was depressed and hopeless.

Temperature 101.5° , and joints swollen and tender. He was put on antidiphtheritic serum, 2 drachms per diem, and by the fourth day his temperature was normal. On the third day colchicine salicylate, $\frac{1}{32}$ grain three times daily, was begun, and it was kept up for a week. Of the antidiphtheritic serum he took in all 2 ounces. He was up on the eighth day, out for a walk on the eleventh, and was finally dismissed on the fifteenth day from the first visit.

The following case of scarlatinal rheumatism is the only one which has as yet come to hand, and in it antidiphtheritic serum answered every expectation.

(191) Miss K., aged seventeen, an old chronic case of acne vulgaris, with the treatment of which I had been recently successful.

Scarlatina, second day, temperature 102° , pulse quick and compressible, but faint. She had lost a fair amount of blood from hæmatemesis. The rash was most prominent over the trunk and was very thick, while the skin seemed thickened; it looked more like an erysipelas as the skin was covered with a fine vesicular eruption, the vesicles being filled with pus. She had the usual sore throat.

She was given serum, 1 drachm every six hours.

Next day (September 15, 1902) temperature was 100.4° and pulse 108. The rash was fully out, and the vesicles were very distinct, ranging from the size of a pin-head to that of a grain of rice and covering the whole trunk.

September 16.—Temperature normal, pulse 92. Rash fading; vesicles quite dried up and scaling; hæmatemesis ceased. Stopped antidiphtheritic serum and gave bismuth, pepsin, and hydrocyanic acid for the stomach.

September 17.—Temperature 100° , pulse 92. Has a sharp attack of arthritis in both shoulders, elbows, wrists, and hands, the left side being most affected. There was also neuritis of both arms, the left side being affected from the shoulder to the fingers, and the right from the elbow, and she was quite unable to move them. Resumed antidiphtheritic serum as before.

September 18.—Temperature 99° , pulse 92. There is an all-round improvement, more marked on the right side than on the left. There is very little pain on pressure over any of the joints, and she had a good night.

September 19.—Temperature normal and improvement continuing. She had some neuritic pain in the night, but that has all gone. The joints are much better, and she would be practically well but for the loss of power on the left side.

September 20.—Very well indeed; has had a good night's rest, and looks well. She is now desquamating in great sheets, and can move the left arm from the elbow fairly well, but not above that joint.

September 22.—Can now lift her left arm from the shoulder, and is otherwise keeping well.

September 24.—Patient can now swing her arm round her head, and it is now perfectly recovered. She had a few wandering pains, which were immediately cleared up by hydriodic acid. Altogether she had 3 ounces of serum. Dismissed well.

The last case treated has already been mentioned, but the particulars are as follows :

(192) T. L., male, aged eleven, was first seen on December 21, 1902, and found to be suffering severely from acute arthritis in both knees and feet. He also complained of pain in his right ear, and would not allow it to be handled. He had been out of sorts for a week before being seen, had lost his appetite, and was disinclined for play. The joints were exquisitely tender, and, although not very much enlarged, they were all tense, inflamed, and contained fluid. He was put on antidiphtheritic serum at once, and had his first three doses in three hours and then every four hours.

December 22.—Temperature 100.4° , pulse 112. Patient much better, and can allow free handling of the affected joints; all pain, swelling, and inflammation of the joints have gone. After the antidiphtheritic serum had been given for about fifteen hours he ceased his screaming fits, which had been caused by the pain; but he had a restless night, and was a bit delirious in the early part of the night. When seen he had taken 6 drachms in the previous twenty-four hours, and he was given another 2 drachms during the remainder of the second day. He was also ordered 1 drachm three times a day of syr. acidi hydriodici.

December 23.—Patient had another restless night, but looked much better. Temperature 100° , pulse 112. Only pain left is a little in his ear, and the tendons at the left knee hurt when put on the stretch. To make sure he was given more antidiphtheritic serum.

December 24.—When seen to-day found that he had had two doses of the antidiphtheritic serum, and that the hydriodic acid had been stopped. Temperature was normal and pulse 84, and all pain had completely gone from both ear and tendons. He was left with two more doses and dismissed well.

This case was almost purely septic, his ear and general

condition strongly suggesting it, and the action of the anti diphtheritic serum confirming it.

As the solitary example of gonorrhœal arthritis, the following may be included, as it may give a hint for other cases :

(193) Mr. K., aged twenty-eight, had pain in the shoulder for nearly a week before being seen. Left shoulder was affected and his temperature was 101° . He was given 2 drachms of antidiphtheritic serum per diem for three days. On the third day he was also given salol 6 grains and phenacetin 10 grains every four hours. On the fourth day his temperature was normal and pain much better. A good deal of stiffness was left, which yielded slowly to a course of massage.

Antidiphtheritic serum has no more effect on the gonococcus than on the rheumatic infection, and only benefits any septic complication.

The following is an example of an inflammatory attack supervening on an old-standing chronic condition.

(194) Mrs. M., aged seventy, has suffered from chronic rheumatism for a number of years ; but the pain in the left knee-joint having increased greatly, and her usual treatment having failed to affect it, the writer was asked to see it. The knee was swollen and very tender on palpation, so much so that when my sleeve happened to touch it she at once complained. To test the case she was given 4 drachms in four doses and seen next day. By that time the knee had lost all its pain, and she could allow the freest handling. She was given 4 drachms more during the next two days, during which the other knee threatened, but subsided, after which the case was reduced to its old chronic condition, and responded as before to treatment.

The following case is the only one which has yet been seen in which the septic element was present concurrent with cardiac complications :

(195) Miss F., aged twenty, a strong, well-developed young woman. No previous history of rheumatism until within the

last few weeks, when she had had slight arthritic pains. When seen temperature was 101° and pulse 132. The left knee joint was swollen, contained fluid, and was very painful to touch. She was given 4 drachms in four doses and seen next day. Temperature was about the same, pulse not so fast, and the joint was very much improved and in parts could be firmly pressed. She was given another 4 drachms, and next day all pain had gone from the joint, which could be handled with impunity.

As the temperature was still 100.8° and there were no other arthritic symptoms, she was carefully examined, and a soft blowing mitral systolic murmur was found. For this she was given 1 drachm per diem of sodium salicylate, and seen two days later. By that time all temperature had gone and the cardiac condition seemed improved. Two days later she was dismissed, but asked to keep in bed for another week to give her heart a rest.

Neuritis.

Of all the varieties of neuritis only the rheumatic and the traumatic have shown themselves amenable to treatment by antidiphtheritic serum, and it is the rheumatic alone which is considered here.

The one point to be settled in the treatment of a case with antidiphtheritic serum is as to whether we have a neuralgia or a neuritis to deal with. If a neuralgia, then ordinary treatment is indicated; but if neuritis is found, then antidiphtheritic serum will give the most astonishing results. When in doubt, it is usual to interrogate the case with four doses in twenty-four hours, and the result is usually more emphatic in this than in arthritis.

For treatment it has not been found necessary to give the doses quite so frequently as in arthritis. Every four or six hours has usually been found sufficient for the cases which have been taken in hand. As in all serum treatment, the

earlier the case is seen the less time and serum will be required to obtain the desired result.

In the following cases the results in early stages are exemplified :

(196) Mrs. K., aged thirty-six, trained nurse. When working in the garden she was suddenly seized with pain, and with difficulty got into bed, where she was seen at 9 p.m. The pain extended from the left hip along the course of the sciatic nerve down to the heel, and she could scarcely move in bed with it. Prescribed for her phenazoni 10 grains, nepenthe 8 minims, tinct. gelsem. 5 minims, every four hours.

Next day (May 19, 1900) the pain was, if anything, worse than the night before, and the slightest movement gave great pain. She was given 1 drachm at once, and another dose was left to be given later on ; but as this was my first case of neuritis, she was also given a prescription for an analgesic mixture.

May 20.—Found the patient very lively, and she moves very freely in bed. She reports that the first dose of antidiphtheritic serum gave her complete relief in an hour, and that since then she could move freely in bed. She only took the second dose this morning, as she had a little twinge of pain. She had been out on the floor to see how she could move, and found that she had no pain. She did not have the analgesic mixture made up.

She was kept in bed with difficulty for two days for precaution's sake, but at the end of that time she had had no return of the pain, nor could any be elicited even on deep pressure. All that was left was a little stiffness, which soon passed off. Altogether she had 5 drachms.

(197) Mr. A., aged thirty-three. Acute neuritis of the right temporal branch of the fifth nerve, with herpes over its distribution. The right eye was much swollen and almost closed, and he felt as though his eyeball was being twisted violently, with great pain behind it. He also had headache and general malaise. One drachm every eight hours.

Next day (July 14, 1900) patient reported that the second dose removed all pain, and he slept well. The œdema was lessening.

July 15.—The eye looks all right, the herpes is fading; there is a little stiffness left in the course of the nerve, but the patient is practically well and was dismissed.

Neither of these cases had or required any other treatment.

The following case is an example of the failure of rheumatic treatment, the removal of the septic element by antidiphtheritic serum, and the clearing up of the remainder by ordinary methods:

(198) Miss D., aged twenty-five, has been suffering from sciatic pains behind the trochanter and down the leg for some time, but lately they have become worse.

January 21, 1902.—First seen to-day, and she was given a lithia salt and ordered rest.

January 25.—Returned to-day, and reported that, although the bowels are now acting freely and the kidneys are working well, the pain is worse instead of better, and has become continuous. She has not slept for the last three nights, and the nerve has become tender to touch. All other treatment was stopped, and antidiphtheritic serum given alone. She had two doses that night, and afterwards every eight hours.

January 27.—Slept soundly the first night after the two doses, and also last night.

January 29.—Slept well since last visit, and pain on pressure had now practically gone. She had occasional pain in the nerve, but as she had neuralgia elsewhere, sciatic neuralgia was diagnosed, and she was given phenazoni 10 grains, pot. brom. 10 grains, pot. iodidi 5 grains, every four hours.

January 31.—All pain gone, neuralgia and neuritis leaving the leg a little weak when standing on it. She was dismissed, having used 1 ounce of serum.

Besides the points of Valleix and other regular means of

diagnosis, it has become usual with me to regard the change from intermittent pain to continuous as a signal for the use of antidiphtheritic serum, and when the continuous pain gives way to the intermittent, to discontinue serum and return to ordinary treatment.

That the rapid results obtained in the foregoing cases are not always obtained under ordinary methods is suggested by the following case :

(199) Mrs. L., aged forty-nine ; sciatic neuritis for the last three months under various treatments by successive practitioners, but all without success. Patient is a big, heavy woman—rheumatic diathesis—and has a history of former attacks. There is pain in the course of the left sciatic nerve, and on the sacro-iliac synchondrosis of the same side. The pain shoots down to the heel ; she is constipated and urates are plentiful. She has bad nights, and cannot lie for any length of time on the one side, but has to be frequently turned and rubbed down during the night. She was given 2 drachms of serum per diem.

Even on this small dosage she improved from the very first, and in ten days the report is as follows : Doing well. Has lost the lop-sided appearance caused by having to save the affected leg, and now walks straight. The only pain is in her muscles from long disuse. She had 3 ounces.

The next case is rather an extraordinary one for several reasons. He had been treated for rheumatic conditions in the feet (with antidiphtheritic serum) twelve months before, and with very doubtful results. He recovered, but not in that satisfactory way in which such patients react to antidiphtheritic serum, and his neuritis soon recurred. It was only the rigors, sweats, and temperature which induced me to try him with it again, and the result seems to suggest that an attack of what we may call simple rheumatic neuritis is materially influenced by its association with the septic infection.

(200) Mr. H., aged thirty-five, has had rheumatic pains in

his legs for the last six years, the pains being intermittent. He dare not have a cold bath without bringing on the pains. With the pains were peculiar jerking sensations in his legs, which would involuntarily twitch and jerk about, one leg at a time, with great pain to him. For some weeks he had been working more closely than usual, and his legs had been giving him more than usual trouble. He took methyl salicylate for two or three weeks without benefit, and finally had to lie up.

On December 31, 1901, he had a smart rigor, followed by fever and sweats, with intense pain in the affected legs, although nothing could be seen to account for it. He had another rigor next day, and was seen in the sweating stage, when his temperature was 103.8° . He had also a cough, with a blood-stained muco-purulent expectoration and bronchial râles in both lungs. He had a foul tongue, headache, insomnia, anorexia, and general malaise, but no other pain. He was given an antirheumatic mixture.

January 1, 1902.—He had only the least chill to-day; temperature was 99° , and he looked and felt better.

January 2.—Patient had the worst rigor and chill of all to-day. It lasted for two hours, and in it he became delirious. The pain was also very severe, and to interrogate the case he was given 1 drachm every six hours for four doses.

January 3.—Patient looked and felt very well. Temperature 97.8° , pulse 70. The first dose of antidiphtheritic serum (8 p.m.) soothed him almost immediately, and he fell asleep within an hour. He had to be wakened at midnight and 6 a.m. for his medicine, and now he felt all right in himself, had eaten food with relish, and had read his morning paper.

He was given 4 drachms more at longer intervals (1 ounce in all), had no further return of rigors, pain, or any of his other symptoms, and after a few days' rest he returned to work. From that day he could bathe in cold water without any trouble, and during the twelve months which have passed

since the treatment he has scarcely had a sign of his old enemy.

The use of antidiphtheritic serum to interrogate a case of neuritis is well seen in the last case and also in the next :

(201) Mrs. H., aged fifty-three, had lumbago and sciatic pains for a week, which had steadily become worse, until for the last few days she had been laid up and could not sleep at night. There was pain on palpation over the sacrum and down the course of the right sciatic nerve to the knee. To interrogate the case, she was given antidiphtheritic serum every six hours.

Next day (October 14, 1902) she reported relief from the first and every succeeding dose, and had slept well during the night. Treatment continued.

October 16.—Patient was much better, and steadily improving. Pain only on moving now, and much less pain at that. Treatment continued.

October 18.—Patient is very well, and can sit up with comfort ; there is only a little weakness left, and she is very enthusiastic over the treatment. Dismissed, and ordered a little syr. acidi hydriodici to clear up anything which may be left.

The following case is interesting as showing that, contrary to usual experience, the rheumatic element was the painful factor in the case even after the septic had been removed :

(202) Miss C., aged thirty-three, cook, has noticed for some time that every little scratch has festered and taken a long time to heal, and she had a festering sore around her left thumb-nail. For a week past she had intense pain down the front of both thighs, and at times down their sides.

This pain has kept her from sleeping, and she has had to sit up at night and rub herself. At night she has chills, and cannot get warm even with a hot-water bottle in bed with her, and only gets warm during the forenoon after she has been at work for some time. She is an old rheumatic subject. From the state of her hands and the intensity of her pain it was resolved

to begin with antidiphtheritic serum, and she was given 1 drachm every six hours for four doses. The result was a rapid healing of her thumb and a complete removal of her chills and cold, and she had no further trouble in keeping herself warm. The pain, however, was not relieved in any way, and as it was evidently rheumatic, she was given an antineuralgic mixture. The result was that the pain was immediately relieved, she slept soundly, and felt a different being.

The writer is of opinion that such a rapid result would not have been obtained if the septic element had not been first eliminated, for it is the intractable element in every disease which it complicates.

The only cases of rheumatic neuritis which have resisted the treatment are the following two. Of the first I am now of opinion that it is not of rheumatic origin, and the second had his own impatience to thank for the result.

(203) Miss A., aged twenty-eight, had suffered from time to time from neuritis of the cervical nerves, and had seemingly benefited from ordinary rheumatic treatment. Another and more severe attack came on, which kept her awake at night, and when she did fall asleep the pain would wake her up. This time all ordinary rheumatic treatment failed, and to test the case she was given eight 1-drachm doses of antidiphtheritic serum, but without the slightest benefit. She was then put on hydriodic acid, with a pill containing quin. valer. 2 grains, ferri arsen. $\frac{1}{20}$ grain, strychn. sulph. $\frac{1}{20}$ grain. On that treatment she improved, and went off for a holiday.

(204) Mr. M., aged twenty-two, had had a smart attack of sciatic neuritis six months ago, and had a chronic condition left. The points of Valleix were all well marked. He was put on antidiphtheritic serum, and after five days he had improved very materially. Thinking that there might be some neuralgic conditions, he was then put on an antineuralgic for a few days. He steadily relapsed, and when the antidiphtheritic serum was

about to be resumed, he refused further treatment, and left the hospital. I was informed that he had done the same with everyone who had attended him.

Of the value of antidiphtheritic serum in the neuritic condition underlying herpes zoster the writer is doubtful, as of two cases treated one was benefited and the other was not.

(205) Mr. M., aged thirty-five, has a history of attacks of sciatic neuritis for the last four years—generally three in a year—which last for about three weeks. Latterly they have been more frequent and more severe—the last three in six months. The present attack is the worst he has yet had; the pain is continuous, and he has had no sleep for the last three nights. He looked ill and exhausted, and could not sit on a chair for pressure on the painful sciatic nerve. He was given antidiphtheritic serum alone every eight hours for two days. He then reported that he had had two hours' sleep the first night after two doses, and sound sleep the next night. Pain was only occasional and much less intense. He looked much better, and walked only a little lame. From the pain having become intermittent, he was given, in addition, an anti-neuralgic. On his next visit, four days later, he reported that all pain and stiffness had gone in twenty-four hours from last visit, and that he had slept soundly ever since. He looked a new man, and has had no recurrence.

Iritis.

That rheumatic iritis should have the septic organisms associated with it was suggested by Boucheron, who used anti-streptococcic serum in the disease with good results, and reported the cases at the Congress of Ophthalmology, May, 1898 (*Treatment*, October 13, 1898, and *Medical Annual*, 1900, p. 290). From his report it seems probable that the streptococcus is the complicating factor. Antidiphtheritic serum, which does not discriminate between the staphylococcus

and streptococcus, so far confirms his statement that the same results are obtained by its use.

In iritis, as in arthritis, antidiphtheritic serum has no place in the treatment of the purely rheumatic cases, which are more amenable to ordinary medication; but when the intractable septic element is associated with it, then in antidiphtheritic serum we have the sovereign remedy.

So far only two cases of rheumatic iritis have resisted treatment; every other case has yielded to antidiphtheritic serum. The doses (1 drachm) should be given every hour for the first three doses in very acute cases, and afterwards every four hours, as required. In any case the use of the remedy should be prompt and liberal, as the longer the inflammation lasts, the more disastrous will be the results, and every effort should be made to cut it short.

As will be seen, good results have been obtained in the cases given, but it is only reasonable to expect that the more rapid dosage will more quickly cut short the process.

The following case shows a septic iritis associated with a simple arthritis:

(206) D. K., aged fifty-one, constable, a rheumatic subject, who has attacks of iritis with arthritis (rheumatic) every winter.

April 2, 1900.—Usual yearly attack. Gave him sod. salic. and potass. iod., and sent him to a specialist for his eyes.

April 23.—Patient returned to-day with his arthritis gone, but his iritis no better. He had to keep in a dark-room, frequently bathe his eyes; had to give up smoking, could get little sleep, and his eyes were much inflamed and very painful. The specialist had diagnosed irido-cyclitis. Tried antidiphtheritic serum, 1 drachm twice a day.

April 25.—Reported to-day that all pain had gone, that he had slept the whole of the previous night—his first sleep for three weeks. His eye was much better, and he scarcely required the lotion. Same treatment continued.

April 27.—Still improving, and specialist was much astonished at the improvement since his previous visit.

April 29.—Resumed usual rheumatic treatment and stopped antidiphtheritic serum, of which he had taken $1\frac{1}{2}$ ounces. Pain did not return after the first two days, and he made a steady recovery, without any relapse.

The next two winters he had his usual attacks, but they yielded to the ordinary treatment, and antidiphtheritic serum was not tried on them.

The next case illustrates a point which it is well to make in the treatment of iritis. When a case of iritis has been going on for some time under ordinary treatment and using atropine, it is necessary to keep up the atropine to prevent adhesions, and if atropine has not been used, then it is advisable to use it in conjunction with antidiphtheritic serum for the same purpose. For cases seen in an early stage, the treatment deals with it so promptly that the writer has never seen a case which required it.

When a case has lasted for some time before being put under antidiphtheritic serum, some damage will have been done to the eye and adhesions formed, and the removal of the infective inflammation does not necessarily imply that the inflammation arising from the adhesions will also have gone. The treatment is one which deals with causes, and while it is all-powerful for inflammation arising from the infections for which it is specific, it cannot affect to anything like the same extent an inflammation arising from a mechanical cause such as adhesions. When antidiphtheritic serum is used in a case of some duration, it at once relieves the pain which has kept the unfortunate patient in misery for so long, gives him sleep after a few doses, renders his tissue resistance effective, and puts the case on the up-grade at once. The case which has been so intractable before has the intractable element removed, and becomes amenable to ordinary treatment.

(207) Miss P., aged twenty-five, has had an acute attack of

iritis, for which she has been under one of our specialists for over three weeks, with no benefit so far as relief from her symptoms is concerned. About a year ago she had a similar attack in the other eye, for which she was treated at the Eye and Ear Hospital for three months, and it was two months longer before she was fit for work. The eye has not been of much use since.

She was given antidiphtheritic serum every four hours, and took the treatment for two days with little benefit, until it was discovered that she had been given a serum which had proved inert for septic infection. Another make of serum was then given, and she had two doses of it before bedtime, and slept soundly all night. Next day the pain was almost gone, and the day after it had gone entirely. The treatment was kept up for the inflammation arising from adhesions, etc., until she had taken 4 ounces, and by that time the eye was very much improved, and the adhesions alone prevented an immediate recovery. Her recovery from them was retarded by her having to work and use her inflamed eye, as her other one was of little use to her. The inflammatory pain did not return, and the health of the patient, which had been failing fast, was quite restored. She has made a splendid recovery.

The following is a later example, treated rapidly as suggested, and the result has been all that could be desired:

(208) Mr. H. G., aged twenty-four, clerk, has had iritis for a week, and, on going to a chemist, was sent on to me for advice. The ring of inflammation was complete; there was pain and pricking in the eye, and also pain around the orbit. The pain came on in bouts, which were sharp while they lasted. He was given the serum in 1-drachm doses—the first three every hour, the second three every two hours, and afterwards every four hours. He thus had 1 ounce of the serum in the first twenty-four hours.

The next day (March 18, 1903) the result was plainly showing, and the eye was much improved. The iritis was

much reduced in intensity, two-thirds of the ring of inflammation had gone, and the pain around the orbit had quite gone. He was given another ounce of the serum to take in the course of the next two days.

March 20.—When seen to-day all inflammation had gone, and only some weakness was left; but he was given another ounce of the serum, to be taken in the course of the next three days to make sure of a perfect recovery.

March 23.—Seen to-day, and the closest examination fails to detect the slightest sign of inflammation in the affected eye. So complete was the absorption of the inflammation that on my asking a colleague who was present which was the eye which had been affected he could only tell by letting the patient gaze at the light, by which he discovered the weak one. Two days' rest without further treatment was prescribed, and he went back to business a week from his first visit, perfectly well, and has continued so.

The following case is interesting, as in it I was testing anti-streptococcic serum orally to see if it would act in the same way as antidiphtheritic serum:

(209) Mr. S., aged thirty-two, telegraph operator, had been suffering from a pustule on the back of his hand, the pus from which gave a pure culture of the streptococcus. While being treated for this in the ordinary way he developed an attack of iritis. For this he was given antistreptococcic serum orally—30 c.c. in a 4-ounce bottle, from which he took 4 drachms every four hours. The iritis gradually improved, until it had quite gone by the time he had taken 8 ounces of the mixture. His general health, which he described as 'rotten,' had also improved, so that, to use his own words again, 'he felt streets better.'

A fortnight later he returned with a recurrence of the iritis, and this time he was given antidiphtheritic serum (1 ounce in 1-drachm doses), which completely cleared up the attack, and he has had no further recurrence.

The shortest time between an attack and recurrence treated with antidiphtheritic serum is six weeks, and that only in one case, so that it looks as though antistreptococcic serum was not quite so thorough in its action as antidiphtheritic serum.

Neither of these cases either had or required atropine or any other treatment.

The following series of three cases all belong to one family, and are most interesting, as showing the complete control which the serum has over the most inveterate cases.

(210) Mr. J. R. D., aged thirty-nine, had his first attack of iritis fifteen years ago, and for the following seven years he had sometimes three attacks in a year. Latterly the intervals have been twelve to eighteen months. The attacks generally lasted for four to five weeks, and the last one before being treated with the serum three months. The attacks were usually very severe, and the long attack was extremely so. Both eyes have been injured by the disease, and he has had both operated on for adhesions. The right eye was so much damaged by the long attack that three specialists all agreed that it was too seriously injured to stand operation, and that if he had another attack in it he might lose it. In the last two attacks, which were treated with antidiphtheritic serum, the right eye was affected, but in each case the inflammation was, as he expressed it, 'nipped in the bud,' and, instead of losing the eye, two of the same specialists, after the two attacks, considered it so much improved that they operated on it, and successfully.

The action of the serum on this case was first seen in the removal of the pain, which went in forty-eight hours; but, owing to the adhesions, the inflammation was kept up by irritation from dragging in the motions of the iris, for fourteen days after all infective inflammation had gone. This, being due to continuous mechanical causes, was outside the scope of the serum treatment.

(211) Mr. E. T. D., aged forty-six, had his first attack

twenty-two years ago. The attacks came on three times in the first two years, then at intervals of some years, and the last two in the last four years. They were usually very severe, and lasted for four to five weeks. The iris of one eye is quite fixed by posterior synechiæ.

Hearing of the success of the treatment in the last case (his brother), he took antidiphtheritic serum for his last attack. He had in all 4 ounces, and it at once took hold, removed the pain and infective inflammation, and that due to mechanical causes had so much improved in ten days that he resumed his usual work as a commercial traveller.

(212) Mrs. E. E. G., aged forty-one, a sister of the previous two patients, had her first attack six years ago, and since then they have recurred about every twelve months. They usually lasted for a month, and were all of a severe type. To use the patient's own words, 'the medicine seemed to work a miracle on me.' The pain was at once relieved, and the inflammation was promptly and thoroughly cleared up. She used in all 2 ounces.

(213) G. B., aged twenty-two, comes of a family which is specially prone to septic infection, so that when he presented himself with an attack of iritis the first step was to interrogate the case with antidiphtheritic serum. This was done by giving him 6 drachms in two days, at the end of which time all trace of the trouble had gone. The case had lasted a week before being seen, and the benefit was apparent from the first dose.

Six weeks later he returned with the early stage of the same disease, was given a 1-ounce bottle, and had no more trouble.

(214) Miss R., aged twenty-five, subacute iritis of four months' standing, in which the inflammation varied in intensity from time to time. Using lotion prescribed by a specialist, she was given 1½ ounces, which cleared up the iritis in a week, so that when she had her eyes examined she was told that she required no further treatment.

The writer himself had an attack, which he promptly put into the hands of a colleague, a specialist, who diagnosed iritis. As soon as the diagnosis was made, antidiphtheritic serum was used, with the result that when the next visit was paid my friend was surprised to see the result, as he fully expected to hear that I had laid up with it. Not a day was lost from practice.

CHAPTER XXIII

SKIN DISEASES

Carbuncle—Furuncle—Acne Vulgaris—Eczema— Pemphigus.

FOR purposes of treatment these three may be conveniently grouped together.

Carbuncle, arising as it usually does from infection by the staphylococcus, comes well within the range of antidiphtheritic serum. The symptoms may be discussed in their constitutional and their local features.

The constitutional symptoms are common to all conditions with septic resorption, with the addition that pain and loss of sleep are added to the temperature, malaise, anorexia, etc., usual in such cases. On these antidiphtheritic serum has its first effect, and generally very quickly it has them well in hand, if not entirely removed. Pain is relieved, sleep is obtained, the malaise is improved, and the appetite begins to return, and very soon the disease has lost its constitutional character, and has become merely a local concern. So long, however, as the slough remains there is resorption going on, although it is prevented from having its usual constitutional effect by the continued use of the remedy. My own practice is to test its removability every time it is seen, and under antidiphtheritic serum treatment it is possible to do so with much less fear of hæmorrhage than under any other treatment. This is due to its local action.

The local action is early seen, pain steadily lessening, surrounding inflammation reducing, and the foul and dirty appearance being rapidly changed into a much cleaner and healthier condition. Of course, it largely depends on the virulence of the infection, on the stage of the disease when treatment is begun, and also on the amount of antidiphtheritic serum administered, whether the results will be satisfactory or not. The more virulent the infection the more must the serum be pushed to get rapid and satisfactory results. The later the stage the more severe will be the constitutional symptoms, and the wider and deeper will be the local tissue infiltration, and necessarily more time and serum will be required to repair the damage already done. But in almost every case the process is immediately arrested. The state of the slough also has something to do with the duration of the condition. If it is firm and tough, then it is usually possible to get it away in one piece fairly early; but if it is too soft, and breaks down into pus, then the case will last a few days longer. All the time the serum is assisting in the elimination of the slough, and this action for the first day or two seems to cause an increased flow of pus from the openings.

One other point gained under serum treatment is the prevention of further infection if the serum is being given in sufficient quantities.

All that has been said applies in a lesser degree to furuncles, except that they are more frequently found in crops and recur more readily.

Recurrence of furuncles after an attack and after carbuncle is the great trouble, and is due to several factors, which are difficult in themselves to meet. Many of such patients seem to have a constitutional inability to resist the infection, either congenital or acquired by frequent attacks. There is also the well-known persistent character of the staphylococcic infection, and the difficulty of rendering the skin aseptic.

To meet this condition, it has been customary with me to

follow antidiphtheritic serum with a course of calcium sulphide (1 grain every four hours) for some time after, and as a rule it has acted very well. With it is also ordered some antiseptic soap, which the patient is recommended to use for the future. When a recurrence happens it is usually after this precaution has been discontinued, although occasionally a patient is found who has a recurrence in spite of all precautions. No recurrence has been seen for some months after antidiphtheritic serum treatment.

The dosage in carbuncle is 1 drachm every hour for three doses, then every four hours, as the nature of the case demands, the treatment being kept up until all slough has disappeared. The dosage for furuncle is three doses at first, as in carbuncle, and then every four or six hours, as may seem best; for acne vulgaris three times a day, with suitable local treatment.

(215) Mr. W., aged fifty-three; much run down in health and carbuncle on back of the neck. He did not seek advice until local and constitutional symptoms compelled him. The carbuncle was a very foul one; the original opening had been followed by another, and both were freely discharging. Two more were on the point of opening, and a fifth was showing up. He was stupid from resorption of toxins, pain, and loss of sleep. He was given 1 drachm twice a day until he had taken 4 ounces, and he was dismissed skin whole in eighteen days. In two days his head was clear and his constitutional symptoms much improved. None of the other threatened openings perforated, and the whole of the contents were evacuated through the two which were active when first seen.

No incisions were made, but full dependence was placed on antidiphtheritic serum. Dry dressings were used all the time.

Dosage shows stage in the development of the use of the serum.

The following case is one with tough slough, and its early removal quickly finished the trouble:

(216) Mr. M'A., aged thirty-three; carbuncle on the back of

the neck of a week's duration, with a great area of brawny tissue surrounding it, and the openings just beginning. He had had no sleep for nights, and was feeling tired and ill. He was given 1 drachm every eight hours.

Two days later (February 7, 1902) he reported that he had slept soundly the previous night when he got off to sleep, and that he felt better than he had done for a week past. The brawny area was almost gone; the carbuncle was open and discharging freely, and looking much better.

February 9.—Removed in one piece the great bulk of the slough, and carbuncle is now only a local concern. Patient is very comfortable; it has been little trouble to him since last visit, and it looks better every time it is dressed.

February 11.—Remainder of slough removed with his dressing since last visit, and only a clean cavity left. Patient dismissed.

He took $1\frac{1}{2}$ ounces.

The following case was a very foul one, and the slough took longer to break down and discharge; but the further progress of the disease was at once checked, and improvement continued till cure was effected.

(217) Mr. G., aged twenty-one, had a large carbuncle on his buttock close to the anus, which had lasted for a week when seen. The openings were just appearing, and exuded a dirty gray-looking pus. Pain had led to loss of sleep, and there were the usual constitutional symptoms. He was at once put on antidiphtheritic serum, 1 drachm every hour for three doses, then every four hours.

Two days later he reported that he had been able to sleep since beginning treatment, and that pain had steadily lessened in intensity as well as in area. The carbuncle itself looked a great deal better and cleaner, the area of brawny tissue had very materially lessened, and there was marked improvement all round. Appetite had returned, and patient looked and felt well in himself. From this onwards till he was dismissed, on the ninth day, the improvement was continuous. In all he

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used $3\frac{3}{4}$ ounces. In this, as in all other cases, there was an instant arrest of the process, a removal of all constitutional symptoms and a switching of the case on to the up-grade.

Furuncles are a sort of *petit mal* to the *grand mal* of carbuncle, but what they lack in size they make up in number, persistence, and recurrence. Many a patient has months of misery from them, not only locally, but constitutionally, the latter effect often remaining after the local conditions have cleared up. This leads the writer to say here that since taking up the special study of sepsis he has come to regard the frequent furuncular recurrence as a condition full of danger to the patient. Cases of appendicitis, phthisis, etc., have come under his notice which have had an antecedent history of furuncular attacks which have ceased in the skin, only to reappear in a more serious form. A system in a constant condition more or less of staphylococcic toxæmia will be below par in its resistance to any other infections which may seek to associate themselves with the original organism. Hence the value of antidiphtheritic serum treatment in so markedly increasing the tissue resistance to the infection.

(218) Mrs. M., aged thirty-three, furuncular attack on hips and buttocks of five weeks' duration, in which she counted fifty boils, large and small, and then gave up enumerating them, as they came crop after crop. Some of them were almost carbuncular, and she could scarcely walk. She was given 1 drachm every six hours, and nothing else. Two days later found her looking well, all constitutional symptoms gone, and the whole crop blasted and shrunk up. The small ones were perfectly dry, and the large had lost their inflamed zone and almost all their pain, and were rapidly declining. She was dismissed that day with a prescription for a course of calcium sulphide and the use of M'Lintock's germicidal soap.

Cultures from the pus gave almost a pure growth of the *Staphylococcus pyogenes aureus*.

She has had one recurrence, a milder attack, which again

yielded to antidiphtheritic serum. She had had other medical treatment, without avail, before the writer was called in.

In the following case the process had run through the furuncular stage, and when seen was little better than acne, but the constitutional symptoms were well-marked :

(219) Mr. K., aged seventeen, had been out of health for some time, and came for advice. He had no life in him, and was quickly tired, had lost his appetite, and work was such an effort to him that he had scarcely the heart to face it.

His skin was muddy and unhealthy-looking ; he had had a succession of 'blind' boils on his neck, and there was a large inflamed pustule on his nose ; otherwise he was healthy. He was put on antidiphtheritic serum (1 drachm) until he had taken 2 ounces, and made rapid and satisfactory recovery. He was then dismissed with a tonic.

In the following case the infection had led to adenitis :

(220) Mr. M., aged thirty-three, has had crops of boils on his left forearm for some months, and has steadily fallen into ill-health. When seen there were some large and small furuncles on his arm, and the glands in the axilla were painful, swollen, and hard, and there was considerable infiltration of surrounding tissues.

Temperature was 100° , and patient was suffering from resorption of toxins, and was evidently ill. He was put on antidiphtheritic serum, at first every six hours, then every eight hours, then twice a day, until he had taken 3 ounces in all, by which time the whole condition had cleared up, and he was dismissed well. His constitutional symptoms disappeared very early in the treatment.

In the following the process had graduated through furuncle to carbuncle :

(221) Mr. C., aged thirty-seven ; carbuncle on neck. The process had begun with small boils, frequently repeated, and after suffering for some time with them a carbuncle had developed. Usual symptoms of toxic resorption, which dated

from the furuncular attack. Antidiphtheritic serum every eight hours cleared his head and so improved his general condition that in thirty hours he reported himself better than he had been for three weeks. He had slept soundly all night after three doses. The local condition was much better: the inflammatory ring had almost gone, and the carbuncle had lost its virulence. The slough quickly separated, and in a few days he was dismissed perfectly well. He was given a course of calcium sulphide.

The following is typical of a class, and the illustration need not be repeated:

(222) Mr. T. has been having furuncular attacks for the last six months, and has been much out of health, weary of everything, disinclined for either business or pleasure, and in very low spirits. Antidiphtheritic serum, 1 drachm every eight hours until he had taken $1\frac{1}{2}$ ounces, cleared up the local condition, and quickly restored his health, vigour, and spirits to normal. He took calcium sulphide for about a month after, and used an antiseptic soap.

Some of the cases yield much more readily than others to the treatment, and a possible explanation is either that the original virulence of the infection is not so great as in others, or, if it is so originally, the systemic reaction has lessened it and made it more amenable to the treatment.

Acne vulgaris, being still more superficial, is more liable to recurrence, and is not so satisfactory in its treatment. Antidiphtheritic serum always does good work, but local measures are necessary, as a rule, to conserve the benefits obtained. It clears up what external treatment cannot reach, and so enables that treatment to do its work much more effectually than without its help.

(223) Miss W., aged seventeen; acne vulgaris of face—large pustules, with indurated bases. She was given $1\frac{1}{2}$ ounces in six days along with calcium sulphide, $\frac{1}{2}$ grain three times a day. The inflammation died right out of the eruption; the further invasion

was prevented ; the pustules dried up, and left the face clean and almost free from even the traces of former attacks. There was no recurrence.

Erythema Nodosum.

The only case of this disease which has been treated with the serum has the following history :

(224) Miss D., aged twenty-three, had not been in very good health for some time ; but there was nothing definite in the symptoms, which consisted of weariness more than usual and loss of energy, so that when her work (typewriting) was done she was unfit for further exertion. These symptoms had increased of late, till she had to lie up altogether. Then the nodes on the limbs were seen, and they came out crop after crop. This went on for a week or more before my seeing her. When seen there were nodes all along the tibia and also on the fibula, ulna, and radius, angry in appearance, and painful to touch. The morning temperature was over 100° and the evening 102° . Her skin was muddy, and on the face there were some acne pustules and papules. The joints of the limbs affected were stiff and aching, but there was no swelling or inflammation in them. The tongue was foul, and there was the usual anorexia, etc.

To test the case the patient was given $\frac{1}{2}$ ounce in four doses during the first twenty-four hours. The temperature was not affected and she slept no better, but the joints affected had lost their stiffness, and she had been able to stand straight up on them. Her general appearance was also clearer, and there were no new nodes. Treatment was continued for another day.

On the second day there was manifest improvement ; she had slept well, and felt very well in herself, although temperature still was about the same. There was also an improvement in the nodes, and most of them had almost entirely lost their tenderness on palpation.

The treatment— $\frac{1}{2}$ ounce per diem—was kept up altogether for four days. On the third day the temperature began to fall, and it was practically normal night and morning on the fourth day. The general symptoms had almost entirely disappeared, and patient felt and looked very well. The nodes had almost gone, and what were left were materially reduced in size and had lost all tenderness. The skin cleared up, the pustules and papules had been removed by the treatment, and the patient looked bright and well. She was given 2 drachms per diem for another two days, and was then practically dismissed, as no other treatment was required.

In this case serum treatment only was used, to the exclusion of all other. The case mended from the very first: no further eruption of nodes took place, the skin cleared up, and the patient was entirely restored to health and strength. One case proves nothing, but the success of the serum in this case was so prompt and complete that there will be no hesitation about the treatment of the next that comes to hand.

I do not know the bacteriology of the disease, but its obviously inflammatory character and the associated rheumatic symptoms suggested treatment on the same lines, and the result was extremely satisfactory.

Since writing the above a case of septicæmia has been reported in the *Lancet* of August 8, 1903, in which erythema nodosum was a prominent symptom, and the article stated that Sir Dyce Duckworth had previously reported a similar case. This still further suggests the septic etiology of the disease.

Various Skin Diseases.

Eczema has never responded to treatment by antidiphtheritic serum so far as its ordinary course is concerned, but the following case was undertaken, as the history pointed to a septic origin, and the result proved the diagnosis.

(225) Mrs. S., aged thirty-six, was seen in November, 1901,

and gave the following history : Three years before she had had a severe attack of facial cellulitis from three septic teeth, and when she recovered she found that she had been left with a bat's-wing flush on her face, with well-marked outline, and frequent flushings and headaches. The palms of her hands and the soles of her feet became dry, hard, and scaly, and the scales accumulated so fast that she had to scrape them off every second day. At all times her hands and feet were hot and burning, and she sought relief by putting the hands into cold and the feet into hot water. At intervals she had cracking and bleeding of the palms, with bleeding points on the fingers, the attacks being heralded by tingling of the finger points. Her nails became brittle and chipped like china when she tried to cut them, and beneath them there was an accumulation of scales, which raised them up. She had been under treatment for the whole three years and for the last eighteen months under a specialist, and all who had treated her were agreed that the disease was due to the septic attack ; but they could do little for it, and told her it would take years to work out of her system.

She was put on antidiphtheritic serum every eight hours at first, then twice a day, and she took in all 6 ounces, which was more than she actually required for cure ; but she had such a horror of the disease that she was afraid to leave off, and insisted on having it longer than was necessary. The treatment was continued with germicidal soap externally and calcium sulphide internally.

She made, and has maintained, except for the slightest return twelve months after, a perfect recovery. She lost the flush from her face, and the headache and flushings of heat ; she did not require to scrape her feet from the first dose of antidiphtheritic serum, her nails grew soft and natural, the scales on the palm cleared up, and in every way the whole lesion was met and eradicated.

Shortly after she became pregnant and had a healthy child

with no septic trouble, and it was when nursing it and getting a little run down that she had the tingling in her fingers, which sent her back for some more of the medicine, which aborted the threatened attack. The writer regards the pregnancy as the direct result of the treatment, and that she proceeded to term and was delivered without septic complications as proof that the treatment had thoroughly cleared the system of the infection. (See its action on the uterus.)

The next two cases are pemphigus, and are the only two which have been seen since the use of antidiphtheritic serum for this purpose. One seen at the early stage yielded quickly to the treatment alone, but the other and more serious case was not affected by it directly, although septic complications were warded off by its use. If the disease is always due to some neurotic conditions, then the only cases in which we can expect antidiphtheritic serum to do any good will be those whose neurotic symptoms are due to septic causes or when septic conditions complicate the case.

(226) Mrs. L., aged forty-nine, a neurotic patient, had well-marked pemphigus on the right hand between the fingers, on the sternum, and over the umbilicus. The patient was run down and out of sorts, but there was no definite illness. It was resolved to interrogate the case with antidiphtheritic serum, and she was given $\frac{1}{2}$ ounce in twenty-four hours, and in that time she had greatly improved. She was then given 1 ounce more, and made a perfect recovery. Her nervous condition received as much benefit as her skin. She had no recurrence till her death, which occurred six months later from cardiac conditions.

(227) Mr. R., aged seventy-two; acute general eczema, which merged later into pemphigus. He was so swollen and his arms were so inflamed that he was given antidiphtheritic serum at the very first, but it failed to touch the case in any way and had to be given up. Later, as the eczema progressed and there was a considerable amount of raw surface, symptoms of septic

resorption began to show themselves, and he had heats, sweats, and finally rigors. These complications were all rapidly cleared up by antidiphtheritic serum every six hours.

When the pemphigus was at its worst—and it was such a condition that a skin specialist called in had little or no hope for him—his legs became very inflamed, and suggested erysipelas, and he showed constitutional symptoms. A renewal of antidiphtheritic serum for a few days cleared it all up and prevented the case from assuming a graver form.

At no time did the antidiphtheritic serum influence either the eczema or the pemphigus. The patient made a good recovery.

CHAPTER XXIV

TONSILLITIS AND PHARYNGITIS

THE tonsils are frequently the seat of inflammation, and, as this treatment is for inflammation alone, they may be considered in the degree of severity of the inflammation, and not by the usual classification. In this case that means first those which have been seen earliest in the course of the disease, and has no reference whatever to the virulence of the infection; for here, as elsewhere, the treatment, when given early enough in a case, has always aborted it. That is where the case is one for antidiphtheritic serum treatment, for there are catarrhal cases which are not septic in any way, and consequently do not come within the range of the remedy. Such cases are, as a rule, easily treated with ordinary medication.

(228) W. G. H., aged thirty-six (April 29, 1902); recurrent septic throat. When seen at mid-day his temperature was 101.2° , and pulse 100. Throat was inflamed and painful, and patient said that his symptoms were exactly those which began his regular attacks. Those attacks always went on to abscess and left him a physical wreck, and it was weeks before he was fit for his duty. Evening temperature was 102° and pulse 100. Antidiphtheritic serum was given at once and every four hours.

April 30.—Morning temperature 101° , pulse 92. A mer-

curial and iron mixture was added to the treatment. Evening temperature 100.4° , pulse 74. Patient was rapidly recovering, but could scarcely believe it.

May 1.—Morning temperature 100° , pulse 68; patient very bright and well. Evening temperature 98.4° , pulse 68.

He was dismissed, and his temperature was taken for some time after, but it did not rise above normal.

The next case was something similar, but it had three days' start of the treatment.

(229) Mr. H., aged forty-four, had had one previous attack of tonsillitis, which ended in abscess, and was incised. When seen he had been confined to his room for three days with acute tonsillitis, the inflammation being very acute and involving the fauces and uvula. He had not slept for the previous three nights with the pain, and for twenty-four hours had not been able to swallow even a drop of water. There was some uncertainty as to whether pus had formed, and he was told that if it had done so the tonsil would have to be incised, but if not that the medicine would clear it up. He was given a dose at once (8 p.m.), and another at bedtime. He had great difficulty in swallowing the first dose, but soon began to feel the benefit of it. He had the second dose, and slept all night, and when seen in the morning after a third dose his throat was found to be almost well. Another day's treatment completed the cure, and he was dismissed well after using 5 drachms.

The patient in the next case had two attacks, one of which was amenable to antidiphtheritic serum treatment and the other was not, the first being septic and the second purely catarrhal.

(230) Mr. B., aged thirty-five, had an attack of acute septic tonsillitis and pharyngitis, in which the glands at the angle of the jaw were swollen and tender. He also had headache, malaise, pains in the limbs, and was generally fit only for bed. Temperature was 102.1 , pulse 90. Antidiphtheritic serum every eight hours,

Next day he reported relief from the first dose, all his general symptoms gone, a good night's rest, and temperature 98.3.

Another day's treatment cleared up all that was left, and he was dismissed well, and went to business forty-three hours from my first visit. He took 6 drachms.

The same patient had a catarrhal attack five months later, in which the pain was sufficient to keep him awake at night, but there was no temperature or swollen gland. The mucous membrane was *not swollen*, but was inflamed and dry. Antidiphtheritic serum failed to touch the case after two days' trial, but it yielded readily to treatment with tinct. ferri perchlor. and hyd. perchlor.

(231) Mrs. R., aged fifty-one, was recovering from an attack of vomiting and diarrhoea when she was seized with acute tonsillitis and pharyngitis of a septic character. During the night before being seen she had some delirium. Temperature was 102°, and she had headache, malaise, and other constitutional symptoms well marked. Antidiphtheritic serum every six hours, and twenty-four hours later temperature was normal, patient was clear in her mind, all constitutional symptoms gone, and throat slightly inflamed but looking clean. The previous day it was foul and dirty, and her breath was very offensive. Another day's treatment finished the case, and she was dismissed well. In all she had 7 drachms.

That antidiphtheritic serum treatment does its work thoroughly is more than suggested by the next two cases, in one of which a dermatitis and in the other an acne vulgaris associated with the septic throat condition were reached by the serum.

(232) M. G., aged ten, schoolgirl; acute tonsillitis; temperature 101.8°, and all the usual symptoms. She was given ordinary treatment for twenty-four hours, but without the slightest benefit. Antidiphtheritic serum twice a day was then given, and reduced the temperature to 99.5° the first day, and

all other symptoms *pari passu*. The next day it was normal, and she was dismissed well.

For some years this patient had had a yearly attack of septic dermatitis, which yielded to calcium sulphide after several weeks' treatment. The annual visitor put in its appearance along with the tonsillitis, and after serum treatment for the throat was stopped, calcium sulphide was given for the dermatitis. Four days' treatment cleared it completely, instead of as many weeks.

(233) Mr. P., aged twenty-nine, had an acute tonsillitis threatening suppuration, which resisted all treatment until he was put on antidiphtheritic serum twice a day. He was at once relieved—headache, anorexia, foul breath rapidly cleared up, and he was dismissed in a few days. He had $1\frac{1}{2}$ ounces. A well-marked acne vulgaris which was present at the time disappeared with the throat conditions.

All the cases already given were seen in time to be aborted, but the following case was seen too late to abort, and is a good example of what the treatment can do for cases which have gone on to suppuration before being seen.

This patient was an exact parallel to the first case of tonsillitis given, as he had had several extremely severe attacks, which ran their course in the face of all treatment and left him a physical wreck. In his former attacks he became delirious, ran a temperature up to and beyond 103° , could not leave his bed, and the case lasted for fully a fortnight.

(234) Mr. M'B., aged forty-three, on September 19, 1902, had the preliminary symptoms of one of his old attacks of tonsillitis; but as he was in Sydney, he consulted a local specialist, who scouted the idea that he was going to have any suppurative condition of the throat, and gave him some treatment. As he made no improvement, the patient returned to Melbourne, and was given antidiphtheritic serum on the 23rd and seen on the 24th. It was at once evident that the case had been seen too late to prevent suppuration, but the treatment was con-

tinued for all the relief it could give. An attempt to find the pus was made on the 25th, but unsuccessfully, and after another attempt on the 26th, it discharged itself through the wound the next day. The attack was as bad, if not worse, than any he had had before, and his throat filled so full that it threatened suffocation ; but under the treatment it was kept clean, and all extension of inflammation was prevented. The pain, while not absolutely abolished, was so much reduced that the patient declared it was nothing to former attacks, and that, but for the mucus accumulating, he would have been able to sleep well all the time. His temperature never rose above 101° , and he was up and about his room every day. His head was clear all the time, and he did not have the slightest sign of delirium. The rapid absorption of the engorged tissues after rupture astonished him, and he was hard at work on his invoices when seen a week after beginning treatment, and delighted with the result.

Cases of septic pharyngitis and tonsillitis could be quoted to a great length, but it is sufficient to say that where the septic organisms are present the treatment has invariably been successful.

Chronic Septic Rhinitis.

This troublesome disease has occasionally been treated successfully with antidiphtheritic serum hypodermically, and its success by this method suggested to me that it might yield to the oral use of the same remedy. Only two cases have come within my reach, and they are as follows :

(235) M. C., aged sixteen, female, has been suffering from foul-smelling discharge from her nostrils for the last seven years. The discharge was most offensive, and in it there were very frequently large foul-smelling, blood-stained crusts. At one time she was using four handkerchiefs per diem, and had to wash them herself, as no one would touch them, they were so offensive. Her breath was so bad that even her mother

could scarcely keep from sending her to 'Coventry,' and she felt herself like a pariah in her own home.

She was given antidiphtheritic serum, 2 drachms per diem for four days, and she was much benefited. Then she was put on hydrogen iodide, but that failed to keep up the improvement, and antidiphtheritic serum was resumed and continued until in all she had taken $3\frac{1}{4}$ ounces. By that time all odour had gone, and what was left was only a simple rhinitis. Since then she has used the douche regularly, and has had no recurrence. That is now over three years ago.

(236) Miss D., aged eighteen ; chronic septic rhinitis of at least one year's duration. There was a patch of bare bone on the raphe in the naso-pharyngeal vault. She had in all 5 ounces, and lost all trace of the odour which had been offensive for so long. The crusts steadily lessened in size, smell, and thickness, and finally cleared up altogether. She did not use the douche, and later on she had a relapse, which yielded to local antisepsis, and by use of the douche regularly she has until now kept quite free from further trouble.

CHAPTER XXV

TRAUMATA

General Symptoms.

THAT antidiphtheritic serum could have any effect on traumatism was not at first suspected, and it was only when a case of acute synovitis begged for some relief from pain that antidiphtheritic serum was given *faute de mieux*. The almost instantaneous relief experienced led to its use in other cases, and the further it went the better it did, until the whole course of traumatism was found to be within its sphere.

The principal symptoms of traumatism are shock, pain, fever, œdema, extravasation of blood, loss of function, with all the other symptoms which arise therefrom.

Shock.—Antidiphtheritic serum has shown itself capable of minimizing shock to a great extent. The larger the dose and the more prompt the administration, the more marked and immediate is the effect. This the writer knows by practical experience.

Pain.—For this antidiphtheritic serum has proved a sovereign remedy—first in relieving the acute pain of injuries, and secondly in rapidly clearing up the pain which is felt only on movement.

Fever.—When seen very early in a case traumatic fever may be largely prevented, but when seen later it is very quickly

brought under control, and septic complications are entirely prevented. The same may be said of *œdema* and *extravasation of blood*. Seen early, they may largely be prevented; but if not, then they are rapidly cleared up.

As synovitis was the first lesion treated, we will take it first.

Synovitis and Joint Inflammation.

When the case is one of simple synovitis, then the result is prompt and satisfactory; but if there are complications such as torn ligaments or damaged bone, then the course of that case is naturally longer.

The first symptom affected by antidiphtheritic serum is pain, especially that pain which is aggressive in its character, and which gives the patient no rest; then the pain on movement and the other symptoms according to their gravity.

(237) Mr. W., aged twenty-one, had a previous attack of synovitis in his left knee, from which he had not long recovered. He had sprained it again, and had been busy for thirty hours poulticing and fomenting it, with little benefit. He was seen at the end of that time, and the knee was very much swollen and so painful that he would scarcely let me look at it, and he begged for relief. For want of something better, he was given antidiphtheritic serum—1 drachm at once and repeat in twelve hours. Eighteen hours later he reported that the first dose of antidiphtheritic serum removed all pain in half an hour, and that he had slept all night. The knee was much reduced in size, tension was gone, and he allowed the freest handling. Two small blisters were applied to help absorption of the fluid, and he was dismissed two days later.

(238) Mr. G., aged thirty-nine, was the same in every respect as the last case, and he was given $\frac{1}{3}$ drachm every four hours. The result was the same: the pain eased from the first, he slept well that night, and when seen next day he had no pain

except on a spot about the size of a sixpence. In each case 2 drachms were enough to cure.

These cases were simple synovitis, and, once that was gone, the patients were well ; but where there are torn ligaments, damaged cartilages or bones, we have a different set of conditions, and longer treatment is required. The removal of inflammation is the great function of antidiphtheritic serum, and when that has been done, then Nature may be left to heal what remains ; but if the cost of the serum be not a consideration, then a continuation of the treatment will materially shorten the period required to finish the work.

In the following case the injuries were greater, and the patient had made them much worse by constant use of the limb until she could do so no longer.

(239) Mrs. C., aged sixty, weight 220 pounds, fell and twisted her left knee nine weeks before being seen. Her doctor had ordered her to keep her bed for three months, but after lying up for a fortnight she got up, and walked around till she could do so longer for pain and loss of sleep.

The joint was swollen and tender ; there was synovitis with fluid in the joint, osteitis in femur and tibia, phlebitis in the internal saphenous vein, and she had not slept for weeks with the night-pains. She was put to bed and given antidiphtheritic serum—1 drachm twice a day (August 28, 1900).

August 29.—Pain in synovial membrane gone, and she can now allow freer handling of the joints, but the bones are extremely tender. No sleep yet, and night-pains very bad.

August 30.—Slept better last night and again this morning, and there is less pain in the bones.

August 31.—All-round improvement ; has had her best sleep since the accident ; was up and had her bed made, and was much encouraged to find so little pain on moving.

September 1.—Much refreshed by a good night's sleep ; pain lessening.

September 3.—Up on couch ; pain almost gone.

September 5.—Pain all gone, and patient dismissed with an elastic knee-cap.

She has done well and has had no relapse.

The next case was evidently septic, but seen in time.

(240) Mrs. D., aged fifty-six (February 18, 1902), had run a needle into her right knee a few days before. The needle was removed, but the knee gradually became more painful, until it kept her awake at night, and she was then seen. There was no fluid in the joint, but sharp pain on the lower patellar margin and adjacent synovial membranes. Antidiphtheritic serum—1 drachm three times a day—and rest in bed.

February 19.—Slept soundly last night, and reported that the joint began to improve after the first dose, and that she could soon move it freely in bed without pain. The synovial membrane was free from pain, and the bone tenderness was much less.

February 20.—Bone pain gone, but she is now threatened with bursitis.

February 22.—Bursitis almost well.

February 24.—Quite well; no pain; dismissed.

In all these cases no other treatment was given, either internal or external.

General Traumata.

(241) Mr. J., aged thirty-seven. In jumping a fence his horse fell and rolled on him. He was badly crushed all down the left side and leg, and his ilium was fractured, without displacement, while his clavicle was dislocated forwards at the sternoclavicular joint. Put to bed and antidiphtheritic serum every eight hours.

All pain except on movement was relieved from the very first, and that on movement lessened day by day, until on the fourth day he could move his limbs freely without pain. Œdema was largely prevented, and what there was had gone

by the fourth day. His first three nights were not good, as he had to lie in one position, but after that he slept well when he could move himself. Although he had had pain, inflammation, and œdema removed so quickly, it was weeks before his ilium was strong enough to bear his weight. He had antidiphtheritic serum only for the first few days.

He had had a good many falls in his day, but this was his worst, and he freely contrasted his comfort this time with the discomfort he had experienced with former and comparatively trivial accidents.

In the last case almost all ecchymosis was prevented, but in the next the power of antidiphtheritic serum to absorb blood-clot is shown in a very marked manner.

(242) Mr. L., aged fifty-two, was gored by a cow between the left buttock and thigh. The horn had penetrated pretty deeply, leaving an external wound 2 inches long and an internal condition of blood-clot and broken-down tissue. The wound externally was washed and stitched up, and patient was put on antidiphtheritic serum three times a day. There was occasional hæmorrhage from the wound for the first three days, but the pain and the area of the internal condition steadily decreased. He was doing so well that in a few days antidiphtheritic serum was stopped, but had to be resumed within forty-eight hours, as the wound threatened inflammation. Again everything went well, and by the time he had taken $2\frac{1}{4}$ ounces healing by first intention had been obtained for the external wound, and a firm fibrous cicatrix remained from the internal condition.

Here every rule of surgery was deliberately broken, so that antidiphtheritic serum might be tested, and it so increased tissue resistance that it relieved the pain, prevented inflammation, absorbed the blood-clot, and kept down œdema, which would naturally in a case of this kind have been a prominent feature in the case. In short, it fulfilled every requirement for the case.

The following experiences of the writer may here be narrated,

and the fact of his using it so freely for himself is the best indication of his faith in the treatment.

(243) The writer, aged forty-six, had to jump over the splash-board of a rather high dogcart during a bolt, and the reader can easily figure out the force of the impact when the factors are given. A body 205 pounds in weight falls a height of 7 feet from a platform having a horizontal velocity of 20 miles an hour. I fell on my hip, but fortunately no bones were broken. Antidiphtheritic serum was taken on the spot, and that afternoon, although badly shaken, I did a round of visiting. There never was pain except on movement, and that night my temperature was normal. Not being able to rest it, the jolting of the trap caused a large hæmatoma to form, which could scarcely be covered with the hand with the fingers spread out. Consulting at home was done for three days, but after that work was resumed, and seven hours' visiting was done the first day. Antidiphtheritic serum was taken three times a day for a fortnight and then irregularly; the hæmatoma cleared right up, and all other undesirable sequelæ were prevented.

Some months before the writer was thrown out by the wheel coming off, and he fell on his knee. The pain was fairly sharp, and no position eased it. Antidiphtheritic serum was then taken, three doses in four hours. In half an hour after the first dose it dawned on me that the pain was gone except on movement, and that afternoon a good day's work was done. The treatment was continued for another day, and the next night a walk of over a mile was done without damage. Using it rather too freely, it began to fill on the third day, when antidiphtheritic serum had been stopped; but another day's treatment cleared it all up, and an elastic knee-cap which had been obtained was returned as not being required.

(244) T. G., aged twenty-eight, had a fall from his horse, in which he damaged his knee and face. The knee was very painful and kept him awake all night, and his face was a

mixture of asphalt and swollen and inflamed bruises. He had 1 drachm twice a day for his knee, and next day he reported his knee free of pain, and that he had had a good night's sleep. But it was also found that the antidiphtheritic serum, true to principle, had cleared up all the inflammation from the face, and his appearance was quite altered. This gave me a wider idea of the range of the serum.

Head Injuries.

In this class of case, for which so little can be done to directly influence the morbid processes set up, anti-diphtheritic serum has a field of action in which it fills every requirement, for here, as elsewhere, it checks hæmorrhage, reduces œdema, prevents septic infection, rapidly absorbs extravasated blood, promotes the healing of wounds, and materially lessens, if it does not always abolish, the ordinary traumatic fever. Cases of this class are not very frequent in my practice, but sufficient have already passed through my hands to give an idea of what the treatment is capable of doing.

(245) Mr. B., aged seventy, fell a distance of 8 feet on his head, and had an incised wound on his occiput, which bled freely. He was found sitting up in a dazed condition an hour after his fall, and quite unable to give any account of himself. He vomited freely, and lost consciousness at intervals, and when he did respond to questions it was only when they were asked in a loud voice. Shock was fairly severe, but reaction set in after vigorous treatment. The wound, which was a superficial one, was dressed; but he rubbed the dressings off in a few hours, and it healed without further dressing. Anti-diphtheritic serum was ordered at four hourly intervals. (February 20, 1902.)

February 21.—Morning temperature 99°, pulse 84; vomiting has continued, and he has had only a few doses of anti-

diphtheritic serum, and none for the last twelve hours. Antidiphtheritic serum was at once given, and he ceased vomiting after the first dose, and every succeeding dose soothed him and put him to sleep. He lies with his back to the light, and slept off and on through the night, but complains that he has not slept. Evening temperature 99.8° , pulse 80.

February 22.—Temperature 99.8° , pulse 79; has had a good night, and slept after every dose of medicine. External wound quite healed and dry. Asked to-day what it was all about, and remembered nothing about a fall. In the evening he was so sound asleep that only his pulse could be taken, and it was 65.

February 23.—Temperature 97.4° , pulse 69; clear in his head, and has no pain; in fact, he has not complained of pain at all except when asked, and then he says he has a dull ache in his head.

From this time on the patient progressed to complete recovery without a hitch. There was concussion of a severe character, and although the cardinal symptoms of fracture were not present, there was something akin to it, as after he recovered he found himself deaf on one side, and the specialist he consulted said that it was due to damage done in the Eustachian tube by his accident.

The most remarkable feature in the treatment was the soothing character of the antidiphtheritic serum, as he would fall asleep within ten to fifteen minutes after his dose. So marked was this that at last it was only given when he was beginning to be restless and excited, and in every case it soothed him down and gave him a natural sleep. In short, antidiphtheritic serum put the case on the road to recovery and kept it there, in spite of the age of the patient and the severity of the damage done.

The following case was one of attempted murder of a woman, and the aggressor, her husband, thought he had killed her before committing *felo-de-se* immediately afterwards.

(246) Mrs. D., aged thirty, had received several blows on the head with the blunt end of a tomahawk. There was a contused lacerated wound just over the anterior fontanelle, and another on the ant. sup. corner of the left parietal. In both the scalp had been split with the force of the blows, and the wounds had bled freely. There was no fracture. There were two more contusions, one on the temple and the other on the occiput. Dressed the wounds with lysol lint, and gave antidiphtheritic serum at once and every four hours. The patient said that pain began to ease after the first dose, and by the evening of that day she had no pain except on palpation, and her temperature was 98.7° . Her mind was going over and over the events of the day, and she could not prevent herself from doing so till her dose of antidiphtheritic serum was given, which at once soothed her, and she slept soundly for most of the night. From this she learned to depend on her medicine, and when she became restless a dose would at once soothe her down.

The issue of the case was never in doubt. The wounds were practically healed in forty-eight hours, and perfectly so in three days, and all dressing was removed on the fourth day. Pain even on palpation was gone in a few days more, and there was no œdema around the wounds at any time.

When one considers the great force of the blows, the contusion and laceration of the soft tissues, and the damage the bone beneath must have received, the result was rather remarkable.

Her recovery from the concussion, with the resulting giddiness, was of the same satisfactory character.

(247) Mr. G., aged eighteen, had a heavy fall from his bicycle, and injured his head and left kidney. When seen he had been vomiting all night, and was looking white and ill. There was a cut just outside the external canthus of the left eye; his head felt heavy and muddled, and he had to be careful how he moved it. The urine showed blood freely, and pain in the left kidney was fairly severe, and was increased on movement.

Antidiphtheritic serum every hour for three doses, then every four hours.

In four days all symptoms had gone, the cut had healed, ecchymosis had been prevented, hæmaturia had cleared up, and there was no pain in either head or kidney. All he complained of was some giddiness on stooping.

In a few days further he was back at business.

The following two cases did not receive antidiphtheritic serum treatment until it was seen that nothing else would save them.

(248) Mrs. M., aged sixty, a chronic rheumatoid arthritis case on crutches, slipped and fell, striking her head on an article of furniture. There was a bruise about 2 inches square at the outer angle of the left orbit, which showed that the impact had been fairly severe. She was shaken up a bit, but did not show any other symptom for a few days, when she began to lose her speech. At first it was ataxic aphasia, which was followed by amnesic aphasia, and patient steadily lost ground. She was then put on antidiphtheritic serum, of which she took $3\frac{1}{2}$ ounces in ten days. At the end of that time she had made practically a perfect recovery, only occasionally hesitating at a word. She was then put on mercuric biniodide, and made a perfect recovery.

(249) Mr. M., aged seventy, when drunk fell and hit his head on the kerbstone. When seen he was suffering from alcoholism and concussion, and complained of great pain in his head. He became more and more stupid and difficult to rouse every day, until it was evident that unless something was done the patient would not last long. Antidiphtheritic serum three times a day was then given until he had taken $1\frac{1}{2}$ ounces. He improved from the very first, and when that quantity was finished he was out of danger. A month or two later he developed symptoms of cerebral thrombosis, and finally died of apoplexy.

In the following case there was originally a traumatism,

causing a puncture, through which infection was carried, and the different behaviour of the fluid in the joint from that of an ordinary traumatism was suggestive.

(250) W. Q., aged nine years, had run a pen-nib into his left knee-joint, and from the wound resulting some blood and clear fluid oozed out. The joint at once became painful, and he had a bad night with it. When I saw him, twenty-four hours after it was done, the knee was swollen and tense with fluid, very painful, and temperature, 102° . He was at once put on antidiphtheritic serum—one dose every hour, and every four hours afterwards. This was kept up regularly, and by next day the temperature had fallen to 100° , but the pain was not much better, and he had had a bad night.

Next day temperature was 99° , but another bad night was reported, although it was clear that the inflammation was practically gone. The pain keeping up, two days later the joint was aspirated, and clear serous fluid was found in it. A few drachms were drawn off, which relieved the tension for a short time; but it quickly recurred, and the nights were in no wise improved. Two small fly blisters were then applied, and the fluid rapidly subsided, and the boy made a rapid and uninterrupted recovery.

This was the first case of the kind which had been treated with antidiphtheritic serum, and the failure of the serum to remove the fluid was the first which had occurred in a joint. The reason for the failure is probably from the etiology. All the other joints treated have been simple traumatic cases, and in them the serum rapidly clears up the excess of fluid.

This failure thus throws some light on the failure of the serum to assist in any way the resorption of the fluid in pleurisy with effusion. This effusion is always the result of some infection, and the action of antidiphtheritic serum is the same in both cases.

There was another action which in this case was well marked, and that was the increase of tension in the joint after every

dose of the serum, until at last the patient refused to take any more for that reason.

From this experience it will probably be found better in such cases to cease administering antidiphtheritic serum when the inflammation has been overcome, and take some other means to clear up the excess of fluid.

Besides the general vaso-motor relaxation due to shock, there is a local dilatation in traumatisms due to the direct violence which has been the cause of the damage to the tissues. From this we have effusion of blood and serum, which leads to œdema of the tissues affected. The cause of this is the local vaso-motor paralysis, and this is very promptly relieved by the tonic action of the serum on the vessel walls. Hence in loose tissues, where contusions are generally followed by considerable œdema, the contraction of the bloodvessels, if the serum is administered in time, will prevent the usual swelling, or, if not in time to prevent it, will by the same action rapidly remove it by preventing further effusion, and so enable the lymphatics to take up what has already passed out into the tissues. The importance of this action in intracranial injuries cannot be over-estimated, for it is to the œdema within an unyielding structure that we owe the serious symptoms which so frequently end in the loss of the patient. Effusion of blood is another danger which the restored tone of the bloodvessels rapidly clears up, where it has not been given in time for prevention. This is seen in the ordinary 'black eye,' which can be so improved that in three days the injury looks from two to three weeks old. Either or both hæmorrhage and œdema, giving rise to increased pressure on the brain tissue, are the direct causes of that restlessness and irritability seen in patients with intracranial injuries before passing into the stage of coma. The cases treated are eloquent as to the effect of the serum in calming and soothing the patients. The regularity with which sleep has been obtained within a few minutes of the administration of the serum has been very remarkable. This

has been brought about by the immediate action of the serum in toning up the vessels, in preventing further effusion, and in assisting in the resorption of what has already been effused.

The administration of the serum should be kept up for some time, but in diminished doses and with longer intervals, until all chance of relapse has passed. By this means the convalescence will be hastened, and the recovery be more thorough and complete. By this same action subsequent inflammation is prevented, and the chances of septic infection are materially lessened.

The rapid recovery seen in traumatisms treated with antidiphtheritic serum seems to be due to the same early restoration of the tone of the vessel walls.

The following case was seen, and treated in the light of the latest discoveries of the action of antidiphtheritic serum as applied to such cases. The others were treated empirically, as no reason could then be given for the action of the serum.

(251) H. C., aged thirty-seven, workman, had a fall of 15 feet from a scaffolding. He fell on his head, his temple striking a brick, which caused a contused and lacerated wound of 4 inches in length, and penetrated the outer table of his skull. Concussion and shock were severe, and, besides, he had a fractured rib and various other contusions, more or less severe. He was seen within an hour of the occurrence, during which he had been liberally supplied with brandy, which, however, had failed to restore him. He was given $2\frac{2}{3}$ drachms at once, and in a few minutes its effects were apparent. He rapidly lost his faintness and nausea, sat up, and had his wound dressed, and after it felt so well that he said he would walk home. He was put into a cab, driven home, and put to bed. The treatment was kept up, 1 drachm every four hours, and he went straight on to recovery, and although the injury was near the orbit there was neither ecchymosis nor the slightest sign of œdema at any time. His temperature did not rise above normal, and his highest pulse was 82. At no time did he complain of

headache, and he took his food well all the time. The rib gave him more trouble than all the rest, owing to respiratory movements. Any pain he had was confined to bruised and strained muscles, those in the cervical region under the occiput particularly, and only then when he attempted to move them.

The wound healed absolutely in seven days by first intention, and its edges, ragged as they were, coapted as accurately as the most carefully closed incision made by a surgeon's knife. The wound had been dressed with alembroth gauze, after being washed out with a mixture of boiled and unboiled water, without other antiseptics of any kind. When he got up on the ninth day the only symptom of concussion left was a slight giddiness on quickly moving his head.

In this case the prompt administration of the large dose of serum by its restorative action on the vaso-motor system quickly raised the tone of the bloodvessels, and by so doing removed the symptoms of shock, the oedema, and the ecchymosis, and also in great part, if not altogether, the concussion. The same action removed the pain, and insured the rapid healing of the wound which followed.

The action on shock is very marked, and in two other cases of traumatism which were treated in emergency the same unmistakable results were obtained. The patients wanted badly to know what the stuff was which so rapidly took the faintness out of them.

In an extreme case 3 drachms might be given at once, and repeated as required, but in those treated so far the initial 3-drachm dose, followed by 1 drachm every four hours, have been sufficient.

SIMPLE PLASMATA

CHAPTER XXVI

DEFICIENT NUTRITION—NON-MICROBIC ORIGIN

As already stated, the oral use of simple plasma is of value only in lowered nutrition. This may arise from many causes, but as far as experience with plasma has gone, its action is limited to lowered nutrition arising from infections, to which the animal supplying the blood is itself specially refractory, and to those cases of non-microbic origin due to what may be defined as traumatic causes. Outside of this the plasma acts well in the lowered vitality sometimes found in children, and frequently and generally in old people.

Its action on the digestion in the cases in which it is suitable is very marked, but it would be a mistake to infer from this that all cases of deficient digestion come within the range of the therapeutic power of plasma. Whatever is the cause, many of those dyspeptic cases—non-microbic, as far as is known—do not respond to the plasma of the horse or sheep. Further experience in this is required, and it may be found that the plasma of the ox may help to solve some of these problems. The ox is resistant to influenza, to which the others are susceptible, and the stomach condition in influenza differs

materially from that of tubercle or traumatic exhaustion. In short, the plasma of any animal can only transfer to the patient the capacities peculiar to the animal supplying it.

Lack of nutrition is the symptom calling for plasma, and, so far as the writer has seen, no other condition is met by its use. Function depending on nutrition is restored, but function is not improved where the cause of its failure is not due to lack of nutrition.

This is true of lactation, for where it is deficient from any other cause than lowered nutrition, plasma is of little value. Subjoined are some examples of its use and the benefits to be obtained.

Most of the mothers, after having function restored to normal, can maintain the supply on reduced dosage; others require to use it only for a time, and are then able to discontinue it. Circumstances must decide when and how it is to be used.

A few typical cases may be given, and first may come the delicate mother who is making a poor recovery from her accouchement, and can scarcely feed herself, let alone a child at the breast. Many such are frankly tubercular or are suffering from that hypetrophy which so often precedes the actual tubercular invasion. In such cases the very effort to suckle the baby only tends to precipitate the attack. In all these the free use of plasma meets every indication. The restoration of lactation to normal, the increased appetite and digestion, the renewed muscular tone, all combine to give the patient, depressed and desponding, a new sense of well-being, and an impetus to recovery which is extremely gratifying.

(252) Mrs. F., aged twenty-five, primipara; baby a month old. She had a rather severe accouchement. Patient was a thin, delicate woman, with tubercular tendencies, much run down; appetite and digestion very deficient, had no energy, and her milk was below normal both in quantity and quality. Baby emptied both

breasts every time she was suckled, and then cried for more. The mother was given 1 drachm plasma four times a day and no other treatment, and seen again in four days. The milk by that time had so much improved that one breast was sufficient to perfectly satisfy the child, and instead of hoping that it would sleep on, the mother now wished that the child would sleep less and drink more to relieve her breasts. This patient again and again endeavoured to do without the plasma, but on every occasion she had to return to it, and on every occasion it succeeded. Once when she had almost lost her milk she began the use of the plasma, and its action was so rapid that in four days she had to be treated for a 'caked' breast, the only case in which this has occurred.

(253) Mrs. C., aged twenty-eight, an extremely fragile little woman. Second child three months old, not thriving, and his motions consisted of little but curd since he was born. Milk was overflowing in quantity, keeping the mother continuously soaking, but the quality was very deficient and the child dissatisfied. Previous child, for the same conditions, had to be weaned at a month, and she was on the point of weaning the second when I first saw her. Plasma—1 drachm four times a day—was prescribed, with no other treatment, and she was seen again in four days. By that time the quantity was reduced to normal, and the quality raised to the same level. The curd had gone from the baby's stools, and his motions were now normal. The patient's own appetite, digestion, strength, and general capacity for her work had greatly improved, and she and her baby now slept soundly and refreshingly. By the continued use of plasma she was enabled to completely satisfy the child till he was six months old, when she weaned him from the breast through the day and reserved it for night. Her own health was also thoroughly restored. Her husband expressed his gratitude for the change which the treatment had wrought in his home.

(254) Mrs. M., aged twenty-one, primipara, had become very anæmic during pregnancy, following an acute attack of puerperal pyonephrosis accompanied by profuse epistaxis at short intervals. Labour was normal, but after the first milk had been disposed of the secretion became very poor and watery in consistence, and failed to satisfy the baby. In three days the administration of plasma entirely transformed the secretion, and rendered it plentiful and good. The mother also was much improved by a continuance of the treatment, and maintained the function for the normal period on reduced doses of the plasma.

Another class consists of those who have been able to satisfy the child for some months, but the strain of suckling at length becomes too much for them, and the usual escape is by giving the child some patent food. Of this class many only require a little bracing up with plasma, and they are then able to complete lactation without any further help, or they may require a bottle or two now and again to keep up a normal secretion. The case in which this action of plasma on mammary secretion was first noted was of this description, and it was a result quite unlooked for.

(255) Mrs. S., aged twenty-three; second child seven months old. Patient has marked tubercular tendencies, her mother having died of phthisis, and she herself having had hæmoptysis at various times. Her first child has also shown the same diathesis. The patient is now run down with suckling; her milk has become deficient in quantity and quality; she sleeps badly and rises unrefreshed, has a bad cough, no appetite or energy, and is rapidly losing strength and weight. She was given plasma in the usual doses and advised to feed the child during the day and keep the milk for night. Improvement was immediate and continuous: the milk quickly increased in quantity and improved in quality, sleep was refreshing, and her general tone and appearance were thoroughly restored. At the end of a fortnight she looked the picture of health, and

said that she had to give the child at least one drink during the day to relieve her breasts.

(256) Mrs. R., aged thirty-nine, the mother of nine children, has always had some deficiency in the quality of her milk, but in her last lactation this feature was much worse than usual; there was deficiency in quantity and she was beginning to get run down. Appetite, sleep, and strength were materially affected. The child was three months old. After a month's treatment with plasma she was thoroughly restored to health, and was able to finish suckling without further use of the remedy, but not so successfully after the plasma was discontinued.

(257) Mrs. H., aged twenty-seven, primipara, at the end of four months found that her health was suffering, and that the milk was failing to satisfy the child, who had become fretful and wakeful. She had two 4-ounce bottles of plasma, which restored her health and energy and renewed the normal supply of milk. She had no more at that time, but found two or three weeks later that a further supply of plasma would be required to maintain her health and the normal milk secretion.

A third class are not only deficient in quantity, but the character of the milk is such that the child is practically poisoned with it. The health of the mother is generally below normal. In such cases the plasma is best given to the mother. If, however, the mother's health is good and the milk-supply is plentiful, but the child is unable to digest it, then it is advisable to give the child half doses. As an example of a case which included, at different times, both of these conditions, the following is interesting :

(258) Mrs. C., aged twenty-eight ; second child, which has had digestive trouble almost from birth, for which the writer had repeatedly to treat him. His mother's health also was unsatisfactory, as she was not making a good recovery. The mother was then put on plasma, and the effect was at once apparent. The child was satisfied with the milk, and

slept splendidly, and the mother's health was much improved. A week's holiday, during which she took full doses of plasma, completed the cure, and when she returned she thought she would try a little porter, as it was cheaper than the plasma. The next day she sent for plasma, as the baby had kept them awake all night. An immediate improvement followed the renewal of the treatment, and this was continued till a nervous shock so changed the milk, even while taking plasma, that the child had an attack of acute indigestion. For this he was given the remedy direct, and in thirty-six hours he had got rid of all his curd, and the motions were healthy. From this time onwards, as his mother's health was completely restored, the plasma was continued to the baby alone, and he soon gained the capacity to digest the milk, and retained it after the treatment had been discontinued.

Two further examples of treatment with plasma of child direct for deficient digestion of mother's milk are reported by Dr. McClelland, of Sydney. Where this is due to microbic invasion plasma is of no value.

(259) B., female, five weeks old: green motions and flaky pieces. Mother plenty of milk. Gave baby 1 drachm plasma four times daily. Milk digested well. Took 2 ounces altogether.

(260) L. Y., male, aged three weeks. On breast since birth, then gastro-enteritis. Gave bismuth and salol, and stopped breast and gave albumin-water. Slight improvement. Then mother gave breast again, and baby was upset and had symptoms.

September 1.—Gave mother 1 drachm plasma, and baby $\frac{1}{2}$ drachm four times daily. Baby's symptoms subsided, vomit ceased, and diarrhoea also. Mother did not come for more serum for several days after she had finished the first supply, and baby was worse. I gave her more, but next day baby had convulsions, which persisted until death, four

days after. The diarrhoea and vomiting ceased three days before death.

The child's head was very big and the anterior fontanelle much bulged, like hydrocephalus due to meningitis.

Another phase of the same lack of nutrition is seen in the debility following acute infective diseases, when the infection has gone and only the debility is left. In all cases of hæmorrhage, post-operative weakness, and other similar conditions, the prompt action of the plasma is most satisfactory. This is especially marked in the very old and the very young. All of them can take and retain plasma when nothing else will keep down. Many children overcome the infection in gastro-enteritic trouble, but are unable to struggle against the exhaustion which is left behind. To such plasma is simply life. In the old the lack of recuperative power is the great difficulty in their successful treatment. In such cases plasma directly supplies them with the very materials which they are painfully struggling to elaborate for themselves. The addition of such a material makes all the difference to many of them of life or death. The patients themselves are the first to recognise how much the plasma is doing for them.

In anæmias of all kinds, either alone or in conjunction with drug treatment, plasma has proved itself capable of supplying elements the lack of which has been one of the prominent factors in the production of the disease. A very notable case treated successfully was one of splenic anæmia, which, as usual, had resisted all that could be done for it, and splenectomy alone remained as the last resource. The case is as follows :

(261) Miss G., aged twenty-three, has been suffering from splenic anæmia for several years. The spleen was enormously enlarged, the lower edge being an inch below the umbilicus, while its pressure had frequently caused inflammatory attacks. She had every constitutional symptom of the disease, and almost every symptom which could arise from the enlarged spleen. She had been recommended splenectomy as a last

resource, all other treatment having failed. Knowing nothing else which would have the slightest effect on the case, she was put on simple plasma, 1 drachm four times a day. From the very first she began to improve, the recurring congestive attacks ceasing absolutely, the appetite returning with digestive capacity, and the dyspnoea, vertigo, cardiac palpitation, and loss of strength all steadily improved. The spleen itself was also reduced to about half of what it had been, and the general appearance and health of the patient steadily approximated to normal. The menstrual discharge, which had been only a dirty green fluid, was changed at the first period into a dark red, and at the next into a normal colour, and the dysmenorrhoea, which had given her so much trouble, had almost entirely disappeared. When she found herself so much better she discontinued the treatment, but at the end of a fortnight she found that all her symptoms had recurred, and she was threatened with one of her old congestive attacks. At this stage she recommenced the use of plasma; the threatened attack was prevented, and soon she was as well as before. She was using plasma, 2 drachms daily, and found that such dosage was sufficient to maintain her health and prevent a recurrence of her symptoms. In this case it seemed evident that the plasma supplied some deficient element or elements in the blood, the lack of which produced the symptoms which have been described. It is also evident that, whatever the function is which is deficient, it is permanently wanting, and the plasma only supplied the product of the function, while failing to stimulate it to do its own work. From this one can easily understand why all such cases are invariably fatal. In a parallel case, one of exophthalmic goitre, the gland was slightly reduced in size, and there was a marked improvement in the general health of the patient. As soon as the treatment was discontinued the patient began to lose some of the benefits she had obtained, although she did not relapse quite to her previous condition. In this case also the plasma evidently only supplied

some missing elements in the blood, and had little or no effect on the function which normally should have produced them. In both the action of the plasma, while falling far short of what is required to effect a cure, does more for the patient than any treatment known to the writer.

In other cases of primary anæmias the use of plasma, in conjunction with the recognised treatment for the conditions present, facilitates the action of the usual remedies by restoring some elements of the blood which it is not their province to influence. Even when given alone the alteration in the quality of the menstrual discharge gives a clear indication of the profound effect of the plasma in such cases in restoring the blood to its normal condition. In amenorrhœa of long standing the continued use of plasma has restored the function when its absence has been due to a deficiency in the nutrition of the patient. In fact, every function which is below par, and whose condition is due to such a deficiency, is directly within the range of the remedy.

(262) Mr. V., aged thirty-one, had an acute nephritis some years before being seen by me. He was then found to be suffering from a chronic albuminuria, the quantity being from $\frac{1}{4}$ to $\frac{1}{2}$ per cent. He was dieted and treated on usual lines, had various holidays into the country for weeks at a time, but nothing seemed to help him. He was pale, listless, had no appetite, could do light work with a great effort, and generally was a most unpromising subject. It occurred to me that as plasma was an assimilable albuminous material, its use would throw no more work on the damaged kidney, while it might help to replace some of the daily loss which had begun to tell so markedly on the patient. He was given the usual $\frac{1}{2}$ ounce per diem, and, by estimate, that just equalled in albumin the quantity which he was losing every twenty-four hours. His weight had fallen from 146 pounds to 128 pounds, and, giving weight for weight of assimilable albumin, should just have kept him from losing more. It did a great deal more than that, for

it restored the lost appetite, renewed his vigour, and in three months added 20 pounds to his weight, so that at the end of that time he was heavier than he had been at any time previously. In three weeks after discontinuing plasma he lost 7 pounds, but kept at that weight, and he has not since required attention. When he ceased taking the plasma the albumin was less than when he began, and there was no comparison between his general health then and when the plasma was begun.

It was the deficient nutrition which was here treated, and the treatment is not recommended for albuminuria.

CHAPTER XXVII

TUBERCULAR INFECTION

THE action of plasma in tubercle may be briefly restated. The plasmata of the sheep and horse are not antitoxic nor antibacterial to the infection. Given orally they increase the patient's resistance to the infection by increasing the resistance of the tissues affected by the toxic products of the organism, thus protecting these tissues by rendering them less suitable soil for the pathogenic action of the bacillus. Hence their action on temperature is slight, as they are not antitoxic, and they are of no value comparatively in mixed infections to which the animals themselves are equally susceptible with the patient.

The cases given show clearly where the serum is successful, and where its use is of little value. More successful cases could be given, but it is well that only average success should be chronicled.

(263) R. E. : tubercular phthisis and laryngitis, began three years ago with pneumonia. Cough troublesome, appetite poor, occasional blood in expectoration ; dyspnœa present. Laryngitis first noticed seven weeks ago, with pain on swallowing and hoarseness ; râles in middle lobe right lung and rhonchi in left. Serum began September 27, 1905, and at end of five weeks weight is the same ; all pain and hoarseness gone from throat, and patient feels generally very well,

takes his food much better, and has not the oppressive feeling after eating which had been present ; breathing is easier.

In health this patient normally was not a very hearty eater, and his appetite is now quite equal to what it was in health.

(264) J. P., aged thirty-five: tuberculous phthisis, four years ago, began with hæmoptysis; has gradually failed. Cough troublesome, appetite failing, and rapidly losing flesh. Fell from 161 pounds to 139 pounds on admission; has had slight sweating. Left lung absolutely dull, with diminished movement. Râles all over front and back, right R.M. good. Since taking serum has made marked progress. Weight has increased from 139 pounds to 155 pounds; appetite quite restored, and patient sleeps well; sweating gone; râles have all disappeared, but dulness still present. Feels much stronger, and is able to get about with greater ease and comfort. Expectoration very much reduced—less than a half of what it was when serum was begun.

(265) F. K., aged fourteen: tuberculous arthritis; has been in hospital for nearly twelve months; has had various operations, and, finally, amputation of right arm above the elbow. Disease appeared again in left wrist, where there was a well-marked synovitis, and his knees have been suspicious. Serum was begun on September 21, 1905, and he has had it for five weeks. He has gained 6 pounds in weight, eats and digests his food well, and shows marked improvement generally. The synovitis has almost gone, and there is no stiffness left in the knees. His general condition is now very good.

(266) D. R., male: both lungs affected; advanced case, with gastric symptoms. Suddenly his temperature would rise a couple of degrees, and he would be sick, the nausea remaining for some days, and then gradually ceasing. There was always pain after food at all times. Under plasma he had two attacks, and then they passed away so effectually that when he took a chill and the action of the plasma was inhibited the sickness did not return, and when he vomited it was from the

severe cough present, there being no nausea. The pain disappeared from the first week. He took a chill, and the serum ceased to help him. Since he has recovered it has again been given, and he is once more improving.

(267) I. McM., an advanced case of laryngeal phthisis. When seen he had been confined to bed for weeks, the throat was very painful, and swallowing, even liquids, difficult; appetite was poor, and patient debilitated. Under plasma he rapidly improved, lost all his throat pain, gained a normal appetite, and was able to swallow freely and without pain. When he seemed on the highroad to recovery and was up and going about, he caught a chill, which immediately inhibited the whole reaction; and the chill, affecting his throat, reduced him again to his original condition. Treatment has not yet been resumed.

(268) T. O'H.: phthisis, nine months. Consolidation in both lungs, râles in left, sweats, loss of weight and appetite; dyspnœa a prominent symptom. Plasma from September 18, 1905, to October 31. Results: No sweating for the last three weeks, cough and sputum a little less; breathing much easier, and can now go upstairs freely—quite impossible before. Appetite good, and a general feeling of betterment. Weight increased 3 pounds. Urine raised from 54 ounces to 80 ounces. Respiration reduced from 24 to 20. Temperature normal and unaffected. Right lung, R.M., a little clearer at base and behind; left some râles, but has lost pleuritic friction.

(269) I. S., aged twenty-one: nine months' acute phthisis. Râles in both lungs; temperature 101° to 102° ; heavy sweats; probably mixed infection. Had plasma for three weeks, but, except for restoration of appetite and a sense of well-being, no other improvement was obtained. She then left the hospital of her own accord.

After thoroughly testing the plasmata on tubercular cases in my own practice, I asked Dr. Stoney, of the Consumptive

Sanatorium, Echuca, to give the treatment of tubercle with plasma a trial. Plasma ovis was used. He very kindly did so, and his first report is as follows :

' Re Plasma Ovis.

' Have used it with five cases at the sanatorium, and in every case found appetite improved, sleep better, and cough not so troublesome.

(270) 'H. O., congestion of both apices, with tubular breathing just over left nipple. Large amount of expectoration, with very poor appetite. Temperature 100° to 101° at night. Since taking plasma (1 drachm three times a day after food) chest much clearer, tubular breathing almost gone, temperature much steadier, sleeps well, appetite much improved, and expectoration less. Inclined to be costive.

(271) 'H. R., advanced rapid case in third stage, with cavity on right just above nipple. Temperature 100° to 102° , perhaps 103° . Since taking plasma weight increased $3\frac{1}{2}$ pounds in three weeks, appetite better, sleeps well, expectoration less, and coughs very little, except in the morning.

(272) 'Miss F. C., incipient, with dulness in right apex. No temperature ; much improved every way.

(273) 'T. K., chronic, has been several years in the sanatorium off and on. Râles all over both lungs, rapid breathing (48), night-sweats, no appetite, vomiting after breakfast, and often after dinner. Since taking plasma has good appetite, sleeps well, no night-sweats, generally improved. Slight epistaxis three days ago.

(274) 'Mrs. T. had influenza attack four days after starting plasma, and had to discontinue it, as it seemed to make her worse.

' Each of these cases had three weeks' treatment.'

In reviewing the cases, Dr. Stoney says : 'There was no great increase in weight in any case. No. 271 was losing weight

up to time of starting plasma, and even with his high temperature put on $3\frac{1}{2}$ pounds. The difficulty is to pick cases which have no mixed infection, such as pneumonia, influenza, etc. In the influenza case the moment the patient got influenza the plasma seemed to disagree with her. My experience with advanced cases here is that there is always present a streptococcic complication, yet in the acute and the chronic severe cases the plasma gave good results. The treatment is being continued in the first four cases.'

My own experience agrees, both as regards the symptoms which show amelioration and also as to the inhibition of the action of the serum when influenza appears on the scene. Influenza complicating tubercle is always serious, and by the combination the case assumes a gravity which was not previously present. From its effects on serum-treated cases it is clear that the reason for this change for the worse is that the normal defence against tubercle is inhibited, and the unfortunate patient is thus open to the attack of both infections, and capable of no defence at all against tubercle.

Of three hopeless cases treated with plasma one, who was doing well for two months before influenza supervened, died a few weeks later, without ever having rallied after influenza seized him. Another, who had a sharp attack, has not been so well since. The third is as follows :

(275) Miss H., aged forty, teacher retired from teaching as unfit, was losing weight from 1 to 4 pounds every week ; appetite poor and fickle, expectoration copious, cough incessant, great cardiac debility. A perfectly hopeless acute case, with cavities in one lung and the other seriously compromised. She has been on horse and sheep plasma for the last eight months. The first effect noticed was the increased appetite and digestion, then loss of weight was arrested ; from the first week she has gained in all 8 pounds. The cough lessened, and expectoration fell to half in a short time. She had an attack of influenza, but has rallied, and during one week in which she was given ox

plasma for the remaining effects of the influenza, she gained 2 pounds in weight. The local symptoms have also much improved, and the râles have practically disappeared. She belongs to a tubercular family, and certainly would not have lasted three months longer when taken in hand for treatment.

(276) Mr. U., aged twenty-five, has had tubercular testicle with sinuses for five years. When seen they were still discharging, and the infection had invaded his prostate and the base of his bladder. Two considerable hæmorrhages had forced him to consult me. For some time his bladder had been very irritable, and he micturated frequently, always losing more or less blood when doing so. He was anæmic and run down. He was given plasma, 1 drachm four times a day, and rested for five weeks. He has done splendidly; the sign of blood is only occasional, the desire for micturition is almost normal, and although he has been steadily at business ever since, he has regained almost all the energy and weight he had lost. The sinuses in the testicles have all closed up except one, and sensation is returning to the glands.

CHAPTER XXVIII

THEORY OF THE ACTION OF SERUMS ORALLY ADMINISTERED

IMMUNITY, ACTIVE AND PASSIVE

AN impartial survey of the history of serum-therapy shows that, while it has been of great service to man, it has not fulfilled the bright hopes of its inception.

Immunity has been produced in animals freely, but the transference of this active immunity in most infections into passive immunity in the patient has proved a problem still requiring a solution ; so much so that investigators are now turning their attention more to the production of active immunity in the patient than to the transference to him of an animal's already acquired resistance.

But vaccination can only be of limited value, and applicable mainly to those cases which are local infections. By a development of the general resistance the local conditions may be cleared up.

A feature which will further limit the general usefulness of this method is the fact that the doses have to be carefully given in accordance with the opsonic value of the blood. An excess dose would at once reduce the resistance.

To do all this requires a time which the general practitioner has seldom at his disposal, a bacteriological skill which he has

had little chance of acquiring, and a laboratory which is beyond the reach of 99 per cent. of the profession.

Where successful, however, an active immunity is obtained, which is always more persistent than any passive immunity. The method advocated in these pages is along the old lines of passive immunity in the patient from active immunity in the animal, and its action does not depend so much on individual idiosyncrasy as the production of active immunity. It differs from the present accepted ideas only in that the tissues themselves are rendered unsuitable soil for the pathogenic action of the organism, instead of its action being inhibited by an antitoxin, and in its therapeutic effects being obtained better by the regular use of the serum by the mouth than by isolated doses hypodermically administered.

The theory which is held regarding the nature and methods of immunity is that the tissue-cell behaves differently to bacterial poisons with which are included snake-poisons and the vegetable poisons ricin, abrin, etc., than to the ordinary arsenic, morphia, strychnine, etc. To the first the side-chain theory is applied, and by it the production of antitoxins and antibacterial agents is theoretically explained. On the other hand, the mineral and vegetable poisons are supposed to affect the whole cell, and it either dies or recovers without forming side-chains, and thus neutralizes the poison. We have, then, antitoxins and antibacterial agents, which by their actions resist infection, and science recognises no other.

As these substances are not absorbed by the mouth, it logically follows from the premises that serums exhibited orally are so much serum lost in the treatment of infection, so far as their antitoxic or antibacterial value is concerned.

In this theory it is taken for granted that all the tissues attacked by a toxin, or an organism react in the same way, and each contributes its quota of antitoxin or immune body. To the writer a survey of the success and failure of these elements of the various serums suggests a close connection with

the lymphatic system. The function of the lymphatics is to resist the entrance of infection, and the glands respond equally to toxin and organism ; but they respond very unequally to different infections, and the efficiency of their defence is similarly irregular. Considering this defence against the organism, it will be found that where the lymphatic defence is efficient, the corresponding antiserum is equally so ; and where the defence is strong in its reaction, but only variable in its efficiency, the corresponding antiserum is exactly similar in its therapeutic action. Where the lymphatic defence is of little or no value against the organism which readily finds its way into the system, the corresponding antiserum is of no practical value.

In the first class are diphtheria and tetanus, and the serums given in time are as efficient as the normal defence against the invasion of the organism.

In the second class antistreptococcic serum and antiplague serum may be placed, and in each of these infections the serums, while of value, only coincide in their value with the unreliability of the lymphatic defence against the organisms.

In the third class are typhoid, pneumococcus, tubercle, etc., the lymphatic defence against which is inefficient, and the resulting antisera correspond.

Viewed from this standpoint of origin, many problems of the action and failure of antitoxin and immune body can be readily explained.

In view of the result of the investigations which have just been described, this idea makes a harmonious whole.

CHAPTER XXIX

ANTITOXIC OR ANTIBACTERIAL?

FOR the last eight years the writer has been obtaining results which could not be accounted for by any theory at present known. Serums used by the mouth according to present ideas were useless as therapeutic agents. Yet the most definite results were obtained, and regularly. The serum used was antidiphtheritic alone for some years, and then others were tested. The antidiphtheritic serum was tried on a great variety of diseases—pneumonia (lobar), whooping-cough, locomotor ataxia, to abort an injection of Hoffkine's plague prophylactic, and in sepsis and traumatisms, etc. In all except the last two it failed to benefit; but in the presence of the staphylococcus, streptococcus, and *Bacillus coli communis*, as well as in non-microbic trauma, it was of great value. This action is discussed in the clinical papers, and here it may only be said that the oral use of the antidiphtheritic serum exerted a definite capacity to limit and cure inflammatory conditions arising either from septic infection or trauma. What was the action of the serum thus used?

Was it antitoxic? The bacteriologists affirmed that diphtheritic antitoxin was not absorbed in quantities sufficient to influence any infection; and although the writer from his results at first questioned this, later on he could only agree with their conclusions. Hence, from this point of view, the action could not be antitoxic.

In clinical work it was noted that the value of the serum for this special work was not regulated by the number of units in the serum. The higher the potency the greater number of units were required, and, bulk for bulk, a serum of 200 units per c.c. was as potent in sepsis as one of 600 units per c.c.

This strongly suggested that the antitoxin was not the active agent in the treatment.

Later still a series of cases—one of facial erysipelas, one of septic hand (*Staphylococcus pyogenes aureus*), one of iritis, and two of osteitis—were all failing to benefit from a profuse administration of the serum (in some 1 ounce per diem). On examination it was found that the serum was different in taste, colour, and consistence from the usual sample. Another supply of the previous quality immediately gave the desired effect. The erysipelas case, which had been showing decided symptoms of cardiac failure, gave no further anxiety on that score. The temperature fell from 105.4° to 101° , and she did well. The hand infection was spreading rapidly till the new serum was given, when its advance ceased abruptly, and it went on, after the necessary incisions to relieve pus, to recovery. The other cases also promptly responded to the change of serum, and did well.

Dr. McClintock, of Messrs. Parke, Davis, and Co., tested samples of both serums through guinea-pigs, and his report is herewith given :

‘The samples were murky, but showed no bacterial contamination.

‘Lot 130, potent for sepsis, and supposed to contain 333 units to the c.c., contained 200 units = 60 per cent.

‘Lot 192, *not* potent for sepsis, supposed to contain 250 units, contained less than 166 units = 66 per cent.

‘Lot 199, *not* potent for sepsis, supposed to contain 266 units, contained 166 units = 62 per cent.’

From this it will be seen that the serum which failed to influence the infections had more antitoxin in it than that

which succeeded. Hence it was clear that, whatever was the element in the serum which did the work, it was not antitoxin. But if diphtheria antitoxin did not do the work, was there not another antitoxin present which would do it? This was answered definitely in the negative by the fact that the same results were obtainable in non-microbic cases as in sepsis.

The next question which arose was whether the serum did not contain some antibacterial elements.

Was the action of the serum antibacterial? This again was answered by the fact that the antibacterial elements are not known to be absorbed by the stomach, also by the fact that the serum acted just the same when no organisms were present—that is, when the same conditions were present from a non-microbic cause as would be produced by infection. It caused healing even more rapidly without infection than with it.

A great many experiments were made to find out whether the serum did or did not act as an antibacterial agent, and amongst them were the following:

The growth of cultures of the *Staphylococcus pyogenes aureus*, *Streptococcus pyogenes*, and Klebs-Loeffler organism was attempted on three media. One was pure antidiphtheritic serum, 200 units per c.c.; another one part same with two parts normal horse plasma; and a third normal horse plasma alone.

None of the organisms grew on the antidiphtheritic serum alone. The streptococci grew on none of the cultures. The diphtheria bacillus and staphylococcus grew freely on the mixtures of normal and antidiphtheritic serums, and on the normal horse plasma. The failure on the antidiphtheritic serum alone was probably accounted for by the preservative—chloretone—in it. The growth of the organisms on the mixed media showed that no bacteriolytic element was present for the staphylococcic and diphtheritic organisms. The doubtful result was that of the streptococci, but that was probably due to the difficulty which is sometimes experienced in making a culture of that organism.

Experiments on Animals.

The first experiment was made with the toxins and dead organisms of a mixed culture of staphylococci and streptococci.

(1) Two rabbits, one larger and heavier than the other, were given 3 c.c. each of a solution containing the dead organisms and toxins of the staphylococcus and streptococcus. The injections were made into the vein in the ear. The smaller of the two animals was also given at the same time 3 c.c. of antidiphtheritic serum by the same channel, and this was repeated a few hours later. The control rabbit received nothing but the toxic injection. He died within eighteen hours of the injection. The other rabbit proved to be pregnant, and it aborted during the first twenty-four hours. It received no further treatment, and died on the fourth day from the reception of the toxic injection.

It is not clear that the treated animal died of the injection, as the uterine condition under the circumstances offered great inducements for further infection.

Later attempts to produce a culture sufficiently virulent to kill without the living organisms failed, and it was resolved to see what the treatment would do for the living organisms. Dogs were chosen, and in every case the dosage was regulated by the weight of the animal. The amounts administered ranged from 1 to 2 c.c. for every four pounds weight, and all intravenously.

(2) Two dogs were given a proportionate dose of a mixed culture of staphylococcus and streptococcus intravenously. The control dog had ether, and the increased vaso-motor tension caused a reflux of the injected culture until it was not clear that he had received it. The other had chloroform, and received the full dose without deduction. The control suffered little constitutionally, but developed a large abscess in the site of the injection. The other animal received orally 1 drachm antidiphtheritic serum (potency 200 units per c.c.) every four

hours for six days. The wound healed by first intention. The constitutional symptoms were very severe, beginning with complete paralysis of the hind-quarters, and going on to partial paralysis of the fore-legs. He gradually recovered, and in six days was almost himself again. The control suffered nothing further after his abscess was incised.

(3) One dog 11 pounds weight and another 15 pounds received doses intravenously in proportion to their weights of a similar mixed culture. The smaller dog was taken as control, and died in four days. The other dog was treated orally with antidiphtheritic serum (1 drachm every four hours), and, although paralyzed in the hind-quarters for four days, rapidly recovered after that, and in six days was almost himself again.

(4) Two dogs, each 15 pounds weight, and equal in every other way, received an intravenous dose of a similar culture. The control dog died in six days. The other dog received orally 1 drachm every four hours for two days, then the treatment was discontinued for thirty-six hours, when it was again resumed, and maintained till the seventh day, when the dog died. The same paralytic symptoms presented themselves as in the other animals, but the serum, after the interval, seemed incapable of further arresting the infection.

(5) So as to repeat the last experiment as well as the ordinary test, three dogs were treated. One was 10 pounds weight, and the other two 12 and 16 pounds respectively. All received doses in proportion to their weight. The injection consisted of a mixed culture, the living organisms of staphylococcus and streptococcus, and was administered intravenously.

The 12-pound dog was chosen as control, and he died in six days.

The 10-pound dog was treated all the time with antidiphtheritic serum orally, 1 drachm every four hours. Paralysis followed, as in all the other cases, which progressed to a fatal conclusion in seven days.

The 16-pound dog received $1\frac{1}{2}$ ounces of antidiphtheritic serum orally during the first two days, and from that had no further treatment. He had the usual paralysis, but after being ill for ten days he began to recover, and in three weeks was fairly well, although but a shadow of his former self.

The conclusions to be drawn from these experiments cannot be dogmatic, but it is evident that the serum enabled the dogs treated with it to resist longer than the controls. It is also suggested that the heavier the dog the greater in proportion is his lethal dose.

Another experiment was the local injection of cultures of the staphylococcus and streptococcus (mixed) into guinea-pigs and rabbits. In every case the animal treated with antidiphtheritic serum orally showed an increased and more vigorous reaction. The abscess resulting matured more rapidly than the controls, and there was a greater quantity of pus. In no case was tissue necrosis prevented. Here there was evidently an increased reaction and greater leucocytosis, but no bactericidal action.

From all of which it is clear that antidiphtheritic serum has no antibacterial effect *in vitro* or *in vivo* on the septic organisms. It is quite evident, however, that there is an increased resistance *in vivo* to the injection shown by the treated animals in all cases living longer, and also by the increased reaction and leucocytosis on local injection.

CHAPTER XXX

SIMPLE PLASMATA IN DEFICIENT NUTRITION AND TUBERCULAR INFECTION

The Action of Simple Plasma.

IF the action of the serum was neither antitoxic nor antibacterial, what was it?

To aid in the solution of this problem it was resolved to test the value of simple plasma orally, and see if in it, which was the basis of all antiserums, there was present any quality which would help to account for the action of antidiphtheritic serum.

From its use in quantity it became evident that, where function was deficient through lack of nutrition, the oral use of the simple plasma acted in the patient exactly as it was intended to act in the animal from which it was obtained. Appetite and relish for food were restored, and increased vigour with restored function, as in lactation, rapidly followed. These results were most definite in debility of old age or infancy, and following traumatic conditions, such as post-partum, post-operation, hæmorrhage, etc. They were such as could not be accounted for by $\frac{1}{2}$ ounce of plasma, even if it were all absorbed unchanged. It was evident that there was present in the plasma the elements which the animal had elaborated for the energizing of its own trophic nerve-centres, and that these

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supplied the vitality deficient in the patient, and produced the same reaction as had been intended in the animal. These elements were probably of glandular origin and, like thyroid and suprarenal gland extracts, capable of rapid absorption and the production of their own physiological action in the patient.

Granting these conclusions, we had here Nature's own method of maintaining nutrition, repair and function, and the means of transferring the necessary elements from the animal to the patient to enable the function to be maintained in the patient as it was intended to be in the animal. This was seen when the plasma successfully used was discontinued. The patient very quickly relapsed, unless in the meantime he had sufficiently recovered to be able to carry on his functions without help. The plasma was supplying nutrition and stimulus which he was incapable of producing, and, like food, it had to be regularly taken to maintain the tissues in their normal condition.

This was all the more marked when the simple plasma of the horse or sheep was used in tubercle, in which infection the same reaction, leading to restoration of function, was obtained as in the non-microbic cases. The resistance of the horse or sheep to tubercle is only relative and not absolute, and the reaction was obtained in the patient, except where mixed infection or an infection virulent enough to overcome the resistance of the animal were present. The stream could rise no higher than its source, but it was clear that the vital reaction produced in the tissues of the animal and in those of the patient receiving the serum were not only alike in their resistance to tubercle, but that both consisted of the same forces which produced the reaction in non-microbic conditions. This was made more evident by the fact that, like the non-microbic cases, the tubercular promptly relapsed on the discontinuance of the plasma; and also by the fact that the reaction in the patient, as in the animal, was immediately

inhibited by any infection such as influenza or catarrh, exactly as would happen in the animal supplying the plasma.

To the writer the interpretation of these results appears to be that the tissue tone or vitality produced by the action of the serum, both in the animal and in the patient, is sufficient to make them resistant to the action of the tubercle bacillus. This is further suggested by the fact that, once this resistance is overcome, both the sheep and the horse become as susceptible as any other animal to the ravages of the disease.

Of course, it is possible that there may be present an antitoxin, but we have no evidence of its presence; and if it followed the same rule as diphtheritic antitoxin, it would not be absorbed when the serum was orally administered.

In short, as in health our tissues are unsuitable soil for the pathogenic organisms simply from their vitality—a varying quantity in individuals from time to time, as well as in races of mankind and animals—so the tissue tone or vitality of the horse or sheep is of such a character as to be resistant to tubercle, greater relatively than in the human, but of the same nature; that this vitality is maintained along the lines of nutrition, and can be transferred by the oral use of the plasma.

CHAPTER XXXI

ANTIDIPHThERITIC SERUM IN SIMPLE AND SEPTIC INFLAMMATION

WHEN the results obtained by the oral use of simple plasma came to be compared with those seen in the use of antidiphtheritic serum, it was evident that the latter was only a development of the former. There was the same reaction as in the simple plasma, but much more marked. With it there was a great increase in the recuperative power of the serum, and especially in the reaction produced in the involuntary muscle. This was manifest in non-microbic cases—as post-partum, post-operation, trauma, hæmorrhage, etc.—by the prompt response of the involuntary muscle to the use of the serum. In shock the whole cardiac and vaso-motor system responded to the serum. In traumatic synovitis, for example, there was a distinct, direct action on the vascular supply, restoring the vaso-motor tone, relieving pain, and rapidly reducing the effused fluid. Post-partum, the regular use of the serum made involution an absolute certainty. In trauma, with contusion, laceration, and blood effusion, the action of the serum was to rapidly restore the tone, both of the damaged tissue and the vaso-motor mechanism, leading to rapid absorption of all effusions, the saving of all tissues not absolutely destroyed, and the early healing of the wounds.

The whole phenomena were those of a tissue recuperation,

so distinct that no other explanation could account for them. It was not antitoxic, as there was no toxin present to antidote.

Use in Sepsis.

The original experiments in the treatment of disease by the oral use of antidiphtheritic serum were made in sepsis. The same reactions were obtained as have just been described as seen in non-microbic conditions. The renewed vaso-motor tone, the feeling of *bien etre*, the improved appearance of the patient, the relief of pain, the decreasing inflammation, all pointed directly to either an antitoxic or bactericidal action of the serum, and to that agency the effects were attributed for years. It was soon evident that it was better to keep the administration of the serum going until the case had completely recovered. If it were discontinued too soon, the case relapsed, and it was much more difficult to treat the second time. Hence the resistance to the organisms and their toxins was not one which affected their vitality. Thus it was exactly parallel to the action of the normal horse plasma in tubercle which benefited the patient as long as used, but from which he relapsed as soon as it was discontinued.

Then there was the question as to why one serum should act in the presence of three different organisms. This was against all our present knowledge, and no connection could be found between any of the three by which such action could be understood. At length the fact that both in diphtheria and staphylococcic infection albumoses were produced suggested a connection. To test it, a special serum was prepared from a culture grown on a 25 per cent. aqueous solution of normal horse serum. The object was to have as much albumose and albumose-forming material in the culture as possible, so as to produce in the animal the greatest quantity of antiproteolytic and antialbumose material. It had already been seen that diphtheria antitoxin was not the active agent. This serum, on

being tested clinically, was found to be of no value orally either in diphtheria or streptococcic infections; but in staphylococcic cellulitis and other staphylococcic infections it was specific in its action. The proteolytic action of that organism was at once arrested: where drainage was efficient pus rapidly ceased, and cases which were dragging their slow length along in a few days had been quite changed, and were quickly healing up.

This showed a definite response in the animal to the toxic products used in the production of immunity. The main elements in the culture were the proteolytic agent and the resulting albumoses, and these, injected into the animal, produced an antialbumose and antiproteolytic capacity in his serum. In this serum there was none of the recuperative power seen in the serum grown on the ordinary broth culture (Paton's), but it appeared more efficient as an antiproteolytic, and should be very suitable for carbuncles, furuncles, and suppuration generally. A modification of it is now made as a 'special' serum for these purposes. From this it is suggested that the animal's defence of his tissues against the proteolytic action of the diphtheria culture on serum is exactly the same defence which is required to meet a similar action on the same tissues by the staphylococcus.

This did not explain the recuperative action of the ordinary (Paton's) serum, nor did it explain its action on the streptococcic infection. The streptococcus forms no albumoses, and hence an antiproteolytic agent would find no field for its action in such an infection. The action of the streptococcus in its tendency to rapidly spread is directly on the vaso-motor system, causing a vaso-motor paralysis wherever its effects are to be seen—not only locally, for there is also a decided depressing action on the cardiac muscle, so that both locally and generally the involuntary muscular system is directly affected by the toxic action of the organisms. The tissue resistance to such an infection must be very different from

that required for the staphylococcus. This is found to be the case, for diphtheria antiserum, which is produced in response to injections of toxic products of the bacillus grown on media containing beef muscle, is found to possess this recuperative power, which is evident not only in the non-microbic cases, but also in those in which the streptococcus is present. Thus it seems that the poison which is formed by the action of the organism even on dead muscle is the specific poison from which the muscular tissue and its nerve-centres have to be protected—hence the production of an increased recuperative power in the immunized muscle. The same principle holds good in the case of the proteolytic action on the blood serum *in vitro*, producing the substances which, injected into the animal, cause the production of the antiproteolytic power contained in the immune animal's serum.

That this is the element in the serum which is efficient against the streptococcus and also in the treatment of non-microbic cases is confirmed by the fact that in non-microbic cases of tissue damage or loss of tone the oral use of anti-streptococcic serum is identical in its effects therapeutically with antidiphtheritic serum. It is also practically the same in the treatment of the streptococcic infection in that it increases the systemic resistance, and maintains the vaso-motor tone without harmfully affecting the organism.

Thus, from beginning to end there is a close relationship between the different serums tested, not only in what they did, but also in what they failed to do. The simple plasma caused the restoration of function, and maintained it as long as it was exhibited. In tubercle the horse and sheep plasma caused the restoration of function (unless under exceptions noted), and maintained it as long as exhibited. In non-microbic damage and tissue depression antidiphtheritic serum caused restoration of function by its restoration of tissue integrity and tone. In diphtheria in the early stage, and in septic infections, antidiphtheritic serum produced the same reactions, and

maintained them as long as exhibited, or till the patient had recovered. In *none* of them was there any antitoxic or antibacterial action. In *all* of them there was restored function, and in *all* relapses on premature discontinuance.

From all of which it follows that there is another resistance to infection which is neither antitoxic nor bactericidal, and which is capable of rendering the soil an unsuitable one for the action of the organisms without affecting them harmfully in any way. This is found normally in the natural immunity of man or animals to infection, and is developed in animals artificially immunized, according to the nature of the attack and the tissues affected by it. It is neither antitoxic nor antibacterial in the ordinary sense of the terms, but it is really so in that it protects the tissues from the pathogenic action of both toxin and organism. The oral use of the serum regularly transfers this active immunity of the animal as passive immunity to the patient.

CHAPTER XXXII

THE PRODUCTION OF TISSUE RESISTANCE

THE significant facts that only the action of the organism on the broth culture produced the muscular recuperative element in the antiserum, and that this element was quite absent from serum, the product of a culture grown on blood serum alone, strongly suggest that the active agent in producing tissue destruction is not only the toxic element supplied by the microbe, but this element, in combination with the broken-down tissue, the result of its action thereon. If it were the toxic element alone, then it would produce its toxic effects entirely independent of the medium on which it was grown. But it does not do so. Grown on a medium with muscular elements present, it produces a muscular poison, to which the animal responds with an increased muscular resistance; grown on the serum, it produces a proteolytic agent, to which the animal serum responds by producing an antiproteolytic power, which antagonizes its action. Thus it is evident that the waste tissue is an essential element in the toxic action on its own nerve-centres. This sheds considerable light on diphtheritic paralysis. In a case where the muscular tissue is badly affected the patient will die of cardiac failure from the toxic action of the paralytic element plus the waste tissue produced by its action. But should the whole process be brought to an

end before a fatal result has ensued, then there will be left behind more or less tissue cells, into which the toxic agent has entered, and which have begun the downward course to degeneration. This process will go on till the cell dies, and sets free not only its own effete material, but the same mingled with the paralytic toxic agent. Groups of these cells so doing will produce sufficient toxic product to paralyze the nerve-centre with which they are connected, and this will persist until the enfeebled tissue has eliminated it and recovered from its pernicious effects. One could easily understand that where a muscle was seriously and extensively affected that the breaking down of the cells and the setting free of the paralytic agent might lead to the infection and destruction of other cells, and so the process be indefinitely prolonged, as it sometimes is, all the more likely when one remembers the lowered tone left in the tissues which have been affected by the disease. Further, a fatal result from this cause could easily be understood if a larger quantity of the broken-down tissue was precipitated suddenly on the enfeebled nerve-centres.

Not only does this give a rational theory for diphtheritic paralysis; it offers an explanation of the immunity process so far as tissue resistance is concerned.

In a healthy individual tissue tone depends on the use which is made of the tissues. Thus, one who lives a sedentary life will have flaccid muscles, voluntary and involuntary, and be incapable of any great or prolonged exertion. Another who lives an active out-of-door life will be capable of much more vigorous and prolonged exertions without fatigue.

Tissue waste being the specific poison for the nerve-centres of the tissues producing it, the more that is produced the more efficient must the nerve-centres become to resist its action. Hence the vigorous athlete has developed a muscular tone which is able to do an amount of work without producing enough waste to lessen its efficiency, which, if attempted by the sedentary individual, would be absolutely impossible from

fatigue. And what is fatigue from this point of view? It is the inability of the nerve-centre to further respond to demands made upon it, the cause of the inability being the toxic action of the effete tissue produced by its own activity. Development of athletic power means a tissue immunization to increased work on normal physiological lines; that is, the more work is done, within limits, the more vitality is demanded and supplied for the carrying out of the work. The supply decreases as soon as the demand lessens, and it does so automatically, as the less toxic waste product the less effort will be required to maintain function, and so the tissue condition goes up or down according to the demands made upon its nerve-centres. This is exactly parallel to the self-regulating mechanism of respiration. A person with too much CO_2 in his blood stands still to prevent the formation of more CO_2 , and to allow of the elimination of what is present in his blood. So in fatigue the wish to lie down and rest is just to prevent the formation of more tissue waste, and to give time for the elimination of waste products. In both cases the healthy person is ready for further exertions when the elimination is complete.

Susceptibility to infection while in a condition of fatigue can thus be understood. The nerve-centres are already depressed by a toxic product, and are incapable of resisting attack as vigorously as they would in the absence of such a material. Animals, naturally insusceptible to infection, can be made susceptible by fatigue, and by this conception it is quite easy to understand how this obtains.

One can also understand how massage does its work in patients incapable of using their own muscles. The various tissues affected are exercised with the minimum of general fatigue to the patient; sufficient waste is produced to cause reaction in the nerve-centres. and by steady use of this method of treatment a much more vigorous tissue tone is developed, which later on enables the patient to use the tissues for himself

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and complete by his own exertions the work begun by the masseur.

The addition of the toxic products of bacterial cultures to the normal processes already described makes a further demand on the recuperative power of the tissues affected by them. Graded doses, as in immunity, give them time to respond by an increased efficiency, which is now as specific for the pathological product as it was for the physiological, which was the result of the normal exercise of its functions. By this development the nerve-centres so vitalize the tissues dependent upon them that, as in the athlete, they are capable in presence of the toxic agent, which was the cause of their increased capacity, of carrying on their functions and maintaining their tissue integrity. This they are able to do to a degree to which in their normal vigour they were absolutely unable to attain.

In short, the effete material produced is the poison to the nerve centre, and the increased vigour and capacity of the nerve-centre reacting to resist the toxic action of the tissue waste is the cause of the increased tissue resistance which is produced. The nerve-centre, to preserve its own integrity and functional capacity, has to so influence its tissues that by the action of the exciting agent, physiological or pathological, the least possible quantity of the effete material will be produced. Hence the increased tone and functional capacity in the tissues affected.

The applications of this principle to the phenomena of disease may be indefinitely prolonged. One or two, however, suggest themselves.

In drug habits it is easy to understand how the nerve-centres respond to the action of the toxic agents on their tissues.

In disease one can realize the conservative character of the recumbent position forced upon patients by most diseases. Power, vitality, energy are required in the tissues attacked, and others must be producing as little waste as possible, so that the effort may be concentrated on the tissues affected by the

disease. And this probably persists all through an illness, and is one of the causes of that general wasting and debility in tissues far removed from those affected by the diseased processes.

Amongst the phenomena produced in disease many things go to support the theory just expounded. Both in natural immunity and in that produced artificially or by an attack of the disease conditions are found which cannot by any stretch be placed within the range of either antitoxin or immune body, and which require some other explanation. A few of these are discussed, first under *natural immunity* and then *acquired immunity*. The case could be lengthened and strengthened infinitely, but enough has been said to strongly support the theory advanced.

CHAPTER XXXIII

NATURAL IMMUNITY

THE nature of initial resistance to infectious disease is practically unknown. Some of the factors which contribute to its existence have been recognised, but no general principle to account for its presence has been found. We know that resistance to disease depends on the 'tone' of our tissues, but there it begins and ends. So long as our tissues are healthy they resist up to a certain point the entrance of disease. This resistance is neither antitoxic nor antibacterial. Tissue 'tone' and 'resistance' may be defined as the power to carry on function unimpaired in the presence of the pathogenic organisms.

Antitoxin is produced to antagonize toxin, and render the organism originating it harmless to the tissues. But this presupposes the entrance of the organism and the production of toxins, and does not account for the initial resistance.

Antibacterial elements are produced for the destruction of the organisms, but there is strong evidence to show that *in vivo* they are not nearly so effective as *in vitro*, and animals whose serum is naturally bactericidal are not thereby rendered insusceptible to invasion by the same infection. Hence, natural resistance to disease does not lie in the presence of the bactericidal element in the serum.

Our mouths are receptacles for all the pathogenic organisms, and we all have inhaled more or less freely tubercular organisms,

while the tonsils are an ever-open door for infection. And yet it is only a portion of humanity on which infection is capable of effecting a lodgment, and on these it does so almost entirely when by an unfavourable environment the patient's local or general tissue tone has been reduced below par, and his resistance to infection has declined *pari passu* with it. If antitoxins or bactericidal agents were our initial defence against the varied infections, we should require an equal variety of antitoxins or bactericidal agents, ready-made, to meet them, and to mention this is only to dismiss it. Hence the conclusion is arrived at that the initial resistance to disease is neither antitoxic nor antibacterial.

The explanation given of the natural immunity of various animals to infection, such as that of the tortoise to tetanus toxin, the resistance to which is demonstrably not antitoxic, is that it does not possess the side-chains required to unite with the toxin. That, of course, would be a good explanation in a case of natural complete immunity, but where antitoxin and antibacterial agents are absent, it does not help us much to understand immunity which is not complete. Either there are side-chains to fix the toxin or there are not. If there are not, then the animal is immune; if there are, then the animal is susceptible. But there is no room for a varied resistance to infection, such as is found, in fact, in different animals, to the same disease. Some other explanation is required, some other resistance must be present.

If this explanation will not suffice, then the other—that the natural 'tone' of the tissues renders the soil unsuitable for the pathogenic action of the invading organism—is sufficient to account for all the gradations in the initial resistance to infection.

By this means we find another method of disarming the organism, for obviously the making of the soil unsuitable for the operations of the organism renders it just as harmless as when the tissues were protected by antitoxin with the same

purpose in view. And this method is in operation long before antitoxin is thought of, and it is only when by some means or another it is broken down that antitoxin, when required, is brought in to supplement the reduced resistance. And this conception of natural immunity is largely confirmed by the fact that it is lessened by anything which will reduce the tone of the tissues. Thus the frog, under normal conditions immune to anthrax, can be made susceptible by keeping him in a raised temperature; and the white rat, insusceptible to the same infection, can lose his resistance when made to do excessive work, and thus exhausted. Man also, when fatigued or exhausted by want of food or exposure to conditions calculated to reduce his tissue tone, becomes thereby increasingly susceptible to all kinds of infection.

The antitoxic value of serum is not affected by these conditions. Thus, in the horse which has been immunized to diphtheria too frequent and copious venesection reduces his general resistance—for the loss of a great quantity of blood always reduces the general resistance—but the antitoxic value of his serum is little affected by the excessive hæmorrhage.

When infection has taken place, what becomes of this resistance? Do the tissues give up the struggle, and leave it all to the antitoxins and antibacterial elements in the blood? The writer is of opinion that such is not the case; nor is it reasonable to expect it.

The maintenance of tissue tone is imperative for the continuation of vital function in disease, even if antitoxic and bactericidal agencies were our only defence. Those vital functions require maintenance in the presence of the infection while the other resistances are being developed; they are necessary for such development, and a tissue resistance must therefore be present even where antitoxins and bactericidal elements are produced to antagonize the invaders. How much more will tissue resistance be required in infections to which no demonstrable antitoxin or antibacterial agent is formed?

CHAPTER XXXIV

ACQUIRED IMMUNITY

INFECTION takes place when the normal relation between the tissues and pathogenic organisms is so changed that the germs overcome the resistance of the tissues, and are able to effect a lodgment and begin their development on or in the tissues. Recovery takes place when the normal relation between the tissues and the organisms is restored, and the tissues are capable of carrying on their functions unimpaired in the presence of the infection. There may be more or fewer organisms present than when infection took place, but the recovery is complete so far as the infection is concerned, whether they are present or not, so long as the normal functions are unaffected by their presence. The vitality and virulence of the remaining organisms do not affect the issue.

Thus in the *British Medical Journal* sub-leader, February 10, 1906, on 'The Early Diagnosis of Typhoid Fever,' it is stated that Conradi obtains cultures of the organism from the blood in the afebrile stage of convalescence. The persistence of the organism in the urine of typhoid convalescents is very common. The organisms are present and vital, but the resistance has been increased till the tissues are insusceptible to their action.

The same holds good in lobar pneumonia, where, after the crisis and during convalescence, the organism is found, and is vital and virulent. Normal relations have been established

between the organisms and tissues, and function is undisturbed in their presence.

A striking example of this recovery was given in the *Journal of Medical Research*, August, 1905, by Duval and Lewis in recording the results of blood cultures in five cases of general septicæmia.

In a case of infection by the *Bacillus mucosus capsulatus* the blood was examined on admission, during the course of the illness, which lasted five weeks, and on dismissal. When dismissed the man was well, and in two weeks more was at work ; yet his blood contained more organisms on leaving the hospital than were present on admission. On each occasion a pure culture was obtained.

Duval and Lewis add : ' These facts seem to indicate that, in addition to the acquired immunity to soluble bacterial toxins and the acquired bactericidal immunity, the human body may have other mechanisms of protection against bacterial infection. The tissues in this case seem to have acquired a resistance to the toxic products of the infecting organism without there being developed substances harmful to the bacterial cell.'

Their conclusions, arrived at in a different way, agree with the writer's on his own eight years' clinical experience.

If such things be, then it is obvious that antitoxic and bactericidal agents do not by any means represent the full defensive capacities of the tissues. The defence is antitoxic where toxin is present, and antibacterial where found necessary ; but tissue resistance, which is the initial defence, by its adaptability to all infections, remains the main element in immunity, and is the element which persists when all others have disappeared.

This being so, one cannot wonder at the futility of the search for antitoxins and antibacterial agents in infections in which none of these are produced or required. Nor can one be surprised at the incompleteness even of those which are

successful if by the methods in which they are administered the tissue resistance which is produced along with the antitoxin is not also obtained. Thus, to obtain the antitoxic effect one or two injections are all that are required, but to obtain the tissue resistance the serum has to be regularly exhibited. Hence to thoroughly treat a case it ought to be given by both methods.

The failure of the hypodermic injection of serum, the product of active immunity in an animal, can also be understood. The animal is immune, but its immunity does not lie in antitoxic or antibacterial defence, but in tissue resistance, and this can best be transferred to the patient by the regular oral use of the serum; hence the failure of isolated doses hypodermically.

But although tissue resistance to the necessary degree is present, is there any evidence that the elements in the serum which maintain it are capable of being so transferred to the patient by their oral exhibition as to produce in him the same results as they were intended to produce in the animal from which they were obtained?

The whole of the work done, both with normal and immune serums, agrees in saying that such results are obtained. This also has been observed by others, as in the treatment of exophthalmic goitre by the serum of sheep from which the thyroid had been excised six weeks before being killed. Moebius and those who have followed him in the use of this serum found that the hypodermic use of it was of little value, and that its oral exhibition was required to obtain the benefits claimed for it. This also obtained with the milk from such animals.

With the principles here being advocated it is quite easy to understand the *raison d'être* of such results.

Conclusions.

From all of which—from the presence of the definite tissue resistances, even where antitoxin is found ; from the action of antidiphtheritic serum in septic diseases, showing that tissue resistance is Nature's method of defence in these infections—we may reasonably conclude—

1. That tissue resistance is the fundamental fact in immunity. It precedes infection, coincides with it, and persists after it has gone.

2. That it is capable of development in infection to protect the tissues.

3. That the degree of natural immunity present in an animal depends on the amount of tissue resistance present.

4. That this tissue resistance, whether as natural immunity or the product of artificial immunity, is an active immunity in the animal, and can be transferred as passive immunity to the patient by the regular oral exhibition of the serum or plasma.

5. That this tissue resistance may be found along with anti-toxins and immune bodies, but may alone be the whole source of immunity, both in natural and acquired resistance.







