into a filtered specimen of normal human blood in saline showed in forty-eight hours a growth suggesting involution forms, which were rounded, ovoid, and dumb-bell shaped. Gram-negative and Gram-positive forms were both present. A control specimen of filtered normal blood in saline gave no organisms. During this period of forty-eight hours the incubated filtrate was examined twice, and the clusters of indeterminable morphology at the end of this time appeared to have broken up into very minute Gram-negative diplococci, many of them showing flattened opposed surfaces. They refused, however, to stain with dilute fuchsin, and could only be demonstrated by immersion in carbol-fuchsin. After incubation for a further period of forty-eight hours enormous numbers of Gram-negative diplococci of varying size were present in the filtrate, and now stained readily with dilute eosin or fuchsin or neutral red. A subculture on nasgar, inoculated at the beginning of this period of forty-eight hours, gave after incubation a profuse growth of extremely minute greyish colonies, with stippled surfaces and irregular margins. In film preparations minute Gram-negative diplococci were seen in pairs and tetrads mixed with Gram-positive forms of the same small size. In both flattening of the opposed surfaces was well marked. At the end of this period of forty-eight hours fresh subculture from the filtrate was made, the plate showing after forty-eight hours in the incubator a thin bluish haze and large numbers of semi-confluent greyish colonies. Films made from the haze and from the isolated colonies showed Gram-negative diplococci with flattened opposed surfaces, Gram-positive forms being also present. The fresh urine of this case was also filtered, but through a new Chamberland F bougie, the filtrate being enriched by secondary filtration through the same bougie of normal human blood in saline. After incubation for one night films prepared from the filtrate showed minute Gram-negative organisms of indeterminable morphology, rounded Gram-negative diplococci, Gram-negative bacilli, and Gram-positive forms.

We are fully alive to the fact that all bacteriological experiments involving the use of filters must be scrutinized with the greatest care, whether the primary object of experiment is determination of the presence or absence of filter-passing organisms, or of the occurrence of a genuine pleomorphism. And we also recognize that to establish a true relationship between the various organisms (excluding the gonococcus) which present a family likeness to the meningococcus of Weichselbaum, itself no fixed type, is an extremely difficult matter. Finality in attempting to bring into line the various types of organism we have constantly met with in our meningitis work is, in fact, impossible at present. And this particularly applies to the thesis whether a particular type may present both Gram-positive and Gram-negative phases, as appears to be the case with the meningococcus of Jaeger.

Contaminations, in short, in experiments of this nature are a perpetual menace to accurate observation, and it is well to remember that their presence or absence is always easier to assert than to prove. None the less, the consistent employment of a scrupulous technique justifies, we believe, an appeal for independent and searching inquiry. And in the meantime we think we have produced sufficiently good evidence to justify further study, with particular reference to the following points:

- (a) The presence or absence of a filter-passing organism in the body fluids of acute and subacute cases of cerebro-spinal fever.
- (b) Its relationship to the disease.
- (c) Its relationship to the meningococcus of Weichselbaum and to the various types of organism we have isolated from the body fluids, especially when these are incubated before subculture.
- (d) The reciprocal relationship of these latter organisms to each other.

We desire to record our thanks to the following for their generous assistance in our work: Dr. F. Foord Caiger, Dr. W. J. J. Stewart, Dr. T. R. C. Whipham, and Dr. Romanes.

REFERENCE.

¹ BRITISH MEDICAL JOURNAL, March 27th, 1915.

CLINICAL LABORATORY METHODS IN
METABOLIC DISEASES.*

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NOTES ON DUFF HOUSE.

DUFF HOUSE was built by the first Earl of Fife in 1745. The architect was William Adam, and the house is designed in the same style as Wentworth Woodhouse, but in Duff House the wings planned were never built, owing, it is said, to a dispute between the Earl and his architect. The house was the residence of the Fife family until a few years ago, when the late Duke presented it, with its park of 165 acres, to the twin burghs Banff and MacDuff. The municipal authorities of these burghs let the mansion to a syndicate which opened it as a hotel. This hotel was not successful, and in 1913 the building was taken by some gentlemen who were anxious to open in Great Britain an institution for the study and treatment of certain diseases of metabolism on lines similar to those of some well-known Continental sanatoriums.

Duff House is just outside Banff, a town 50 miles from Aberdeen on the Moray Firth.

No systematic weather records except those of rainfall were taken until 1914, when Mr. A. J. Leigh, B.Sc., was appointed Meteorological Observer, but since then daily reports of rainfall and sunshine have been telegraphed to South Kensington. From these reports it would appear that the climate is decidedly good. The sunshine is the highest in Scotland, reaching in the summer as high as 37 per cent. of the possible. The number of hours of bright sunshine recorded in 1914 was 1,400. The rainfall amounted to 27.5 inches in that year, and I can testify to the fact that whilst I was in Banff, during December, 1914, and January, 1915, the weather contrasted very favourably with reports which reached me from other places. It is remarkable that the mean temperature is only 3° F. lower than that of places on the south coast, though Banff is over 600 miles north of them.

The scenery, both river and sea, is interesting, and specially brilliant sunsets were frequent during my visit. The facilities for sport are good. The shooting was excellent, and the fishing on the River Deveron is said to be good. There is an eighteen-hole golf course in the park, the soil of which is sandy, and the course, though not a first-class one, has the merit of drying quickly. Indoor the patients have the use of a full-sized billiard table, and can play card games in the lounge, and one way or another time passes very quickly there.

To the naturalist the district is specially interesting, owing mainly to the variety of bird life. The Scottish naturalist Edwards, whose interesting life was written by Smiles, lived in Banff, and made his wonderful natural history collections in the neighbourhood.

The management was fortunate in obtaining the services of a well-known and experienced chief medical officer, who has gathered round him a very keen and able staff, consisting of chemists, an x-ray specialist, masseurs, matron, and nurses.

The chemical laboratory struck me as very complete, and Mr. Leigh and his assistant, Mr. Sanders, seemed to find plenty of work to do in conducting the analyses required. The chemists have done very useful work in making analyses of many of the foods sold as suitable for diabetes. It is greatly to be hoped that this work will be published for the general information of the profession, as I know that some quite unsuitable articles of diet are often recommended for such cases.

The x-ray department, under the direction of Mr. Marxer, is also well equipped. The work done in this department is mainly screen work on patients who were having bismuth or barium meals, but a great many negatives are taken, and already a most interesting collection of plates has accumulated, showing unexpected and unusual causes of intestinal trouble, and sometimes unwished-for results of gastro-enterostomies and other short-circuiting operations. The diagrams indicating the position of the barium meal become part of the dossier of the patient.

* A paper read at Harrogate Medical Society on March 26th, 1915.

The majority of the patients treated at Duff House are cases of diabetes or obscure gastric and intestinal trouble, with or without intestinal stasis.

Urine is collected in a Winchester quart, fitted with a suitable funnel and glass stopper. The faeces are collected by placing an enamel vessel in the pan of the w.c. When used, a well-fitting lid, with the number of the patient's room, is placed on the vessel, and it is sent to the laboratory.

The urine of diabetics is analysed every day quantitatively, both for sugar and diacetic acid. The method used for sugar estimations is gravimetric. The cuprous oxide is oxidized and weighed as cupric oxide in a Gooch crucible. I published a note in the *BRITISH MEDICAL JOURNAL* of March 7th, giving the result of a comparison with the gravimetric method of fifty estimations made by me by Dr. Parnell's method. The mean difference between the two methods over the series of fifty was only 0.19 per cent. The blood is also examined for sugar at least twice a week. The diet is generally at first quite strict, but when the percentage of sugar in blood and urine has been brought down, weighed quantities of farinaceous foods are added, and the effect on the sugar and diacetic acid in the urine and on the sugar percentage in the blood carefully noted. By these means the diet proper to the individual

objection, I consider, has a good deal in it, and I expected that there would be a great deal of conversation amongst the patients about their health, but this was not the case. I found there was little talk of health or treatment, the reason being that the "chief" is fully alive to the danger, and explains to every patient that it is contrary to the rules of the establishment and the interest of the patient to talk to his fellows about his ailment or the treatment thereof.

2. A second objection is to the situation of Duff House. It is said that it is too far away from the large centres of population and too difficult of access. It is quite likely that these facts tend to limit the number of patients willing to go to it, but I believe the isolation is a decided advantage to those who do go. There is no temptation to break the rules laid down for guidance, and, in point of fact, I was much struck by the loyal obedience to every regulation on the part of my fellow guests and envied Dr. Spriggs his power of seeing that all his instructions were carried out. I am aware that all this care and attention can be and is given in nursing homes in London, but there must be a great many people who would be happier and better at a place like Duff House. The fact that the majority of my fellow-patients had been sent by London physicians of the highest rank confirms me in this opinion.

DUFF HOUSE, BANFF, SCOTLAND.

case is gradually discovered, and experience often shows that one form of starch is better digested than others. The "chief" orders so many calories daily, and decides in what particular form the required number are to be taken. He also decides on the amount of exercise necessary and the time to be occupied in rest and the hours at which the rest is to be taken.

All the food supplied to the patients is weighed, and anything the patient leaves is also weighed and subtracted from the quantity given. All this appears on the report sent to the "chief" daily. A nurse visits the patient twice a day, taking pulse and temperature. This seemed to me to be a little unnecessary in these chronic cases, but it is part of the routine observation. Patients are weighed twice weekly before breakfast.

The treatment at Duff House is mainly dietetic, but in many cases ordinary medicinal treatment is given. Many patients were having massage—a few dry, but the majority were treated by a form of Vichy douche with much more abdominal massage than is given at Harrogate.

The bath installation consists of the Vichy douche, the Plombières douche, the electric cabinet bath, the sitz bath, the effervescent recumbent baths, and others.

I can imagine some objections to such an institution as Duff House.

1. That the amount of time and attention given to the patient might tend to make that patient introspective and be likely to turn him or her into a neurasthenic. This

3. A third objection has been raised to Duff House, and, being an ethical one, I am loth to deal with it, but feel that I am bound to do so, as several medical friends have spoken to me about it. The objection is that the institution is probably financed by laymen. I do not know myself who found the money; but even if the financial managers were entirely composed of laymen, I do not see how it can be helped. Given that such an establishment is desirable, surely it is better to have it financed by laymen than that it should not be founded at all.

Ethical objection might more reasonably be taken if any of the shares were held by practising medical men, but I am assured that no shares are so held. In such an establishment as this I feel sure it is not right that any man having the power to send patients should have a personal interest in the financial welfare of the institution. Also it is to be remembered that the same objection applies to many other recognized institutions, such as some hydropathics, homes for inebriates, sanatoriums for tuberculosis, and asylums other than public, and others. The point, to my mind, is not so much how it was founded as how it is conducted, and on this point I have no doubts. The patients are sent by doctors, and the staff keep in touch with them. A very full report is sent to the medical man or men on the patient's departure, and, contrary to the very bad practice in many Continental spas, the patient is told very little; for instance, he is not supplied with an elaborate analysis of the urine, which is often alarming to

him, because he does not know what is normal and what is not.

An excellent point in the management of Duff House is that all the patients pay the same fee, quite irrespective of the methods of investigation or treatment.

I have brought this subject under your notice because I think it has special points of interest for Harrogate and other health resorts in Great Britain and Ireland, specially now, when so many Continental spas are not available.

For years past I have been endeavouring to get better facilities for *x-ray* investigation here, particularly in the field of abdominal work. Our late manager, Mr. Buckland, agreed to get a suitable installation, as the difficulty was not want of skill on the part of the operator; it was entirely due to inefficiency of the apparatus, and our present manager, Mr. Broome, is quite willing to carry out Mr. Buckland's intentions, and I am now pleased to hear that an *x-ray* specialist is likely to settle amongst us very shortly, and that it will no longer be necessary to send cases to Leeds for the *x-ray* investigation of abdominal conditions. The nursing homes here are quite willing to give the barium meals at a moderate charge, even if the patient does not reside in the home. I also urged on our late manager the importance of having a chemical laboratory here, but nothing came of it, so that we still have the bother and delay of sending specimens of urines in difficult cases away for an authoritative analysis. This is also probably about to be remedied, as the chemists in the town, if assured of medical support, are likely to join together and found a central laboratory under the care of a skilled analyst. Should this be done, arrangements will be made to distribute the Winchester and faeces pans and collect them when filled.

In conclusion, I would like to say that I left Duff House fully convinced of the importance of this pioneer institution, and with the greatest admiration for its methods of investigation. I do not think it practicable to have such a place here, nor do I think it necessary, but I do believe that it is very desirable for us to imitate in some degree the thorough methods of Duff House and the improved *x-ray* facilities, and the chemical laboratory will help us to do so.

An Address

ON

WOUND INFECTIONS;

AND ON

SOME NEW METHODS FOR THE STUDY OF THE
VARIOUS FACTORS WHICH COME INTO CON-
SIDERATION IN THEIR TREATMENT.

DELIVERED BEFORE THE ROYAL SOCIETY OF MEDICINE
ON MARCH 30TH.

By COLONEL SIR A. E. WRIGHT, M.D., F.R.S.,

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(Continued from p. 668.)

We may, with such new knowledge as we have won from the experimental methods I have described, now revert to the consideration of those three methods of combating wound infections which were enumerated earlier in this discourse. It will be remembered that these were: *Treatment by antiseptics, treatment by physiological methods, and vaccine therapy.* We will take them one by one.

TREATMENT BY ANTISEPTICS.

If we were to adopt the Socratic method, and were to inquire of the first man whom we might find engaged in washing out a wound what were the grounds for his confidence in the utility of his procedure, he would probably make some such answer as the following: "I know that the antiseptics which I am bringing into application are agents which directly kill and inhibit the growth of microbes. There is no other agency known which would be competent to do the bactericidal work that these antiseptics do in the wound. And, again, it is everybody's knowledge that Lister, by bringing in his antiseptic

treatment, extirpated those septic infections of wounds, which before the advent of his method devastated the surgical wards of every hospital."

And if we were to push our question further, and to ask of the surgeon what was the particular end and object to which his procedures were directed—whether it was the sterilization of the wound; or the killing off of a large proportion of the microbes; or the imposition of a check upon the survivors; and if we were further to ask, whether the particular antiseptic in the particular strength in which he was employing it could be relied upon to achieve the end in view; we should probably be told that, supposing that the antiseptic did not completely sterilize the wound, it would inevitably kill a large number of microbes; and it would probably also inhibit the growth of any survivors. And, inasmuch as one or other of these objects would be sure to be achieved, there could be no question but that advantage would be accruing to the patient.

We should, in short, get an answer which proceeded upon at least one erroneous premiss, and which betrayed loose and inconsequent thinking, and a reluctance to come to close quarters with the question. But the reasonings of the larger part of humanity are neither better nor worse than this, and it is not for that less necessary to take them into very serious account, and to do our best to correct them when they mislead.

Let us begin, since Lister is the fount and origin of all antiseptic treatment, with what relates to his work. Lister's name is associated with two discoveries. The first of these is the discovery that we can, by an *anticipative prophylactic application*, hold off microbes from surgical wounds, and so avoid wound infections. The second is that in cases of compound fracture where the wound is already infected we can still, by what I may perhaps call a *retrospective prophylactic application of antiseptics*, stave off the wound infection. The first of these is a discovery of absolutely universal application, and it will carry the name of Lister down to remotest posterity. The second discovery has reference only to a particular kind of traumatic wound, and shows that prophylactic applications of antiseptics can be usefully employed also in connexion with some wounds which are already infected.

It is clear that neither of these discoveries finds any direct application either in connexion with prophylaxis or the treatment of the wound infections which occur in projectile wounds.

What it is necessary to say on the possibility of preventing septic infection by sterilizing projectile wounds can be said in a very few words. The principle that microbes can be held off from wounds by an antecedent employment of antiseptics has no application to projectile wounds, for these are infected before they are seen by the surgeon. Nor, again, is the Listerian discovery that prophylactic applications of antiseptics can in the ordinary compound fractures of civil life stave off wound infection a discovery which relates to conditions such as obtain in projectile wounds. Retrospective, or as we may also call them *ex post facto*, prophylactic applications of antiseptics will give good results only when the microbes are accessible. In the case of the ordinary compound fracture of civil life this is the case. For here the microbes lie exposed on the external surface of the bone which has been thrust through the skin. The contrary holds for projectile wounds. Here the microbes are inaccessible. They have been carried down deep into the tissues, and lie on the inner face of a torn and ragged track; and that track is blocked by blood clot and hernia of muscle.

It is clear that the utmost that prophylactic applications of an antiseptic could under such conditions achieve would be an incomplete sterilization. And an incomplete sterilization would leave us with a wound infection, and in a few days with as bad an infection as before. Coming now to actually subsisting wound infections, we see that exactly the same thing would apply. We are not entitled to infer from the fact that the method of Lister is within its limitations an effective method of prophylaxis that it is also an effective method of treatment. That is clearly a question which must be determined as an independent issue.

When we approach the question in this way we see that the first point which has to be determined is: What particular concentration of each particular antiseptic will,