THE DIAGNOSIS OF TYPHOID FEVER IN INOCULATED SUBJECTS.

By GEORGE D. DAWSON, M.D., D.P.H. MANCH.,
UNIVERSITY OF MANCHESTER.

(A preliminary account of a research carried out, under the direction of Professor Delépine, at the Public Health Laboratory, Manchester University. The expenses in connexion with this research were defrayed by a grant made by the Medical Research Committee.)

SOME observations made whilst working with a certain strain of the *Bacillus enteritidis* (7160)* suggested that this bacillus might be of use in the diagnosis of typhoid fever in inoculated persons. In such cases the usual Widal test affords little or no help to a rapid diagnosis.

During the period January to June, 1915, quantitative agglutination tests, more than 1,000 in all, were made with the *B. enteritidis* 7160 and with the *B. typhosus* with blood obtained from the following classes of persons:

CLASS 1.—Persons who had been inoculated with typhoid "vaccine," and who, as far as could be ascertained, were not suffering and had not suffered from any illness resembling typhoid fever—50 cases. In none did the blood give a positive reaction with the *B. enteritidis* 7160. The blood of nearly all these cases caused agglutination of a typical *B. typhosus*; the reaction was very marked in most cases. In a small percentage the result of the test was negative.

CLASS 2.—Persons who had not been inoculated with a typhoid "vaccine," and who were suffering from typhoid fever—50 cases. The blood of all these persons caused agglutination of a typical *B. typhosus*. In 44 a positive result with the *B. enteritidis* 7160 was obtained at the first test. In 6 a negative reaction with this bacillus was found on a first examination, but on testing a second sample of blood in 5 of these 6 cases, each gave a positive reaction. From the sixth case a second specimen of blood has not yet been obtained.

These results showed beyond doubt that active typhoid infection confers on the blood a power of clumping the *B. enteritidis* 7160, which is not produced by injection of dead typhoid bacilli. They afforded strong presumptive evidence that an inoculated patient whose blood gives a positive reaction with the *B. enteritidis* 7160 is infected with the *B. typhosus* or a near ally.

CLASS 3.—To test these conclusions, 14 cases of suspected typhoid fever in inoculated men were investigated. Each case gave a positive Widal reaction. In 7 the clinical evidence decidedly favoured a diagnosis of typhoid fever, and in each case the blood was found to give a positive reaction with the *B. enteritidis* 7160. From 4 of these cases the *B. typhosus* was isolated, in 3 from the stools, and in 1 from the blood. From none of these cases was the *B. enteritidis* or a *B. paratyphosus* isolated. The other 7 cases, clinically, were much more doubtful. In none was a positive reaction with the *B. enteritidis* obtained. Careful bacteriological examinations of the blood and excreta failed to discover the *B. typhosus*, the *B. paratyphosus*, or the *B. enteritidis*.

CONCLUSIONS.

1. A positive reaction with the *B. enteritidis* 7160 is due to something more than previous antityphoid inoculation, and hesitation in diagnosing typhoid (or paratyphoid) infection should be occasioned only by the necessity of excluding infection with the *B. enteritidis* itself. The symptoms associated with *B. enteritidis* infection are, however, generally clear enough to make the distinction easy.

2. A single negative test with the *B. enteritidis* 7160 does not exclude a diagnosis of typhoid fever, though, if obtained late in the course of an illness, it would constitute good evidence against typhoid infection. Repeated negative tests are much more conclusive, and should be of value in deciding the nature of doubtful cases. The time required, however, is a hindrance to rapid diagnosis, which is absent in the case of a positive reaction.

A full account of this research is in course of preparation, and will be published later.

* A bacillus recently isolated by Professor Delépine from the spleen in a fatal case of food poisoning.

CHEAP ABSORBENT DRESSINGS FOR THE WOUNDED.

By CHARLES W. CATHCART, F.R.C.S.,
SENIOR SURGEON, ROYAL INFIRMARY, EDINBURGH.

1. Pinewood Sawdust.

IN the BRITISH MEDICAL JOURNAL for October 17th, 1914, I published a short note on the value of pinewood sawdust as a cheap material from which very efficient absorbent dressings for surgical work can be easily made. In the following number of the JOURNAL favourable opinions of this material were expressed by Professor Rushton Parker and by Mr. F. D. Bennett, and on May 26th of this year an instructive paper on "Pinewood Sawdust as a Surgical Dressing," by Professor Rushton Parker, was published in the *Clinical Journal*. To these recent papers and letters your readers may be referred for information as to the value of pinewood sawdust.

My present reference to the subject will be limited to an indication of some recent improvements in the method of preparation.

Instead of a fairly open muslin we now use one with a close mesh, which has 70 by 50 threads to the square inch. This retains the finer particles of wood in the bags and renders the use of a No. 40 sieve unnecessary. It costs 2½d. a yard of 40 in. wide. A No. 8 riddle or sieve is used as before to exclude the larger fragments of wood, and all that passes through it is employed for the dressings.

The bags are now made of three sizes—namely, 12 by 8 in., 10 by 6 in., and 7 by 5 in. The same sizes are used for the other two materials recommended in this paper. The method of tearing the muslin and sewing the bags is described in one of the leaflets to be afterwards referred to.

Besides sawdust, however, there are two other substances—both also home products—which are better absorbents than cotton-wool, and are available under present circumstances at a very low cost. These are *fresh sphagnum moss*, and moss becoming peat, which for short we may call *peat moss* or *moss peat*.

2. Sphagnum Moss.

The following particulars are taken from an article contributed to the *Scotsman* on November 17th, 1914, by Professor I. Bayley Balfour and the present writer:

Bog moss or sphagnum is the only moss which in nature has a far-reaching influence upon the surface of the earth as a soil-forming agent, and it is the only moss which has proved itself as yet to be of economic value to civilized nations. Its formative influence and its economic value respectively depend upon the peculiar construction of the plant. Its smooth stem is densely beset with leaves, and emits a branch at every fourth leaf; often these branches are turned downwards, and apply themselves more or less closely to the stem. At the periphery of the stem are one or more layers of fine colourless chambers, known as capillary cells, whose thin walls have big perforations, and are strengthened against collapse by a thickening band running spirally or in rings around the inside. The leaf is formed of a single layer of chambers or cells. Some of them, narrow and green, form a network of feeding cells, in the meshes of which are larger, broader, colourless cells, perforated and thickened after the fashion of those of the peripheral layers of the stem. The whole construction results in a system of delicate capillary tubes, having the effect of a very fine sponge. The perforated cells readily take in water and hold it firmly. The water can be squeezed out of them but they do not collapse, and are ready to take in water again.

In life the plant takes all its water from the atmosphere. It is not dependent on soil water, and from top to bottom is laden with the water retained in its delicate chambers. By its mode of branching the plant forms compact cushions. These have a bulging centre, and as the older parts die off below and pass into the condition of peat, the tops constantly and vigorously elongate and branch so long as the precipitation of moisture from the atmosphere suffices. While the older cushions are thus growing new cushions are being formed by lateral extension, and thus there is formed what is known as "High Moor." By gradual extension at the periphery the

plant may in time cover miles of country, spreading over, and in the end exterminating, adjacent vegetation, even forest. On all our mountains and moors sphagnum is found in patches of varying extent, small or large.

The presence of these capillary cells makes sphagnum economically useful. Horticulturists have long made use of it as an agent for holding moisture around such plants as orchids; moreover, by chopping it and mixing it with soil in pots, they secure that moisture does not pass too quickly through the soil. In recent years the upper layers of the sphagnum deposit have come largely into use for stable litter instead of straw on account of its great power of absorbing and retaining fluids. There is, however, a further economic use which has been found for it—the importance of which at this critical time cannot be over-estimated—that of a substitute for cotton-wool in the dressing of wounds. For this purpose its resilient perforated cells fit it admirably, and, indeed, suggest its superiority to cotton-wool in absorptive capacity. We owe the introduction of sphagnum moss as a surgical dressing to Germany, where it has been established for this purpose for many years. *L'as est et ab hoste doceri.* In the early eighties of last century a workman at one of the outlying peat moors in North Germany accidentally sustained a severe lacerated wound of the forearm. In the absence of anything better to apply to the wound, his fellow-workmen wrapped it up with fragments of peat which were lying near, and after an interval of ten days he arrived at the surgical clinic at Kiel with the original dressing undisturbed. It was feared that the wound when exposed to view would be found in a very unsatisfactory state, but, on the contrary, when the peat dressing was removed the wound was found to have healed in a most satisfactory manner. The unexpectedly good result obtained with a dressing material which at first sight seemed so unpromising led to a careful inquiry into its nature and properties. An investigation was made from the physical, chemical, and bacteriological points of view of the growing plant on the surface of the moor, downwards through its various stages of decay to the brown amorphous deposits of fully-formed peat at a varying distance below. The practical outcome of this inquiry was that the value of sphagnum moss as a surgical dressing was found to be due to its marvellous power of absorbing fluids. The growing plant, collected and dried, has this power at its maximum, but the light brown layers of semi-decayed moss which lie above the peat proper retain great absorptive powers, and constitute the valuable material known as “moss litter.” It was probably from this layer that the extemporized dressing already referred to was taken. After its value had been discovered, many papers dealing with sphagnum moss as a surgical dressing were published in German surgical journals by Neuber¹ and others. Before long “moos” (that is, sphagnum moss) came to be accepted as the standard material for surgical dressings and other similar requirements in medical practice in some of the largest German hospitals and in private practice. Thirty years' experience has not lessened the favourable opinion at first formed of it in Germany, but we have been slow in this country to recognize its value. British surgeons use mostly the prepared product known as “absorbent cotton-wool.” It is much less efficient than sphagnum moss, and is considerably dearer than moss would be if we used the moss which grows plentifully in our own country instead of importing it prepared from abroad. The methods of preparation employed are not designed to improve the absorbent powers of sphagnum moss; they could not do that. They only furnish the surgeon with the moss in more compact and more conveniently handled forms. For practical purposes, however, sphagnum moss, which can be gathered on our moors and damp places, can be utilized without any preparation worthy of the name in a technical sense. The growing plant and its underlying layers of withered stems and leaves should be collected, picked free of other plants, and dried. It has afterwards only to be lightly packed in bags of “butter muslin,” which are then sewn up and handed to the surgeon, to sterilize and place on the wound. Such pads are soft, elastic, and very comfortable for the patient. They are easily packed, convenient to handle, and extraordinarily absorbent.

No doubt many proprietors in districts where moss grows plentifully would allow school children, Boy Scouts, and others to collect the moss, and members of the Red Cross Society with time to spare might be found willing to carry out the simple preparation which

the surgeon requires. An organization for the purpose would have to be formed, but this should present no great difficulty.

It would be well if moss destined to be sent by train to any centre or centres were dried in the district in which it was collected, as by far the greater part of the weight of the fresh plant is due to the water it contains. This will be evident from the following simple experiment recently performed in the Royal Infirmary: 5 lb. of the fresh moss were weighed out, then pressed, and slowly dried by heat. It was found that the dried plant, which had retained 4 lb. 6 oz. weight of water, itself only weighed 10 oz.

Until the British firms can put on the market the moss from our own moors at a moderate price, much may be done by voluntary workers to make use of this at present neglected but most valuable surgical dressing for our wounded men.

Since this article was written several letters on the subject, from the Marquess of Breadalbane and others, have appeared in the *Scotsman* and other Scottish newspapers, and the moss is being collected and sent into the War Dressings Supply, Edinburgh, by voluntary workers from all parts of the country. The same might, no doubt, be done in many parts of England, Wales, and Ireland.

As an inducement—if such be required—to proprietors to allow this moss to be collected and removed from the moors it may be mentioned that sphagnum moss harbours the beetle which is responsible for grouse disease. This was pointed out recently in the *Scotsman* (June 19th):

For this well-known plant an unusual demand has recently sprung up in hospitals, as it is believed to be an excellent substitute for cotton-wool for dressing purposes. In numerous parts of the Highlands it is being gathered by many willing hands and forwarded to the receiving depôts. . . . Proprietors and shooting tenants would hail with pleasure the total extirpation of this moss. It is within its narrow, simple leaves that the destructive heather beetle lays its clutch of eggs. A widely acknowledged authority on the economy of moors—Mr. Percy H. Grimshaw—has given it as his definite opinion that practically all cases of diseased heather are due to the ravages of this insect. A somewhat similar statement was made in the report of the Grouse Committee issued seven or eight years ago. Owing to its perennial dampness, it is difficult or impossible to destroy sphagnum by burning, and the picking of it by hand will operate potently to the benefit of game preserving.

Peat Moss.

This name has been given to the semi-decayed sphagnum moss which forms the upper layers of certain deposits of peat. Other deposits have been formed from heather. As a material for surgical dressings the less decayed and therefore more fibrous upper layers are preferable. These are selected at Messrs. Richardson's “moss litter” works by the instructions of Mr. Richardson, who has kindly interested himself in this matter. The selected “bricks” after being torn up by machinery are compressed into bales and sent out like those of ordinary moss litter. After the removal of the binding wires the bales are easily broken down into a loose material which can be further reduced by rubbing between the hands. In this process a good deal of fine dust is produced, but, like the fine wood dust, it is retained by the close mesh of the muslin employed for the bags and is a valuable absorbent. These peat moss dressings are extremely absorbent and very light.

As absorbents all three of the above-mentioned materials—sawdust, dried sphagnum moss, and peat moss—are superior to cotton-wool in one important particular: they diffuse the discharges in the bags and retain them much better. While a mass of absorbent cotton-wool laid over a freely discharging wound will allow the discharge to pass through to the bedclothes before the greater part of the cotton-wool has been used, bags of these materials suck up the discharges and become filled with them. They are all very valuable also where there is an outflow of urine.

As regards price, the chief expense is the muslin for the bags. Sawdust and peat cost a fraction of a penny per pound. Voluntary workers in the country collect and dry the moss, and in most cases send it to the War Dressings Supply Organization in Edinburgh carriage paid. What the price would be were all the workers paid is another matter, but in present circumstances the cost is very little.

The following appreciation of the value of pinewood

sawdust as a dressing for septic wounds is very valuable. It is the translation of a letter from Dr. Stauffer, Médecin en Chef, Hôpital Dumerloque, Dinard, to Mrs. Bromley-Davenport, of the War Hospital Supply Dépôt at Hove. She has kindly given me permission to publish it:

Madame,—Miss du C—gave me, from you, a few days ago, some bags of pine sawdust to try as a wound dressing. I have used the bags in my treatment for ten days. I found them very satisfactory, and it is with pleasure I communicate to you the result.

1. From the point of view of absorption the bags are more advantageous than the best cotton, one bag alone of 45 grams takes the place of 250 of cotton. The absorption takes place equally slowly, and, thanks to the larger pores of the sawdust, the infiltration is much more general in the case of the bags than it is in that of the cotton-wool. The bag never gets wetted right through in one place alone before the whole of the sawdust has become absorbed. The opposite takes place in a wound dressing of cotton. One spot is wetted through quickly, and spoils the bandages, the body linen, and the sheets, whilst the surrounding dressing remains dry.

2. Its power of deodorization is very strong. The smell of the pine is so penetrating that it covers nearly always that of the wounds; and the bandages become impregnated with this smell, and can therefore be used again, which, for a military hospital, means a considerable economy in bandages.

3. From the two preceding considerations there necessarily follows a very appreciable economy in bed linen.

I shall be pleased and infinitely grateful if, Madame, you would send me a considerable quantity.

Conclusions.

To sum up, there are several advantages in using absorbent dressings made of the materials mentioned: they are thoroughly satisfactory as dressings, are very cheap, and can be prepared by voluntary workers without technical training. None of them is injured by sterilizing.

The War Dressings Supply Organization in Edinburgh prepares all three forms of dressing, and sends them out to hospitals for the wounded, where necessary, free of charge, in other cases at a minimum cost to cover working expenses.

As some of the leaflets drawn up to help workers to collect sphagnum moss and to prepare the dressings from it as well as from sawdust and peat may be useful to others wishing to organize similar work, I shall be glad to see that they are supplied if requests are addressed to me at the Royal Infirmary, Edinburgh.

REFERENCE.

¹ Erfahrungen über Iodoform und Torf-Verbande, *Arch. f. Klin. Chir.*, Bd. 27, 1882, S. 757.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

WOUND DRESSING.

I HAVE found the following method useful in the treatment of many of the wounded arriving from the front:

Take an ordinary patty tin and punch a hole about the size of a shilling through the middle. These tins may be bought, of various sizes, at a cost of 2d. or 3d. a dozen. They are saucer-shaped, with rolled-over edges. Place the patty tin over the wound, resting by its rounded border on the healthy skin beyond the wound; fix it to the skin by one or two narrow pieces of rubber strapping, and cover it with sufficient antiseptic gauze and wool (or oakum) to absorb any escaping discharges, and apply a bandage over all in the usual way. The patty tin should be bent, if the part be rounded, to fit comfortably. This is easily effected by hand.

The advantages of this method of treatment are many:

1. There is no pressure on the wound, as the dome of the tin stands half an inch above it. Any drainage tube projecting from the wound is likewise shielded from pressure.

2. If there be much discharge, it can easily escape into the hollow of the tin, instead of being blocked in the wound by the dressings.

3. When a dressing is changed there is nothing adhering to the wound, since nothing touches it. There is consequently no bleeding or pain and no damage to granulation tissue or young skin when the dressing is removed.

4. The patty tins may be boiled and used over and over again, thus making for economy.

5. The state of the wound can be judged by looking through the hole in the tin, which may often be left an extra day in position.

6. Should a wet dressing be desired, an unperforated tin may be used to cover it, instead of oilsilk.

Exeter.

D. W. SAMWAYS, M.D., D.Sc., M.R.C.P.

ECLAMPSIA OF PREGNANCY.

I was recently called in by a colleague to see a woman suffering from acute eclampsia in the seventh month of her eighth pregnancy. She was unconscious, and fits were occurring every few minutes; the tongue protruded for about 4 inches from the mouth; the urine was loaded with albumin, and there was no sign of commencing labour.

Injections of morphine had proved unavailing. Hyoscine and morphine was injected, and the patient was put under chloroform and a lumbar puncture made till the canal was drained; it was under pressure (120 drops to the minute). She was next bled to 1 pint, and was then given 2 pints of Rogers's hypertonic solution intravenously. Two phials of pituitary extract were afterwards injected. The tongue was well slit from tip to base at each side.

After six hours I found her sitting up in bed, quite sensible. There had been no further fits, and large quantities of urine had been excreted. I then gave 40 grains of calcium chloride, and injected two more phials of pituitary extract, and twelve hours later spontaneous delivery occurred without any one being present. The child was dead. There have been no unpleasant symptoms since, but her urine still contains some albumin.

Nairobi.

R. W. BURKITT, F.R.C.S. Irel.

British Medical Association.

CLINICAL AND SCIENTIFIC PROCEEDINGS.

DORSET AND WEST HANTS BRANCH.

At a meeting held at Sherborne on July 7th, Dr. C. D. MUSPRATT, President, in the chair, Dr. UNWIN of Yeovil read a paper on *The thyroid gland*, which dealt with the development, anatomy, physiology of and pathological changes in, the gland. Under the latter heading was given a description of Graves's disease, which was looked upon as a disease arising from a derangement of the perfect balance normally existing between the actions of all the internal secretory organs, more especially the thyroid, suprarenals, and pituitary gland, the cause of the derangement being, more often than not, a sexual one. An allied condition, though not true Graves's disease, occurred in young married women after the birth of the first child, and the underlying cause here was certainly a sexual one. This condition was characterized by a loss of flesh and colour, and a placid nature became an easily worried one. These women always felt better when pregnant. Cases coming under the heading of thyroid inadequacy were next dealt with, and lastly the treatment of the various conditions was described and illustrated by the treatment of actual cases. The paper was discussed by the PRESIDENT, Dr. EDWARDS, Dr. MIDELTON, Dr. HAYLOCK, and Dr. SIMMONS. Dr. WHITTINGDALE showed a case of *Complete ophthalmoplegia* in a woman, aged 68. She was married, and had one child; there had been no miscarriages; no history of syphilis. She first noticed drooping of the left eyelid about Easter, 1915, and at the same time had pains behind the left ear running up to the vertex, sickness and slight vertigo occasionally. Later complete ptosis supervened, with a fixed pupil and loss of all power of movement in the eye. The other eye and both discs were normal. The knee-jerks were not very active. She had been taking antispasmodic remedies, but without any benefit except to the headaches. Dr. MCCARTHY showed a case of *Dermatitis* of six months' standing in a healthy domestic servant, 22 years old, immediately following a severe scald of the foot. The affection was symmetrical in character, covering the face and neck, and in the former situation having the distribution of lupus erythematosus. The general opinion expressed was that it was an artificial eruption, the agent employed being probably lysol.