brilliant green. By so doing we more frequently get pure cultures of the organisms of the group, and where they are not present we much more often succeed in obtaining sterile plates. Stokes and Clarke adopt pretty much the same technique. If we put the faeces direct into brilliant green peptone water it is exceptional to get pure cultures or negative plates. Frequently the medium is decolorized, and when it is decolorized we may be sure that colon bacilli are present in abundance. On the other hand, by the modification I have adopted decolorization of the medium is very uncommon; indeed, it is practically impossible to tell whether there is growth or not in brilliant green until after we have plated out.

When likely colonies are obtained, the same routine is adopted as in the case of the direct plates. They are transferred to lactose peptone water. If after forty-eight hours no fermentation results, the organism is tested on glucose, mannite, dulcitol, maltose and broth, and then submitted to the final test of agglutination by specific serums. The direct plates were examined by the whole laboratory staff—five in all—whereas the indirect method was carried on throughout by myself. That alone indicates the saving of work of which the method is capable.

Results of the Examination of 1,023 Specimens.

Result.	No. of Cases with Likely Colonies.	Lactose Fermenters.	Carried to other Sugars.	Necessary Agglutination Tests.	Actual Positives.
By direct plating	373	59	314	161	17
By brilliant green and telluric acid	120	39	81	45	21

In no single case did we obtain pure growths by direct plating; they were always mixed. By the brilliant green method there were pure growths of colourless colonies in 62 cases. In no single case by direct plating was the plate sterile, whereas 50 per cent. of plates by the indirect method showed no growth whatever. This means an enormous saving of time. When the growth on the indirect plate was mixed, the colourless colonies generally preponderated, and in all cases were easily detected. By the direct method the final test of agglutination had to be done on 161 cases, with a positive result, so far as typhoid-paratyphoid bacilli were concerned, in 17 cases, while, on the other hand, only 45 cases had to be carried to agglutination, with positive results in 21, in the case of the indirect method. By the direct method 6 cases of dysentery organisms were found in addition to these, whereas only one was discovered by the brilliant green method, for dysentery bacilli are apt to be killed off by brilliant green.

On referring to the specimen index we found that the 1,023 specimens were provided by 622 individuals. There were two cases of typhoid carriers in the lot. Typhoid bacilli were picked out on all of five occasions by the brilliant green method, and on four occasions by the direct plate. Paratyphoid A bacillus was picked out on the single occasion by both methods. Paratyphoid B bacilli were isolated on fifteen occasions by brilliant green and on twelve occasions by the direct plate; but this only gives one side of the picture, for it happened that no less than five paratyphoid B carriers were detected by brilliant green which were altogether missed by the direct method, whilst, on the other hand, two carriers were found by the latter method and missed by the former.

For the isolation of typhoid-paratyphoid organisms from urine I tried a slight modification of the method in 1,100 specimens. Equal quantities of urine and brilliant green peptone water (the dye being in a concentration of 1 in 100,000 in the latter) were mixed and incubated for twenty-four hours, and a loopful from each was spread on MacConkey plates. In only one case was an organism of the group isolated—a paratyphoid A. In almost all other cases the plates were sterile. The test was of no great value because it was uncontrolled, and no care had been taken to ensure the proper reaction of the composite medium. But I am enabled by the courtesy of my colleague, Dr. T. H. C. Benians, to give a short but striking experiment in favour of the value of the method. He took the urine of a carrier in which *B. paratyphosus* A and *B. coli* could be demonstrated by straight plates, and added portions of this urine to fifteen other urines in the

proportion of 1 to 10. To a parallel series he added brilliant green in a concentration of 1 in 250,000. After twenty-four hours' incubation plates were spread, with the result that by the direct method in only one case was the paratyphoid organism recovered, though *B. coli* were found in abundance on all plates, whilst by the interposition of brilliant green he found the paratyphoid organisms in nine cases in practically pure culture.

The method of Browning, Gilmour, and Mackie is therefore a useful method in detecting a number of carriers of typhoid-paratyphoid that are liable to be overlooked by the ordinary procedure. Both methods should be done together as a check on each other. Owing to the saving of time, if one method alone has to be used it should be the brilliant green.

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THE LOCAL TREATMENT OF BURNS ON A NAVAL HOSPITAL SHIP.

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THESE remarks refer to cases which have been under my care while afloat. They numbered 28, and were received (a) immediately after the *Natal* explosion, and (b) about forty-eight hours after the recent Jutland naval battle. The first application to the burn in every case was the Service picric acid dressing.

Out of the 28 cases, 15 were aseptic, and all these recovered. The remaining 13 cases were septic to a greater or lesser degree, and 5 of them succumbed, but one of these had other serious injuries. Four of the cases from H.M.S. *Natal* were virulently septic, and the two fatal cases developed erysipelas. I attributed this acute sepsis to the patients' immersion in water containing oil and sewage which had escaped from the sinking ship.

PLAN OF TREATMENT.

The treatment employed in my wards was as follows:

1. The blisters were punctured and the contents drained under strict antiseptic precautions, the surface being first sponged with carbolic acid solution, 1 in 20.
2. If it was a recent burn (for example, cases from H.M.S. *Natal*), I applied the Service picric acid dressing as the first dressing.
3. I smelt the dressings at my morning and evening duty rounds. Early sepsis in burns has an unmistakable odour, and the sense of smell can detect it early.
4. If there was no smell the first dressing was left on for two days, when it was removed in order to puncture any further blisters which might have formed. An ointment was applied, made of equal parts of boric ointment and vaseline. This was plentifully spread on strips of white "surgeons' lint," and was changed once daily. It is a good dressing, which does not tend to adhere, and so is not a painful procedure.
5. If the dressing had the septic smell the infected part was fomented with boric fomentations every four hours. The fomentation was four-ply, and the covering jaconet projected for $\frac{1}{2}$ in. beyond the margins of the focus in order to keep in the moisture. When the area cleared up—that is, when all sloughs, etc., had separated and a clean surface was left—the above-mentioned ointment was similarly applied once a day, according to the amount of pus which had been secreted from the raw surface.
6. If the burn was aseptic the loose skin of the blisters was not removed, but was left to act as a protection to the exposed deeper and painful layer of the skin.
7. If the burn was septic all loose skin was cut away; under these conditions the skin harbours harmful toxins which are readily absorbed to the detriment of the patient.

8. The dressing next to the skin was covered by alembroth wool, which contains a small amount of antiseptic (mercury perchloride), sufficient to prevent multiplication of any organism the wound discharges. The whole dressing was fixed by a bandage loosely applied.

9. Face masks were not used except when a fomentation was required. With face burns the nose, cheeks, and lips were frequently smeared with the ointment, which was gently massaged in with the convex surface of a teaspoon.

As prevention is much easier than cure, the greatest possible care was taken to prevent any infection of the burn wound, and the precautions particularly applied to a wound which was already septic. The vitality of such a patient is low, and his vitality is still further reduced by the continued absorption of the toxins formed by the septic bacteria. The exposed deep layers of the skin absorb toxins with avidity; until the septic sloughs have separated, and the infected area is quite clean, this absorption continues to occur, thereby seriously exhausting the patient's strength. If sepsis was present every effort was made to eliminate it as quickly as possible. If the patient can be kept going until this has occurred, he will most probably ultimately recover. If a further infection is added by any act of surgical uncleanness on the part of the surgeon, nursing sister, or sick berth steward, this in a large number of cases proves to be the last straw. The patient may succumb before the separation of the slough from the living tissue (that is, the elimination of the sepsis) can be effected. Therefore to neglect antiseptic precautions in the treatment of a burn is akin to soundly kicking a man who is down on his luck.

To prevent infection sterile india-rubber operation gloves were used for dressing the burns, and were changed for each case. Further, a bowl of 1 in 20 solution of carbolic acid was kept on the dressing bogey, and the gloved hands were constantly sluiced in this. No burn was ever exposed until the area had been isolated by towels wrung out in carbolic acid, 1 in 20 solution; these lay on a sheet of jaconet the same size as a towel. After finishing a dressing, the towels were folded up and used for the next case. The same towels sufficed for a large number of dressings. All blisters were opened and drained, under such antiseptic precautions. The person who applied a fomentation had first thoroughly washed his hands before doing this.

If I were suddenly inundated with a large number of burn cases I would provide, if possible, all persons who were to dress the wounds with smooth india-rubber gloves. Should circumstances prevent changing of the gloves between cases, the gloved hands would be constantly rinsed in carbolic acid, 1 in 20 solution. For practical purposes any organisms would be thus removed from the smooth surfaced glove.

REMARKS.

This small series well illustrates the fact that burns up to the third degree will heal immediately, provided they are protected from the air by a mild antiseptic dressing. This can take the form of (a) lint soaked in picric acid, (b) dry boracic lint with boracic powder, or (c) ointment either smeared on directly or spread on lint.

As a first covering for a recent burn the Service picric acid dressing is excellent, and can be quickly applied. When this dressing is removed in an aseptic case the skin presents a dry yellow crinkled surface, all loose skin being curled up.

Having once removed the picric acid dressing I never repeat it. My reasons are: (a) That a burn after the first forty-eight hours is more comfortable with an ointment dressing, and that the wound heals quicker; (b) the burnt area should be examined in order to empty any further blisters which have formed. To neglect the latter may mean that the coagulated serum becomes organized by vessels from the deeper layers of the skin, a most undesirable thing to happen.

The reason for using an ointment of equal parts of boric ointment and vaseline is that it gives a mild antiseptic ointment of excellent consistence for the purpose. Boric ointment by itself is too firm and lies on the skin in the form of uncomfortable hard flakes. Vaseline by itself melts too freely at the body temperature and becomes disseminated in the lint upon which it is spread.

Any dressing which adheres to the raw area is not a good one, as it is uncomfortable for the patient, and there is bleeding on its removal. A boracic fomentation is

comfortable and is an excellent method of quickly cleaning up a septic burn. The fomentation should be renewed every four hours.

I did not use face masks excepting when fomentations to the face were required. I find a patient dislikes a mask intensely, and covering up his face has a depressing effect on him. More important still, with a face mask on it is impossible to treat efficiently the purulent conjunctivitis which was so frequent an occurrence in burns of the face; the eyes required irrigating at least every two hours.

The great value of the protection afforded by clothing was illustrated by the fact that in 22 out of 28 cases the head (including its junction with the neck and also the face), wrists, and hands were burnt. A mask should protect the face, while gloves should protect the hands. The gloves should have gauntlets, as two or three of my patients burnt on the arms were wearing coats at the time, and the flames had travelled up the sleeves.

The bandaging of the patients' limbs is a most important point. In the excitement of the battle it is easily forgotten that there is a great deal of oedema and swelling after burns. A bandage, even loosely applied, will soon become uncomfortably tight. This causes intense agony, and if left on too long will result in gangrene of the limb. Immediately the cases arrived in my wards (on June 2nd, 1916) I had all the bandages of the burn cases cut and left loose as they were until I was able to dress them. This gave great ease.

DESCRIPTION OF A FIRST DRESSING FOR BURNS.

I have thought out the question of a combined outer dressing with its fixation, and have made (and tried) one

FIG. 1.—Showing the dressing laid out ready for use with an arm *in situ*.

which I will describe. It is simple, efficient, and comfortable. It can be quickly applied and changed. Most important of all, it does away with the real danger of gangrene, where the first dressing has from necessity to be left on for any length of time. It would be best made

FIG. 2.—The portion marked A has been turned back to cover the limb; the side portions, marked B, overlap A and are secured in this position by tapes.

of an antiseptic wool (corrosive wood wool or alembroth) with a layer of gauze on either side after the manner of Gamgee tissue. If, after its application, the patient complained of pain due to tightness, any one near could loosen the offending tape—an easy matter compared with the finding of the actual point of constriction of a too tight roller bandage. It might prove a convenience to have this dressing packed up to contain a Service picric acid dressing. In case of necessity the whole would be ready for instant use.

The centre portion of the dressing upon which the arm rests should be made of thicker wool than the flaps A and B. (See Fig. 1.)

Fig. 1 shows the dressing laid out ready for use with an arm *in situ*.

The portion marked A is turned back to cover the limb. The portions marked B overlap A, and are secured in this position with tapes.

Fig. 2 shows the flap A turned back.

Fig. 3 shows the dressing fixed by the tapes. It will be noted that the tapes cover a wide area and are sewn on far back in order to fix the whole bandage.

FIG. 3.—Showing the dressing made secure. Note the distribution of the fastening tapes.

When finger cases were dressed care was taken to move the various joints passively before reapplying the dressing. Joints tend to get very stiff under overlying burns, and dangerously so if left unmoved for any length of time.

FIG. 4.—The dressing complete.

The patient holds his burnt hands and wrists in a position of flexion of the wrist with extension of the fingers. Any tendency to wrist-drop was countered by the application of a light splint (for example, poroplastic) to the palmar surface of the limb.

Only the treatment that was actually employed in the series has been detailed.

For ordinary septic wounds, particularly where there is a cavity, I consider that eusol solution is deservedly popular; for septic burns, however, I prefer the hot boracic fomentations.

Lists of the cases treated in my wards are attached.

I am indebted to Surgeon Glover for the photographs from which the drawings have been made.

Burns up to the Third Degree.

No.	Situation of the Burns.	Degree of Burns.	Aseptic or Septic.	Result.
1	Head, wrists, hands	1st, 2nd, 3rd	Aseptic	Quickly healed.
2	Head, neck, wrists, hands	1st, 2nd, 3rd	"	" "
3	Face	1st, 2nd, 3rd	"	" "
4	Head, wrists, hands	1st, 2nd, 3rd	"	" "
5	Head, chest, wrists, hands	1st, 2nd, 3rd	"	" "
6	Head, wrists, hands	1st, 2nd, 3rd	"	" "
7	Face	1st, 2nd, 3rd	"	" "
8	Head, hand...	1st, 2nd, 3rd	"	" "
9	Head, wrists, hands	1st, 2nd, 3rd	"	" "
10	Wrists	1st, 2nd, 3rd	"	" "
11	Wrists	1st, 2nd, 3rd	Septic	Healing delayed, but did well.
12	Head, arms, hands	1st, 2nd, 3rd	Aseptic	Quickly healed.
13	Head	1st, 2nd, 3rd	"	" "
14	Head, hands, thighs	1st, 2nd, 3rd	Septic	Healing delayed, but did well.

Burns up to the Fourth Degree.

No.	Situation of the Burns.	Degree of Burns.	Aseptic or Septic.	Result.
15	Head, wrists, hands, leg	1st, 2nd, 3rd, 4th	Aseptic	Did well.
16	Face	1st, 2nd, 3rd, 4th	"	"
17	Head, hands ...	1st, 2nd, 3rd, 4th	"	"
18	Head, wrists, hands	1st, 2nd, 3rd, 4th	Septic	Healing delayed, would do well.
19	Head, wrists, hands	1st, 2nd, 3rd, 4th	"	Healing delayed, would do well.
20	Head, arms, hands	1st, 2nd, 3rd, 4th	"	Healing delayed, would do well.
21	Head, wrists, hands	1st, 2nd, 3rd, 4th	"	Very ill when discharged, but he ultimately did well.
22	Head, wrists, hands	1st, 2nd, 3rd, 4th	"	Healing delayed, would do well.
23	Head, wrists, hands	1st, 2nd, 3rd, 4th	"	Healing delayed, would do well.
24	Head, wrists, hands	1st, 2nd, 3rd, 4th	"	Died 4 days after action. Had other injuries.
25	Head, arms, hands	1st, 2nd, 3rd, 4th	"	Died 4 days after action from acute sepsis.
26	Head, arms, hands	1st, 2nd, 3rd, 4th	"	Died 7 days after action from acute sepsis.
27	Head, arms, legs ...	1st, 2nd, 3rd, 4th	"	Died 11 days later from acute sepsis with erysipelas.
28	Head, arms, hands	1st, 2nd, 3rd, 4th	"	Died 5 days later from acute sepsis with erysipelas.

CONCLUSIONS.

1. Of the 28 cases the burns were aseptic in 15. Five of the series died; in 4 of these the cause was acute sepsis.

2. The keynote of treatment is the prevention of sepsis. A burn must be regarded and must be treated with exactly the same care as is a fresh operation wound. Further sepsis, added to an already septic burn of the fourth degree and upwards, will probably kill the patient.

3. Picric acid as a first dressing is unrivalled.

4. For an aseptic case, equal parts of vaseline and boracic ointment, plentifully spread upon white lint, makes a good, comfortable, and easily removed subsequent dressing.

5. Immediately a burn is known to be septic hot boracic fomentations should be begun.

6. Unless loosely applied a roller bandage put on at the first dressing will cause severe pain and it may lead to gangrene. To prevent this a new outside dressing is described.

ON THE EXTENSION TREATMENT OF GUNSHOT FRACTURES.

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In reply to Mr. Aitken's criticism, in your issue of August 12th, of my address on the treatment of gunshot fractures, I would begin by thanking him for the fair and courteous tone of his remarks. Far from considering it a personal attack, I only welcome this or any other reasoned statement, which is much easier to meet than a mere appeal to the *ipse dixit* of dead or living authorities.

I have advised that full extension of a shattered limb should be postponed until active infection of the wound is at an end—that is, until there is evidence of readiness for repair. But this is only carried out in those grave cases where there is fear of gangrene or secondary hæmorrhage. It does not involve any great distortion of the limb, so that remarks about kinks and twists of the vascular channels seem to me to have no bearing.

Now as to the mechanism of extension. I am sorry Mr. Aitken finds my physiology faulty, but I will, for the sake of argument, accept his own statements on this subject. We are agreed that there is a certain contractile force which tends to shorten a broken limb. The two practical points are: How can this force be overcome most effectively? and how can the correct length of limb be maintained most surely?

How can a Recent Fracture be Restored to Full Length?

The advocates of Thomas's teaching say that by simply pulling upon the limb, full length can be restored in a few moments and without anaesthetic or apparatus. With the utmost respect I say that I do not believe this, and I should like to see it demonstrated on any case of fractured femur which is about to be exposed for an open plating operation; but that such a fracture can be infallibly restored to full length or to over-extension by weight action has been proved over and over again.

One of the most striking instances of the difficulty of immediate lengthening of a limb as compared with the facility of slowly doing so, is afforded by the use of an extension apparatus which acts by two extending screws pushing apart transfixion pins driven through the two parts of the broken bone. When this double transfixion apparatus is applied either to the femur or the lower leg bones, and the extension screws twisted, a force of 200 lb. can be brought to bear, but I content myself with using 50 lb., at which point considerable resistance is found in further twisting the screws. But the next day, the screws can be twisted by the finger and thumb so as to get further extension, and by doing a little each day, full extension is easily obtained; this would have been impossible at the first sitting. This is exactly what Mr. Aitken himself describes as his own practice in many cases—that is, extension up to a certain point, followed by further extension on one or more subsequent days. But this is surely gradual extension, and it quite contradicts the idea that it is only necessary to pull harder than the muscles once and for all for full length to be obtained?