will do its work, and the other will, at any rate, do no harm.

The number of cases we give is, we think, sufficient to justify, at any rate, a provisional opinion on the subject, and we have no hesitation in using this reaction ourselves, and recommending it to the profession as a simple and harmless method of obtaining accurate information, which we have found to be of great value in many obscure cases.

A FURTHER CONTRIBUTION ON THE STERILIZATION OF THE SKIN OF OPERATION AREAS.*

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My first communication on the sterilization of the skin of operation areas¹ by iodine was based on an experience of 57 cases. A further experience of 291 cases has increased my belief in the method and enabled me to improve my technique.

In the accompanying table I have added my cases together, so that I can submit a complete list representing the operations I have performed during the last ten months which were suitable for such a preparation. The cases have

No. of Cases.	Operation.	Result.	Remarks.
5	Abscess	S.	2 healed per primam.
1	Amputation: hip	S.	Was suppurating.
3	" thigh	2 P., 1 S.	1 was gangrenous.
1	" foot	P.	
1	" hand	P.	
6	" fingers	P.	
4	" toes	P.	
14	" breast	P.	
3	Anthrax	S.	Malignant pustules.
9	Appendix: quiet	P.	
8	" suppurating	S.	
3	Appendicostomy	P.	
1	Castration	P.	This healed per primam, in spite of secondary haemorrhage necessitating re-opening the wound.
6	Circumcision	S.	
2	Colostomy	S.	
4	Colotomy	S.	
3	Empyema	S.	
2	Epithelioma, lip and face	1 S., 1 P.	
6	Fractures, wired	4 P., 1 S.	1 died (tetanus); 1 compound, some suppuration.
7	Glands in neck	6 P., 1 S.	1 was suppurating.
11	Goitre	P.	1 malignant, died in 48 hours.
1	Harelip	P.	
15	Hernia: radical cure	P.	4 femoral, treated with metal staples.
5	" strangulated	4 P., 1 S.	1 was suppurating.
4	Hydrocele: radical cure	P.	
1	Ingrowing toenail	S.	Was suppurating.
6	Knee-joint operation	P.	
	Laminectomy	P.	Died within 48 hours
12	Laparotomy: various	11 P.	1 after watery solution healed per primam; abscess followed.
1	" extrauterine fetation	P.	
3	" ovarian	P.	
	" uterine fibroid	P.	
6	" ventrifixation of uterus	P.	
1	" nephropexy	P.	

*Read before the Kidderminster Medical Society.

No. of Cases.	Operation.	Result.	Remarks.
1	Laparotomy: suture bladder	S.	Was suppurating; died.
7	" gastro-enterostomy	P.	
1	" perforated gastric ulcer	S.	Died within 24 hours.
1	" gall stones	S.	
1	" enterectomy	S.	Died within 48 hours.
1	" intestinal anastomosis	S.	Died within 48 hours.
6	Mastoid operation	S.	
1	Nerve suture	S.	It had been suppurating; nerve held.
10	Naevus	P.	
3	Osteotomy	P.	
6	Paracentesis thoracis	P.	
3	Plastic operations	P.	
2	Ruptured perineum	S.	Healed per primam.
19	Small tumours; bursa, etc.	18 P.	One suppurated.
5	Sinus exploration	S.	All suppurating.
7	Tenotomy	P.	
1	Tendon suture	P.	
1	Tracheotomy	S.	
2	Trephining	P.	
36	Varicose veins	P.	
1	Varicocele	P.	
272	It has also been used in the following cases:		
23	Casualty wounds	S.	In most cases a perfect result; 1 gangrene, 1 tetanus.
27	Injection of antitoxin	P.	
25	Skin grafting	S.	
1	Vaccination	P.	Did not take!
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N.B.—In column three: P = perfect; S = satisfactory.

not been selected; they represent various classes of the community and ages varying from a few days to 84 years.

Of the 272 operations some were performed for conditions already septic, but from my experience of similar cases prepared by the former method I have no hesitation in saying that their after-progress was more satisfactory. They are marked as "satisfactory" in the table. Some have healed per primam and are marked "perfect."

I have had only three failures among the clean cases:

CASE I.—The first was an old man upon whom I performed an exploratory laparotomy. He was found to be suffering from malignant disease of the liver, and the abdominal wound was closed. When dressed on the eighth day, it was perfectly healed, and the stitches were removed. Five days later a collection of pus (about two ounces) was found beneath the cicatrix. This case was prepared with a watery solution of iodine, which I was then experimenting with. It is possible the failure was due to that, or there may have been no failure at all, and the abscess may have been due to infection from another source. This appears probable, because the skin wound healed perfectly, and there was no trace of redness about any of the sutures.

CASE II.—The second was the case of a small boy with a mole on his cheek, near the angle of the mouth, which I excised. It is difficult to apply a closed dressing in this situation, and it is still more difficult to keep it dry, in an adult; in a boy it is wellnigh impossible, and I feel satisfied that this was the cause of infection.

CASE III.—The third case is more difficult to account for. The patient was a man, aged 32, whose leg was fractured at football on March 28th by indirect violence. The left tibia was broken, obliquely, and an x-ray photograph showed about $\frac{1}{2}$ in. separation between the fragments.

On April 2nd I made an incision and fixed the ends of the bone with a screw and silver-wire suture. The operation was quite simple, and was performed in the usual way.

On the fourth day the temperature was raised, but when the wound was dressed it appeared to be all right. By the sixth day there was a decided red blush, which spread with alarming rapidity, and within twenty-four hours reached his groin. He was treated with Bier's congestion and injections of polyvalent serum (B. and W.). On the tenth day he developed signs of tetanus, which increased; he had constant convulsions, and

died on the twelfth day. It is impossible to say how the infection occurred. If it was the fault of any of the preparations it is probable that the cases operated upon at the same time would have been affected. The ligatures used were catgut, prepared after the method of Sir William Macewen.

Suspicion was directed against catgut by Mr. W. G. Richardson in the *BRITISH MEDICAL JOURNAL* of April 17th, 1909. In the *JOURNAL* of May 29th, 1909, I reported a case of tetanus which occurred in a man eighteen days after an operation for varicose veins. The wounds had all healed per primam, and I was unable to account for the infection. I feel now, as I felt then, that there is no proof to connect them. The fact that this man was in a poor state, with a mouth full of decaying stumps, may have been, at any rate, a contributory cause.

Two or three other operations were performed the same morning under precisely similar conditions, including the excision from a man's neck of a huge carcinomatous mass, which necessitated the removal of the sterno-mastoid muscle and the deep jugular vein—a large dissection, lasting an hour and three-quarters. It healed up perfectly, and the stitches were removed on the eighth day, and he went home within a fortnight.

Besides septic and clean cases there are a considerable number which cannot be placed in either category. In such cases as appendicectomy and gastro-enterostomy, with the possibility of infecting the wound from the opened viscera, the skin preparation could not be blamed. Fortunately all these cases were successful and can be quoted in support of the method.

In cases such as circumcisions, where it is practically impossible to keep an aseptic dressing applied, healing occurs more quickly and there is less inflammation. Casualty wounds which have all been exposed to infection have in most instances healed perfectly. There were two failures—one a gunshot wound of the thigh which was followed by tetanus, and one a wound into the knee-joint followed by gangrene.

I tried the treatment in one vaccination, and I asked my friend Dr. O. C. P. Evans, the Public Vaccinator, to try it also. Our experience was very similar. It was too effective because it destroyed the lymph and there was no result, in spite of the fact that I allowed the iodine to dry on before performing the operation.

A former house-surgeon informs me that he finds the method useful for sterilizing his fingers in midwifery cases.

In this connexion arise the questions of staining, desquamation, and dermatitis. The staining does not persist, and I find that by the time most operations are completed all the colour has disappeared. If my hands become stained, as they often do, it is easily removed by washing them in a 1 per cent. solution of cyllin (3 per cent. carbolic solution is equally efficient), and towels are cleaned by soaking in a similar solution. There is no desquamation as a rule. I have seen it in one case, due, I think, to the solution being too strong, owing to exposure during a long operation and consequent evaporation. It should always be stored in a stoppered bottle, and only sufficient for use poured out. I prefer to use it direct from a wide-mouthed bottle. It can be applied with a sterilized swab or brush.

I am informed by several members of the profession that they are familiar with cases of acute dermatitis following the application of tincture of iodine, but personally I have not come across one. I have never heard any complaint of pain, and one house-surgeon who applies it freely to all casualty wounds informs me that there is no complaint.

My experience is that it is absolutely unnecessary to shave the skin, and this is an important advantage. Of all the preparations a lady has to undergo prior to an abdominal operation the shaving is the most repulsive, and during the period of convalescence the irritation of the growing hair causes great discomfort.

The only disadvantage I have discovered is lacrymation, to which some assistants are more susceptible than others. The tincture made with rectified spirit is far less irritating than that made from methylated spirit, and can be tolerated by most people. I still use the methylated spirit solution for the primary painting, which is performed immediately before the patient is anaesthetized. The second painting is done with the tincture when anaesthesia is complete, and the final when the operation is finished, with methylated. The tincture is of course suitable for all these purposes, but the increased cost is a factor which

has to be considered in hospital administration. To prepare a patient properly by my former method necessitated at least three days' residence in hospital prior to an operation. It occupied the house-surgeon or a nurse for periods varying from one to several hours, and besides all the chemical materials, at least two sets of aseptic dressings were required. The cost to the hospital on each case was considerable. On a large number a good round sum is saved in a year. What is still more important, the patients are saved the misery caused by these preparations. What is most important is that it is an efficient and reliable method, and the surgeon can always be certain that it has been thoroughly performed.

REFERENCE.

¹ *BRITISH MEDICAL JOURNAL*, 1909, ii, p. 368.

THE SCIENCE COMMITTEE OF THE British Medical Association. REPORT CXXII.

A SOURCE OF FALLACY IN COUNTING RED CELLS.*

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It seems desirable to record some observations in connexion with red cell enumeration and the estimation of colour index, from which it is clear that the employment of Toisson's fluid for red cell counts is apt in some anaemic conditions to give very fallacious results.

I have prepared Toisson's fluid according to the following receipt: Distilled water, 160 c.cm.; glycerine, 30 c.cm.; sodium sulphate, 8 grams; sodium chloride, 1 gram. To the completely dissolved mixture I have added a few drops of a saturated aqueous solution of methyl violet to obtain the desired tint.

When counting the red cells of a rabbit which had been bled from the auricular vein on three successive days, I noted that the field contained, besides the usual red cell appearances, a number of very pale red cells, many of which were very difficult to see and readily escaped being counted, the result being an erroneously low red cell count and a correspondingly raised colour index. The number of these pale cells was increased with the interval of time after the mixing of the blood and Toisson's fluid in the counting chamber, and many cells became quite invisible with any ordinary methods of illumination.

The phenomenon was absent from normal rabbits' blood, but was observed in the blood of rabbits which had received phenylhydrazin subcutaneously. Table I gives some examples of this.

TABLE I.

Nature of Case.	Hb. per Cent.	Red Cells per c.mm.		Toisson per Cent. of Hayem.	Colour Index.	
		Toisson.	Hayem.		Toisson.	Hayem.
Rabbit X (normal) ...	69	5.49	5.61	98	0.63	0.61
Rabbit X after phenylhydrazin	32	1.20	1.60	75	1.34	1.0
Rabbit 27 (normal) ...	80	6.63	6.03	110	0.60	0.66
" " ...	78	6.47	6.49	100	0.60	0.60
Rabbit 27 after phenylhydrazin	34	1.34	1.92	70	1.30	0.89
" " "	50	2.09	2.60	80	1.25	0.96
Rabbit 29 (normal) ...	84	7.05	7.06	100	0.6	0.6
" " ...	86	7.27	7.07	103	0.59	0.60
Rabbit 29 after phenylhydrazin	28	1.06	1.49	71	1.3	0.96
" " "	38	1.53	2.11	72.5	1.26	0.90
" " "	48	1.99	2.40	83	1.23	1.0

* Towards the expenses of this research a grant was received from the Science Committee of the British Medical Association.