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Contributors

Mackie, William.
Keith, Arthur, Sir, 1866-1955
Royal College of Surgeons of England

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WILLIAM MACKIE, M.D.
LATE PHYSICIAN AND SURGEON

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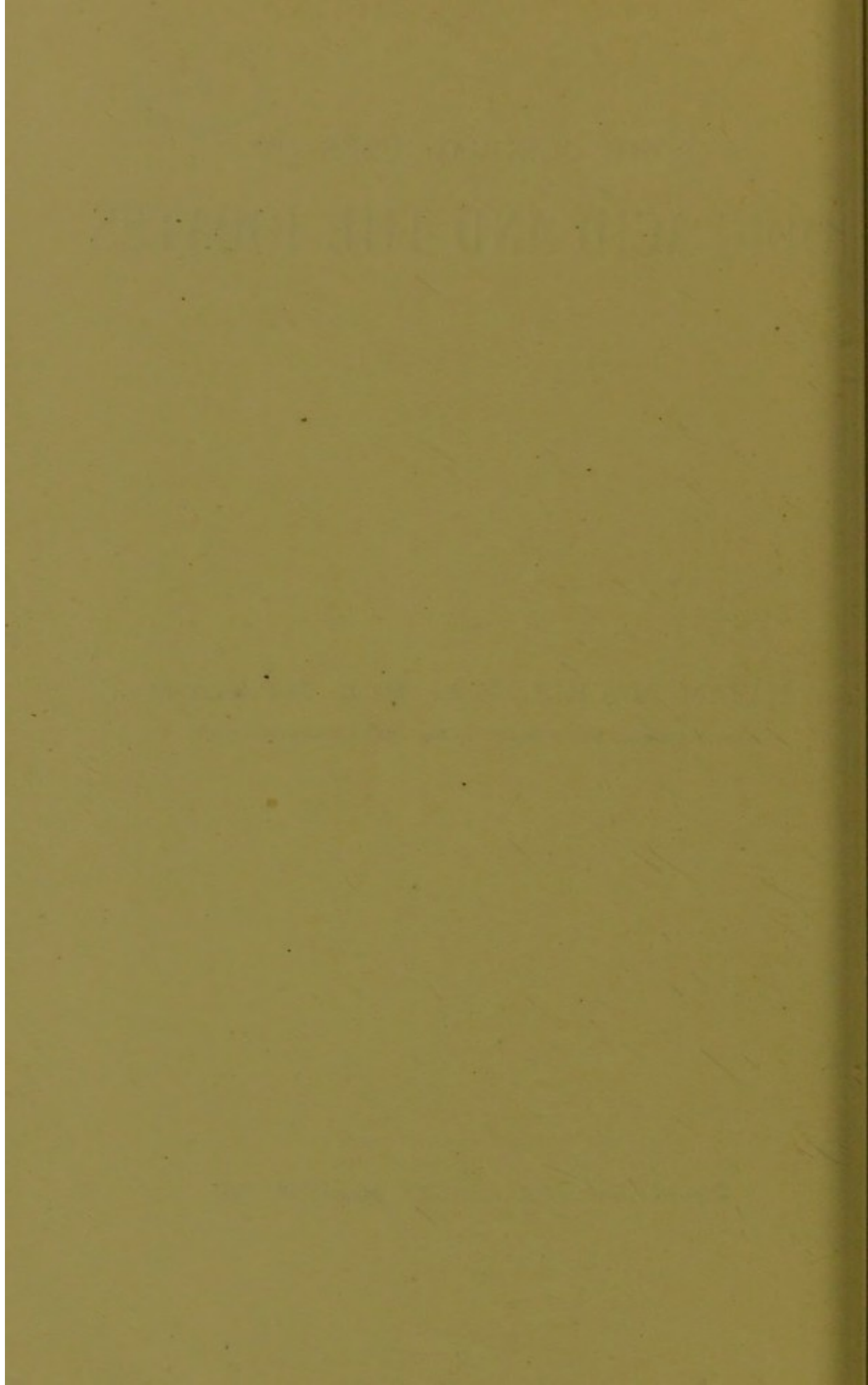
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SOME CLINICAL USES OF
IODIC ACID AND THE IODATES

BY

WILLIAM MACKIE, M.A., M.D., D.P.H. ABERD.,
LATE PHYSICIAN AND SURGEON TO DR. GRAY'S HOSPITAL, ELGIN.

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SOME CLINICAL USES OF IODIC ACID AND THE IODATES.

A FEW years ago I directed attention to some of the surgical and medical uses of calcium iodate.¹ In the interval I have continued to use it both in hospital and in private practice and the results which have since been obtained only serve to substantiate the promise it then gave. Before going on to consider iodic acid and the other iodates it may be useful to summarise the uses to which the calcium salt has up to the present been put.

Its application in fine powder to all cicatrising surfaces—such as after the curetting of scrofulous glands, excision of dead bone, to all incised, lacerated, or contused wounds, and particularly in the case of septic and suppurating wounds—gives excellent results. To leg ulcers it may be applied in ointment spread on lint in strength of from 10 to 20 grains to the ounce of vaseline or other unoxidisable excipient. Out of a large number of cases so treated only once has there been complaint of smarting in the case of male patients, perhaps twice or thrice in the case of female patients, but in no case even where smarting was complained of was any injury done to the tissues. On the other hand, the ulcer was in every case much improved by the application and healing generally took place with unexpected rapidity. Only once has it been applied to a burn in the acute stage when its use was attended with such excessive smarting that it was promptly discontinued. It has never been tried again. Even here it produced no irritation of the tissues. It has now been used in a considerable number of major amputations and excisions of the breasts where it has been applied at the operation in a 3 per cent. gauze. At subsequent dressings irrigation with the warm saturated solution, with or

¹ See THE LANCET, Dec. 29th, 1900, p. 1867

without dusting of the surfaces with the powder according to discretion, and again covering with iodate gauze has been the routine practice. The results have been all that could be desired. Some of the cases were very unpromising but I shall give details of only one which may be taken as a fair example of the power of calcium iodate in preventing sepsis.

A chronic alcoholic, aged 72 years, was admitted into hospital at midnight in a state of intoxication with a compound fracture about four inches below the tuberosity of the tibia. The upper fragment projected through a large ragged wound. Under an anæsthetic the fragments were easily brought into their natural relations, but the soft parts could not be made to meet over them in consequence of evident loss of tissue. The leg was put up on a back splint and at once incased in plaster of Paris with an opening in front opposite the wound for dressing. On the next day, partly from the history given by the patient and partly from inspection of the parts, it was ascertained that there had been an extensive surface of bare and presumably dead bone before the accident and that in this condition it had existed for years. As the fragments were in excellent position—and they were rigidly maintained so throughout—it was resolved to allow a chance of union. The wound was irrigated every other day with the warm saturated solution, the fine powder being subsequently “showered” in, and for the eight succeeding weeks during which the limb was kept on the splint not a single divergence from a strictly normal temperature was observed. When the splint was removed at the end of that time it was found that there had not been the slightest attempt at union. Amputation was accordingly resolved on and was made through the knee-joint by Stephen Smith’s method. The internal condyle of the femur was found to be diseased and was accordingly removed. The case, which was dressed as before described, gave no trouble except for a considerable serous oozing from the wound during the first few days and healed perfectly.

In the case of smaller amputations, such as of fingers or toes, it has been frequently observed that after a liberal use of the powder, repeated two or three times at consecutive dressings, healing takes place under a dry scab without the necessity of further protective dressing. The same remark applies to incised wounds. In not a single case out of a large number of hand injuries received in all

conditions of filth has ever the shadow of sepsis been seen where calcium iodate has been used.

The warm saturated solution has been largely used as a vaginal douche, and here its deodorant, antiseptic, and astringent effects have probably all, in varying degree in different cases, contributed to the satisfactory results obtained. Perhaps the best—but at the same time not quite unexpected—results have attended its use as a bladder irrigant. For this purpose the warm solution may be used up to the point of saturation. No untoward effects have been observed and a permanent cure has been obtained in a proportion of the cases after a single irrigation. The case of tuberculous bladder which was referred to in a previous paper has been kept under observation since the date of the last irrigation, August 5th, 1900. There has been no recurrence and in the interval not even a suspicious symptom. In another case where tubercle bacilli along with multitudes of colon bacilli were found in the urinary deposits, and where there was a continuous high temperature with general symptoms of some gravity, the warm iodate solution was also used several times. The bladder condition was for the time being complicated with pregnancy, but the patient—now two and a half years after—seems to be in a fair state of health, and the symptoms at least for the present in abeyance. While this case was under treatment it was incidentally observed that a solution of 1 in 1150 inhibited the movements of the colon bacillus.

It was for long in daily use as a mouth wash and gargle, for which purposes it was found eminently efficient as well as cleanly, but latterly, as will be noted, iodic acid has usurped its place in this respect. The saturated solution has also been used as an irrigant in empyema of the chest.

I have also been informed by a dentist of large experience that he has used it for all the purposes for which iodoform or its substitutes are generally used in dentistry and that it is particularly efficient when applied for pyorrhœa alveolaris for which it may be ordered as a dentifrice of the undiluted powder.

It has been found to be all but a specific—in ointment 10 grains to the ounce—for the eczema capitis and other eczemas of infants. As might be expected, the eczema may recur on disuse of the ointment but it always yields to a fresh application. In local eczemas of adults it has also been found of value in some cases, in others not, but it would be difficult to draw any clinical distinction between the cases in

which it is and which it is not likely to do good, though I have thought that a specific origin counted for something in a number of the cases. In otorrhœa it is very useful as an irrigant, for which it may be used up to full saturation. It has been used for hypodermic injection into tuberculous joints, after the manner of iodoform emulsion, in only one case—a knee-joint in a boy, aged seven years, who had night starting and elevated temperature. There was bogginess on each of the patellar tendons. About half a drachm of an emulsion (three drachms of calcium iodate to the ounce of glycerine) was injected on two occasions. The temperature became normal, night starting disappeared, and there was at least temporary improvement. In another chronic knee case, probably also tuberculous, in a man, aged 51 years, pus was evacuated by incision and drainage. This was followed by the use of emulsion of the strength indicated. Healing had taken place at the end of five weeks. Injection of emulsion in similar strength was also adopted as the routine treatment in a case of hip-joint disease in a fragile boy, aged seven years—so fragile, indeed, as to preclude the advisability of radical measures—where there existed two large sinuses leading down to dead bone. Whether the treatment contributed in any way to the result may be left an open question, but the sinuses have long healed and the boy is now well and ambulant. Two drachms of emulsion were also on one occasion injected into an abscess cavity of the lung with apparent temporary amelioration of the symptoms.

Medicinally further evidence of its efficiency as a gastrointestinal antiseptic has been obtained. In a very small proportion of cases it has been found to disagree but the symptoms have not gone beyond a slight temporary discomfort. So far it has only been used in one case of typhoid fever, but in that the results were such as to encourage further trial. The patient was a young woman, aged 20 years, in the middle of the third week of the disease. The morning temperature at the time of the first exhibition of calcium iodate was 102° F. It was ordered in half-ounce doses of the saturated solution diluted with water to be given twice daily and was quickly increased to one and a half ounces three times a day diluted as before. On the second day after its use the diarrhœa, which had been copious, ceased, the temperature began to come down, and on the fifth morning it had reached normal and never rose again. No unpleasant symptoms were observed, though the medicine

was continued in the larger dose for a fortnight after a normal temperature was reached. The patient then said that there was a slight metallic taste in her mouth but made no complaint. I may say that I now order iodic acid in place of the iodate for internal use and I should also do so—and have done so—in typhoid fever if I considered any medication on antiseptic lines necessary in that disease.

From a purely economic point of view it may be mentioned that calcium-iodate is produced at two-thirds the price of iodoform.

The success that has attended the use of calcium iodate for the purposes I have noted led me at a later date to try the mother acid—iodic acid—in hopes of attaining even still better results. Generally, it may be said that the acid possesses all the properties of the salt in an enhanced degree. Iodic acid has been used on the continent in solid form or in strong solution as a caustic. It was also at one time thought of as an iodoform substitute but in undiluted powder it was found much too irritant for that. It has, so far as I am aware, never been used for any of the purposes noted below. As regards inhibitory power on the growth of micro-organisms I estimate that as at least three times that of the calcium salt. The following experiment will indicate its power in this direction. Four quantities of the same sample of urine had added to them on March 22nd iodic acid in the following proportions: (*a*) 1 in 25,000, (*b*) 1 in 9000, (*c*) 1 in 4500, and (*d*) 1 in 2500. These along with a control were exposed in unsterilised test-tubes to the atmosphere of the laboratory with the following results: (*a*) began to show signs of decomposition on April 16th, the control having begun to smell badly on the fourth day after exposure; (*b*) showed a few fungoid balls in the mucus at the bottom of the tube on May 22nd, but there was no smell: it had decomposed by June 19th; (*c*) is described as still sweet and clear on July 21st, but some fungoid growth had appeared by August 4th; while (*d*) remained perfectly sweet and clear up to Feb. 15th of the following year, when a single clump of fungoid growth was first observed in the mucus at the bottom but the supernatant urine was still perfectly sweet and clear at the end of the year on March 25th.

In addition to its power as an antiseptic it was found to possess remarkable—in my experience unique—powers as a deodorant and use has mainly been made of it in this direction. With potassium permanganate it compares more

than favourably, its power being roughly estimated as three while permanganate is two for equal weights of the salts. It has also been found of service as a deodorant where permanganate quite failed, probably because the chemical action of the two substances is not identical. Iodic acid has the additional advantage of not staining the hands or the tissues, while it is, of course, a much stronger antiseptic than permanganate. Among the uses to which it has been put the following may be briefly enumerated: 1. As an irrigant in the case of a burn in an epileptic female, aged 77 years. The burn was extensive, reaching from above the knee to the ankle and round half the circumference of the limb. On admission it was found put up in a Carron-oil dressing which had not been changed for several days and was in consequence very offensive. There was also deep and extensive sloughing. Iodic acid of the strength of 1 in 500 was used for irrigation and the surface was afterwards dressed with lint wrung out of the solution. The fœtor was discharged at once and no complaint was made of smarting. 2. As an irrigant in ozæna. 3. Also for the same purpose in a patient of filthy habits who had infected an amputation wound of the thigh with the colon bacillus. 4. For placing in the recipient vessel in the case of a most offensive urine—without exception the vilest ever experienced—in the case of an old man who had long led a catheter life. 5. As an irrigant in empyema of the chest, also in strength 1 in 500. 6. Lint wrung out of 1 in 500 solution was used in the first instance as an application to clean and to deodorise two very offensive leg ulcers in an ataxic female, aged 75 years, and proving efficient and non-irritant was continued till perfect healing had taken place. 7. In same strength as a mouth wash in a case of recurrent and inoperable epithelioma of the mouth and cheek. 8. As a vaginal douche in a case of inoperable cancer of the uterus and vagina. In all of these cases the solution of 1 in 500 proved efficient beyond expectation. As regards the last two cases no one knowing the fœtor attending such cases would probably believe without trial that the results obtained were possible. For months both were kept perfectly free from the slightest indication of fœtor. 9. During a year's experience in the local Fever Hospital iodic acid was the all but exclusive substance, in strengths up to 1 in 300, used for applications to the throat in diphtheria and scarlet fever, while it was in general use as a mouth wash in 1 in 500 and was found particularly useful for the latter purpose in cases of typhoid fever.

10. Internally I have frequently ordered a drachm of I in 100 freely diluted with the happiest results for gastrointestinal sepsis or fermentation. For this purpose I consider it to be a more elegant prescription than the ordering of one or two drops of tincture of iodine in solution. No untoward symptoms have been recorded after its use. 11. It was given internally in two cases of typhoid fever. Both were of exceptional severity but it was credited with checking excessive diarrhoea in one of them after other treatment had failed. The case, however, which was complicated with multiple abscesses all over the body, eventually proved fatal. 12. The last two operations which I performed in Dr. Gray's Hospital—an amputation of an arm through the upper third of the humerus and an excision of a breast—were carried through on antiseptic lines with iodic acid for the whole technique, for disinfecting the skin, the instruments, &c., and for irrigation at subsequent dressings, calcium iodate gauze being used as before. The results were unexceptional.

The iodate of zinc has also been used. It is soluble at ordinary temperatures to slightly over 2 per cent. and contains about 61 per cent. of available iodine. I have found it useful where a stronger solution of calcium iodate than the natural insolubility of that salt admits of being prepared appeared to be indicated and it has been used in various strengths up to full saturation in the following cases: (1) for injecting chronic sinuses left after curetting tuberculous glands; (2) in the same way in disease of phalanges and metacarpal bones (three cases) after curetting; (3) for disinfecting the locus of operation after removing suppurating glands of the axilla; (4) for washing out deep abscess cavity of the palm; and (5) for irrigation in offensive otorrhœa up to three grains to the ounce. While the results were excellent in all I may say that I was particularly pleased with its action under (2) and (5).

Subiodate of bismuth has also been used. The samples prepared by me, as well as those prepared for me, showed about 48 per cent. of available iodine. It is a very fine white powder in consistency very like the carbonate of the same base. It has been used with unexpected, but perhaps not always permanent, results in lupus. Three cases in all have been treated.

The first case was that of a female, aged 28 years, who had had lupus since nine years of age. The parts affected were both cheeks, the upper lip, and both *alæ nasi*. The anterior nares were occluded from cicatricial contraction,

There was a discrete patch of the size of half a crown under the chin. The case had been repeatedly curetted in Dr. Gray's and other hospitals—14 times in all, she said. She was admitted on Feb. 11th, 1901, and the treatment, which was at first purely tentative, consisted in the removal of all crusts and dusting the surface with either calcium iodate or bismuth subiodate. A comparative test was made between the two substances, calcium iodate being applied to the general surface of the cheeks and upper lip and the bismuth salt to the patch below the chin. It was soon observed that the latter gave the better result and the calcium salt was thenceforward entirely discarded. On March 12th, in order to accelerate the action, a general curetting was done under chloroform and the treatment with bismuth iodate was continued. Eventually the following method of treatment was evolved. All crusts and scabs were removed every other day, the surface was irrigated with a solution of iodic acid (1 in 500), and while still wet it was dusted over with the subiodate. From time to time, as seemed to be indicated, small corners of the affected area were curetted under chloretone and probably the whole surface would in time be gone over in this way. At the end of ten weeks from the date of admission she left the hospital with the whole surface healed over. The disease was well in hand some weeks before this but the patient was kept longer in hospital for the purpose of opening out and keeping dilated the anterior nares. It is understood that recurrence took place about two years afterwards, which was certainly the longest period of remission since the start of the disease.

The second case was also that of a female, aged 40 years, who had been the victim of lupus for ten years. Curetting with various subsequent applications had been made on several previous occasions and for a time I believe she had thyroid extract with apparently temporary benefit. She was admitted on May 20th, 1901. She left the hospital on June 29th. No general curetting was done in this case but the piecemeal curetting under chloretone was carried out as before. She left us to undergo the Finsen treatment at the London Hospital. On her return after five months' treatment she was seen by me, but beyond the fact that the skin was whiter, as would naturally be expected, there was little advance on the condition in which she left us.

The third case was that of a boy, aged 15 years, who showed a spot of about the size of a crownpiece on one cheek. When he left the hospital at the end of six weeks it was

entirely healed. It is not known whether there has been any return.

In a very chronic skin affection of the face in a female, aged 35 years, which was probably of the nature of lupus erythematosus and which had resisted various applications, bismuth subiodate ointment, 20 grains to the ounce, was also found to have a very beneficial effect.

*Complete
cure
has never
returned*

The subiodate has also been used as a dusting powder in a fairly large number of cases after curretting scrofulous glands. In the less extensive cases healing under a dry scab was found to be the rule. The same result, though I think less frequently, has also been noted where calcium iodate was applied. After a fairly extended trial in such cases I am inclined to prefer the bismuth salt, though results are certainly good with either.

No irritant or other unpleasant effects have at any time been observed after its use.

Mercuric iodate has been used on the continent but so far as I know exclusively for the hypodermic medication of syphilis. It contains about 46 per cent. of available iodine. This salt is likely to prove a general antiseptic of equal efficiency with the perchloride or iodide. With common salt it is soluble up to 2 per cent. or more. This would facilitate its use as a general antiseptic as it would make a supply easily portable in concentrated solution. It has the advantage over the perchloride of containing weight for weight something less than half as much mercury and of striking as an antiseptic with both ions of the salt. Comparative tests also show that it deposits mercury less readily on steel or metal instruments than the perchloride, its power being exerted rather in the direction of oxidation of the steel than of deposit of mercury. Further, what deposit does take place is readily wiped off. The following tests of its restraining power were made. 0.020 gramme of the salt was placed in 100 cubic centimetres (1 in 5000) of unsterilised, undiluted, ascitic fluid in an unsterilised flask. It readily dissolved on shaking. Along with a control it was then freely exposed to the air. The former had decomposed by the end of a week, while the fluid to which the iodate had been added continued sweet and limpid up to the end of the fifth week. With 0.030 gramme in 300 cubic centimetres (1 in 10,000) in like manner it did not begin to decompose till the middle of the fourth week. Iodic acid in the proportion of 1 in 1000 gave a result similar to the stronger solution, from which it may be inferred that

mercuric iodate shows roughly five times the restraining power of the mother acid.

Mercuric iodate has been put to the following clinical uses. A man, aged 28 years, was admitted into hospital with a pronounced sycosis over all the hairy parts of his face but the right cheek was very much worse than the left. Before admission he had been treated with all sorts of applications, calcium iodate in ointment among the number. His teeth, which were carious to a degree, had all been extracted without result. On admission mercuric iodate in 20 grains to the ounce of chrisma was ordered for application to the right cheek which, as stated, was by far the worse, and unguentum vaselinum plumbicum to the left, the beard being kept closely shaved. By the end of a month the difference in the effect of the two applications had become so marked that the patient begged to be allowed to apply the mercury iodate to both cheeks which was accordingly done with complete cure in ten weeks from the start of the treatment. There has been no recurrence.

In eight consecutive cases of tinea barbæ, some of them very bad, an ointment of the same strength was ordered and has given most gratifying results. Several of them yielded after two or three applications of the ointment. All of them vanished with what for the disease in question would be considered quite surprising rapidity. From its solubility in presence of sodium chloride one would infer considerable penetrating power and to this in part the results obtained are probably due.

On the whole it may be said that iodic acid and the iodates come quite up to the expectation formed of them on theoretical grounds and actual trial shows that they may be made of extensive clinical use.

Elgin.

