fibrosis caused by previous radiation treatment, but it is difficult to reconcile this statement with the diametrically opposite expressions of other surgeons. I think it is regrettable that surgeons, who have necessarily only a limited experience of the effects of x-ray treatment on the general health of patients suffering from hyperthyroidism, should publish opinions which are in direct contradiction to the general experience of men daily carrying out such treatment. Radiologists do not dispute the undoubted good results obtained by operative measures because occasionally patients present themselves for radiotherapy after operation has failed to cure the condition.

Having observed the undoubted value of carefully applied x-ray treatment in Graves's disease, I consider that unless radiotherapy has been given a fair trial and has failed to bring about a definite improvement in the condition, the operative treatment of Graves's disease ought not to be undertaken in view of the risks entailed. In Graves's disease, as in other diseases, the best results are obtained by team work, and close co-operation between physician, surgeon, biochemist, and radiologist is essential.

I have found the following technique give good results. I use a Coolidge tube, backing up a 9-inch spark-gap, and give either a two-thirds or three-fourths Sabouraud B, measured after filtration through 2 mm. aluminium, as a dose to each side of the neck once a week. Only one side of the gland is radiated at one sitting, as in some cases there may be a temporary increase of the hyperthyroidism if a heavy radiation is given and both sides are radiated simultaneously. I prefer the fractional dose, spread over a course of twenty to thirty radiations, to a massive dose given, as at Erlangen, in only one or two sittings. The latter method may have the advantage of quicker results, but is, I think, risky. In a case of true Graves's disease the average number of radiations necessary to produce good results is about twenty-five, and although in some cases treatment at intervals of three to six months, or even a year, may be required, yet, in my opinion, the period of the disease is shortened by radiation treatment. I think, moreover, cases of mild hyperthyroidism should have a course of x-ray treatment as a prophylactic measure against the development of true Graves's disease, as I believe that the full development of the condition has been prevented by this course of action in some cases which have come under our care.

Illustrative Cases.

In about 75 per cent. of all the cases treated, I believe great improvement occurred, and about 50 per cent. have ceased to have symptoms of hyperthyroidism. Only one patient developed any serious skin lesion; this patient was treated about twelve years ago before our technique was as good as it is to-day.

The following notes on a few cases are typical of the results obtained in 50 per cent. of the cases submitted to radiation treatment.

1. A severe case of Graves's disease in a female who weighed 8 st. $\frac{1}{2}$ lb. Treatment commenced on March 1st, 1922, and continued to May 19th. Steady improvement in health resulted, and on July 4th the patient weighed 8 st. 10 lb.; all symptoms of hyperthyroidism had disappeared.

2. A patient with fourteen years' history and the usual symptoms, and pulse rate 135, commenced treatment on September 9th. By September 22nd improvement was noticeable, and by October 10th the pulse rate had fallen to 104. On November 28th the pulse was 92, and the treatment ceased on December 1st.

3. A very severe case of exophthalmic goitre in a female who was carried into my consulting room, unable to walk. The ankles were swollen, the pulse rate was 135-140. The patient was rapidly going downhill, and a grave prognosis was given by the physician in charge. She commenced treatment on May 9th, 1917, and improvement commenced on the 26th. On June 6th the pulse was 116; on the 13th a gain of 4 lb. in weight was recorded, and on July 2nd another 8 $\frac{1}{2}$ lb. gain coincided with a very marked general improvement. The swelling of the legs had disappeared by July 16th, and the patient was able to walk on the 19th. No more severe paroxysms of tachycardia occurred, and the treatment came to an end. Her improvement steadily continued after cessation of treatment, and early in 1918 she had completely recovered her health, and was working on the land.

4. A severe case of hyperthyroidism in a female, to whom treatment was given from February 2nd to April 20th, 1922. The weight in this case diminished during the treatment, but the general health gradually improved, and by August 31st she was

practically well. When seen in November, 1922, the patient had increased in weight and improved so much in appearance and health that we did not know her.

5. A severe case of Graves's disease in a male, with a very rapid pulse, and weight 9 st. 1 lb. He commenced treatment on July 2nd, 1917, and by August 13th had gained 7 lb. in weight. On August 27th there was a further gain of 4 lb., and on September 5th the pulse was 80. By September 24th the weight was 10 st. $\frac{3}{4}$ lb., the pulse 76, and there was very marked general improvement in health. After a few further treatments given in December the patient weighed 11 st., and returned to work on the railway.

6. A male with seven years' history of severe Graves's disease; thyroid very much enlarged; pulse 120; marked tremors and exophthalmos. Treatment commenced on December 29th, 1919. On February 5th, 1920, the pulse was 102; on April 7th it was 80, and there was a general improvement in health. Three courses of treatment were given between December 29th, 1919, and August 17th, 1920. The patient steadily improved in general health and the enlarged gland returned to an almost normal size.

We do not know how the x rays produce their effect and cure hyperthyroidism, but as the function of the gland apparently becomes normal again it is highly probable that, apart from any local action such as thickening of the intima of the blood vessels and an increase in the fibrous tissue elements of the gland, other changes occur which affect or modify the quality or quantity of the gland secretion. It must be borne in mind that radiating so vascular an organ as the thyroid may produce changes in the blood serum which may also influence the gland. I have only personally seen myxoedema produced in two cases of Graves's disease, and as in one of these cases only a very few radiations had been given and the other had received no more than the usual amount of radiation, it seemed highly improbable that the radiation was the cause of the myxoedema in either case. Both patients did exceedingly well under thyroid treatment. It is our practice to stop radiation before the heart frequency comes down to normal, as the effect of radiation is cumulative and continues for some weeks after actual treatment has ceased.

Some patients who have still symptoms of hyperthyroidism on completion of their first course of treatment present themselves some few months later without any symptoms of the disease. I have not found radiation treatment satisfactory in cases in which symptoms of hyperthyroidism have supervened upon an old large parenchymatous, adenoparenchymatous, or cystic goitre. These cases should be referred to the surgeon, especially if there is pressure on the trachea. If the condition of the patient precludes surgery radiation treatment must be tried, as improvement in the patient's general health sometimes occurs, although the gland is not obviously reduced in size.

REFERENCE.

¹ BRITISH MEDICAL JOURNAL, November 11th, 1922, p. 911.

AN ANTIDOTE FOR ARSENIC, BISMUTH, AND MERCURY POISONING.

BY

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ALL the larger venereal clinics and not a few practitioners are occasionally faced with the anxiety incidental to cases of arsenical jaundice and dermatitis, and more commonly with the problem of treating stomatitis due to bismuth and mercury. It is the purpose of this communication to draw attention to the value of intravenous injections of sterile solutions of chemically pure sodium thiosulphate in combating the toxic effects of these drugs.

A preliminary report in 1920 by P. Ravaut¹ was followed in 1922 by a more detailed account by McBride and Dennie,² whose clinical results, based as they are on seven cases of severe arsphenamin dermatitis, seem to me to justify their claims and to warrant trial on a more extensive scale.

Their conclusions, shortly stated, are that the course of the dermatitis is shortened from months to weeks; that intravenous injections of the salt are preferable to all other

methods of administration and are non-toxic up to a dose of 2 grams; and that acute and chronic mercurial poisoning is rapidly controlled.

For the purpose of trial in my clinic Messrs. May and Baker (manufacturers of novarsenobillon, etc.) were good enough to prepare a quantity of chemically pure dehydrated sodium thiosulphate, and to put it up in doses varying from 0.2 to 1.5 grams in sealed ampoules. A short experience has convinced me that both the larger and the smaller doses are unnecessary, and the stock now available in the department is limited to doses of 0.45, 0.6, 0.75, and 0.9 gram.

The number of instances of drug toxæmias has been very small during the past few months, but such as it is it affords considerable ground for the belief that in sodium thiosulphate we have a specific, safe, and rapid antidote for stomatitis due to mercury and bismuth; it also offers a hope that the course of arsenical poisoning, both in the skin and the liver, can be controlled and in some degree shortened by its administration.

The action of the salt when injected into the circulation containing a metal or an arsenical derivative is an interesting biochemical problem. I find it difficult to accept the theory that an insoluble sulphide is formed. Such an explanation ignores the probable effect of a heavy precipitate on the capillary meshes of the brain, kidneys, etc., where infarction would seem inevitable. Whatever the chemistry, there is no doubt that the distressing symptoms of mercurial and bismuth stomatitis are effectively and rapidly relieved. Three to four injections of 0.45 to 0.6 gram, given intravenously in 5 c.cm. of water on alternate days, were found sufficient (in our four mild cases) to clear up the fetor and salivation, and permit of early dental treatment to insure against a recurrence.

CASE I.—Bismuth Stomatitis.

A male (5277), aged 26, contracted syphilis in 1919, and developed jaundice during his treatment. Bismuth was therefore substituted, and in October, 1923, he began a course of intramuscular injections of trepol. After the fourth injection he developed soreness of the gums and salivation. On November 26th he received 0.45 gram of sodium thiosulphate intravenously, and 0.5 gram on the 28th. The salivation and tenderness of the gums cleared up immediately, and no further injections were given. After dental attention he was able to resume his course of trepol, and he showed no further symptoms of intolerance.

CASE II.—*Mercurial Stomatitis.*

A male (4897), aged 36, developed mercurial gingivitis after three injections of mercurial cream. Three injections of 0.45, 0.6, 0.75 gram, on alternate days, cleared the symptoms of fetor and salivation within a week, and the patient, after a brief rest and dental treatment, was able to continue his course.

CASE III.—*Bismuth Salivation.*

This was a mild example of the condition and yielded to a single injection of 0.45 gram.

CASE IV.—*Mercurial Stomatitis.*

A woman (5321), aged 24, developed severe gingivitis with fetor and salivation after taking hydrargyrum cum creta from September 18th to October 16th, 1923. On the later date 0.45 gram of sodium thiosulphate was given intravenously, and 0.6 gram on October 18th. Bleeding of the gums and bad taste in the mouth ceased after the second injection. Two more doses of 0.6 gram on October 23rd and 25th cleared up the symptoms.

CASE V.—*Arsenical Jaundice.*

A male (5224), aged 33. The symptom appeared within twenty-four hours of receiving the last of the following series of six intravenous injections of novarsenobillon each at an interval of three weeks from the preceding: 0.45, 0.45, 0.45, 0.6, 0.6, and 0.75 gram. On admission the temperature was normal, the tongue furred, and the liver just palpable below the right costal margin. The patient complained of nausea and depression, and stated that he had had several bouts of severe shivering and vomiting. There was no itching of the skin. The urine, which had contained no albumin when, at each of the above injections, it had been examined, now contained a trace, together with bile and a few granular casts.

As time is all-important in these cases, an intravenous injection of 0.75 gram of sodium thiosulphate in 10 c.c.m. of water was immediately given, and the detailed pathological investigation postponed to the following morning. I am greatly indebted to Dr. P. O. Ellison, Assistant Pathologist to the Royal Northern Hospital and V.D. Department, for his painstaking work, the results of which are worthy of a detailed consideration. The levulose tolerance was as follows:

When fasting the blood sugar was...	0.115	per cent.
1/2 hour after 35 grams of levulose ...	0.155	"
1 hour " " " " " " " "	0.2	"
1 1/2 hours " " " " " " " "	0.19	"

These figures, in Dr. Ellison's opinion, indicated severe hepatic inadequacy, and were further supported by the blood content of lipase—namely, 0.4 c.cm. N/10. Van den Bergh's test suggested jaundice of the haemo-hepatogenous type. The history and pathological findings left no doubt in my mind as to the etiology in this case, and I continued to inject daily doses of sodium thiosulphate (0.45 to 0.5 gram) from February 6th to February 15th, until a total of 4.7 grams of the salt had been given. No symptoms of intolerance supervened, and from the very first dose the subjective manifestations of icterus—namely, nausea and depression—were stated to have improved, while the icteric tint, never very pronounced, faded visibly from day to day, and the stools regained their normal colour. Dr. Ellison submitted a second report on the levulose tolerance on February 19th, and a comparison with his former result is interesting and appears to tally with the clinical progress of the case.

Levulose Tolerance.	February 7.	February 19
Fasting blood sugar	Per cent. 0.115	Per cent. 0.12
Half an hour after levulose	0.155	0.15
One hour after levulose	0.2	0.15
One and a half hours after levulose ...	0.19	0.14

The latter estimation is approaching the normal figure. The blood lipase test gave a reading of 0.35, and the van den Bergh's test a negative result. The patient was therefore discharged from the ward, free of all symptoms, on the thirteenth day from his admission.

Although the results were suggestive of a specific antidotal action in this case, they are by no means conclusive, as mild cases of arsenical jaundice clear up without any further medication than small doses of calomel. For proof of specificity more cases and more serious types are necessary. If, as is presumed, the action of the thiosulphate is to neutralize the arsenic, good results can only be confidently expected if treatment is commenced immediately the toxic symptoms are apparent, as was done in this instance. If actual tissue destruction has already occurred and so-called yellow atrophy of the liver is in progress, a favourable issue is hardly to be expected. The importance of early recognition and treatment of such cases cannot therefore be overemphasized.

CASE VI.—*Acute Dermatitis after two Sulpharsenol Injections.*

Injections.
A nursing sister, aged 47, was admitted for chronic psoriasis which had previously involutioned under intramuscular injections of some arsenical compound. Following the second injection of 0.36 gram of sulpharsenol intravenously, an acute irritable eruption appeared, mainly on the trunk and arms, and resembling a serum urticaria in type. There was no rise of temperature, nor a history of previous dermatitis of any kind, and we were therefore compelled to assume that the sulpharsenol had produced it. An injection of 0.5 gram of thiosulphate was immediately given, and the following morning the pruritus had subsided, and the above dose was repeated. Slight desquamative reaction supervened forty-eight hours later, and the patient made an uninterrupted recovery in five days.

The rapid clearance of symptoms in this case after only two injections of thiosulphate can be explained only on a theory of direct neutralization, which is extremely probable, as not more than an hour elapsed between the appearance of the rash and the injection of the antidote. It would not have been possible in an out-patient. If the diagnosis was correct—and that of course is a matter of opinion—there could scarcely have been a more valuable illustration of the importance of instantaneous action. McBride and Dennie (*loc. cit.*, Case 6) report an irrefutable example of this point in a woman who swallowed $7\frac{1}{2}$ grains of perchloride of mercury with suicidal intent, and was brought to the hospital four hours later with acute abdominal symptoms and haematuria. The administration of 15 grams of thiosulphate by the mouth and 0.45 gram intravenously checked the pain and diarrhoea in a short time. Eight hours later 0.9 gram more was given and the following morning 0.45 gram. The patient made a complete recovery in a week, and although eight months pregnant did not abort.

It would be difficult to produce more convincing evidence of the value of thiosulphate in metallic poisoning, and such a case is a strong argument for its accessibility in a convenient form in all casualty departments and surgeries where such emergencies are likely to be met with. The rationale of administration by the mouth in the above case

is self-evident, and the salt probably reacted *in situ* with the perchloride. My own experience of oral administration is confined to a single case, in which it produced severe colic and diarrhoea when given in drachm doses twice daily.

CASE VII.—*Mercurial Stomatitis and Eruption.*

In this case the condition followed the intravenous injection of 1/16 grain of mercury perchloride for severe septicæmia. The patient was certainly saved by the heroic measures adopted to combat the infection, but the resultant mercurial poisoning, which only supervened a fortnight after the injection, was a troublesome sequel. At the time I had no experience of the intravenous method, and in view of the patient's dread of further injections I ordered the thiosulphate in a mixture. The stomatitis began to improve at once, and the rash showed signs of involution and began to desquamate slightly on the fourth day, but the patient developed severe colic and the treatment was abandoned.

The dose (1 drachm three times a day) was probably too large, although the amount mentioned in McBride's sixth case—namely, 15 grams—is actually four times greater (the B.P. allowance of dose is up to 1 drachm). This experience has somewhat biased me against administration by the mouth, and in future cases I intend to rely on the more rapid and evidently less toxic intravenous route.

Local Antidotal Properties of Thiosulphate.

CASE VIII.

On March 5th a male patient, aged 23, received 0.6 gram of novarsenobillon in 10 c.cm. of water into the left antecubital vein. The injection was given by an assistant who was operating for the first time. In spite of careful control the needle slipped through the posterior wall of the vein, and the last part of the barrel contents (about 2 c.cm.) formed a distinct tumescence subcutaneously. The patient complained of severe burning pain and fainted. The syringe was disconnected, leaving the needle *in situ*, and 8 c.cm. of distilled water, containing 0.75 gram of sodium thiosulphate, were injected so as to mix with and dilute the novarsenobillon solution. When I saw the patient again, on March 12th, there was no trace of local infiltration to be seen, and apparently no pain on deep pressure over the site of the injections, which was still marked by the presence of a bruise, where blood had escaped from the perforated vein. This is the first time in my clinic that an extravasous leak of novarsenobillon has escaped the sequela of painful subcutaneous infiltration.

Whilst fully conscious of the shortcomings of this communication, based as it is on only seven cases in early stages of metallic or arsenical intoxication, I feel justified in claiming that my results confirm those of the American authors, and support their view that sodium thiosulphate given intravenously is a potent antidote for mercurial and bismuth stomatitis, and of real value in counteracting the serious effects of acute arsenical toxæmia. It may be found, furthermore, to be an indispensable adjunct in the treatment of all cases of acute metallic poisoning.

REFERENCES.

¹ Ravaut, P.: *Presse Médicale*, 28, 73, January, 1920. ² McBride and Dennie: *Arch. Derm. and Syph.*, vol. 7, No. 1, January, 1923, p. 63.

Memoranda :

MEDICAL, SURGICAL, OBSTETRICAL.

"SLIPPING RIB."

I HAVE lately had under my care a patient suffering from the condition described by Mr. Davies-Colley in the *BRITISH MEDICAL JOURNAL* of March 8th, 1922, under the above name. As he remarked, it is more than likely that if the condition was described in the textbooks more cases would be recognized and relieved of their disability. Still, it apparently is not a common complaint.

My patient was a lady aged 26. There was no history of injury. Eight years ago she began to feel pain in her back when playing golf, and the pain has got steadily worse. It was always much increased by any exercise such as golf, tennis, or riding, and during the last year it has been very severe, practically preventing games and sometimes even preventing sleep. The pain was always in the dorsal region and the left costal margin. Her husband had noticed that she held herself crooked and walked "like a crab." She had been treated for a supposed movable kidney by a belt, without any relief, and was contemplating going to England to have the kidney operated on.

Examination on several occasions failed to discover a palpable kidney; but on the left costal margin at about

the level of the tenth costal cartilage was a movable tender object about the size of a hazel nut, which on palpation slipped away with a sensation resembling crepitus, to reappear on almost any change of the patient's position. The diagnosis of "slipping rib" was made.

At operation the cartilage was found to be in place at the moment, but it was easily displaced, and was seen to be freely movable. About two inches of the distal end was excised. The patient had considerable post-operative pain for a few days. For three weeks there was a dragging pain in the wound and the old backache persisted for nearly three months, but with gradually decreasing intensity. The backache was almost certainly muscular in origin and due to the habitual faulty attitude she had assumed.

The operation was done over three and a half months ago, and the patient expresses herself as being now entirely free from pain or discomfort, and able to enjoy as many as five sets of vigorous tennis in the afternoon.

Alexandria, Egypt.

E. N. RUSSELL, M.D. Cantab.

REPAIR OF RECURRENT INGUINAL HERNIA BY A GAUZE FILIGREE.

THE principle involved in this case is at present under trial for the radical cure of femoral hernia. After tying off and removing the sac the femoral canal is filled by a gauze plug and held in position by a few catgut sutures.

J. P., a pastrycook aged 25, was admitted to St. James Hospital, Balham, on March 10th, 1923, with a recurrent right inguinal hernia. He had been operated on three years previously. He was thin and undeveloped, with a marked impediment of speech. He had a bulging scar in the right inguinal region. The hernia was about the size of a pigeon's egg, and as it interfered with his comfort he was very anxious that something should be done to relieve him.

On March 12th the scar of the aponeurosis of the external oblique, which was found to be three-quarters of an inch wide, was excised and the sac exposed and dealt with in the usual way. It was impossible to do a radical repair after Bassini's method, as the internal oblique was thin and friable and separated from the lower border of Poupart's ligament by about one and a half inches. Some ordinary sterile absorbent unmedicated roller gauze, which is prepared from cotton and is used in all operating theatres, was folded three times and cut to fill the inguinal canal. In this case it was about two and a half inches long and one and a half inches wide. The gauze was saturated with flavine and tucked under the lower border of the internal oblique and behind Poupart's ligament. It extended forwards and inwards to the usual situation of the external abdominal ring. The cord was not displaced in any way. The aponeurosis of the external oblique was united over the gauze with catgut sutures, and the skin closed by a continuous silk suture. It may be added that the strictest aseptic and antiseptic precautions were taken during the whole of the operation.

The patient made an uninterrupted recovery and has been under observation for more than twelve months. The wound is firmly healed, there is no discomfort, and no evidence of recurrence of the hernia.

It is too early at present to form an opinion as to the ultimate results.

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DISCHARGE OF ASCARIS LUMBRICOIDES THROUGH APPENDICITIS SCAR.

WHEREAS formerly it was believed that *Ascaris lumbricoides* was a harmless intestinal parasite, there is now a growing list of more or less serious complications from its presence in the human body. Crowell¹ in a classification of the pathological effects of this parasite, mentions that it has several times been found in the appendix vermiformis, and in the case we now record five ascarids made their escape through the scar after an operation for appendicitis; they had kept up a persistent sinus for four months.

A girl aged 12 was admitted to the Bristol General Hospital on October 8th, 1923, suffering from diffuse peritonitis of forty-eight hours' duration. The abdomen was at once opened by one of us (D. G. C. T.), and a diffuse peritonitis of the pelvis and both sides of the lower abdomen from a perforated appendicitis was found. The appendix was seen to have perforated and to be sloughing throughout its entire length. It was removed and the stump ligatured and buried by a purse-string suture. The free pus was mopped out with gauze swabs and the pelvis drained by a rubber tube. No ascarids were seen, nor were they thought of. The tube was removed in forty-eight hours, and convalescence was quite satisfactory, the child being discharged from hospital on November 5th, 1923, with the wound nearly healed.

After discharge from hospital the child remained in the care of the other of us (A. S. C.), who found that she complained of

¹ *Amer. Journ. Med. Sci.*, March, 1920, p. 380.