examination of a catheter specimen of urine. Nothing could be made out in any of the other viscera, the heart and lungs were normal, and the spleen was not enlarged. The next day (January 1st) the patient was rather drowsy, incontinence of urine was present, and a specimen, on standing, showed quite an appreciable deposit of pus.

The patient's condition remained much about the same until January 6th, on which date bladder control was regained although frequency of micturition continued and pus was still present in the urine. There was some diarrhoea on January 5th only, but at no other time. On January 8th a small quantity of blood appeared in the urine and persisted until January 12th; but the pus persisted in considerable quantity until January 17th, when it was noticed to be very much diminished. On this latter date a few hyaline casts were observed.

On January 1st the patient was placed on treatment with the following mixture, which was continued three times daily throughout the illness:—Hexamine gr. x, sodii acid. phosph. gr. xv, syr. aurantii ʒi, aq. ad ʒi.

On January 3rd *B. paratyphosus* B was recovered from the urine in pure culture; it gave the usual sugar reactions and agglutinated strongly only with a specific paratyphoid B agglutinating serum. The same organism was again isolated from the urine in pure culture on January 10th. A blood culture on January 5th proved negative.

A vaccine was prepared from the *B. paratyphosus* B recovered from the urine, and on January 11th an initial dose of 50 million was administered. On January 13th the agglutination reaction of the patient's serum against his own *B. paratyphosus* B was tested, using the macroscopic method, and a completely positive result was obtained up to a dilution of 1 in 100. On January 12th *B. paratyphosus* B was again recovered from the urine in pure culture. By January 12th the patient was free from pain and stated he felt much better. On January 16th 100 million of the autogenous vaccine were given as a second dose, and on the following day it was noticeable that the amount of pus in the urine was enormously diminished.

There was continuous fever from the onset up to January 7th, the temperature varying from 104° F. to 101° F., and from January 7th to January 15th there was an habitual evening rise to 100°–101°, although the morning temperature was normal. From January 16th onwards the temperature remained normal. The pulse-rate varied with the temperature. During the first three days it ran between 100 and 120 per minute, then tended to be a little slower, and on January 7th it varied between 80 and 90. From January 7th to January 15th the pulse ran between 80 and 100, on three occasions only going beyond 100. From January 16th onwards the pulse varied between normal and 100, surpassing this limit on only nine occasions.

On January 18th no paratyphoid B or other organisms could be recovered from the urine, and no pus cells were observed on microscopical examination. On January 20th tenderness over the bladder had disappeared, frequency of micturition had gone, and the patient felt quite well; a very faint cloud of albumin only was present in the urine.

On January 22nd we again failed to recover any organisms from the urine, but a few pus cells were seen on microscopical examination of the centrifugized deposit. On January 23rd the third dose of vaccine was given—namely, 250 million. On the 27th a trace of pus could still be made out in the urine, and on the 29th a 500 million dose of vaccine was administered. On February 1st a slight local reaction to the vaccine was noticed for the first time, and the patient's serum was found to completely agglutinate his own *B. paratyphosus* B in dilutions up to 1 in 400. On February 5th no organisms could be recovered from the urine, and a fifth dose of vaccine, consisting of 750 million, was given. On February 13th 1,000 million of vaccine were given as a sixth dose, and on this date the urine was found to be free from albumin, although a few pus cells could still be detected. On the following day bacteriological examination of the urine failed to show any organisms.

On February 20th the urine was still free from albumin, and no pus cells could be detected whatsoever. On February 24th the seventh and last dose of vaccine was given, namely, 1,500 million. On March 10th a careful search was made of the urine and only a few degenerate bladder epithelial cells were found after centrifugation. No pus cells or organisms were seen, and cultures proved sterile. The patient, perfectly well, left hospital on this date for a convalescent home.

The faeces were examined bacteriologically on February 22nd, March 1st, 5th, and 14th, but on no occasion was the *B. paratyphosus* B or other member of the typhoid group recovered.

The infection in this case appears to have chiefly affected the bladder, although one cannot exclude an associated pyelitis which possibly was also present, but in a considerably slighter degree. The onset of the illness in its suddenness resembled ordinary paratyphoid fever, and in which "a feeling of chilliness is also common."¹ Apart from the localization of the infection the present case was markedly atypical in other respects. The pulse was not relatively slow (80 per cent. of cases), but was increased in rate in proportion to the rise in temperature; the spleen was at no time enlarged (50 per cent. of cases); there were no "spots" during the course of the illness (75 per cent. of cases), and no vomiting or abdominal tenderness beyond the early tenderness over the hypogastrium. In typical

paratyphoid fever diarrhoea is common during the first second, and third days, and it is a striking feature of our case that diarrhoea should not have occurred until the sixth day and then ceased on the day following.

It has been observed that in certain cases the *B. paratyphosus* B shows a marked tendency to pus formation; thus, among the purulent infections described are splenic abscess, suppurative orchitis, empyema, liver abscess, lung abscess, and peritonitis without perforation.² All these conditions, however, occurred following, or as a complication of more or less typical attacks of paratyphoid fever. H. Robinson,³ in commenting on a long series of paratyphoid cases, mentions, among complications, the fact that cystitis occurred once, and in this case *Bacillus paratyphosus* A was isolated from the urine. Stolkind,⁴ who is convinced that paratyphoid as well as typhoid infections are symptom-complexes, also states that cases of infection of separate organs have been met with—for example, appendicitis paratyphosa, cystitis paratyphosa, etc. He also describes, *inter alia*, an influenzal or respiratory form, but even in these cases the patients seem to show a large spleen and "spots."

It would appear, further, from a perusal of the literature, that it is by no means common to find paratyphoid bacilli in the urine during the course of an ordinary attack of paratyphoid fever. Fortescue-Brickdale,⁵ Dawson and Whittington,⁶ and others mention cases, but references are not numerous. As far as we are aware, urinary carriers of *Bacillus paratyphosus* B—that is, the bacillus occurring in the urine of otherwise healthy subjects—have not yet been reported. Wiltshire,⁷ in an examination of 98 cases of paratyphoid fever, says: "Kidney and bladder complications were very rare. In many cases . . . the urine was examined carefully for possible renal complications, always with negative results." Incontinence, apart from pyuria, sometimes occurs in severe paratyphoid, and was present in a few of Willcox's cases.¹

In connexion with our case it is interesting to recollect that in urinary carriers of typhoid the *B. typhosus* has its habitat generally in the renal pelvis, which is usually chronically inflamed, and it has also a secondary habitat in the chronically inflamed bladder.⁸ In fatal cases of typhoid fever the renal pelvis is often found congested, but the ureters and bladder are usually normal, though signs of cystitis may be found at times. In contrast to paratyphoid, bacilluria occurs in about one-third the cases of typhoid, although pyuria is recognized as a rare complication. Pyelitis sometimes occurs (Osler), and Patrick⁹ has recorded one fatal case of typhoid in which multiple abscesses were found in the kidneys *post mortem*.

In conclusion, to summarize the chief features in the case recorded above, we note:

1. Pyuria due to a pure infection with *B. paratyphosus* B.
2. The absence of the usual signs of paratyphoid fever.
3. The successful treatment with autogenous vaccine and hexamine.
4. The patient had not been abroad.

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A CASE OF GANGLIO-NEUROMA OF THE SYMPATHETIC.

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ABOUT six cases of ganglio-neuroma have been recorded in Great Britain.¹ The history of this case is as follows:

A well-developed male child, aged 3 years, was admitted to Kilmarnock Infirmary on October 2nd as a case of acute intestinal obstruction from intussusception.

Twenty-four hours previous to admission he began to complain of severe pain in the abdomen, which was observed to be swollen and hard. Blood and mucus, with a small quantity of faeces, were passed several times by

the bowel. His condition was ascribed to a known indiscretion in diet. He had had no previous illness.

On admission the child looked ill and was very restless. The temperature was 104° F., pulse 160, and respirations 36. The abdomen was freely palpable. A swelling could be felt occupying the right iliac and right hypochondriac regions. It was immovable, very hard, and apparently circumscribed. Although the outline of the mass could not be entirely determined, the tumour appeared to be adherent along its deep surface, while the abdominal wall was freely movable over it. On palpation the whole mass seemed to be smooth, and of the size and shape of a large orange. A provisional diagnosis of sarcoma or of tuberculous glands was made.

The following morning laparotomy was performed. The abdomen was tense. The intestines were nowhere adherent, the ileum and part of the ascending, the transverse, and the descending colon were very red and inflamed, and about 6 in. of the ileum was collapsed, apparently from pressure. There was no further sign which might have indicated a previous intussusception, and acute colitis was evident.

Behind the intestines, and pushing them over to the right and down into the pelvis, a large mass was found situated retroperitoneally along the right side of the bodies of the last four lumbar vertebrae, with the external iliac artery and vein crossing it superficially. The psoas muscle was behind the tumour and it appeared to be flattened. The tumour was immovable, and firmly adherent along its central and posterior surfaces; it was not adherent to the aorta. The condition was thought to be due to a sarcoma arising from the periosteum of the bodies of the vertebrae. A wedge-shaped piece was taken out of the substance of the growth for microscopical examination; a considerable amount of haemorrhage took place from the wound thus formed.

The child died the following day. The tumour was easily removed *post mortem*, it being apparently capsulated and only bound down by connective tissue to the sheath of the psoas muscle. No glandular involvement could be made out, and the kidneys and suprarenals were free from any implication in the tumour growth.

The tumour was kidney-shaped and rather flattened on its deep and central surfaces. Its length was 11 cm., breadth 9 cm., thickness 7 cm., and its weight 226.8 grams. The general appearance of the tumour was very like that of a fibromyoma. On section there was seen to be a very definite fibrous capsule. The substance of the tumour was firm, tough, and resilient. The cut surface was smooth and in some places glistening. White, grey, and yellow fibres could be distinguished in a general felted mass.

Microscopical sections were stained with the usual stains and also for axis cylinders, myelin, Nissl's bodies, fat and glia. It was easy to recognize that the great mass of the tumour was composed of nerve fibres supported in a fibrous tissue stroma. Both medullated and non-medullated nerve fibres were present. Large numbers of ganglion cells, similar to those of normal sympathetic ganglia, were seen in groups scattered throughout the growth. There were also many developmentally early ganglion cells, the so-called sympathoblasts. The growth was non-malignant, and there was no metastasis.

I have to thank my chief, Dr. W. McAlister, for permission to publish this case.

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SIR WILLIAM TURNER, Vice-Chancellor and Principal of the University of Edinburgh, left personal estate in the United Kingdom valued at £71,467, of which £33,730 is in Scotland.

IN the summer term of 1914, the last academic peace term, there were 4,750 foreign students attending the German universities. In the summer term of 1915 this figure had fallen to 1,305, owing, as is alleged, mainly to the expulsion of about 2,600 students from hostile countries. It is, however, claimed that even in 1915 there were 62 Russians, 2 British, 5 Italians, and 1 Belgian students resident in Germany. Among the foreign students were 150 women.

THE THERAPEUTIC VALUE OF HYPOCHLOROUS ACID.

BY

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IN October of last year I communicated to the *BRITISH MEDICAL JOURNAL*¹ some experiments on the neutralizing effects of hypochlorous acid on diphtheria toxin, and drew attention to the resistance the animal body offers to large quantities of the solution used.

During the last nine months various investigators have dealt with the hypochlorites as antiseptics—Lorrain Smith, Murray Drennan, Rettie and Campbell,² Dakin,³ Schütze⁴—and also given the results of treatment by intravenous injection—Lorrain Smith, Ritchie and Rettie,⁵ and Brand and Keith,⁶ in cases of puerperal infections; Fraser and Bates,⁷ in cases of toxæmia consequent to gas gangrene.

In this paper I publish further and more detailed experiments to determine the antitoxic and antiseptic power of hypochlorous acid *in vivo*.

It has been shown by Dakin³ that *in vitro* staphylococci suspended in saline are killed within two hours by sodium hypochlorite, 1 in 500,000, but that when serum is present a concentration of 1 in 1,500 is needed.

It has been thought, therefore, important to prove experimentally (1) which is the highest concentration of HClO tolerated by animals, and (2) what is the lowest concentration producing an antiseptic or antitoxic effect.

Rabbits of about 2 kilos in weight and therefore with approximately 90 c.cm. blood were used. The HClO solution employed was eusol with a hypochlorous acid concentration of 0.5 per cent., physiological saline being used in place of water and CaCl₂ added on account of its antitoxic properties; it is prepared as follows:

To 800 c.cm. physiological saline add 10 grams bleaching powder and 10 grams boric acid, shake vigorously, allow to stand for two or three hours, then filter and add to the filtrate 2 grams of chemically pure calcium chloride. The solution now contains HClO in a strength of between 0.5 and 0.6 per cent.; saline is added until the required concentration of 0.5 per cent. is reached. Owing to its instability the solution must not be used longer than three days after preparation.

While 20 c.cm. of this HClO solution, giving a concentration of about 1 in 1,100 in the blood of the animal, were generally well tolerated, 10 c.cm. proved to be entirely harmless, and the concentration of about 1 in 2,000 that resulted appeared, moreover, to be near the limit of efficiency; 5 c.cm. doses (about 1 in 3,800) seldom led to beneficial results.

Attention may be drawn to the fact that a great number of toxins of bacterial origin are considered to be of an albuminoid nature (Brieger and Fraenkel,⁸ Brieger and Boer,⁹ Etienne Burnet¹⁰); it is possible, therefore, that hypochlorous acid may neutralize toxins by coagulating and eventually precipitating them.

The following tables show the efficacy of 10 c.cm. doses of the HClO solution in certain artificially produced infections and toxæmias.

TABLE I.—Diphtheria Toxin.

Rabbit.	Dose of Toxin Injected Subcutaneously	Quantity of HClO Solution Injected Intravenously.				Results.
		Immediately	After 24 hrs.	After 48 hrs.	After 72 hrs.	
1	10 L.D.	10c.cm.	10c.cm.	—	—	Animals remain healthy.
2	10 L.D.	10c.cm.	10c.cm.	—	—	
3	10 L.D.	10c.cm.	10c.cm.	—	—	
4	10 L.D.	—	10c.cm.	10c.cm.	—	
5	10 L.D.	—	10c.cm.	10c.cm.	—	After 5 days paralysis of the legs.
6	10 L.D.	—	10c.cm.	—	10c.cm.	
Control	10 L.D.	—	—	—	—	Dead after less than 48 hours.