isotonic is oxidized in the body, so that isotonic dextrose solution is more efficient as a source of water than an equal volume of isotonic salt solution.

In conclusion we desire to thank Dr. Hale White, Mr. Symonds, and Mr. Steward, of Guy's Hospital, for permission to publish the results of investigations made on patients under their care.

REFERENCES.

Catheart, *Journ. of Physiol.*, xxxv, 1907, 500; xxxvi, 1907, 27; xxxix, 1909, 311. Langdon Brown, *Proc. Roy. Soc. Med.*, iv, 1911, Part III, Therapeutical Section, p. 63.

RENAL CALCULUS IN CHILDHOOD.

WITH A REPORT OF TWO SUCCESSFUL CASES OF NEPHRO-LITHOTOMY IN YOUNG CHILDREN.

BY

ROBERT OLLERENSHAW, B.Ch., F.R.C.S.Eng.,

HONORARY SURGEON TO SALFORD ROYAL HOSPITAL; HONORARY SURGEON TO MANCHESTER NORTHERN HOSPITAL FOR WOMEN AND CHILDREN.

As to the infrequent occurrence of stone in the kidney in young children all writers are agreed. Sir Henry Morris,¹ in an analysis of 283 cases of renal calculus, met with only one case in a patient under 10 years of age. Drew records the removal of a uric acid stone from the kidney of a child aged 6 years. The rarity of calculi causing symptoms at this period of life seems somewhat extraordinary, when one remembers that at autopsies on the bodies of infants it is extremely common to find small brown granules of uric acid deposited in the pelves and calyces of the kidneys. Holt² considers that very small calculi are common in infancy, but in a series of 1,000 autopsies made by him on the bodies of children under 12 years only one stone of any noteworthy size was found.

It is probable that the almost exclusively fluid diet of the first two years of life is responsible for the solution, or washing out, of these uric acid granules, though the earlier histories of certain cases which come to operation in later years make it extremely likely that the calculi were present in childhood. Morris records that on several occasions he has met with a history of symptoms dating back from twenty to thirty years, showing that the calculi existed in quite early life. Amongst his cases also are those of children of 13 and 11 years who had presented symptoms of calculus for seven and three years respectively.

Heaton³ gives an account of the successful removal of a uric acid stone weighing 35 grains from a female child of 11 years; the patient suffered severely from shock after the operation, but ultimately recovered. Amongst cases in which calculi were found at autopsies are three reported by Newton Pitt.⁴ These were all uric acid stones, and weighed 2 grains, 4 grains, and 2 grains respectively, being found in children under 2 years of age who died of diphtheria and bronchopneumonia. In the second of these cases the mother noticed polyuria but no haematuria; in the last case haematuria was observed, but in the first case there were no renal symptoms at all. A similar case is noted by Partridge⁵; at autopsy a stone of 4 grains weight was found in the pelvis of the left kidney. The child had shown no symptoms suggesting the presence of a calculus, and no examination of the urine was made. Death occurred from pneumonia.

The reputed uncommon occurrence of stone in the kidney in children is probably the chief reason why it is overlooked when actually present. Again, renal pain is practically always referred, by a child, to the abdomen, and so is ascribed to gastro-intestinal disturbance, the most common of the complaints of childhood. The pain may also be referred to the hip or spine, and produce simulation of disease in these regions to such an extent that the kidneys are never suspected, and escape examination. Pain due to renal calculus depends on the position and mobility of the stone or stones; the kidney substance is insensitive, the pelvis and calyces highly sensitive. The pain is frequently referred to the groin; in boys it is accompanied by retraction of the testicle, which is much more commonly seen at this stage of life than in later years.

It is obvious, from what has already been said, that in children, as in adults, calculi may be present without causing any symptoms. The most constant and reliable symptom, however, is haematuria. Lumbar pain is not common in children. The presence of fine uric acid sand should be looked for in suspected cases; the urethral irritation caused by this substance is sometimes a cause of nocturnal incontinence, and the urine of patients suffering from this trouble should always be carefully examined for uric acid crystals. Transient haematuria may be caused by the effect of these small grains on the tender kidney tubules, and is not of much importance; if it persists it must be regarded as serious and especially so if there be pain along with the haemorrhage.

In infants from 6 to 18 months old the commonest cause of haematuria is scurvy, and it must be borne in mind that blood may be present in the urine for some days before tenderness of the limbs becomes noticeable. In Drew's case, mentioned above, intermittent lumbar pain was the only symptom; there was no haematuria, but a skiagram revealed the presence of a calculus.

In May, 1912, Dr. J. J. Cox asked me to see the following case:

A little girl, aged 3 years, who had been suffering from intermittent haematuria for some weeks. In May, 1911, there had been a similar attack, and I am informed that on one or two occasions the child complained of some slight lumbar pain. From that time until January, 1912, there was no further evidence of any disease, the child appearing to be in perfect health. For three months before the time when I saw her the general health had been failing, though the child looked well nourished. Dr. Cox noticed the presence of slight haematuria and a little tenderness in the back; on some days blood was absent, but a trace of albumen was always there. On no occasion were casts or pus cells present.

Cystoscopic examination showed the escape of clear urine at regular intervals from both ureteric orifices. Nothing abnormal was seen beyond some slight congestion round the orifice of the left ureter. A skiagram showed the presence of a calculus in the left kidney, the rest of the urinary tract being quite clear.

Operation.

On May 20th, 1912, the usual lumbar incision was made, the kidney exposed and brought out on the loin. Careful palpation afforded no indication as to the whereabouts of the stone, but the radiogram showed that the stone lay about 1 in. above the lower pole. The cortex was incised along its convex border over the position of the shadow and a rough spiculated stone about $\frac{3}{4}$ in. in diameter was removed. The cortex was sewn up by interrupted catgut stitches, the muscles brought together and the wound closed, a small rubber drainage-tube with gauze filling ("cigarette" drain) being placed down to the kidney.

After-History.

The drain was removed in forty-eight hours. The wound was quite sound at the end of ten days and the child pursued a quite uninterrupted convalescence. On the fifth day after the operation there was but a mere trace of blood in the urine and by the end of the week it had disappeared entirely.

Calculi removed (actual size).

Case I.—Composition, uric acid; weight 4 grains.

Case II.—Composition, calcium oxalate and phosphate; weight 16½ grains.

The second case came under observation on June 26th, 1912.

A boy, aged 8 years, a patient of Dr. Mumford, had suffered from occasional attacks of abdominal pain in the left side for twelve months; during the last three months the attacks had been more severe. The pain was of an aching character and was frequently accompanied by vomiting. On examination nothing abnormal was found except some little tenderness below the twelfth rib in the left lumbar region and also by deep pressure on the kidney from the front. The urine contained 0.05 per cent. of albumen but no blood. Microscopic examination was negative and the cystoscope showed no abnormality. A skiagram was taken and showed a calculus in the lower pole of the left kidney, which was slightly enlarged.

Operation.

On June 28th, 1912, a rounded, very hard spiculated stone weighing 16½ grains was removed from the lower part of the left

renal pelvis. The wound was treated as in the previous case; the child was up and about in three weeks, and left the hospital on July 22nd. He has had no trouble since that time.

Such cases impress upon us the importance of being on the look-out for renal calculi, which are probably much more common during childhood than is generally supposed. In cases of abdominal, spinal, hip-joint, or lumbar pain where the signs and symptoms are not clear, the urine should be carefully tested and a microscopic examination made. The kidney area should be closely examined and a skiagram taken of the whole urinary tract. If possible a cystoscopic examination should also be made.

If no sepsis has occurred, the prognosis is excellent. Post-operative shock is the only real danger. Heaton's second case suffered severely from shock, and Aldibert lost one case out of a series of three in children. When sepsis is present a fistula may persist—this happened in Morris's case and required nephrectomy to remedy it. Palliative treatment by alkalis and other solvents may be effective when mere sandy particles are present, but when a calculus exists of size sufficient to be shown on an x-ray plate, it is quite certain that nothing short of operation will remove it. It must also be borne in mind that the sooner the operation is undertaken the better the condition of the kidneys, and therefore the better the chances of success.

REFERENCES.

- ¹ Morris: *Surgical Diseases of the Kidneys and Ureters*, 1906.
² Holt: *Diseases of Infancy and Childhood*, 1908. ³ Heaton: *Birmingham Med. Review*, 1897. ⁴ Newton Pitt: *Trans. Path. Soc. Lond.*, 1895.
⁵ Partridge: *Trans. Obst. Soc., New York*, 1910.

THE QUALITATIVE AND QUANTITATIVE EFFECT OBSERVED ON POLYMORPH NEUTROPHILE LEUCOCYTES IN THE TREATMENT OF TUBERCULOSIS BY TUBERCULIN.

By E. HAMILTON BLACK, M.B., CH.B. EDIN.,

ACTING RESIDENT ASSISTANT MEDICAL OFFICER, COUNTY AND CITY
ASYLUM, HEREFORD.

It is with diffidence that I desire to draw attention to the following phenomena noticed by myself in a series of cases, some of which I have not previously seen recorded. From a clinical standpoint they may have great significance. Some of these observations have not been checked, so far as I know, by other contemporary workers, and therefore require confirmation. An important change occurs in the qualitative and quantitative values of polymorph neutrophile leucocytes after tuberculin treatment in those cases of tuberculosis in which these values on investigation have been found to be poor and below the normal. No doubt this fact has been overshadowed or perhaps overlooked by workers investigating the more complex questions in relation to dosage, antibodies, tox-immunity, etc.

One phenomenon observed, due to the formation of antibodies, is the increased power of the neutrophile polymorph leucocytes to draw into their substance the invading micro-organism—a fact made use of in estimating the opsonic index.

I have repeatedly observed by a series of counts that this increased power is almost equally shared by what I term "all qualities" of neutrophile polymorph leucocytes—that is to say, by those having one or more than one nucleus. This should be kept clearly in mind, in view of the following facts which I have from time to time carefully collected, and which I think are deserving of consideration on account of their clinical significance.

First, the phagocytic value of polymorph neutrophile leucocytes in drawing into their substance tubercle bacilli is increased in proportion as the number of nuclei contained in them is also increased. This is contrary to the view held by some that those neutrophile leucocytes with more than one nucleus are examples of degenerated forms.

Counts were taken from a series of slides prepared from emulsions of leucocytes treated by control serums, and those freshly obtained from tuberculous patients. Whether the tuberculo-opsonic index was high or low, it was found that the average values were maintained throughout with

little variation as follows: Taking equal numbers of the variously nucleated neutrophiles, the number of tubercle bacilli ingested by polymorph neutrophile leucocytes with one nucleus was found to be about 10 per cent., by those with two nuclei about 18 per cent., by those with three nuclei about 22 per cent., by those with four nuclei about 25 per cent., and by those with five nuclei about 25 per cent. These figures represent the combined results of all the counts made from the whole series of slides. Charts 1, 2, and 3 are some examples of the counts made from the series of slides above mentioned. Hence, instead of those

Chart 1.—Phagocytic values. The number per cent. of tubercle bacilli ingested by equal numbers of the variously nucleated polymorph neutrophiles treated with fresh serum from the blood of a phthisical patient.

Chart 2.—Phagocytic values. The number per cent. of tubercle bacilli ingested by equal numbers of the variously nucleated polymorph neutrophiles treated with the fresh serum from the blood of a healthy non-tuberculous subject.

Chart 3.—Phagocytic values. The number per cent. of tubercle bacilli ingested by equal numbers of the variously nucleated polymorph neutrophiles treated with fresh serum from the blood of a phthisical patient.