original haemorrhage than a recurrence. One, aged 35, had a recurrence after eight months and became normal; two (aged 32 and 37) after a year and became normal; one (aged 38) recurred after four months; and one (aged 39) after seven months.

REFERENCES.

- ¹ Blacker: Menorrhagia treated by Radium, *Lancet*, 1923, vol. i, p. 423.
² Idem, *ibid.* ³ Bonney: BRITISH MEDICAL JOURNAL (Annual Meeting), September 8th, 1923, p. 410.

THE IMPORTANCE OF BENCE-JONES ALBUMOSURIA IN DIAGNOSIS.

BY

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The subject of Bence-Jones albumosuria is an old one, but from recent experience I am sure that it is by no means always recognized, nor is the importance of its presence sufficiently appreciated, not only as a diagnostic or even pathognomonic sign, but also as an indication of a serious condition of affairs in what may appear to be a simple and straightforward case. These points are illustrated by the three following cases I saw in 1925.

CASE I.

A man, aged 60, consulted me on February 20th, 1925. He said that six months previously he had pains over the left shoulder and down the arm, which gradually got worse and then slowly improved, but were still present. These were apparently due to an ordinary brachial neuritis affecting the fifth and sixth cervical roots. He then said that for three weeks he had had pains across the front of the upper abdomen, which he put down to dyspepsia. I found no abnormal physical signs anywhere (the spine being freely movable) except a small gland the size of a hazel-nut, just above the left clavicle; it was painless and indeed had not been noticed by the patient. On testing the urine as a mere matter of routine, I was surprised to find large quantities of Bence-Jones albumose present. I wrote to Dr. Walter Buck, who had recently seen the patient, and warned him that it might turn out that the pains were caused by a myeloma of the vertebrae. An x-ray photograph revealed nothing abnormal.

The pains got worse; a surgeon was consulted some weeks later, who thought there was some thickening in the lower cervical region. I saw him again at his home with Dr. Buck on May 2nd. His left arm was now partially paralysed, and the pains down the spine were intense. He afterwards had constant vomiting, intense pains in the head, and died of exhaustion in July last. Unfortunately no *post-mortem* examination was made.

CASE II.

A compositor, aged 49, was sent to see me by Dr. Baker of Preston on September 24th, 1925. In the previous April he had complained of pain in the left side of the chest, which was thought to be due to diaphragmatic pleurisy, but there were no physical signs. In August the pain got worse, and extended round from back to front on both sides in the area of distribution of the fifth to the seventh dorsal roots. A specimen of urine was sent to a pathological research laboratory, and the report was that the urine contained a trace of albumin and a "substance of a balsamic nature of uncertain origin." An x-ray report stated that disease of the fourth to the seventh dorsal vertebrae was present (? growth in the vertebral bodies or in the posterior mediastinum). There was a marked prominence of the fifth and sixth dorsal vertebral spines, and the pain in the back was very intense. On examination of the urine I found that the "substance of a balsamic nature" was an immense quantity of Bence-Jones albumose.

Dr. Baker kindly wrote to me on January 26th, 1926, stating that the patient has much improved as the result of deep x-ray therapy applied by Dr. Rayner of Preston, and with the assistance of a spinal support had been able to return to work, as the pain was so much less, but x-ray photographs show a rather more marked angular curvature, and the Bence-Jones albumosuria is still present.

CASE III.

On November 29th, 1925, I was asked by Dr. T. Gregory of Manchester to see a clerk, aged 19. He had been first seen by Dr. Gregory in October, 1924, suffering from rapid heart and dyspnoea, with no obvious cause. The symptoms continued, and in January, 1925, the supraclavicular glands on both sides were found to be enlarged. In July the spleen was enlarged, as well as the left axillary glands, and in August occasional rises of evening temperature up to 100° F. began, with enlargement of the right axillary glands and pains in both iliac fossae and

over the sacrum. Bence-Jones albumose was found in the urine for fourteen days.

In September the albumosuria recurred occasionally, and he got rapidly worse, with much anaemia; the evening temperature sometimes reached 102° F. During November the albumosuria was present in increased amount, and the whole spine was found to be a uniform convex (backwards) curve from end to end; any movement caused intense pain in the spine and round the abdomen and chest, and sometimes in the arms and legs. The temperature rose irregularly each evening to 102° or 103° F., and he died on December 4th.

This was obviously not a case of pure myeloma, but rather one of acute lymphosarcoma affecting many parts, including the spine, or of acute Hodgkin's disease become malignant.

The presence of this peculiar albumose was first described by Bence-Jones in the *Philosophical Transactions* of the Royal Society in 1848 as found in the urine from a case said to be of "mollities ossium" [but much more probably of myeloma—E. S. R.]. As the reactions given are somewhat different from those of other albumoses found in the urine, it is always best to refer to this substance as "Bence-Jones albumose." Its source is probably the cells of the tumour. An excellent and full paper on the subject, containing a detailed description of the reactions obtainable, was written by Bradshaw in the *Transactions* of the Royal Medical and Chirurgical Society for 1898 and 1899; and another paper by Anders and Boston (based on three cases) was published in the *Lancet* in 1903.

Chemical Characters.

The essential reactions are as follows: On applying heat to the slightly acidulated urine a white precipitate occurs at a temperature of about 55° C. (132° F.). On further heating this precipitate dissolves, and reappears on cooling. It will, of course, be remembered that serum albumin is only precipitated at about 80° C. (176° F.), and does not disappear on further heating. Cold nitric acid causes a dense precipitate of Bence-Jones albumose, and this precipitate disappears on heating and reappears on cooling. Even when the urine is diluted with twenty times its volume of water hydrochloric acid causes a sharp white ring to appear at the place of contact, and this ring disappears on heating and reappears on cooling (albumin is only precipitated by hydrochloric acid in excess).

Now in ordinary clinical work most of us do not use thermometers when testing urine by heat, nor we do as a rule use hydrochloric acid. So I wish to point out a very easy observation which will infallibly indicate Bence-Jones albumose. Take about 4 inches of urine (slightly acidulated if necessary with acetic acid) in a test tube, and apply heat gently to the top inch. If Bence-Jones albumose is present it is astonishing to note how soon a precipitate forms, and how this precipitate, which is at first of a particularly fine grain, spreads rapidly down the urine. On further heating this fine precipitate dissolves; but in my experience not by any means entirely, as much of it clings together in thick masses, sticking to the side of the test tube. If the cold nitric acid test is now tried, by pouring the acid very gently down an inclined test tube containing the urine, a dense precipitate will form at the place of contact, and this will rapidly spread up the urine as a fine-grain precipitate. These simple experiences are entirely different from those obtained with an ordinary albuminous urine, and once seen are never forgotten.

It is, of course, principally in cases of myeloma that Bence-Jones albumose is formed. The myeloma itself may not be evident, as it may occur in the vertebrae and it may not be discernible by x rays; moreover, the only symptoms may be definite root pains, such as occur in an ordinary local neuritis, or there may be vague pains relating to the vertebral column; in such cases the presence of Bence-Jones albumosuria at once indicates the seriousness of what at first sight appears to be a slight illness.

This condition is supposed to be very rare; but I can recall five other cases I have seen in hospital or in consultation within recent years, in addition to the three cases mentioned above. I am therefore inclined to think they are commoner than is usually supposed, but that they are not always recognized (even in pathological research laboratories), and for that reason I have written this note to revive some old knowledge.