fairly well. What we want to know is the cause of the endogenous variety. If this could be discovered we might reduce maternal mortality by one-third. This is an object upon which expenditure is worth while. The saving of 1,100 women's lives is no small matter.

Fifth. The existing organization of midwifery is more or less chaotic, and there is a lack of cohesion between the local authorities on the one hand and medical practitioners and midwives on the other. The midwife can call in any doctor she thinks fit. He may be experienced or may not, and there is no adequate supervision by the medical profession of the midwifery service as a whole. Panels of medical practitioners specially experienced in midwifery should be set up, and except in cases of emergency the midwives should be restricted to the members of these panels. Each patient should be seen by a medical practitioner at least once during her pregnancy. There should also be attached to every panel one or more specialists whose opinion could be sought in cases of exceptional difficulty. Every case of death in childbirth should be reported and investigated, so as definitely to ascertain the cause and whether the treatment has been as it should. Ante- and post-natal clinics and child welfare clinics should be co-ordinated. More beds should be provided for difficult cases, and arrangements made to pass on from the ante-natal clinics those women whose confinements are likely to be difficult. Cases of sepsis should not be treated in fever hospitals, but in open-air isolation wards of maternity hospitals.

That the mortality rate is exceptionally high in sparsely populated districts proves the advantages of skilled and prompt attendance. Steps should be taken to remedy these conditions by a more comprehensive system of administration; and here again the value of ante-natal work is apparent. If every expectant mother were to present herself for ante-natal examination by a medical practitioner, arrangements could be made, even in sparsely populated areas, to provide her with the necessary assistance.

In conclusion, let me say that there is no occasion for despondence, but every reason for hope. Statistics are dangerous things. For instance, the Scottish figures are most depressing, showing as they do that deaths from puerperal causes in Scotland have increased since 1855 from 4.9 to 6.2 per 1,000 births. I do not believe that these figures accurately show the state of affairs. I cannot believe that more women die from childbirth to-day in Scotland than in 1855. These figures depend on classification and knowledge on the part of the medical attendant. Even in an obstetric hospital we find it difficult to tabulate the diseases of pregnancy, notwithstanding an elaborate system of cross-indexing. This applies particularly to venereal diseases.

These matters demand urgent practical attention. Whatever criticism there may be on either side, we all have the same object in view. We are all anxious to improve the midwifery service and to save human lives.

THE TREATMENT OF SEVERE AND PERSISTENT UTERINE HAEMORRHAGE BY RADIUM.

WITH A REPORT OF 200 CASES.

BY

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THE type of haemorrhage under consideration is frequently described as idiopathic or essential haemorrhage, and pathologically it is referred to as chronic metritis, fibrosis uteri, or chronic subinvolution; but, however debatable the pathology, the one distinctive feature is the excessive and uncontrollable haemorrhage with absence of any pelvic lesion to account for it. This series of cases does not include the minor uterine haemorrhages which are relieved by drugs or a single curettage, but only cases which had been dealt with in the ordinary way and proved refractory. In many of the cases I have myself performed curettage in the hope that it would alleviate the condition, and

only used radium when it was subsequently found that the operation had had little or no effect. The cases were chosen for the following reasons:

- (1) The persistence of uterine haemorrhage after prolonged medical treatment.
- (2) After curettage or other operation with no relief.
- (3) Advanced degree of anaemia, with shortness of breath, headaches, oedema of the legs, etc.
- (4) Cases in which the patient had to spend some part of each month in bed on account of the severity of the haemorrhage.

Analysis of this series of 200 cases shows the following reasons for the treatment:

	Cases.
Dilatation and curettage	96=48.0 per cent.
Other operations	20=10.0 "
X rays	1= 0.5 "
Confined to bed for part of life ...	12= 6.0 "
Anaemia	38=19.0 "
Palliative treatment failed	33=16.5 "

A large number (48 per cent.) had already been treated by dilatation and curettage, of which 8 had been curetted twice, 4 three times, and 2 five times. Blacker¹ records a case where the patient had been curetted eighteen times. It seems hardly credible that this operation could be repeated four, five, and more times; nevertheless it is frequently done. It is reasonable to repeat it once where a patient has derived considerable benefit from it for months and is nearing the menopause, but there can be little reason for pursuing it beyond this point.

Twenty cases had undergone some other form of operative treatment, including excision of polypi, amputation of the cervix, resection of cystic ovaries, ventral suspension, salpingectomy, appendicectomy, and myomectomy—the best results being relief for a few months, and the poorest no relief at all. One patient (Case 5) had been curetted, and, this proving of no avail, was subsequently given five exposures of x rays, the details of which I did not learn; she improved for a few months, relapsed, and was then successfully treated by radium.

Twelve cases (6 per cent.) were almost completely bed-ridden, and spent the greater part of their time between bed and a couch.

Thirty-eight cases (19 per cent.) were in an advanced degree of anaemia through continuous loss. One (Case 17) had been treated palliatively and later by curettage; after the operation the bleeding did not stop and she was becoming seriously ill. The surgeon had had her prepared for hysterectomy, but as I was in the hospital that morning treating another case he asked me to see her. We decided to give her the chance, and radium treatment was carried out. After one exposure temporary relief occurred, and five months later a second exposure was given, which established amenorrhoea permanently.

Case 66.—This patient, aged 18, had been an in-patient and out-patient at a general hospital for sixteen months, but she continued to lose excessively 8-10 14-21. This was aggravated by intermenstrual loss, and culminated in a five weeks' continuous and severe haemorrhage. She was seen at her home in consultation by one of my colleagues, and immediately sent to hospital in an ambulance. She was colourless, breathless, and looked to be in a moribund state. A blood count showed—red blood cells, 2,200,000 per c.mm.; white cells, 12,000. She was given 100 mg. of radium bromide for twenty-four hours. Amenorrhoea ensued for three months; then she had irregular periods of five-day type for five months, and then became, and remains, regular every four weeks of the five-day type. This patient had what is known as the haemorrhagic diathesis, for extraction of a tooth was followed by troublesome haemorrhage and the socket required repeated plugging; she bruised very easily, but no gross internal haemorrhage had been noted. It is also interesting that during her period of amenorrhoea she had attacks of epistaxis.

History.

This condition may occur at any period of menstrual life, but is more commonly found at and around puberty, between 30 and 40 years of age, and at the menopause. The clinical picture is that of menorrhagia and metrorrhagia, and the period may be so prolonged that the patient finds it easier to describe how many days in the month she is clear, rather than to describe how long the haemorrhage lasts. Finally, she may have to spend most of her time in bed on account of the haemorrhage and consequent anaemia.

Of 50 of these cases submitted to the Wassermann test, not one showed a positive reaction; I do not therefore believe that syphilis plays any part in the etiology. In later life a large majority of the patients are parous women, so the possibility that infection plays a part must be admitted, although histological evidence is not obtained; but when it is remembered that this condition is not so uncommon at and around puberty (I have curetted and treated 16 cases), previous infection by gonococcal and pyogenic organisms cannot be a constant factor.

Pathology.

Clinically two types of uterus are met with in this condition—the systolic and the diastolic.

(a) *The systolic uterus*, which is but slightly if any larger than the normal organ, is hard, heavy, and regular in outline, with a cavity $2\frac{1}{2}$ to 3 inches in length; it yields little or no tissue to the curette, but gives a characteristic rasp as the metal loop passes over the surface. It has commonly lost its flexion, and is perfectly straight, with a greater or less degree of retroversion. On section the wall may be as much as an inch in thickness, and the arteries are prominent, with gaping mouths and quite incapable of collapse; if a portion of one of these vessels be dissected out of the uterine wall it will be found to retain its patent condition.

(b) *The diastolic uterus* is bulky and retroverted, with a cavity varying between $3\frac{1}{4}$ and 5 inches, and yields a considerable quantity of thickened, oedematous tissue to the curette. It occurs in parous women, and most often as they are approaching the climacteric. After curettage the hyperplastic endometrium slowly re-forms and the symptoms return. These patients frequently undergo curettage two, three, or more times, in the hope that it will tide them over until the menopause sets in. It is a condition which is almost certainly cured by exposure to radium. If the patient be examined some months after the exposure to radium, when amenorrhoea is fully established, the uterus will be found to have contracted down to the size of what I have called the systolic uterus.

Of the series of 200 cases, 64 (32 per cent.) belong to the systolic group, 18 of which were nulliparous women; 120 (60 per cent.) belong to the diastolic group, of which 8 were nulliparous; and of these 184 cases 30 had small fibroids. In the remaining 16 cases an attempt was made to control the haemorrhage rather than to establish amenorrhoea.

Diagnosis.

The diagnosis must necessarily depend upon the result of an exploratory curettage, the exclusion of new growth, the absence of any other pelvic lesion which would induce haemorrhage, and upon the physical characters of the uterus as determined bimanually and by the curette.

Analysis of Cases.

In nearly all cases at or near the menopause (128 cases = 64 per cent.) one exposure, the dose of which I will discuss later, sufficed to establish amenorrhoea. Three cases were given a second treatment before amenorrhoea was established, and one case required three exposures. Late recurrence took place in some of these cases, but they will be mentioned later. Of the 200 cases, 14 (7 per cent.) in all required two exposures, and 6 (3 per cent.) required three exposures before the menopause was induced, but they occurred for the most part in the younger women. The ages were as follows:

				Cases.
16-29 years	...	...	...	18 = 9 per cent.
30-35 "	...	...	...	20 = 10 "
36-40 "	...	...	...	52 = 26 "
41-45 "	...	...	...	46 = 23 "
46-50 "	...	...	...	42 = 21 "
51-55 "	...	...	...	22 = 11 "

It is important to notice that practically all the cases which were refractory to a single treatment occurred in young women. In two cases (Nos. 76 and 110) hysterectomy was done.

Case 76.—A single woman, aged 24, had haemorrhage of a severe type $\frac{10-11}{21}$ for some years, which had gradually got worse. Two years before she came under my care she had her appendix removed, after which the periods lasted fourteen days, and four

months before I saw her dilatation and curettage was performed. Following the last operation the haemorrhage did not cease and she lost more or less daily. On July 17th, 1923, I examined her under an anaesthetic, and found a small firm uterus, $2\frac{1}{2}$ inches in length, which yielded no scrapings and gave the characteristic rasp of fibrosis uteri. I decided to try and modify the periods rather than abolish them, and introduced 50 mg. of radium bromide into the uterus for twenty-four hours. She had a prolonged show through August and September, which became severe at the end of this month and the beginning of October. On October 8th I again introduced 50 mg. into the uterus for twenty-four hours. She remained free for a month and then had irregular losses, becoming gradually worse until January, 1925.

On January 23rd, 1925, I introduced 100 mg. of radium bromide into the uterus for twenty-four hours, but she continued having irregular losses until July; she then came determined to have hysterectomy performed, and if I would not agree she was going to another surgeon. On September 16th I performed complete hysterectomy. I now think it probable that had I given her a large dose at the outset the subsequent history would have been different.

Case 110.—A single woman, aged 51, had severe and irregular haemorrhage for nine months. Dilatation and curettage were performed. The uterus was retroverted and enlarged $3\frac{1}{4}$ inches. Scrapings were sent for microscopic section. The report was that there was no malignancy. Ten days later I introduced 100 mg. of radium bromide into the uterus for twenty-four hours. She had two shows after this, followed by amenorrhoea for ten months. She then began losing again, and consulted another surgeon, who performed subtotal hysterectomy. The uterus contained no growth and the endometrium was hard and firm. I did not see the patient again after the treatment by radium, but judging from the condition of the uterus after removal, I think the cause of the recurrent haemorrhage ten months after radium would be found under the group "causes of late recurrences," to be discussed later.

Thirty cases were complicated with fibroids, all small in size and no larger than a Tangerine orange, some of which were only diagnosed by the curette; all did equally well with the non-fibroid cases. In the ordinary way I believe that any case of fibroid tumour of the uterus which calls for treatment at all requires either myomectomy or hysterectomy, according to the age of the patient, and should not be treated by any form of radiation; for although the tumour shrinks and the haemorrhage ceases, the character and extent of degeneration in the tumour cannot be foretold, and it is much wiser to remove than to leave it. There is one exception to this view—a patient who is very anaemic through loss of blood should have the haemorrhage controlled by radium pending the restoration of her blood picture. Cases have been recorded where fibroids the size of a five months' pregnancy have been irradiated, with the result that the tumour has shrunk into a pelvic tumour; this is not entirely satisfactory, for I have operated upon one such case in which the pelvic fibroid was producing pressure symptoms.

I have treated 16 young women (18 to 26 years of age) with the object of modifying the period rather than abolishing it; 12 became normal after varying periods of amenorrhoea, 3 remain amenorrhoeic (five, seven, and nine months); and one had hysterectomy performed.

The group between the ages of 30 and 35 numbered 20 (10 per cent.): 6 of these required two exposures before amenorrhoea was established; 6 others after varying periods of amenorrhoea became normal in type; 4 were given prolonged exposures (forty and forty-eight hours) so as to ensure amenorrhoea; the remainder behaved normally, amenorrhoea being established after the initial dose. In this group again it was found that the younger the patient the larger the dose required, and it emphasizes the observation that it is difficult to induce amenorrhoea in young women by medium doses.

Technique.

Various methods have been described—namely, placing the radium in the uterus, vagina, and upon the abdominal wall. Blacker² describes application to the abdominal wall as well as to the interior of the uterus; any action produced in this way must necessarily be upon the ovary, which we desire to avoid, and, in addition, it must be very uncertain. Since his paper was published I note that the annual report from University College Hospital indicates that this method has been abandoned.

Prolonged exposures in the vagina are fraught with danger of fistula formation, and I know of two cases of vesico-vaginal and recto-vaginal fistulae produced by this method, both from the same clinic. I have no experience in these two last methods, all my cases having been

treated by the intrauterine method, and I have never seen a fistula follow it. Finally, the results from radium *in utero* are so constant and satisfactory as to place other methods which are open to criticism beyond the scope of clinical practice.

Anaesthesia.

Whatever treatment be adopted for this condition, anaesthesia is required for an imperative exploration of the uterus, and the radium in suitable cases is introduced at the same time. Where a second or third exposure is required it can be introduced into the uterus without another anaesthetic after softening the cervix with glycerin plugs.

In all cases dilatation of the cervix and an exploratory curettage is done, and any tissue removed is referred for microscopic examination. In all cases the radium is screened in brass or lead to exclude all except the gamma ray, and the tube is then surrounded with rubber tubing 2 to 3 mm. in thickness to exclude secondary rays. The radium is placed in the uterus, and the vagina is plugged with gauze soaked in liquid paraffin, with the twofold object of keeping the radium in position and maintaining the bladder and rectum as far as possible from the source of energy. A further precaution is taken to maintain the bladder in a flaccid condition by the introduction of a self-retaining catheter into the viscus and leaving it there until the radium is removed. In some cases it is necessary to stitch the vulva in order to support the vaginal plug. In cases of advanced anaemia the patients are kept in bed for three weeks, but in ordinary cases the patients are allowed up at the end of three days and sent home at the end of a week.

Dosage.

The determination of the adequate dose cannot be stated in a general way, for each case must be considered on its merits. While excessive dosage does not show itself in the same way as the narcotics do, nevertheless radium is capable of producing severe burns if administered in ill considered doses; and such burns, although *in utero*, may subsequently declare themselves as a source of infection, producing symptoms which are difficult to explain unless such a lesion is considered. Later, following such burns, pyometra may result.

In women at or near the menopause 100 mg. of radium bromide, enclosed in 0.5 mm. silver and 1 mm. brass or lead wrapped up in rubber tubing 2.3 mm. thick, is given for twenty-four hours, and is commonly successful; but when a great deal of blood has been lost and it is of urgent importance to stop the haemorrhage the radium may be left in for thirty-six or even forty-eight hours. Again, in cases of fibroids I give a minimum exposure of thirty hours; these doses invariably prove satisfactory, and a second treatment is rarely required.

In dealing with young women I was much less sure of my ground. In my early cases I was afraid of producing permanent amenorrhoea, and gave treatments of 50 mg. of radium bromide for five, six, eight, or ten hours, and was surprised to find how small an effect was produced; but with increased experience I found that it was a much more difficult problem to induce amenorrhoea in them than in the menopausal women. In certain urgent cases I gave exposures of 100 mg. for twenty-four hours, which succeeded in establishing amenorrhoea for a short time, but then the periods returned (Case 66). Several other cases behaved similarly, and now I have little fear of producing permanent amenorrhoea in them.

Symptoms during and following Exposure.

While the radium is in the uterus the patient may complain of a pain which she likens to the onset of a period, or to the pain complained of whilst a stem pessary is in position. It is tiresome but not unbearable, and is immediately relieved when the radium is removed; it is due to contraction of the uterus in an effort to expel a foreign body. In sensitive patients it may require the administration of a sedative, and there is no reason for withholding it.

Vomiting may be a pronounced symptom and take the form of a prolongation of anaesthetic vomiting; it never

becomes serious, and ceases abruptly with the removal of the radium.

Temperature.—There may be a small rise of temperature to 100°, which persists for a day or so, and is probably due to some absorption from the closed uterus.

Haemorrhage.—When the exposure is given immediately before the onset of a period, the haemorrhage consequent upon the curettage may pass directly into the monthly flow. This period is prone to be a very severe one, accompanied by flooding, and may necessitate plugging as in Case 28. The common history, however, is a prolonged show of two to three weeks' duration, followed later by a second show, and then amenorrhoea. A fair number will experience a third period, or two or three irregular losses, but where one exposure is going to succeed there is rarely more than this. Generally speaking, three months must elapse before the full result can be estimated, and where haemorrhage persists beyond this further treatment will be necessary.

Leucorrhoea invariably follows the treatment, and in some cases produces irritation of the vulva. I order all patients to douche themselves with two quarts of salt and water daily for six weeks, and at the end of this time the leucorrhoea has practically disappeared; but in cases complicated with a fibroid the discharge may last longer.

After-History.

There is not infrequently a complaint of painful micturition, which quickly passes off with the administration of barley water and a mixture of urotropine, and is probably due to the irritation produced by a catheter in the bladder. I have not met late rectal or vesical symptoms in these cases, probably on account of the moderate dose employed and careful packing of the vagina. Bonney³ frequently quotes fistula formation as an after-result; if this were a danger in the intrauterine method it is quite certain that I should not have escaped the experience in 230 cases, of which somewhat less than 1 per cent. are unaccounted for.

Contraindications.

The sole absolute contraindication to the use of radium in this condition is the presence of pelvic inflammation, and this is a very real danger, for the pelvis may become filled with an inflammatory tumour, the nucleus of which is a deeply seated abscess and the walls composed of uterus, bladder, and bowel, which renders any operation very difficult and pregnant with risk to the patient. I have experienced a case of this kind in treating a carcinoma of the cervix, when I had to risk the evil to combat the growth. Relative contraindications are patients bled white through loss of blood, where the red blood count is reduced by one-half, the leucocytes increased by one-half, and pulse and temperature warn us that the patient is at a low ebb. In these cases I always keep the patient in bed for two to three weeks on a free diet, injections of iron, sodium cacodylate, and large quantities of lemon water to drink.

Causes of Bleeding some Months after Amenorrhoea.

Chief among the causes of late recurrence are: (1) septic foci, pyorrhoea, etc.; (2) cystic ovaries; (3) pelvic inflammation; (4) high blood pressure associated with contracted kidneys.

Recurrence of symptoms at a late period (a year and more) at the menopausal age was found in 7 cases. One of these occurred two years after amenorrhoea was established, and took the form of a blood-stained discharge; examination showed the cervix to be normal and the body of usual size. Some curious stumps with pyorrhoea were found on routine examination; the former were removed and the discharge disappeared with a simple douche. Two more cases were associated with pyorrhoea, and the haemorrhage ceased after removal of the teeth. In two other cases the recurrence was associated with chronic nephritis and increased blood pressure. Two were associated with ovaries which had become enlarged and cystic. Apart from these cases there was no recurrence. Two of this group had been treated with two exposures to radium and one with three exposures.

Recurrence in patients between 30 and 40 years of age took place in 10 cases, in 5 of which radium had to be used a second time, but they were more a continuation of the

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.