the slightest abrasion. The tube of radium was applied in this case without any bandage or gutta-percha tissue, the patient holding it in place during each sitting.

The third case is probably too recent to be satisfactory, and I should not mention it except for the remarkable situation and the fact that a more rapid effect from the radium has been experienced, perhaps because of the accident that the whole mass of radium could be collected at the end of the tube and placed directly over the sore. The patient is a blacksmith, aged 55, from whom I excised a small rodent ulcer on the right side of the nasal septum. It was not an easy thing to do perfectly without causing deformity, but for eighteen months it appeared to be cured. Early this year, however, he had a severe attack of influenza, and began to complain of pain at the end of his nose, where, on the inner side of the nostril, at the angle caused by ala and septum, and amongst the usual little tuft of hair, a tiny but characteristic ulcer appeared; before submitting to excision again, he consented to a trial of the radium tube. This was easily applied by passing it a little distance into the nostril and plugging the remainder of the orifice with gutta-percha tissue. We gave him sittings of fifty minutes' duration daily for a week, at the end of which time the hair had all fallen out and the ulcer was rapidly cicatrizing. At the present time he is quite cured. He is a very nervous man, and complained that the treatment made his head ache, but as he complained of sleeplessness and other symptoms of terror, I am doubtful of the sequence.

The effect on the tissue of the first application of the radium tube usually seems to be *nil*; at the second or third marked hyperaemia is apparent, and later on a peculiar oozing from the previously dry surface; it is then that cicatrization commences, and proceeds most rapidly. I have not time nor, alas! have I intelligence enough to investigate the actual process microscopically or chemically, but macroscopically we get dryness, hyperaemia, sweating, cicatrization, with marked freedom of pain or other discomfort. Whether these results will be as permanent as after the more usual treatment has yet to be proved; but no one seeing the new skin can have any doubt of the greater perfection of cosmetic effect over any other treatment hitherto known.

The therapeutic agents from radium appear to be somewhat more complex than either from Finsen's light or the x rays. Radium always maintains itself at a higher (some 3° or 4° F.) temperature than its surroundings, and gives off three differing kinds of rays without any diminution of its original bulk, namely:

The Alpha rays constitute about 99 per cent. of all the emanations of radium, and are caused, consist of, or at least are accompanied by a gas which, if not actually helium, becomes so eventually after keeping some weeks.

The Beta rays are identical with the cathodal rays which are nearest in the spectrum, the ultra-violet or Finsen rays.

The Gamma rays, which appear to be identical with the x rays.

This combination of rays, although considerably stopped by glass, is powerfully actinic, will affect a photographic plate through the thickness of twelve pennies, and will, if allowed to rest long on the skin, cause similar intractable ulcers to the x rays.

The little glass tube which contains 5 mg. of radium bromide has become a rich violet colour, exactly like that caused by the action of the rays of the sun reflected from the wares displayed inside a silversmith's shop window, and is probably similarly due to the action of helium on the manganese in the glass.

LEUCOCYTHAEMIA TREATED BY THE X RAYS, WITH A RECORD OF FOUR CASES.

By CHARLES H. MELLAND, M.D. LOND., M.R.C.P.,
Senior Honorary Physician, Ancoats Hospital, Manchester.

A CONSIDERABLE number of cases of leucocythaemia in which treatment by the x rays has been applied have now been recorded in American and Continental writings, but those in this country are still very few, and Ledingham¹ and McKerron add to their account of a single case by giving an extensive and valuable bibliography, all the references of which deal with cases described in foreign literature.

This almost complete absence of cases recorded in our own medical literature, as well as the extreme interest of the changes which the cases that I have had under observation

have already undergone, must be my excuse for publishing what is admittedly a preliminary report of 4 cases that have now been under my care for this treatment for from three to ten months, and are still under treatment.

These 4 cases have been patients at the Manchester Royal Infirmary under the care of Professor Dreschfeld, Dr. Wilkinson, and Mr. Thorburn, and have been sent to my department for therapeutic applications of the x rays, and I have to thank these three gentlemen for permission to utilize my observations on the cases.

I will begin with a description of the cases in detail, referring especially to the physical condition and characters of the blood before and during treatment, and will then state the conclusions which can be drawn from these, as yet unfinished, observations, and compare the results arrived at with those in the cases previously recorded.

CASE I.

History.

Mrs. B. H., aged 57, was in comparatively good health until about Christmas of 1903. The only illnesses that she remembers for a considerable time before that date were a week spent in bed with a feverish cold in November of that year and the loss of a considerable amount of blood by the bowel on a single occasion in the early part of 1903. She describes a feeling of discomfort in the left side of the abdomen, which she felt some six years ago, likening it to the sensation of fetal movements; but this is probably too long back to have had any true connexion with her present illness, separated as it was by such a long interval free from symptoms. She has had some pain in the left side of the abdomen, however, off and on since the middle of 1903.

In January, 1904, she had an attack of vomiting, and this continued, with intermissions, for nine or ten weeks; on one occasion she vomited blood. She has been losing flesh since then, but has not become paler to any noticeable degree. About the middle of May she first noticed swelling on the left side of the abdomen; the swelling does not appear to have increased in size since she first noticed it.

Condition on Admission.

The right border of the spleen was found to extend just to the middle line, the notch being at the umbilicus; inferiorly, it extended down into the iliac fossa, with a rounded, not easily localized margin. The lower part was distinctly tender. The dimensions of the spleen before treatment are shown on the accompanying chart; its longest diameter measured ten inches.

Fig. 1.—Case I, June 30th, 1904; spleen reaches to middle line and down into iliac fossa, 10 in. from costal margin.

Fig. 2.—Case I, Jan. 20th, 1905; spleen projects 6 in. below costal margin.

The examination of the blood on July 11th showed the characteristic changes of splenomedullary leucocythaemia.

Haemoglobin	...	61 per cent.
Red corpuscles	...	3,360,000 per c.mm.
Leucocytes	...	426,000 per c.mm.

A large proportion of the leucocytes were typical myelocytes, but unfortunately the slide has been mislaid, so that it is impossible to give the exact differential count or to describe the changes in the characters of the red corpuscles, such as the number of nucleated red corpuscles present, or the frequency of degenerate forms. The patient did not appear highly anaemic, though she stated that she was paler than formerly.

What she complained of most was weakness in walking, finding it an effort even to walk across the ward. Pain over the spleen was also a marked feature; it was worse at some times than at others, though seldom completely absent. She stated that her usual weight had been about 13 st., but on coming under treatment she was no more than 10 st. 4 lb.

TREATMENT AND RESULTS.

The x ray treatment was commenced on June 30th, 1904. She had applications regularly twice a week to the spleen of an average duration of twenty minutes, the tube being about 4 in. from the abdominal wall. After about six weeks the applications had to be suspended for about three weeks owing to the supervention of dermatitis, but this rapidly got well, and, on the resumption of treatment, gave no further trouble. She had no medicinal treatment, as it was specially wished that the effect of the x rays alone, uninfluenced by concurrent arsenical treatment, should be elicited.

The effects of treatment were very slow, but, after the first few weeks, the applications proved steadily beneficial. The first change noticeable in the spleen was increased mobility. Before any decrease in its dimensions could be recognized by the measuring tape it was quite evident that its total volume was diminished, as it could be moved about with much greater freedom than on admission, when it appeared to be tightly wedged into the left side of the abdomen, hard, resistant, and almost immovable. With the shrinkage in size of the spleen there was a marked improvement in the patient's general condition. She felt stronger and better, and was able to walk better. She took food well and improved distinctly in colour and began slowly to put on flesh.

In keeping with these evidences of improvement there was amelioration in the condition of the blood. On August 4th the red corpuscles were 3,460,000 per c.mm., the leucocytes only 160,000, a drop of 86,000 in a little over three weeks.

Treatment was continued, twice a week as before, until January 27th, 1905, when the knees, as being the largest collection of bone-marrow available, were exposed for 12½ minutes and the spleen for another 12½ minutes, making 25 minutes twice a week in all. After five weeks, from March 3rd onwards, so marked did the improvement appear, the applications were given only once a week.

The following list gives in tabular form the changes in the blood over the period of treatment:

Blood Examinations:

Date.	Haemoglobin.	Red Corpuscles per c.mm.	Leucocytes per c.mm.	Differential Count of Leucocytes.							Nucleated Red Corpuscles per c.mm.
				Polymorphonuclear Neutrophils.	Myelocytes.	Small Lymphocytes.	Large Lymphocytes.	Large Mononuclears.	Eosinophiles.	Basophiles (Mast Cells).	
1904.	%			%	%	%	%	%	%	%	
July 11	61	3,360,000	246,000								
Aug. 4	—	3,460,000	160,000								
Aug. 20	—	4,160,000	94,000	64.0	24.8	3.0	1.0	3.0	1.0	1.2	188
Sept. 13	—	3,800,000	71,500								
Oct. 12	70	3,600,000	112,000								
Dec. 6	—	4,090,000	24,500	70.4	18.4	5.2	1.6	0.8	1.2	2.4	194
Dec. 27	—	—	22,000								
1905.											
Jan. 10	—	—	24,200								
Jan. 20	93	4,200,000	25,600	70.0	16.0	5.6	1.4	1.0	2.6	3.6	Less than 50
Feb. 24	—	4,200,000	25,400	79.4	9.8	3.2	1.0	2.2	1.6	4.8	50
April 14	95	4,850,000	19,400	77.0	10.8	4.2	1.4	2.4	1.8	2.4	155

The improvement in the character of the blood is thus of a most striking character. The haemoglobin has risen from 61 per cent. to 95 per cent., the red corpuscles from 3,360,000 to 4,850,000 per c.mm., whilst the leucocytes have dropped from 246,000 to 19,400 per c.mm. But not only has the absolute number of red and white corpuscles undergone great improvement, there has also been a marked beneficial change in the characters of the leucocytes, as shown by increase in the polynuclear cells and diminution in the percentage of myelocytes. Even on the last examination, however, there was still a high enough proportion of myelocytes to make it quite evident that the normal function of the bone-marrow is still seriously affected, and the continued presence of a con-

siderable number of nucleated red corpuscles points in the same direction. There was no pronounced difference in the character of the blood, which could be attributed to the exposure of the bone-marrow to the rays, as distinguished from that of the spleen alone.

But it is not only the condition of the blood which has undergone this astonishing change. The spleen has steadily contracted, as shown in the above diagrams, till on January 20th, 1905, it projected only 6 in. from the edge of the ribs, and was felt as a quite small body instead of the enormous mass filling the whole of the left side of the abdomen which was present on the commencement of treatment, and to-day projects no more than 4½ in.

The patient's general condition is entirely in keeping with the changes in the blood and the spleen. She has grown decidedly stouter, is a perfectly healthy colour, and describes herself as feeling better than she has for eighteen months. She is able, as she expresses it, to knock about and do her housework, which she had not been able to do for the period mentioned; and but for very occasional reminders of the pain over the spleen, felt principally now along the costal margin, feels practically free from illness.

CASE II. History.

Mrs. A. C., a young woman of 23, gave a history of having been quite well up to her first confinement, 13 months before her admission to hospital. She began by feeling weak and ill with heaviness in her left side; for four months before admission, her weakness having increased, she had to give up all work. She also lost much flesh. She had pain at times in the left side of the abdomen, was troubled by constipation, and had occasionally had slight bleeding from the nose.

Condition on Admission.

On November 28th, 1904, she was found to be very anaemic and very much emaciated. The spleen extended to the umbilicus, where the notch was situated, and for about 3 in. below this level down into the left iliac fossa, which it very largely filled. The anterior edge of this lower part extended slightly to the right of the middle line as shown in the diagram. The posterior border was not easily defined. The patient appeared very ill and weak, and from the very first had considerable pyrexia of a hectic type.

The examination of the blood on December 3rd, 1904, showed the following condition:

Haemoglobin	...	...	38 per cent.
Red corpuscles	...	...	2,085,000 per c.mm.
Leucocytes	...	...	141,000 "
Differential count of 500 leucocytes:			
Polymorphonuclear neutrophils	...	...	47.2 per cent.
Myelocytes	...	...	29.8 "
Lymphocytes, small	...	...	4.0 "
" large	...	...	13.0 "
" large mononuclears	...	...	0.2 "
Eosinophiles	...	...	2.4 "
Basophiles (mast cells)	...	...	1.4 "
Nucleated red corpuscles equivalent to 564 in c.mm.			

Treatment and Results.

Treatment by x rays was commenced at once, the applications being, as in Case I, given twice a week to the spleen—some weeks three times—for a period of twelve and a half minutes on an average. She appeared to improve considerably under their influence. The spleen got smaller, and on December 17th had so far diminished that it did not reach to within 1 in. of the umbilicus, and its longest diameter measured 8½ in. She also felt better in herself, was a better colour, stronger, and able to take her food better. Her temperature was still of the same hectic character, but in spite of this the improvement was maintained, and on January 7th, 1905, when the treatment had been in action for little over a month the following remarkable condition of the blood was found:

Haemoglobin	...	...	68 per cent.
Red corpuscles	...	...	4,640,000 per c.mm.
Leucocytes	...	...	6,000 "
Differential count of 500 leucocytes:			
Polymorphonuclear neutrophils	...	...	45.3 per cent.
Myelocytes	...	...	19.7 "
Lymphocytes, small	...	...	10.3 "
" large	...	...	8.6 "
" large mononuclears	...	...	7.0 "
Eosinophiles	...	...	2.0 "
Basophiles (mast cells)	...	...	3.4 "
Nucleated red corpuscles equivalent to 60 in c.mm.			

The change in the character of the blood is very striking. There was distinct increase of the haemoglobin and of the red corpuscles, but the fact of outstanding interest was the drop in the leucocytes from 141,000 per c.mm. down to 6,000. The spleen had meanwhile undergone also great diminution in size, and on January 23rd, as shown in the diagram, it was quite small, projecting only $4\frac{1}{2}$ in. below the costal margin.

Fig. 3.—Case II. November 28th, 1904: spleen reaches 3 in. below the level of the umbilicus.

Fig. 4.—Case II. January 23rd, 1905: spleen projects only $4\frac{1}{2}$ in. below the costal margin.

Shortly before this date she had appeared better also in her general condition, and described herself as feeling stronger, and she was also taking food well. Still she did not improve as much as the changes in the blood and the spleen would have led one to expect and her temperature began to show a still more markedly hectic character than on admission.

On January 21st she had a severe attack of pain, due to pleurisy over the base of the right lung; treatment was stopped and was not resumed before she left hospital on February 28th. In addition to the pleurisy there was rapid accumulation of fluid in the abdomen and on January 28th she was tapped, 100 oz. of turbid fluid being drawn off. The cause of the more severe symptoms was doubtless the super-vention of tuberculous infection on the leucocythaemic condition. The hectic type of the temperature, associated with the pleurisy and peritonitis at once suggested this and it was confirmed by examination of the ascitic fluid, which proved infective to guinea-pigs. The presence of this tuberculous infection entirely vitiates any conclusion in this case with regard to the character of the blood, since it is well recognized that there is almost always a marked drop in the leucocytes, on the super-vention of many forms of acute or chronic infection in cases of leucocythaemia, as also decided contraction in the size of the spleen.

That the rays had some share in the reduction seems probable, since the examination of the blood on February 1st, after the treatment had been stopped, showed a considerable rise in the number of leucocytes. At this date the blood examination gave:

Haemoglobin...	...	50 per cent.
Red corpuscles	...	3,200,000 per c.mm.
Leucocytes	...	64,000 "

At a later stage, however (February 15th), the number had again diminished, and an examination revealed no increase above the normal number of leucocytes.

The patient got steadily worse and died at home a day or two after being taken out of hospital. No autopsy was obtainable.

CASE III.

History.

J. T. F., aged 43, commenced with pain in the left side, along the costal margin, in November, 1903; a few weeks later the enlargement of the spleen was detected. He suffered from a haemorrhagic rash on the legs and chest about that date, and later on had what appeared to be an apoplectic attack; he was unconscious for four hours, and partial paralysis of the right arm remained for about three weeks. He had always previously been exceptionally healthy, with powerful muscular development, and though below average height had weighed 12 st. 8 lb.

Condition on Admission.

He came as a patient to the Manchester Royal Infirmary under Dr. Wilkinson on August 18th, 1904. He presented the

characters of a typical case of splenomedullary leucocythaemia. In appearance, he showed very slight, if any, signs of anaemia, though he stated that he was not such a good colour as he had been. The spleen was much enlarged, reaching downwards and forwards $7\frac{1}{2}$ in. from the costal margin, whilst a horizontal measurement gave a breadth of $8\frac{1}{2}$ in. It was slightly tender on pressure, and he occasionally suffered from severe pain over it.

The blood examination on this date revealed the following condition:

Red corpuscles	...	4,800,000 per c.mm.
Leucocytes	...	394,000 "
The differential count of 500 leucocytes gives:		
Polymorphonuclear neutrophils	...	39.8 per cent.
Myelocytes	...	38.0 "
Lymphocytes, small	...	3.8 "
" large	...	7.8 "
" large mononuclears	...	0.0 "
Eosinophiles	...	7.4 "
Basophiles (mast cells)	...	3.2 "

Nucleated red corpuscles were present in numbers equivalent to 6,304 in the c.mm., of which a small proportion were megaloblasts.

Treatment and Results.

The patient was kept on arsenical treatment, only small doses—up to πv of Fowler's solution—being reached; but as he was getting weaker, and had to give up his occupation, that of a clerk, the x-ray treatment was begun on October 25th, 1904. The examination of the blood on that date showed that the disease had progressed in the interval. There were:

Red corpuscles	...	3,570,000 per c.mm.
Leucocytes	...	548,000 "
a very great increase in the number of leucocytes, with, at the same time, considerable decrease in the number of red corpuscles. The differential count of 500 leucocytes gave:		
Polymorphonuclear neutrophils	...	36.6 per cent.
Myelocytes	...	38.0 "
Lymphocytes, small	...	1.4 "
" large	...	1.4 "
" large mononuclears	...	10.8 "
Eosinophiles	...	7.0 "
Basophiles	...	3.8 "

The majority of the cells which were classed under the group of large mononuclears had the characters of what have been described as non-granular myelocytes—that is, imperfectly-formed myelocytes—representing a progressive deterioration in the character of the white corpuscles. There were 7,672 nucleated red corpuscles per c.mm.

Fig. 5.—Case III. August 18th, 1904. Spleen extends $7\frac{1}{2}$ in. below costal margin; greatest breadth, $8\frac{1}{2}$ in.

Fig. 6.—Case III. April 30th, 1905. Spleen $6\frac{1}{2}$ in. below costal margin; greatest breadth, $7\frac{1}{2}$ in.

The applications were given regularly twice a week to the spleen from October 25th, 1904, to January 22nd, 1905, each exposure being, for the first month, about $12\frac{1}{2}$ minutes on an average, and after that, till January 22nd, 20 minutes' duration. From January 26th up to the present date the applications have been $12\frac{1}{2}$ minutes to the spleen and the same length to the knees. For the past three months he has taken small doses of liq. arsenicalis, but only πiv , three times a day at first, and for the last few weeks not more than πj doses, as he was unable to take the full dose prescribed on account of gastric irritation produced by the drug.

The effect of treatment in this case, though not so marked as in Case I, has been very satisfactory. His general condition has improved more than the size of the spleen or the characters of the blood. Instead of steadily going downhill,

as had been the prospect held up before him, he is feeling better now than he has done for eighteen months. He is able to keep regularly at his work, takes his food well, sleeps well, and gets about without discomfort, and with only very occasional pain over the spleen. His only complaint is that he is unable to hurry or walk uphill at a moderate pace. His colour is excellent, and he is putting on flesh. He is perfectly satisfied with the progress he has made, so that we may conclude that the subjective symptoms have changed for the better.

The spleen is but little smaller than on the date when he commenced with the x-ray treatment. It still occupies, as the diagram shows, a considerable part of the left side of the abdomen. Its lower edge is just below the level of the umbilicus, and it projects beyond the costal margin to the extent of $6\frac{1}{2}$ in. It still feels very firm and immovable, and does not present the features which the spleen in Cases 1 and 11 did—that before they were noticeably diminished in their measurements they showed decided increase of mobility.

The characters of the blood are shown in the subjoined table.

Blood Examination.

Date.	Haemoglobin.	Red Corpuscles per c.mm.	Leucocytes per c.mm.	Differential Count of Leucocytes.							Nucleated Red Corpuscles per c.mm.
				Polymorphonuclear Neutrophils.	Myelocytes.	Small Lymphocytes.	Large Lymphocytes.	Large Mononuclears.	Eosinophiles.	Basophiles (Mast Cells).	
1904.	%			%	%	%	%	%	%	%	
Aug. 18...	—	4,800,000	394,000	39.8	38.0	3.8	7.8	0.0	7.4	3.2	6,304
Oct. 25...	—	3,570,000	548,000	37.6	38.0	1.4	1.4	10.8	7.0	3.8	7,672
Nov. 25...	70	3,420,000	636,000								
1905.											
Jan. 8...	—	—	214,000								
Jan. 26...	90	5,400,000	288,000	42.4	39.4	1.4	7.4	2.4	5.4	1.6	1,152
Mar. 9...	—	4,740,000	251,000								
Apr. 9...	84	5,000,000	193,000	50.8	29.0	2.8	3.6	7.8	4.0	2.0	396

It is thus seen that there has been considerable improvement, though much less marked than in Case 1, and that this has become more definite as the treatment has been persevered with, the last of these observations, on April 9th, giving the lowest leucocyte count since he came under treatment, with also a considerable drop in the percentage of myelocytes and in the number of nucleated red corpuscles—both criteria of great importance in determining improvement, or the reverse, in the condition of the blood.

CASE IV.

History.

Mrs. R., aged 43, first noticed abdominal swelling about June, 1904, the result evidently of a left-sided tumour. She came back from Capetown, where she had lived for twelve

Fig. 7.—Case IV, January 31st, 1905: Greatest length of spleen measured from costal margin, $10\frac{1}{2}$ in.; greatest breadth, $11\frac{1}{2}$ in.; abdominal girth, $40\frac{1}{2}$ in. Spleen extends 3 in. to right of umbilicus.

Fig. 8.—Case IV, May 1st, 1905: Greatest length of spleen from costal margin, $10\frac{1}{2}$ in.; greatest breadth, 11 in.; abdominal girth, 38 in. Spleen extends $2\frac{1}{2}$ in. to right of umbilicus.

months, in May, 1903. She had pretty good health whilst in South Africa, with no attacks of malaria. There had been no pain over the enlarged organ at any time. Its size had caused pain down the thighs, such as she had had when pregnant, and slight swelling of the feet after she had been on them all day.

Condition on Admission.

She had grown paler, but still was not markedly anaemic; nor is she particularly short of breath, though she got tired easily on slight exertion. The abdomen has increased enormously in size, and has measured for some time past 42 in. in circumference, though the measurement on commencing treatment was only $40\frac{1}{2}$ in. The spleen was very greatly enlarged. It filled up practically the whole left side of the abdomen, extending also across the middle line, 3 in. to the right of the umbilicus. It projected $10\frac{1}{2}$ in. beyond the costal margin, and was $11\frac{1}{2}$ in. in its greatest breadth. It was firm, hard, and almost immovable. It was not tender on pressure.

The blood, at the first examination on January 31st, 1905, presented the following features, in every way characteristic of a well-marked case of splenomedullary leucocythaemia:

Haemoglobin	...	...	70 per cent.
Red corpuscles	...	...	3,460,000 per c.mm.
Leucocytes	...	...	542,000 "
Differential count of 500 leucocytes:			
Polymorphonuclear neutrophils	...	...	44.0 per cent.
Myelocytes	...	...	34.8 "
Lymphocytes, small	...	...	2.4 "
" large	...	...	2.8 "
" large mononuclears	...	...	9.4 "
Eosinophiles	...	...	3.6 "
Basophiles	...	...	3.0 "
Nucleated red corpuscles, 1,084 in c.mm.			

Treatment and Result.

The x-ray treatment was commenced on February 10th, 1905, and, from the first, applications were given both to the spleen and to the knees, of twelve and a half minutes' duration to each, and were continued so throughout, twice weekly.

Within a few weeks alteration in the spleen was noticeable. It became soft and mobile, and although the actual measurements showed but little diminution, it was quite evident that it was much less bulky. Her general condition remained about unchanged. She was put on arsenic, but even small doses appeared to upset her stomach and bowels, and she lost a considerable amount of weight. Her abdominal measurement also diminished, partly the result of shrinkage of the bulk of the spleen, but partly also from loss of fat.

The changes in the blood somewhat lagged behind the changes in the bulk of the spleen. The list below gives the condition present at different periods:

Blood Examination.

Date.	Haemoglobin.	Red Corpuscles per c.mm.	Leucocytes per c.mm.	Differential Count of Leucocytes.							Nucleated Red Corpuscles per c.mm.
				Polymorphonuclear Neutrophils.	Myelocytes.	Small Lymphocytes.	Large Lymphocytes.	Large Mononuclears.	Eosinophiles.	Basophiles (Mast Cells).	
1905.	%			%	%	%	%	%	%	%	
Jan. 31	70	3,460,000	542,000	44.0	34.8	2.4	2.8	9.4	3.6	3.0	1,084
Feb. 27	—	3,570,000	368,000	61.8	27.2	1.0	1.2	3.6	2.2	3.0	2,208
Mar. 20	80	4,140,000	409,000	53.6	35.8	1.6	1.4	3.2	1.4	3.4	Less than 818
April 18	100	4,660,000	190,000	69.0	23.4	1.8	1.0	2.0	0.8	2.0	Less than 380

Her present condition, after three months of active treatment, is very satisfactory. The above diagrams show the size of the spleen before treatment was commenced, and on May 1st. The blood, as recorded above, has shown marked improvement, though still very far from approaching the normal. Both the haemoglobin and the red corpuscles have risen most satisfactorily to practically normal figures, the proportions of the abnormal cells specially characteristic of the disease, the myelocytes, the basophiles, the eosinophiles,

and the large mononuclears and large lymphocytes, have all markedly diminished. The number of nucleated red corpuscles is also diminished.

Her general condition is greatly improved. She is feeling well and comfortable, and her appetite is better than she can ever recollect it. Her abdominal girth is now only 38½ in., and the discomfort of the large protuberant spleen is to a great degree ameliorated. She has put on weight, and appears more cheerful than for months past, and is taking steps to resume her professional duties as a music teacher.

CONCLUSIONS.

In drawing general conclusions from these four cases we must exclude, I think, Case II, in which the conditions of the problem were complicated by the fact of the tuberculous infection, which, as is well recognized, has the effect of producing marked changes in the clinical aspect of cases of leucocythaemia, particularly noticeable in the shrinkage in the size of the spleen and diminution of leucocytes, so that the improvement in these two respects in Case II cannot be wholly attributed to the effects of the x rays.

In the other three cases there has been marked improvement, which we cannot but attribute to the effect of the rays, little as we can at the moment explain the rationale of their therapeutic effects. In each case the spleen has diminished in size, and there has been improvement in the character of the blood, the degrees of improvement differing in the three cases. It is noteworthy that the case in which the spleen has diminished most in size, and the characters of the blood have been most favourably influenced, has been kept absolutely free from arsenical treatment, so that it cannot be urged that the effects produced are the result of concurrent therapeutic measures.

The improvement in the condition of the blood has run on parallel lines in each case. The percentage of haemoglobin and the number of red corpuscles have gone up as the result of treatment, and the leucocytes have fallen in number. There has been diminution in the percentage of those varieties of leucocytes increase in which especially characterizes the disease—namely, the myelocytes, basophiles, large lymphocytes, and eosinophiles, with at the same time a rise in the percentage of the polymorphonuclear neutrophils, and further improvement in the type of the blood has been shown by diminution in the number of nucleated red corpuscles.

But even more marked and of far greater importance than changes in the blood or the spleen has been the improvement in the patients' general condition of health, as indicated by improved colour, increase of weight, diminution or disappearance of pain, improvement of appetite, and general subjective sense of well-being and the ability to resume their daily occupations.

But though we may accept as a fact this temporary improvement, it is too soon to assert that permanent benefit has been conferred. Most of the cases recorded, so great has been their interest, have been rushed into print whilst the treatment has been incomplete, or before sufficient time has been allowed to elapse to judge of the likelihood of recurrence. Senn's case, which was apparently completely cured, came back under treatment about a year later with what is described as a slight relapse. But what can be safely asserted is that as the result of this method of treatment great amelioration in the patient's condition can in many cases be secured, and even if eventual cure be not obtained, many months, or perhaps even years, of comfortable existence may be given.

It is hardly necessary to say much about previous accounts of the use of the x rays for the treatment of this disease since Ledingham¹ and McKerron, in reporting a case which had been under their care, and which had improved under treatment, supply a very full bibliography on the subject. In their case, a boy of 11 years, the leucocytes came down from 220,000 per c.mm. to 23,000 as the result of six weeks' treatment, though the qualitative changes in the leucocytes were still those characteristic of splenomedullary leucocythaemia. There was, however, as in the above-recorded cases, a steady improvement in the ratio of the polynuclears to the myelocytes. In some of the cases to which Ledingham and McKerron refer all the abnormal cells appear to have vanished from the blood, notably in Senn's case² and in Bryant³ and Crane's first case, in which at the end of treatment the varieties of leucocytes were said to be in the proportions of those in normal blood. But in the majority of the cases in which complete detailed blood examinations have been recorded—and these are the minority—there has only been the fall of leucocytes without the disappearance of the

abnormal cells from the blood, although in each case, as in those which I record above, there has been distinct diminution in the myelocyte percentage, and a corresponding rise in the polynuclear percentage, that is to say the essentially leukaemic character of the blood has shown a tendency to disappear, but not entirely. And associated with this amelioration in the character of the blood there has been more or less diminution in the spleen and improvement in the patients' general condition. Only in exceptional cases did the condition remain unimproved or the patient get worse and die in spite of treatment.

Brown (E. J.)⁴ records a case in which, as in Senn's case, the blood lost completely its leucocythaemic character, the number and varieties of leucocytes becoming practically those of normal blood, with return of the red corpuscles to their normal number and disappearance of nucleated forms. Aubertin⁵ and Beaujard describe, with full haematological particulars, a case of splenomedullary leucocythaemia which, on the other hand, whilst improving under treatment, still retained the characters of leucocytes typical of the actively-developed disease.

REFERENCES.

¹ *Lancet*, 1905, i, p. 71. ² *Medical Record*, August 22nd, 1903. ³ *Medical Record*, April 9th, 1904. ⁴ *Medicine*, 1904, vol. x, p. 521. ⁵ *La Presse Médical*, August 20th, 1904.

THE TREATMENT OF RINGWORM OF THE SCALP BY THE X RAYS.

By T. M. H. MACLEOD, M.A., M.D., M.R.C.P.,

Assistant Physician for Diseases of the Skin, Charing Cross Hospital;
Physician, Skin Department, Victoria Hospital for Children, and
Lecturer on Skin Diseases, London School of Tropical Medicine.

THE x-ray treatment of ringworm of the scalp may now be said to be established as a valuable addition to our methods of dealing with this most intractable affection. Ever since the therapeutic possibilities of the x rays were recognized, occasional cases have been thus treated, but until comparatively recently in a more or less half-hearted manner, partly owing to imperfect technique and partly as the result of a certain degree of timidity on the part of the operator, in case the treatment should be followed by dermatitis and the production of a cicatricial alopecia.

We are indebted to Sabouraud and Noiré of Paris for the introduction of a technique which has given brilliant results in their hands, and by which these dangers have been obviated. At the Ringworm Schools connected with the Hôpital St. Louis of Paris this treatment has been almost exclusively adopted during the last year, and Sabouraud has reported a large number of cases successfully treated by the rays, with no untoward after-effects since the introduction of his improved technique.

During the last six months we have been employing this treatment, both at Charing Cross Hospital and at the Victoria Hospital for Children, where Mr. Cassels Smith, house-surgeon, kindly gave the exposures, and about 60 cases have been so treated, with encouraging results, but not with the absolute success which we anticipate when the technique has been still further improved. They were all cases of small-spored ringworm of the scalp in children, and by means of the x rays the time occupied in the treatment of the case is being considerably reduced from that taken by the previous methods we employed—namely, depilation by the inflammatory reaction set up by an irritant ointment or pigment containing carbolic acid, tar, or croton oil. But not only has the time under treatment been lessened, but the discomfort, and even pain, associated with the inflammatory treatment has been obviated. In none of these cases has a serious dermatitis resulted from the rays. As this is a somewhat new form of treatment, a few notes on the technique and our experience of it may prove of interest.

TECHNIQUE.

A brief description of the apparatus in use and the technique we employ at the hospital will serve to indicate the mode of procedure. As far as possible we have followed the method of Sabouraud and Noiré, but differences in our x-ray apparatus from that employed by Sabouraud necessitated certain variations in the detail of procedure. For a description of Sabouraud's technique the reader is referred to an article by him in *La Presse Méd.*, December 28th, 1904, and *Ann. de Derm. et de Syph.*, July, 1904.