years is provided by the figures published in the Annual Reports of the Registrar-General for Scotland, which are available for the years 1938 to 1949 and which are shown in Table VI. This shows that there has been a gradual rise in the number of deaths from leukaemia during twelve of the fourteen years covered by the present study.

TABLE VI.—*Registrar-General's Reports (Scotland), 1938–49. Deaths from Leukaemia, at All Ages and of All Types*

Year	Deaths from Leukaemia	Year	Deaths from Leukaemia
1938	114	1944	149
1939	108	1945	148
1940	105	1946	168
1941	137	1947	162
1942	129	1948	153
1943	150	1949	201

On these grounds it is suggested that there has been a real and progressive increase in all forms of leukaemia in recent years in Scotland, and, in particular, an increased incidence of the lymphatic type of the disease.

Summary

A review of the features of 647 cases of leukaemia is presented.

This series was obtained by two separate surveys carried out in Edinburgh and in Aberdeen of the cases admitted to hospitals in these centres over the period 1938 to 1951.

Contrary to previous reports, the commonest type was chronic lymphatic leukaemia, followed by the chronic myeloid, acute lymphatic, acute myeloid, and monocytic types, in that order. About one-fifth of the total number of cases were aleukaemic. This phenomenon occurred most frequently in the acute forms of the disease and was least common in chronic myeloid leukaemia.

The age incidence of the chronic lymphatic, chronic myeloid, and acute lymphatic types conformed to the previously reported figures, but acute myeloid and monocytic leukaemia showed a much wider range of incidence than is generally quoted.

Males were more often affected than females, in the ratio of 7 to 6. The male predominance was most pronounced in the cases of chronic lymphatic leukaemia, and was less obvious or was absent in the other types.

Evidence is presented which suggests that there has been a twofold increase in the overall incidence of leukaemia over the period of this survey. There seems to have been a particular increase in the lymphatic type, but all forms of the disease have shown a rising incidence.

We would like to thank the members of the staffs of the hospitals in Edinburgh and Aberdeen for their kind permission to study and publish details of cases under their care. In particular, we are indebted to Professor R. McWhirter for records of many cases seen and treated in the Department of Radiotherapy, Edinburgh Royal Infirmary. Much valuable assistance was given by Professor L. S. P. Davidson and Professor H. W. Fullerton and by the haematological laboratories under their charge in the Departments of Medicine, Universities of Edinburgh and Aberdeen respectively.

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EFFECTS OF GLANDULAR FEVER INFECTION IN ACUTE LEUKAEMIA

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Acute leukaemia is one of the most catastrophic diseases in medicine. Affecting chiefly the younger and middle-age groups, appearing without warning, and giving rise to an acute symptomatology which by its diffuseness indicates the generalized nature of the disease, it has hitherto defied all attempts at treatment. Such agents as deep *x*-ray therapy, drugs such as urethane and the nitrogen mustards, which have their place in the treatment of the chronic leukaemias, are worse than useless in the acute condition, in which their depressing action on marrow elements already gravely affected by the acute leukaemic process is often rapidly lethal.

The folic acid antagonists, of which aminopterin is an example, have been tried and, after the hopes aroused by early reports, have proved most disappointing. The short periods of partial remission which they have certainly produced in a small proportion of cases have been dearly paid for in toxic reactions which in their unpleasant features are excelled only by the acute leukaemic process itself. Blood transfusion in acute leukaemia is of doubtful value and seldom produces more than the most transient improvement. Substitution transfusion had a short vogue, but has nothing to recommend it; it can do nothing that simple transfusion will not also do. Simple transfusion, preferably with fresh blood, is very often performed in acute leukaemia, if only in order to do something. Opinions regarding its value vary. Whitby and Britton (1950) quote Dreyfus, who in reviewing the literature on remissions of acute leukaemia concluded that when such are recorded they have almost always followed the transfusion of blood or plasma. However, this may well be explained by the fact that such a high proportion of all cases of acute leukaemia do, sooner or later, receive transfusions. Wintrobe (1946), on the other hand, considers that, because of the disturbance to the patient and the temporary character of the effect produced, blood transfusion has little justification in acute leukaemia. My view is that, in the absence of distressing symptoms from granulocytopenia or thrombocytopenia, it is most doubtful whether transfusion in itself is valuable, or even humane.

It has seemed to me that, in the study of acute leukaemia and in the search for some effective line of therapy, insufficient attention has been paid to the spontaneous remissions which do from time to time occur, independent of any treatment, and which may last for a few months. Careful study of conditions under which such remissions occur, and search for agents

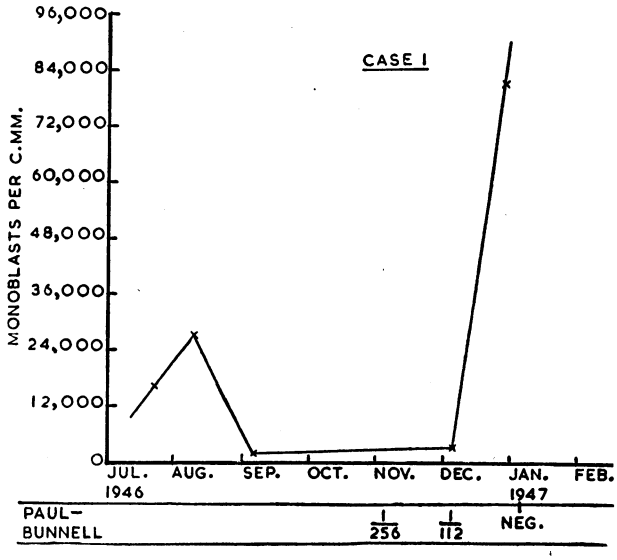
possibly responsible for such remissions, might well be fruitful, and might open the way to completely new lines of attack on this disease.

The part played by intercurrent infections in the induction of remissions—partial or complete—in acute leukaemia is as yet undetermined. At a conference on folic acid antagonists held in America in 1949, and quoted by Dameshek *et al.* (1950), views were put forward by very experienced haematologists that in children suffering from acute leukaemia it is not uncommon for remissions to follow infection, but that similar observations in adults were extremely rare.

The observations recorded here relate to the acute monocytic variety of acute leukaemia and are based on the observation of a clinical remission which occurred in a case of acute monocytic leukaemia in an adult. In this case a remission appeared to coincide with the appearance of glandular fever type cells in the peripheral blood and of a positive Paul–Bunnell heterophil antibody reaction in the serum. In the remaining five cases attempts were made to induce glandular fever infection in cases of acute monocytic leukaemia; the results of these attempts are recorded and their possible significance is examined.

Case 1

A man aged 35 was admitted on July 17, 1946, complaining of intermittent and fleeting pains in the limbs and body for seven weeks, diagnosed as fibrositis. There had been some loss of weight. Increasing pallor had been noticed.



There was a family history of pulmonary tuberculosis. The patient's previous health had been good. On examination there was moderate pallor of the conjunctivae. Small glands were palpable in the neck, axillae, and groins. The spleen was just palpable. The sternum was tender to pressure. No petechiae and no stomatitis were found. An evening rise of temperature to 99.5–100° F. (37.5–37.8° C.) was present and persisted.

The blood picture showed a haemoglobin of 54% (Haldane), 2,200,000 red cells per c.mm., 30,000 leucocytes per c.mm., with 39% monocytes and 12.5% monoblasts. Frequent normoblasts were present. A myelogram confirmed the diagnosis of acute monocytic leukaemia. The patient had a transfusion of 3 pints (1.7 litres) on July 19, but the clinical condition deteriorated. A short course of urethane was given early in August without benefit, and further transfusions of 3 pints were given on August 19, September 7 and 28, and October 8.

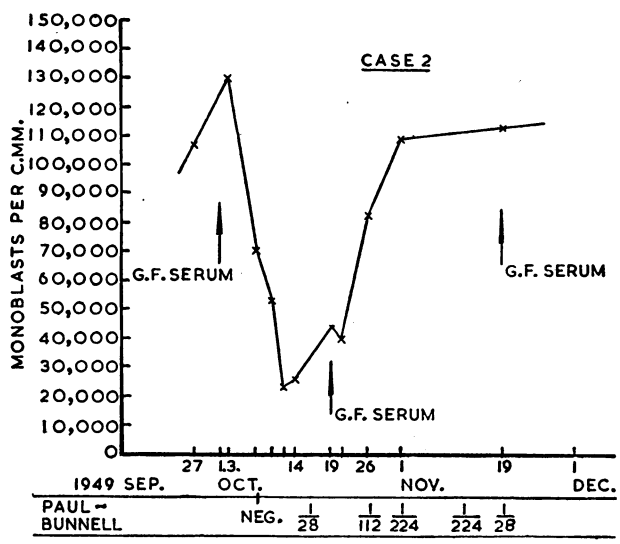
By October 16 he was so much better that he was sent home with a haemoglobin of 74%. The total leucocyte count had fallen to 6,000, with 34.5% of monocytes; no monoblasts were present. There were no symptoms of any sort. He remained well and returned to work. A blood examination made elsewhere early in November showed a haemoglobin of 83%, and the appearances of films at the time prompted the performance of a Paul–Bunnell test, which showed a positive reaction to a titre of 1/256—unchanged after absorption with guinea-pig kidney. Glandular fever was considered as an alternative diagnosis. He was seen in the out-patient department on December 2 and was then apparently in perfect health. Neither spleen nor liver was palpable, there were no glands, and the haemoglobin was 80%. However, the leucocyte count showed clearly that the leukaemic process was still present, and a few monoblasts were seen; small numbers of myelocytes and occasional nucleated red cells suggested a widely disseminated process.

By the middle of December his condition was rapidly deteriorating, and he was readmitted to hospital. The blood picture again showed an acute monocytic leukaemia, with a haemoglobin of 35% and a total leucocyte count of 104,000 per c.mm., 81,000 of which were monoblasts. The liver and spleen were much enlarged. The Paul–Bunnell reaction was negative.

In spite of immediate transfusion the patient died three days after readmission. At necropsy the hepato-splenomegaly was confirmed, and spleen, liver, kidneys, lungs, and all lymphatic nodes showed diffuse leukaemic infiltration.

Case 2

A woman aged 35 was first seen on September 28, 1949. She complained of a few days' acute pyrexial illness with rigors, bouts of abdominal pain, spontaneous bruising of the legs and arms, and increasing soreness and ulceration



of mouth and tongue. Rapidly developing pallor had been noticed. For five months she had had occasional vague dragging pains in the upper abdomen and occasional spontaneous bruising of the legs for five weeks before the onset of the acute illness. She had been a very healthy and athletic young woman, and had had no previous illnesses of any note.

On examination obvious severe anaemia was found, with a slightly icteric tinge. Multiple ecchymoses of varying ages and sizes were scattered over the body and limbs, and a few petechiae were present. There was acute gingivitis with widespread ulceration, and three deep ulcers on the dorsum of the tongue were found. The sternum was tender to pressure. Tachycardia was present, with a soft systolic

murmur at the apex. Her temperature was 103.5° F. (39.7° C.). The spleen was palpable and the liver enlarged. No free fluid was present. A few small soft glands were palpable in both anterior triangles of the neck and a few small shotty glands in the axillae and the inguinal regions. The blood picture showed an acute monocytic leukaemia, with 110,000 leucocytes per c.mm., of which 98% were monoblasts. The haemoglobin was 44% and red cells 1,990,000 per c.mm. Granulocytopenia and thrombocytopenia were pronounced.

The patient was admitted to hospital, and in spite of immediate transfusion of 2 pints (1.1 litres) of blood there was further deterioration with falling haemoglobin and red-cell levels. On October 3 7 ml. of pooled glandular-fever serum from two recent cases of acute glandular fever was given intramuscularly, and 3 pints (1.7 litres) of fresh blood was transfused. Full local and systemic penicillin therapy was employed. Her general condition rapidly improved, and her temperature, which was 104° F. (40° C.) on admission, had settled to normal by October 7. The oral sepsis and ulceration rapidly resolved, haemorrhages ceased, and the abdominal pain disappeared. The patient felt comparatively well. The total leucocyte count fell rapidly to 45,000 by October 13, owing to a fall in the numbers of monoblasts; the granulocytes and lymphocytes increased. The platelets increased to around 100,000 per c.mm. The patient remained fairly well, complaining of nothing except lassitude and occasional slight upper abdominal pain. There was a slight but progressive tendency for the haemoglobin and red-cell levels to fall, but no haemorrhagic tendency and no further oral sepsis.

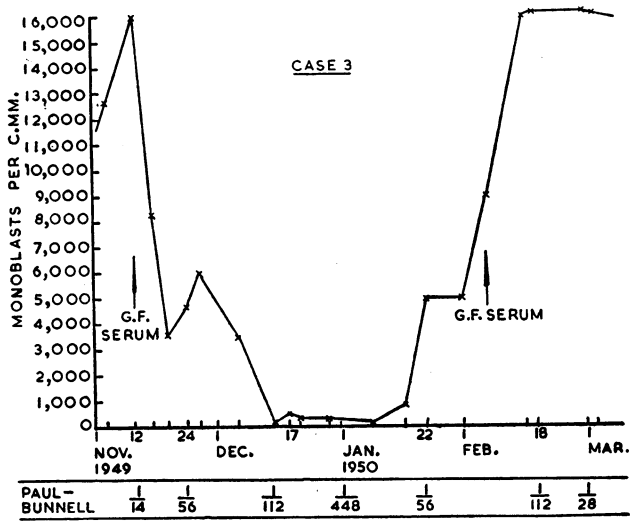
On October 19 5 ml. of fresh glandular fever serum from an acute case was injected intramuscularly. At about the same time a few fresh small glands appeared in the neck in both anterior and posterior triangles. No other glands were enlarged. The spleen remained unchanged in size. Injections of a crude liver extract and full doses of iron were given. By October 26 the haemoglobin was down to 44% and the red-cell count to 2,300,000, and 2 pints (1.1 litres) of blood was transfused. On October 31 the temperature was 100° F. (37.8° C.) and a small ulcer appeared on the side of the tongue; systemic penicillin, which had been discontinued after the first fortnight of the illness, was recommenced and a week's course was given. The ulcer by then had cleared up. The leucocytes were up to 150,000 per c.mm. on November 1, and the haemoglobin was 49%. On November 14 2 pints of blood was transfused, and on November 22 10 ml. of fresh glandular-fever serum was given intramuscularly. Although the patient's general condition remained fairly good, upper abdominal pain became more severe and continuous. There were no fresh signs on abdominal examination, and the source of this severe pain remained obscure.

The patient died suddenly on December 2 without having developed any further haemorrhagic or agranulocytic manifestations.

Case 3

This patient was a woman aged 50 whose previous health had been good and whose medical history revealed nothing relevant. The onset of illness was sudden on October 15, 1949, with symptoms of malaise, pyrexia, lassitude, rapidly increasing pallor, and a severe and increasing stomatitis. Within a few days of the onset subcutaneous haemorrhages and a few scattered petechiae appeared. Small glands were palpable in the anterior and posterior triangles of the neck. The spleen was not palpable. The liver was enlarged and palpable two fingerbreadths below the costal margin. The sternum was very tender to pressure.

The blood picture on November 5 showed a severe macrocytic anaemia, with 20,000 leucocytes per c.mm., including 12,800 monoblasts and 400 myeloblasts, haemoglobin 50%, and red cells 3,620,000 per c.mm. Granulocytopenia and thrombocytopenia were pronounced. By November 9 deterioration was rapid and the temperature was high and



swinging. Next day 3 pints (1.7 litres) of fresh blood was transfused and 5 ml. of fresh glandular-fever serum from an acute case was injected. Full penicillin therapy had already been instituted.

By November 16 both the clinical condition and the blood picture improved, with falls in the total leucocytes to 12,000 and monoblasts to 8,500 and increases in granulocytes and platelets. The stomatitis was clearing up and no fresh skin lesions were appearing. The temperature had fallen to normal, and the patient was feeling better. There was a slow but steady fall in the haemoglobin and red-cell levels. Three pints (1.7 litres) of fresh blood was transfused on December 9, and 2 pints (1.1 litres) on December 31. The patient was now leucopenic, with total leucocyte counts of 1,000–2,000 per c.mm., including 300–700 monoblasts.

On December 24 a small crop of ulcers appeared on the inner aspect of the lips, but these soon cleared up. The patient remained fairly well, though weak, until the end of February, 1950. Early in this month some deterioration in the blood picture was noted. With a rise in the leucocytes to 12,000 and monoblasts to 9,000, and an increase in the anaemia (haemoglobin 53%).

A further 2 ml. of glandular-fever serum was injected on February 6.

At the end of February she had a short but severe attack of abdominal pain with diarrhoea and vomiting, and this left her very exhausted. Her mouth was again becoming sore, and the glands in the neck were larger. Neither spleen nor liver showed any marked increase in size. The deterioration in the general condition became very rapid, and was associated with a very steep rise in the monoblast level and fall in the haemoglobin and red-cell levels. The patient became semi-comatose and died on March 18.

Case 4

A man aged 17 was admitted to hospital on June 7, 1950, complaining of a purpuric skin eruption of recent onset, with pyrexia, sore mouth, and some pain in the region of the right knee. The history was of vague duration—probably extending over the previous three months. On examination there was only slight anaemia. The gums were spongy and hypertrophied, and both gums and soft palate showed the same petechiae which covered the whole body. The spleen was not palpable, but the liver was enlarged and palpable two fingerbreadths below the costal cartilages. The sternum was very tender on pressure. The right knee-joint was a little swollen and painful on movement.

The blood showed a haemoglobin of 78%, red cells 4,020,000, and leucocytes 14,500, with 52% monoblasts. Platelets numbered 20,000 per c.mm. Marrow biopsy confirmed the diagnosis of monoblastic leukaemia. On June 8 4 ml. of a high-titre glandular fever serum was injected

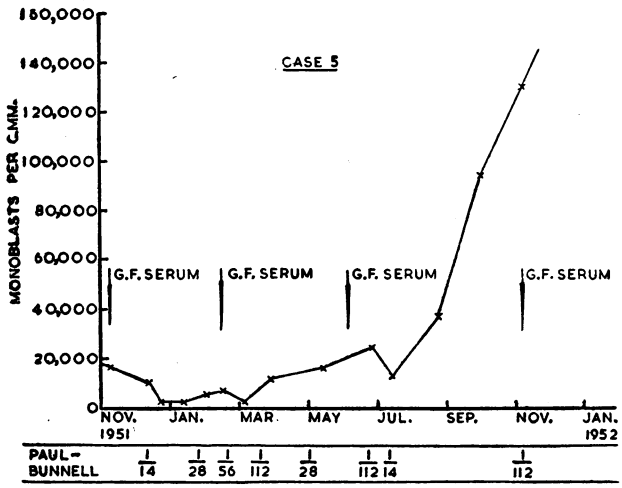
intramuscularly. Paul–Bunnell reactions before and after the injection remained negative and no glandular fever cells were seen in the peripheral blood at any time.

The patient's condition deteriorated and severe epistaxes began on June 18. By June 22 the haemoglobin, in spite of repeated transfusions, had fallen to 38%, the leucocytes numbered 30,000 per c.mm., with 59% monoblasts, and platelets were practically absent. Death occurred on July 10.

Case 5

A woman aged 41 was admitted to hospital on November 23, 1950, with the complaint of a tender painful swelling on the right side of the neck for about four months, with increasing dyspnoea on effort, some loss of weight, spontaneous bruising, and sore throat.

Examination showed a moderate degree of anaemia; there were scattered bruises on both legs, and both spleen and liver were just palpable. On the right side of the neck



there was an irregular glandular mass, involving both anterior and posterior triangles and very tender on palpation. No other glands were palpable. At this time the haemoglobin was 74%, red cells 4,800,000, total leucocytes 32,500, with 36% monocytes and 39% monoblasts. The platelets numbered 135,000. Sternal marrow biopsy confirmed the diagnosis of acute monocytic leukaemia.

While in hospital the patient's condition deteriorated and there was low-grade pyrexia and severe stomatitis. On November 29 4 ml. of a high-titre glandular-fever serum was given by intramuscular injection. During the next six weeks there was a steady clinical improvement. The pyrexia settled, weight increased, and the mass in the neck became smaller. At the same time small rises in both haemoglobin and red-cell levels occurred, the monoblast count fell from 15,000 per c.mm. on November 28 to 3,500 on January 4, 1951, and the total leucocyte count fell from 41,000 to 19,000. The Paul–Bunnell titre rose from an original 1/28 to 1/112 on December 9 and thereafter fell slowly. Small numbers of morphologically typical glandular-fever cells were seen in films following the glandular-fever serum injection, but there was little alteration in the total lymphocyte count.

The patient was discharged from hospital on January 12. Since then she had attended as an out-patient; her condition improved, and she was able to lead a fairly normal life. In February, and again in June and November, further injections of glandular-fever serum were given with subjective improvement on each occasion. Occasional slight stomatitis was controlled by local penicillin. There was no spontaneous bruising and the mass in the neck, though still tender, was neither as large nor as painful as before. The Paul–Bunnell titre rose to 1/112 after each of the glandular-fever serum injections but fell away to 1/14 very rapidly.

The blood picture showed little alteration over the next nine months, with the haemoglobin a little over 70%, red cells about 3,800,000, total leucocytes from 25,000 to 40,000, and monoblasts varying from 6,000 to 28,000 per c.mm. Towards the end of 1951 the leucocyte count rose sharply to over 100,000 per c.mm., including 80–90% monoblasts. There was a parallel deterioration in the patient's clinical condition, and death occurred early in January, 1952, from exhaustion with severe abdominal pain.

Necropsy showed extensive leukaemic infiltration of liver, spleen, kidneys, and lymphatic nodes.

Case 6

A woman aged 35 was admitted to hospital on March 19, 1951, complaining of increasing pallor for two months, repeated epistaxes for one month, severe haemorrhage and stomatitis following tooth extraction three weeks earlier, and severe and continuous bleeding per vaginam since her last menstrual period 12 days before admission.

On admission there was obvious gross anaemia, a severe stomatitis, and a few scattered petechiae on the shoulders and arms. The spleen was not palpable, but the liver edge was just palpable. No glands were enlarged. The blood picture on admission showed haemoglobin, 15%; red cells, 1,980,000 per c.mm.; leucocytes, 6,000 per c.mm., with 23% monoblasts. The platelets numbered 20,000 per c.mm. The M.C.D. was 7.9 μ. Sternal marrow biopsy confirmed the diagnosis of acute monocytic leukaemia.

An intramuscular injection of 2 ml. of a high-titre glandular-fever serum was given. Neither before nor at any time after this injection was the Paul–Bunnell reaction positive, nor were glandular-fever cells seen in the peripheral blood. In spite of massive and repeated transfusions the patient's haemoglobin and red-cell levels fell rapidly, and the uterine haemorrhage continued. Little change took place in the leucocyte total or differential counts. Death occurred from anaemia on April 28.

Discussion

This group of cases of acute leukaemia consists of six cases of acute monocytic leukaemia. In Cases 1, 2, 3, and 5 remissions of varying degree appeared to follow infection by glandular fever; in Case 1 this infection seemed to have been accidentally acquired, and in the other three cases deliberate attempts were made to induce glandular fever by injection of serum taken from cases of glandular fever in the acute stage. Evidence of infection with glandular fever in these cases of leukaemia was provided by the appearance of positive Paul–Bunnell reactions and by the appearance in the peripheral blood of typical glandular-fever cells in varying numbers, accompanied in some cases by transitory glandular enlargement. At the same time in each case there were falls in the total leucocyte counts, the fall being generally due to a sharp drop in the monoblast count. There was a tendency for haemoglobin and red-cell levels to improve and for the platelet counts to rise.

In Cases 4 and 6 there was no evidence whatever of infection following glandular-fever serum injection, and the disease in these cases ran its usual rapid and uninterrupted course.

Attempts to induce glandular fever in two cases of acute lymphatic leukaemia in children have also been made, and the results seem to justify further trial.

Wising (1942) has collected evidence which supports the virus theory of glandular fever aetiology and has described the successful transmission of this infection to man by means of heparinized blood. Bang (1943), in describing unsuccessful attempts to transmit glandular fever to man, suggests plausibly that the method of inoculation and size of dose are less important than the susceptibility of the experimental subject. This may explain the degree of success achieved in this experiment when quite small injections (2–5 ml.) of fresh untreated serum were used.

The manner in which glandular-fever infection might have a beneficial effect on the acute leukaemic process is quite uncertain. The cases of monocytic leukaemia described above were all of the "Schilling" type, which seems to me to bear a distinct resemblance both in its site of origin and in some of its clinical features to the more severe forms of glandular fever. The large type of glandular-fever cell seen in the first few days of acute glandular fever bears a close resemblance to certain of the leukaemic monocytes, although the mature cell of glandular fever is quite unlike any variant of the leukaemic monocyte or monoblast. It is possible that infection by the benign condition exerts a diversionary influence on the malignant leukaemic process.

It would be obviously most unwise to draw any sweeping conclusions from this very small series of cases. It does seem, however, that the clinical and haematological results obtained are more than can be explained either by the blood transfusions which some of the patients received or by chance.

It is suggested that further trial of the effect of induced glandular fever in cases of acute monocytic leukaemia is justified. It is even possible that in suitable cases the effects might be more profound and lasting than in those described.

Summary

Observations on the effect of glandular fever infection, natural and induced, in cases of acute leukaemia are recorded. It is concluded that there is evidence that such infection may in some cases be responsible for remissions in leukaemic disease.

Thanks are due to Dr. B. B. Hosford and Dr. J. M. Ranking for their co-operation, to Professor G. Payling Wright for helpful criticism, and to Dr. C. J. C. Britton for two batches of the glandular-fever serum used.

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MONOCYTIC LEUKAEMIA PRESENTING AS POLYARTHRITIS IN AN ADULT

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Leukaemia presenting as acute polyarthritis is common in children but rare in adults. There is no agreement about the pathological cause of this joint involvement, so the following case, in which an infected joint was examined histologically, is reported.

Acute rheumatism and leukaemia have been reported as occurring together by Ehrlich and Forer (1934). Uncomplicated leukaemia presenting as acute polyarthritis has been described by many authors, and its rarity in childhood was stressed by Bichel (1948) and Baldridge and Awe (1930). A few adult cases have been recorded by Seward (1930), Barney (1933), Henschen and Jezler (1935), and Wintrobe and Mitchell in 1940, and the whole question of bone and joint lesions in acute leukaemia has been reviewed by Dresner (1950).

Case History

In February, 1950, a 39-year-old police constable developed a febrile illness diagnosed as measles. In the following three months he lost nearly a stone (6.4 kg.) in weight and complained of fleeting pains in different joints. No abnormality was seen in a chest *x*-ray film, so he was referred by his doctor to a physiotherapy department. *X*-ray examination of the spine and pelvis showed no abnormality, but an E.S.R. of 77 mm. in the first hour (Westergren) and a normocytic anaemia with Hb 66% (9.8 g.%) were found. The leucocytes totalled 5,000 per c.mm., with a normal differential count. At the end of May his elbows, knees, and left ankle became swollen, and he began to sweat excessively. He was referred to a surgeon, and thence to hospital. He was admitted on June 14 with a provisional diagnosis of acute infective arthritis.

On examination he was found to be a pale, thin, excitable, and self-depreciative man, with a moderate pyrexia and accompanying tachycardia. His tongue was furred and the fauces were inflamed. One small lymph node was palpable in each axilla. Both knees and both ankles were swollen and tender, and the left elbow, though not swollen, was painful on movement. There was no other physical abnormality. The urine contained a small amount of albumin but no other abnormal constituents. The E.S.R. was 72 mm. in the first hour (Westergren). The Hb was 56% (8.3 g.%) and slight anisocytosis was present. The leucocytes totalled 5,000. Routine agglutination tests were all normal and blood culture was sterile. *X*-ray films of the chest and ankles showed no abnormality.

During the next 14 days systemic penicillin and sodium salicylate were given in doses large enough to produce symptoms of salicylism and a serum salicylate level of 40 mg. per 100 ml., but his fever and flitting joint pains continued. The E.S.R. rose to 140 mm. in the first hour, and 18 days after admission his Hb had dropped to 46% (6.8 g.%) with 2,800,000 erythrocytes. The leucocyte count remained at 5,000 (polymorphonuclears 50%, lymphocytes 43%, monocytes 7%, and an occasional nucleated erythrocyte).

Two days later he became extremely ill. The E.S.R. was 150 mm. in the first hour, the Hb fell sharply to 34% (5 g.%), while the leucocytes increased to 5,800. At this stage a diagnosis of acute aleukaemic leukaemia was considered and a sternal marrow puncture was performed, but a satisfactory marrow specimen was not obtained. An intravenous infusion of 4 pints (2.3 litres) of packed red cells was given, and this temporarily raised the haemoglobin percentage without improving the patient's general condition.

On July 9 the tonsils and some cervical and inguinal lymph nodes became enlarged, but a chest *x*-ray film showed no enlargement of hilar nodes. Haemorrhages appeared in the retinae and palatal mucosa. The leucocyte count was 10,000 (polymorphonuclears 50%, lymphocytes 41%, monocytes 9%). Next day the leucocytes rose to 12,000 and the film showed abnormal mononuclear cells. Sternal puncture was again unsuccessful. By July 12 the Hb was 48% (7.2 g.%). The leucocyte count was 13,800 (stem cells 9%, monoblasts 20%, promonocytes 34%, monocytes 11%, lymphocytes 12%, neutrophil polymorphs 13%, plasma cells 1%). There was one nucleated red cell per 100 leucocytes. Next day the total leucocyte count had risen to 17,000. The picture was thought to be that of acute monocytic leukaemia.

By this time the patient was prostrated, with a swinging temperature and severe dyspnoea. Both ankles were swollen and there were effusions in both knee-joints. There was generalized lymph-node enlargement and the liver was felt three fingerbreadths below the right costal margin. The spleen was not palpable. Several small hard nodules were felt in the scalp. During the next few days the glands became bigger and the spleen became palpable three finger-