treatment for suspected paratyphoid fever during the six weeks before admission to the Royal Infirmary, Sheffield, while another (Case 2) had shown features of erythema multiforme. Case 3, a medical practitioner, had been admitted on the surgical side with pain in the right hypochondrium radiating to the back, upward flatulence, distaste for fatty foods, and a positive Murphy's sign. So far as the haemopoietic system was concerned, the only physical sign was mucosal pallor. Case 4 had complained of lethargy and had shown mucosal pallor only for two months. The fifth patient of this group (Case 11) had had progressive loss of energy, dyspnoea on effort, flatulent dyspepsia, and pallor of the mucous membranes only for four months, while the sixth patient (Case 12) had had a six-weeks history of malaise and pallor only, with no other suggestive physical signs.

A further 26 of the cases of acute leukaemia (15 myeloblastic, 10 monoblastic, 1 erythro-leukaemic) had the well-known fetid breath associated with a variety of intra-oral leukaemic lesions. In addition, five of these patients had epistaxis, one haemoptysis, three melaena, and two haematemesis plus melaena.

The remaining 13 cases of acute leukaemia (10 myeloblastic, 2 monoblastic, 1 erythro-leukaemic) had no halitosis at all. Five of these patients had oral petechial haemorrhages, and, in addition, one had nasal petechiae with epistaxis.

None of the 11 cases of chronic lymphatic leukaemia had halitosis, and only one had oral lesions consisting of slightly swollen gums. Ten of the 11 cases of chronic myeloid leukaemia had neither halitosis nor upper respiratory or alimentary lesions. The other case had a fetid breath. This patient had, however, bled excessively into the gut and the abdomen following partial gastrectomy for a large chronic gastric ulcer five days previously, and had received repeated blood transfusions. His tongue was tender and enlarged, the surface being dry, cracked, and yellowish red in colour.

Discussion

In 6 out of 73 cases of leukaemia, the peculiar sweet-smelling breath was of value in reaching a tentative diagnosis of acute leukaemia after clinical examination only. So far as I am aware, this physical sign has not been described previously in its present context. This may well be due to the fact that halitosis is usually associated with obvious lesions in the upper respiratory and/or alimentary tract, and/or with abnormal physical signs elsewhere suggesting the diagnosis.

The abnormal breath at present under discussion does not appear to be related to enlargement of the liver, spleen, or lymph nodes, to the haemoglobin level, to the total leucocyte count, or to the blast-cell count (see Table). A sweet, slightly faecal odour likened to the smell of mice or to a freshly opened corpse has been described in hepatic failure (Sherlock, 1955), but in none of the present cases was there clinical evidence of such a state. Recent work has shown that, in both man and animals, the lung plays an active part in the removal (from blood and organs) and release (to blood and organs) of leucocytes and platelets under various stimuli (Bierman, 1955). The mechanisms whereby these changes are induced remain to be clarified. They may possibly play a part in the halitosis, but this is only conjecture. Finally, the odour in the above six cases may have been due to lesions in the alimentary and/or respiratory tract which were not found on ordinary clinical examination.

Summary

A physical sign is described consisting of a peculiar sweet odour of the breath found in relation to 73 cases of leukaemia (51 acute, 22 chronic). It was present in 12 of the cases of acute leukaemia without obvious clinical involvement of the gums, mouth, or upper respiratory and alimentary tracts. In six of these cases there

were signs and symptoms, such as splenomegaly, to suggest the true diagnosis, while ordinary clinical examination of the other six cases, halitosis apart, was unrewarding, and it was only after examination of the blood and bone marrow that a firm diagnosis could be made. Possible sources of the halitosis are discussed.

I am indebted to my medical and surgical colleagues in the United Sheffield Hospitals and in the Sheffield Regional Hospital Board area for referring their cases, and to the medical staffs who have confirmed the observations. I also thank Dr. H. T. Swan for reading the manuscript.

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Medical Memoranda

Congenital Absence of Spleen Associated with Cardiac Abnormalities

Polhemus and Schafer (1952) described four cases of congenital absence of the spleen associated with gross cardiac abnormalities and reviewed the literature up to that time. Since then Ivemark (1955), Gasser and Willi (1952), Bush and Ainger (1955), Polhemus and Schafer (1955), and Nihoyannopoulos *et al.* (1956) have reported further cases. Bush and Ainger lay emphasis on the unusual peripheral blood picture which may be found in this condition—namely, normoblastaemia, reticulocytosis, leucocytosis, Howell-Jolly bodies, and a decreased osmotic fragility.

Details of a further case are given below. I have been unable to trace any previous report of this condition occurring in an infant born in Britain.

CASE REPORT

A male child was admitted to hospital 48 hours after birth because of an imperforate anus and possible upper intestinal obstruction. The mother's pregnancy and labour had been normal. The birth weight was 5 lb. 1 oz. (2.3 kg.). The two previous pregnancies had resulted in one miscarriage and one living healthy child.

On admission the infant's general condition was good. There was no cyanosis or dyspnoea. A precordial systolic murmur was detected at this time, but, despite repeated auscultation, was not heard again for 10 weeks. The abdomen was not distended, but there was a tight anal stenosis, probing of which produced a small amount of meconium. The anus was dilated and gave no further trouble. Straight x-ray examination of the abdomen showed gas shadows only as far as the duodenum. A laparotomy was therefore performed by Mr. A. Jolleys under general anaesthesia. An atresia of the third and fourth parts of the duodenum was found. The continuity of the lumen was restored by anastomosing the blind ends.

Progress was uneventful for the next 12 days, when the infant started passing loose green stools which became increasingly offensive. These were at first thought to be "starvation stools" because of the small feeds the child was taking, but the loose stools persisted when normal feeds were taken. The blood count at this time showed a haemoglobin of 96%. The total nucleated cell count was 19,000 per c.mm., with polymorphs 27%, lymphocytes 22%, monocytes 9%, eosinophils 2%, late normoblasts 40%. The reticulocyte count was 30%. In an attempt to account for the normoblastaemia the osmotic fragility of red cells was investigated and a slight decrease of fragility was found, 50% of cells being still present at a dilution of 0.36%, the indirect Coombs test was negative, and the urine contained no bilirubin or excess of urobilin.

When the infant was 5 weeks old, cyanosis appeared and gradually increased in intensity. In view of the absence of

a heart murmur at this stage the blood was examined for sulphhaemoglobin and methaemoglobin, with negative results. However, a systolic murmur was again heard at the age of 10 weeks, and soon after a precordial thrill also developed and the child became increasingly dyspnoeic. E.C.G. was within normal limits except for the presence of slight left axis deviation and a suggestion of left ventricular hypertrophy in the precordial leads. Radiological examination of the chest showed some widening of the upper mediastinum with a slightly globular heart shadow. The lung fields were clear. The diarrhoea, which had persisted throughout, now became profuse, and death occurred from uncontrollable dehydration at the age of 13 weeks.

At the post-mortem examination a bilocular heart was found with the aorta and pulmonary artery arising in the correct relationship from the common ventricle. The aortic arch was right-sided and the pulmonary artery was hypoplastic. On each side a superior vena cava and two pulmonary veins entered the common auricle. Each lung possessed three lobes. There was a complete absence of spleen and splenic tissue. The stomach was represented by a thick-walled widening of the gut embedded in the liver. The pancreas consisted of a small round mass of tissue.

COMMENT

In such cases as this the diagnosis of splenic agenesis might be suspected during life from the unusual blood picture and the presence of cyanotic heart disease.

I am indebted to Dr. G. M. Komrower and Mr. A. Jolleys for permission to report this case; to Dr. H. B. Marsden for the post-mortem findings; and to Dr. Komrower for his encouragement and advice.

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Polyneuritis Caused by Antirabic Vaccination

Polyneuritis is one of the neuroparalytic complications of antirabic vaccination. The incidence of neurological complications during prophylactic treatment seems to vary widely, having been reported as 0.017% (Greenwood, 1945), 1.3% (Babés, 1912), and in India about 1 in 8,500 cases, or 0.012% (Ahuja and Brooks, 1951). The sexes are affected equally, but the extremes of age are generally immune. In my series of 2,455 patients receiving antirabic vaccination from August, 1954, to July, 1955, neurological complications occurred in five (0.2%), two of whom developed polyneuritis.

The pathogenesis of polyneuritis is controversial. Van Rooyen and Rhodes (1948) suggest that antibodies develop to the brain tissue, and that an antigen-antibody reaction occurs in the perivascular tissues, giving rise to inflammation and degeneration of the vessel wall.

With regard to its pathology, both mesodermal and parenchymatous toxi-degenerative lesions characterize the palsy. Either of these may occupy the foreground; they may also coexist, yet not develop in the same parts of the tissues.

The incubation period is between the tenth and fifteenth days from the first prophylactic dose of vaccination, with a limit of five weeks, the period being shorter than the incubation period of the disease itself, and dependent not on the interval elapsing after the bite but on the treatment.

Among the different forms of neurological complication—consisting of acute ascending paralysis of the Landry type; dorso-lumbar myelitis; cranial neuritis; polyneuritis; and meningo-encephalitis—dorso-lumbar myelitis is the commonest and polyneuritis is the rarest. The rarity of the latter condition warrants this report.

CASE 1

A Hindu peon aged 37 was admitted to the J.A. Group of Hospitals, Gwalior, complaining of weakness in all his limbs of three days' duration. The onset was gradual. As he had been bitten by a rabid dog, a course of antirabic vaccination (5 ml. for 14 days) was given. Three days after the last injection he felt weakness in all limbs, which gradually worsened. There was nothing significant in his personal and family histories. On examination there was lower motor neurone paralysis of the limbs, with severe weakness, loss of all tendon-jerks except the supinator, and tenderness of the calf muscles. There were no other subjective or objective sensory disturbances and no evidence of myelitis. Other systems were normal, and he had full sphincteric control during his illness. Laboratory investigations revealed no abnormality in any system.

He was treated in hospital for nearly four months with vitamins B₁ (100 mg.) and B₁₂ (100 µg.) parenterally on alternate days. For the first two months the condition deteriorated, and there was wasting of the distal muscles of the limbs. Subsequently he improved slowly. When he was discharged from hospital the limb weakness, loss of all tendon-jerks except the supinators, and the wasting of the distal muscles persisted, though there was slight improvement. At the time of writing he could walk about, but had very little power in his hand muscles.

CASE 2

A Hindu office superintendent aged 42 was admitted into the J.A. Group of Hospitals, Gwalior, having had pain and weakness in all limbs for 10 days. The onset was gradual, with fever. Two days after being bitten by a rabid dog he was put on a course of antirabic vaccination (5 ml. each dose). Following the seventh injection he had slight fever and felt weakness in his limbs. After an interval of four days two more injections were given. As the weakness increased the injections were stopped, and he was admitted to hospital. There was nothing significant in his family history. At the age of 15 he had received 14 injections (each 5 ml.) of antirabic vaccine after being bitten by a rabid dog. On examination there was lower motor neurone paralysis of all limbs, with marked weakness, complete loss of tendon-jerks except the supinators, and no muscle wasting. The calf muscles were tender. There were no other subjective or objective sensory disturbances and no signs of myelitis. Other systems were normal and sphincteric control was retained throughout. Laboratory investigations revealed no abnormality in any system.

He was treated with vitamins B₁ (100 mg.) and B₁₂ (100 µg.) parenterally on alternate days. About two weeks later there were signs of improvement. He gradually recovered after six weeks. After two months in hospital he was discharged with a fair degree of power in all limbs, loss of all tendon-jerks except the supinators, ability to write but inability to type, and no tenderness in the calf muscles.

COMMENT

The first case showed poor improvement even after four months, while the second case improved very well within six weeks. The difference in the degree of improvement could possibly be due to the difference in the amount of vaccine being injected. The persistence of the supinator-jerks, when all the other tendon-jerks were completely lost, was interesting. Sensory disturbances in both cases were very slight.

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