Culture of numerous specimens of faeces failed to grow the organism. Blood cultures taken after the chest exploration also failed to grow the organism.

The drain continued to discharge pus until April 26, when it was gradually shortened. The wound closed at the end of May.

Stools of relatives were examined but no carrier was found.

Discussion

The commonest site for the infection to localize is the lungs, where it may produce a bronchopneumonia, lobar pneumonia, pleurisy with effusion, or an empyema. The organism has been isolated from the sputum and the pleural fluid. Pulmonary involvement occurred in one-third of Harvey's cases and in 32 of Saphra and Wassermann's, and in this country the organism was isolated from the lungs at necropsy in one of the cases of Schwabacher *et al.*

Harvey noted several cases of infection due to *Salm. choleraesuis* occurring post-operatively. It followed such procedures as laparotomy, cystoscopy, antral operation, and drainage of an ischio-rectal abscess. One patient developed bronchopneumonia after laparotomy for myomas of the uterus. The organism in this case was cultured from the blood but not from the sputum.

Localization in bone and joints occurred in 15 of Harvey's cases and in 19 of Saphra and Wassermann's. Two cases have previously been reported in this country; arthritis of the shoulder-joint in an infant 8 months old (Nabarro *et al.*, 1929), and arthritis of the shoulder-joint in an infant 7 months old (Guthrie, 1941).

The mortality is high. In Harvey's series it was 38%. In Saphra and Wassermann's series it was 21%, and they compared the mortality rate with 300 consecutive infections of *Salm. oranienburg* and *Salm. typhimurium*; here it was 4.7% and 4% respectively. There have been five deaths in the seven cases reported in this country.

The organism in both the above cases was sensitive *in vitro* to chloramphenicol, yet sterilization was not achieved by courses of this drug. In Case 1 the blood stream may have repeatedly been reinfected from the osteomyelitis of the spine which possibly was present for some time, although evidence of this was lacking.

American workers have shown that the hog is the main carrier of *Salm. choleraesuis*. Infection is probably acquired through careless handling of contaminated pork or eating it insufficiently cooked. The carrier rate is low compared with other salmonellae. Scott (1940), in this country, isolated 38 strains of *Salmonella* from mesenteric lymph nodes of 1,000 healthy pigs, 10 of these were of the species *Salm. choleraesuis*. A more recent investigation by the Salmonella Subcommittee of the Public Health Laboratory Service (1955) failed to isolate the organism from a large number of samples of bile, liver, mesenteric lymph nodes, and faeces of healthy pigs. It was suggested, however, that the medium used, selenite-F, may not have been the best medium for isolating this organism. The source of the organism in these two cases is not known for certain, but in Case 1 it is reasonable to suppose that infection was acquired by contact with diseased ham.

From the wider aspect it can be seen that in view of the patients' occupations the infections presented a major risk to the public health. It is surprising that no further infections by this organism were notified in Liverpool at this time.

Summary

Two cases of the generalized type of infection with *Salmonella choleraesuis* are reported: one case with septicaemia and osteomyelitis of the spine, and the other with empyema following splenectomy. The high mortality is noted. The source of infection in these two cases is not known.

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UNUSUAL HAEMOGLOBIN VARIANT IN A GUJERATI INDIAN

BY

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During a survey for haemoglobin D an example of an unusual haemoglobin was discovered. This haemoglobin, which was accompanied by normal adult haemoglobin, moved faster than the latter at pH 8.6 on paper electrophoresis, and its characters are described below.

The subjects surveyed were 326 Indians living in and near Kampala, Uganda, and nearly all were first-, second-, or third-generation immigrants from the Bombay region of India. A few Sikhs and Punjabis were included. Two unrelated subjects were found to exhibit both haemoglobins A and D. It may be mentioned here that this series, added to the 174 persons examined by Jacob *et al.* (1956), brings the total of Uganda Indians examined to 500; and among these the number of examples of haemoglobin D found now becomes four.

The Haemoglobin

One woman (Mrs. L. M.), however, showed the abnormal haemoglobin here described, and it was demonstrated in her blood on two subsequent occasions. Both she and her husband came from Gujerat, north of Bombay. Unfortunately the family is scattered in India, Tanganyika, and Kenya, and it was not possible to examine her husband, parents, brother, or sister. Three children, aged 16, 14, and 13, were examined, and showed normal adult haemoglobin only.

A haemolysate of the washed erythrocytes of Mrs. L. M., prepared without freezing, resolved into two components when subjected to electrophoresis on paper in 0.05 M barbitone buffer at pH 8.6. One of these components, representing 20–25% of the whole, moved more quickly than haemoglobin A, its separation being slightly less than that

Paper electrophoretic pattern, at pH 8.6 in barbitone buffer, of the new haemoglobin and haemoglobins A and S.

between haemoglobins A and S (see Fig.). In phosphate buffer at pH 7.8 two components were still discernible, the abnormal haemoglobin having the greater mobility, but complete separation did not occur. At pH 6.5 in phosphate buffer, however, the abnormal haemoglobin was not separable from haemoglobin A, but trailed behind it.

The solubility of Mrs. L. M.'s haemoglobin was 1.57 g. per litre in 2.58 M phosphate buffer, by the method of Itano (1953). After ten weeks' storage at about -25°C . no precipitate was formed in a haemolysate that contained 8 g. per 100 ml., and no change was observed in the proportion of the abnormal haemoglobin after this period of freezing.

Haematological Findings

The relevant findings in Mrs. L. M. and three of her children are given in the Table. None of these subjects showed sickling, malaria was absent in all, reticulocytes did not exceed 0.2% in any subject, the serum bilirubin was normal in all, and alkali-resistant haemoglobin was absent in every case—less than 2% by the method of Singer *et al.* (1951). No changes were observed in wet preparations in saline, dithionite, and cresyl blue.

Haematological Findings in the M. Family

	Mrs. L. M., Mother	T. M. (16), Daughter	P. M. (14), Son	N. M. (13), Son
Haemoglobin (g./100 ml.)	15.06	12.57	14.9	14.67
Erythrocytes (mil. c.mm.)	6.15	5.91	5.5	5.55
M.C.V. (cubic microns)	77.2	66.8	76.4	79.0
M.C.H.C. (%)	31.8	31.8	35.4	33.7
Plasma Fe ($\mu\text{g.}/100\text{ ml.}$)	73	235	—	—
Osmotic fragility (Limits)	0.42–0.3	0.34–0.24	0.42–0.3	0.42–0.3
frangibility (50%)	0.37	0.29	0.36	0.35

The stained blood film of Mrs. L. M. showed no abnormality except that a very occasional oval erythrocyte could be found. The films of the two younger children were quite normal, and, though the M.C.V. recorded in these three members was rather low, this did not appear to represent any abnormality. The daughter (T. M.), however, displayed definite abnormalities, her erythrocytes showed considerable variation in size and shape, there were many elliptocytes, target cells were numerous, but no polychromatic staining was seen. These findings accord with the lowered cell volume (66.8 cubic microns) and the increased resistance to hypotonic saline, and are suggestive of thalassaemia minor. The plasma iron of this girl was high (method of Ramsay, 1953), which is in favour of the same diagnosis. Presumably the inheritance was through T. M.'s father, who unfortunately was not available for examination. The presence of the thalassaemia gene in this family must be a coincidence, but it is not a surprising one, for thalassaemia is by no means rare in the Indian immigrants in Uganda.

Discussion

Several human haemoglobins having greater mobility than haemoglobin A at pH 8.6 have been described.

The present haemoglobin differs from haemoglobin H (Rigas *et al.*, 1956) in its cathodal mobility at pH 6.5, its stability when frozen, and the absence of any associated disease. It differs from haemoglobin I (Rucknagel *et al.*, 1955) and from the haemoglobin described by Cabannes *et al.* (1955), in that it appears to be less mobile at pH 8.6.

Haemoglobins J and K are less mobile than H and I. Exactly which haemoglobin should be designated K has been the subject of some confusion. The letter was originally reserved by Itano (1955) for a component reported by Battle and Lewis (1954), but subsequently he could not confirm that this was a distinct variant (Itano *et al.*, 1956). At the sixth International Congress of Haematology it was suggested that K might describe another haemoglobin reported from Algeria by Cabannes *et al.* (1956), and one of the new variants (Liberia II) found by Robinson *et al.* (1956) in Liberia.

Fortunately haemoglobin J is a clearly defined entity. Described by Thorup *et al.* (1956) in a negro, it had a mobility

similar to the present example, and was not associated with disease. Robinson *et al.* (1956) found a haemoglobin in Liberia (Liberia I) that is identical with haemoglobin J, and in both these descriptions the abnormal fraction in A-J individuals accounted for about 60% of the total haemoglobin. Huisman *et al.* (1957) reported the finding of haemoglobin J in an Indonesian, in whom it formed only 35% of the haemoglobin.

Through the kindness of Dr. H. Lehmann and Dr. T. H. J. Huisman the present haemoglobin has been compared with haemoglobins H, I, J, K, and found to correspond with haemoglobin J in its mobility at pH 8.6. Thus the presence of the gene for haemoglobin J in the Indian mainland is established, and this gene (like that for haemoglobin S) appears to have a rather wide variability of expression in heterozygotes, producing in different individuals from about 20% to 60% of the total haemoglobin.

Summary

A haemoglobin variant, with greater mobility than haemoglobin A at pH 8.6, was discovered in an Indian woman in Uganda. It was unassociated with any abnormality in the blood. Its properties are recorded, and correspond with those of haemoglobin J.

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Medical Memorandum

Acute Myeloblastic Leukaemia following Chloramphenicol Treatment

Various blood dyscrasias, ranging from slight granulocytopenia to agranulocytosis and aplastic anaemia, following administration of chloramphenicol have been reported during the last few years, but no case of acute leukaemia has yet been published. A case has recently been seen where acute myeloblastic leukaemia was discovered following agranulocytosis and hypoplasia of bone marrow after a single course of chloramphenicol.

CASE REPORT

A man aged 63 was first seen in September, 1953, with a history of sudden attacks of amnesia over the last year. No very definite abnormality was found on physical examination; a peripheral blood film showed a normal picture with haemoglobin 94%. Wassermann reaction negative. He had no symptoms when seen in January, 1954, but was admitted to this hospital in August, 1954, with further attacks of amnesia, frontal headaches, and momentary aphasia. Examination revealed slight nominal dysphasia, right homonymous hemianopia, slight papilloedema of right disk, and accentuated right-sided tendon jerks. A skull radiograph was normal, but the cerebrospinal fluid was xanthochromic, under enhanced pressure, and contained increased protein and excess globulin. Blood count on August 27: Hb 74%; R.B.C. 4,060,000 per c.mm.; C.I. 0.92; W.B.C. 6,800 per c.mm.; polymorphs 62%; lymphocytes 37%; monocytes 1%. A left carotid angiogram