in cacodylate buffer pH 6.5, and stated that it was not identical with Hb C, Hb S, Hb D, or Hb G. However, to our surprise, he said that Buginese X in this buffer moved more rapidly than Hb S and Hb D. We have found, on repeated examinations by paper electrophoresis, that Buginese X in phosphate buffer pH 6.5 was slower than Hb C, Hb S, and Hb D. One wonders whether the difference in findings at pH 6.5 was due to the different buffers or the different supporting media used.

Dr. Itano also examined our haemoglobin in the Tiselius apparatus in barbitone buffer of pH 8.6, ionic strength 0.1 and found that it migrated more rapidly than Hb E and C and more slowly than Hb S, in both the ascending and the descending limbs. This finding is in agreement with ours on paper electrophoresis with the same buffer of the same pH.

As it has been confirmed by different laboratories that Buginese X differs from all other known haemoglobins, it should be allotted a letter. N was the letter most recently used to designate haemoglobin Liberian I (personal communication by Dr. James V. Neel). So far as we know, the letter O has not yet been used, and therefore Buginese X should be called Hb O. Dr. James V. Neel agreed with this choice.

Distribution and Incidence of Hb O

Haemoglobin O has so far been found only in persons who originate from the Indonesian island of Sulawesi. The only blood specimen containing Hb O obtained in Djakarta was from a pure Buginese from Sulawesi. We have found Hb O in the following ethnic groups:

6 Hb O carriers among	455 Buginese in South Sulawesi
3 " " "	136 Makassars in South Sulawesi
1 " " "	107 Gorontalo in North Sulawesi
1 " " "	77 Toradjas who originate from Central Sulawesi but who were living in Makassar.

Thus Hb O is not very rare on this island. In the south the incidence is more than 1% in the Buginese. However, we did not find it among 233 Minahassers in North Sulawesi. In the Buginese and Makassars Hb E was also found in a low incidence.

Heredity.—We have not been able to conduct family studies in our Hb O carriers. However, after close inquiry it was found that the three Makassars who were Hb O carriers were related.

Haematological Study

A haematological study was difficult to carry out because of lack of adequate laboratory facilities in Sulawesi. The blood was to be flown to Djakarta directly after it had been

Details of Two Carriers

	Mrs. Sal	Mrs. Muna
Age in years when examined	35	30
Hb (g./100 ml.)	13.2	11.0
R.B.C. per c.mm.	5,230,000	4,300,000
Packed cell volume (%)	42.0	—
M.C.V. (cubic microns)	80.3	—
M.C.H. ($\mu\text{g.}$)	24.9	—
M.C.H.C. (%)	31.4	—
Leucocytes per c.mm.	6,100	—
Differential count of W.B.C.	Normal	Normal
Poikilocytosis and anisocytosis	±	±
Target cells	Very rare	Very rare
Saline fragility	Initial at 0.44	0.44
Complete at	0.20	0.20
Serum bilirubin	Not increased	Not increased
Alkali-resistant haemoglobin % of total (Singer's technique)	0.6	0.8
Hb analysis	A+O	A+O
Malaria	Negative	Positive

drawn, but the persons who were to do this always failed to arrive at the time scheduled by us. We were therefore able to examine only two of the carriers. In Mrs. Sal the data obtained (see Table) were within normal limits: only the resistance of the erythrocytes to hypotonic saline solu-

tions was increased. In Mrs. Muna there was a slight anaemia. However, her blood contained malaria parasites. In Mrs. Muna also the resistance of the erythrocytes was increased. The peripheral blood of both women did not show obvious changes, and did not resemble the picture we usually see in thalassaemia-trait carriers. Anisocytosis and poikilocytosis, when present, were very slight indeed. Target cells were very rare and no stippled cells were seen.

We are trying to get hold of the other Hb O carriers, and we hope to be able to give more details regarding them and their families in the near future.

Summary

The physico-chemical properties of Hb O (Buginese X) are described. The distribution and incidence of this haemoglobin are reported and the haematological findings in two Hb O carriers are presented.

We thank Dr. T. H. J. Huisman and Professor J. H. P. Jonxis, of Holland, Dr. H. Lehmann and Dr. J. A. M. Ager, of London, and Dr. H. A. Itano, of the U.S.A., for studying this haemoglobin and for their kind co-operation which made this publication possible. Thanks are also due to all colleagues and personnel who have helped to collect the blood specimens in Sulawesi. We are grateful to the Red Cross Blood Transfusion Service, Djakarta, especially to Miss Emmy Zachari, who sent us a large amount of blood containing haemoglobin O.

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Medical Memoranda

Unusual Reaction to Chlorpromazine

As chlorpromazine is being increasingly prescribed both in hospitals and by general practitioners, the rare toxic reaction described below seems worth reporting.

CASE REPORT

A youth of 20 attended the psychiatric clinic with the complaint that for a month he had been feeling "muddled up in his mind." As there was a strong family history of schizophrenia it was thought that he might be developing this disease. Chlorpromazine, 100 mg. thrice daily, was prescribed and he was asked to return in a fortnight. However, he was brought back to the clinic in a week by his father with the story that for the past two days he had had attacks in which—to quote the father—"he had horrible poses of his head and neck." Two attacks occurred in the clinic, each seeming to be precipitated by the stress of questioning. In the attack his head was drawn slowly backwards and to the right, and his shoulders became hunched up; the facial muscles, and to a less extent those to the neck and shoulder, underwent slow writhing movements; he was unable to speak but appeared fully conscious and was able to indicate that he understood what was said to him. The first attack lasted about 10 minutes, the second about 20 minutes. The postures were not identical in the two attacks. There was no tremor or clonic movement, nor was there difficulty in walking. In the intervals between the attacks the patient seemed quite unconcerned about them and said they caused him no anxiety or pain.

The father volunteered the information (which the patient confirmed) that two days previously the patient had taken six of his tablets at the same time—that is, 600 mg. of chlorpromazine—"in order to get some sleep." The attacks began about 12 hours after this.

The patient was admitted to hospital. He had several further attacks during the evening but then no more. Examination of his nervous system next day, and of his cerebrospinal fluid and skull x-ray film, revealed no

abnormality. He was discharged home after three days, and when seen at the clinic a fortnight later said he felt much better mentally. He was advised to resume chlorpromazine but would not do so.

COMMENT

There appear to have been only two reports of similar reactions after chlorpromazine. Labhardt (1954) mentions two patients, one a neurotic and one a psychopath, who showed "hysteriform" symptoms resembling *arc en cercle* and spasmodic torticollis, but gives no further information. Ayd (1956) describes the case a 16-year-old girl receiving 300 mg. of chlorpromazine daily who on the twelfth day suddenly developed dysarthria, facial grimacing, and involuntary muscle movements. She began taking chlorpromazine again three days later and had no recurrence of dystonia.

This type of reaction, very rare with chlorpromazine, appears to be less rare with the related drug prochlorperazine ("stemetil"). As one of the recognized toxic effects of both chlorpromazine and prochlorperazine is a parkinson-like syndrome, it is perhaps not altogether fanciful to picture the dystonic syndrome described here as in some ways analogous to the oculogyric crises of post-encephalitic parkinsonism.

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A Guided and Guarded Trephine for Bone-marrow Biopsy

There are many conditions in which histological examination of bone marrow may give information not obtainable by the examination of films made from material aspirated from the bone-marrow cavity.

Sometimes very small masses of marrow are withdrawn by needle puncture, and these may be picked out from the material aspirated and sections made from them. A small trephine, 5 mm. in diameter, may be driven into the sternum after an incision to obtain small portions of bone marrow (Dameshek, 1935). The specimens obtained, however, may be much too small for adequate histological study.

A larger trephine may be used at open operation on the sternum (Custer, 1949), a portion of rib may be excised (Hutt, Smith, Clark, and Pinniger, 1952), or a wedge of the crest of the ilium may be removed (Leonard, Israëls, and Wilkinson, 1957).

There is need for an instrument which will always produce an adequate amount of bone marrow for histological study from a part of the skeleton where red bone marrow is always present, without crushing of the specimen, without danger of damage to important structures, with the scar in an inconspicuous position, and by a method which is acceptable to the patient as a relatively minor diagnostic procedure that may be repeated at intervals, if desirable, to observe changes in the bone marrow with time or treatment. The instrument here described was designed in an attempt to fulfil these requirements.

It is unlikely that any method will be devised for obtaining an adequate amount of bone marrow without open operation.

The instrument consists of a combined guide and guard, and a trephine with a hole up the handle into which the guide fits (Fig. 1). Two trephines are available, 15 mm. and 11 mm. in diameter, the smaller one being more suitable for the narrower ribs of female patients.

A portion of rib is exposed posteriorly, and the periosteum is reflected from the outer surface and also from the inner surface to about half-way down the width of the rib. The tongue of the guard is inserted in a vertical direction behind

the rib, with the guide firmly pressed against the upper border of the rib. The trephine is then placed over the guide and, by pressure and rotation, is driven home against the guard. Care must be taken to saw through the bone, and not to use too much pressure, or the bone marrow may be crushed, rendering it useless for histological study. An

FIG. 1.—Diagram of the instrument.

instrument which is designed to bite out portions of bone is unsuitable because of the crushing of the marrow which occurs. The guard and trephine are then removed together. A portion of the upper margin of the rib, of the whole thickness of the rib, and nearly semicircular in shape, is thus obtained (Fig. 2). Contact smears or films can be made from the cut surface of the bone marrow and the semicircular disk of rib then placed in fixative and processed in the usual way.

If the patient's condition warrants it, the operation is best done under general anaesthesia as advised by Hutt *et al.* (1952). It takes about five minutes under general anaesthesia and ten minutes under local analgesia.

Not once, either in the post-mortem room or in the operating theatre, has a rib been broken or the pleura damaged.

I am grateful to Professor W. St. C. Symmers and his staff of the Department of Morbid Anatomy, Charing Cross Hospital Medical School, for facilities, and particularly to Dr. Rosalinde Hurley for obtaining many of the post-mortem specimens. I am grateful to Mr. A. R. Makey for carrying out the biopsies.

The prototype of the instrument was made in soft metal by Alan Hickling, mechanical sciences undergraduate, Cambridge University, from which the instrument was made in stainless steel by the London Splint Company Limited, 67-69, Weymouth Street, London, W.1.

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FIG. 2.—Actual size of sections obtained with the two trephines.