Preliminary Communications

Erythrocyte Osmotic Fragility in Nigerian Infants and Adults

Fast-moving haemoglobin fractions which are present at birth and which disappear with the decline of foetal haemoglobin during the first few months of life have been reported by workers in several widely separated parts of the world (Fessas and Papaspyrou, 1957; Ager and Lehmann, 1958; Vella, 1959; Lie-Injo Luan Eng, 1959; Hendrickse, Boyo, Fitzgerald, and Ransome-Kuti, 1960). The significance of these observations is as yet obscure, and evidence of any correlation between the presence of a fast-moving haemoglobin component at birth and any physical, haematological, or biochemical abnormality in later life has to date not been forthcoming. Among the infants reported from the University College Hospital, Ibadan, who had fast-moving haemoglobin components at birth, two in whom osmotic fragility of the red cells was investigated showed a reduced fragility to hypotonic saline (Hendrickse *et al.*, 1960). Because of this observation it was decided to pursue the investigation of the relationship between the possession of a fast-moving haemoglobin component at birth and the osmotic fragility of the erythrocytes. The results of this investigation are reported here.

MATERIAL AND METHODS

Infants selected for study were those born at University College Hospital, Ibadan, on whom electrophoresis of the haemoglobin had been performed at birth and who were thus known to possess a normal electrophoretic pattern or to have an abnormal fast-moving component. Adults studied were healthy blood donors. Patients in whom haemoglobins S and C were detected were excluded from the investigation. Filter-paper electrophoresis of the haemoglobin was carried out with the hanging-strip method in barbitone buffer at

pH 8.6, ionic strength 0.05. Erythrocyte osmotic fragility tests were done using the technique described by Jonxis and Huisman (1958). Results were read by measuring the extinction of the supernatant fluid in a spectrophotometer at 540 m μ . It was thus possible to estimate the median corpuscular fragility (M.C.F. 50% haemolysis). The tests were performed in an air-conditioned room in which the temperature was approximately 20° C. All tests were performed within two hours of collecting the blood samples and none of the samples were refrigerated.

Alkali-resistant haemoglobin was estimated by the one-minute denaturation method of Singer, Chernoff, and Singer (1951).

RESULTS

Fig. 1 shows the range of osmotic fragilities of the erythrocytes and the Table shows the M.C.F.s in the infants. It is clearly apparent that the range is different in the two groups. Cases showing an abnormal fast-

Comparison of Mean Corpuscular Fragilities* of Erythrocytes in Normal Infants and Those Showing an Abnormal "Fast-moving" Haemoglobin During the First Two Months of Life

Normals			Cases with Fast-moving Haemoglobin at Birth		
No.	Age when M.C.F. Estimated	M.C.F.	No.	Age when M.C.F. Estimated	M.C.F.
S.55	At birth	0.42	S.29	2 years	0.37
S.55A	" "	0.45	S.53	At birth	0.38
S.60	" "	0.41	S.76	" "	0.30
S.62	" "	0.37	" "	1 month	0.32
S.64	1 month	0.43	S.38A†	6 months	0.25
S.72	At birth	0.38	" "	9 "	0.27
S.75	1 month	0.41	S.44A†	6 "	0.31
S.77	At birth	0.42	32918	9 "	0.37
S.79	" "	0.39	34078	9 "	0.35
S.80	" "	0.37	36732	9 "	0.35
S.81	" "	0.41	33496	9 "	0.33
S.82	" "	0.42	12828	2 years	0.36
S.87	" "	0.42	44666	3 months	0.33
S.88	" "	0.37	45665	3 "	0.33
40281	2 years	0.39			
		0.46			

* Normal range = 0.40–0.44% (Jonxis and Huisman, 1958).

† Samples of haemoglobin from these patients taken at birth were examined by Dr. H. Lehmann with the help of Dr. J. A. M. Ager and were thought to contain the haemoglobin described by Fessas and Papaspyrou (1957). The findings in the cases have been reported in an earlier publication (Hendrickse *et al.*, 1960).

Case S.38A showed the lowest erythrocyte osmotic fragility in the series. Initially this case was thought to be haemoglobin genotype AA, as sickling was not detected for several months after birth and electrophoresis during the first few months revealed no obvious S haemoglobin. It has become apparent, however, that this child is in fact genotype AS, but the quantity of S is only approximately 25%.

moving haemoglobin fraction at birth were more resistant to hypotonic solutions. All the children in this group showed erythrocyte osmotic fragilities below the accepted normal range.

Of 69 adult blood donors, 52 had erythrocyte osmotic fragilities within normal limits; eight were greatly reduced with a mean corpuscular fragility between 0.35 and 0.375% NaCl; and nine had intermediate results (Fig. 2). Alkali-resistant haemoglobin was estimated in five of the eight cases with greatly reduced erythrocyte osmotic fragility and was found to be less than 1% in all.

DISCUSSION

Approximately 10% of normal Nigerian infants show an abnormal fast-moving haemoglobin fraction at birth (Hendrickse *et al.*, 1960). Results of the present investigation indicate that these cases have a significantly reduced erythrocyte osmotic fragility. The observation that approximately 10% of normal blood donors have a reduced erythrocyte osmotic fragility in the same range as that observed in these infants suggests a relationship

FIG. 1.—Showing range of erythrocyte osmotic fragilities in Nigerian infants.

between these two sets of observations. It has been demonstrated that destruction of erythrocytes in hypotonic saline solutions is apparently related to intracellular osmotic activity of the individual cells (Sharpsteen, 1955). If this is the case then our findings would seem to indicate yet another "abnormal haemoglobin" which occurs with appreciable frequency in Western Nigeria. The reduced osmotic fragility of the erythrocytes in a percentage of the local population is not related to an increase in the quantity of alkali-resistant haemoglobin, but current studies by one of us (E. J. W.-W.) indicate that it is in some cases associated with increased haemoglobin A₂ and other characteristics of thalassaemia.

FIG. 2.—Showing range of erythrocyte osmotic fragilities in Nigerian adults.

SUMMARY

The osmotic fragility of the erythrocytes of Nigerian infants showing an abnormal fast-moving fraction at birth is appreciably lower than that of children with a normal electrophoretic pattern. The incidence of these cases is similar to the incidence of adult Nigerians with normal haemoglobin electrophoretic patterns but exhibiting reduced fragility of their erythrocytes, and suggests a relationship between the two observations. These observations might indicate yet another haemoglobin variant occurring in high frequency in Western Nigeria.

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Medical Memoranda

Deliberate Self-intoxication with Petrol Vapour

Cases of petrol-vapour poisoning that have been described in Britain are usually accidental. They are comparatively rare, in view of the universal use of petroleum (Ainsworth, 1960; Saxton, 1960).

The case described here is one of deliberate and repeated self-intoxication with petrol vapour over a lengthy period.

CASE REPORT

A girl aged 17, the adopted child of an elderly and respectable couple, was admitted into the women's hospital at H.M. Prison, Birmingham, for examination and observation, so that a medical report could be submitted to the court. She was charged with the theft of a watch and had been convicted of larceny on five previous occasions over a period of seven years. A medical report was requested because the police and her probation officer had noticed that she had at times behaved somewhat strangely.

Physical examination revealed no abnormalities. She suffered from mild chilblains, but otherwise was in excellent health.

She had no knowledge of her true parents and knew of no brothers or sisters. It appeared from the probation officer's report that she had been overindulged by her adoptive parents. According to her statements, she had been happy at home and had no complaints to make. She talked quite freely about herself.

Shortly after leaving a secondary modern school at the age of 15 she discovered that the inhalation of trichloroethylene vapour produced sensations which she found enjoyable. The trichloroethylene had been given to her for cleaning purposes by a friend who worked in a factory where the substance was used. When the supply of the trichloroethylene was exhausted she tried to obtain more, but failed to do so. She then struck upon the idea of using petrol as a substitute. It was obtained either as cigarette-lighter fuel or was taken from the tanks of motor vehicles. Her mode of inhalation was to dip a handkerchief or a piece of rag in a small quantity (usually about one teaspoonful) of petrol, warm it in her hand, and then inhale the vapour.

According to her description of the effects, she first began to feel drowsy. This drowsiness lasted, so she estimated, for about five minutes. During this time she had a pleasurable feeling of excitement and had "dreams." She could not describe these "dreams" fully, but they do not appear to have been erotic. However, she found them agreeable. This was followed by the onset of giddiness and an unpleasant nausea which terminated in an attack of vomiting. This vomiting relieved the nausea, and then she felt herself to be normal again.

During the period of two years she had inhaled petrol vapour three or four times every week. Rather surprisingly, it was a solitary indulgence and she had not told any of her friends about it. She knew of no other person addicted to the habit.

Eventually, however, it came to the notice of her parents and she was taken to the family doctor. Tablets were prescribed for her, but while pretending to take them she surreptitiously threw them into the fire, because, she said, she did not wish to be cured of the habit. The doctor also recommended that she should receive treatment as an