

HÆMOGLOBIN LEVELS IN RECRUITS AND TRAINED SOLDIERS

BY

Lieut.-Colonel P. D. STEWART, M.B., Ch.B.

Royal Army Medical Corps

Staff/Sergeant J. R. YEATES, A.I.M.L.T.

Royal Army Medical Corps

AND

Private J. L. BARNFATHER

Royal Army Medical Corps

THE results of hæmoglobin surveys using Haldane's method published in Great Britain prior to the last war (Price-Jones, 1931, and Price-Jones, Vaughan & Goddard, 1935), when compared with similar results published in America, indicated that the hæmoglobin content of British males was lower than that of American men. Jenkins & Don (1933) were, however, unable to confirm this impression and the results of their investigations, in which the hæmoglobin was estimated by Van Slyke's apparatus, showed that the values in healthy British and American men did not differ. The apparent discrepancy was resolved by King *et al.* (1947), who proved that the Haldane standard, which had been used in so many British surveys, had a value of 14.8 g. equal to 100 per cent, and not of 13.8 g. as had previously been accepted*. When the previously published British figures were recalculated on the basis that 100 per cent Haldane equals 14.8 g. it was found that they were then in general agreement with the American values (King *et al.*, 1947).

The confusion which has resulted from the multiplicity of hæmoglobin standards can best be avoided by expressing all results in grammes per 100 ml. This practice has been followed when compiling Table 1, which gives a representative selection of previously published hæmoglobin values for normal males.

During the first half of 1956 we visited a number of military units and carried out a limited hæmoglobin survey, some of the results of which are also included in Table 1.

* By recent International agreement, the chemical constituents of hæmoglobin have now been defined in such a way as to make the British Haldane Standard 100% = 14.6 g. Hb/100 ml.—Ed.

METHOD

Two visits were made to the Guards Depot, Caterham, the first in March, the second in April, 1956. Blood was taken from recruits, both Regular and National Service. Most of these recruits had arrived at the Depot on the day of our visit; a few had been in the army for several days. All the men had recently been passed as fit for military service. The trained soldiers belonged to a field ambulance comprised of R.A.M.C., R.A.S.C. and A.C.C. personnel. The great majority were medically fit for duty everywhere and their service ranged from 4 months to 4½ years.

Capillary blood was taken between the hours of 2 p.m. and 6 p.m. One pipette, the calibration of which had been checked, was used throughout and all examinations were carried out by the same person. The hæmoglobin was converted to alkaline hæmatin by 0.1 N. sodium hydroxide and estimated in an EEL photo-electric colorimeter, using Gibson and Harrison's (1945) solution as a standard.

RESULTS

The mean hæmoglobin values and the ranges observed are given in Table 1. Of the 140 recruits examined, 2 (1.4 per cent) had hæmoglobins of under 12 g. per cent and a further 6 had values under 14 g. per cent. There were 13 recruits with 17 g. per cent or more of hæmoglobin. Among the trained soldiers there were none below 12 g. per cent and 2 above 17 g. per cent. Service had little effect on the hæmoglobin level.

Table 1. *Hæmoglobin Values in Adult Males*

| Authority | Number | Nationality | Age | Mean in g. | Range in g. | Method |
|----------------------------------|--------|-----------------------|-----------|------------|-------------|-----------------------|
| Berry et al. (1949) | 147 | Cosmo- politan (a) | 16-47 | 16 | 13.7-18.6 | Alkaline Hæmatin |
| Hamre & Au (1942) | 137 | Cosmo- politan | 16-25 | 15.1 | 11.8-17.2 | Alkaline Hæmatin |
| Jenkins & Don (1933) | 118 | British | | 15.8 | 13.8-19.0 | Van Slyke |
| M.R.C. (1945) | 849 | British | Under 30 | 15.1 | | Haldane |
| Osgood (1935) | 259 | American | 14-30+ | 15.8 | 14-18 | Osgood and Haskins |
| Price-Jones (1931) | 100 | British | av. 27 | 15.6 | 14.2-17.2 | Haldane |
| Price-Jones et al. (1935) | 90 | British | 20-42 | 15.7 | 13.6-18.0 | Haldane |
| Walters (1934) | 100 | American | 20-30 | 15.1 | 12.9-18.7 | Acid Hæmatin |
| Wintrobe (1933) | 86 | American | Students | 16.0 | 13.9-18.4 | Acid Hæmatin |
| This survey— recruits | 140 | British | 17-29 (b) | 15.5 | 11.1-18.3 | Alkaline Hæmatin |
| This survey— trained soldiers | 89 | British | 18-24 | 15.3 | 12.1-17.5 | Alkaline Hæmatin |
| This survey— Total ... | 229 | British | 17-29 (c) | 15.4 | 11.1-18.3 | Alkaline Hæmatin |

(a) Olympic athletes.

(b) Includes only 2 men over age 22.

(c) Includes only 5 men over age 22.

DISCUSSION

The mean hæmoglobin level of the 229 soldiers included in this recent survey shows no appreciable change from previously reported values for healthy males. When considering the range of values obtained it must be remembered that the extremes recorded may not in fact represent the true limits of normal, as a few abnormal bloods may inadvertently be included in a survey (Wintrobe, 1933). Leonard (1954) examined 4,221 R.A.F. recruits and found 50 (1.2 per cent) with hæmoglobin values of under 12 g. per cent, which he regarded as indicating undoubted anæmia. By this standard our series of 140 recruits also included 2 cases of anæmia (1.4 per cent). While a hæmoglobin of under 12 g. per cent is usually taken to indicate anæmia in the male, one of only 13.7 g. per cent may be quite consistent with the physical perfection of Olympic athletes (Berry *et al.* 1949). It would therefore appear that the distinction between a low but normal hæmoglobin and an abnormal one is not clear cut.

A number of factors are thought to influence the hæmoglobin content of healthy individuals. We were able to eliminate the effect of any diurnal variation (Renbourn, 1947) by collecting the bloods at the same time of day, but were unable to standardise the other environmental conditions which may alter the hæmoglobin level, *e.g.* temperature, climate, exercise and psychological reactions.

CONCLUSION

The mean hæmoglobin value of 229 recruits and soldiers was found to be 15.4 g. per cent.

Two recruits out of 140 had hæmoglobin values under 12 g. per cent.

ACKNOWLEDGMENTS

We should like to thank the officers commanding the units visited for their co-operation. We are also much indebted to the unit medical officers for providing the necessary facilities.

REFERENCES

- BERRY, W. T. C. ; BEVERIDGE, J. B. ; BRANSBY, E. R. ; CHALMERS, A. K. ; NEEDHAM, B. N. ; MAGEE, H. E. ; TOWNSEND, H. S., AND DAUBNEY, C. G. (1949). *B.M.J.*, **1**, 300.
- GIBSON, Q. H., & HARRISON, D. C. (1945). *Biochem. J.*, **39**, 490.
- HAMRE, C. J., & AU M. N. (1942). *J. Lab. Clin. Med.*, **27**, 1231.
- JENKINS, C. E., & DON, C. S. D. (1933). *J. Hyg.* **33**, 36.
- KING, E. J. ; GILCHRIST, M. ; WOOTTON, I. D. P. ; DONALDSON, R. ; SISSON, R. B. ; MACFARLANE, R. G. ; JOPE, H. M. ; O'BRIEN, J. R. P. ; PETERSON, J. M., & STRANGWAYS, D. H. (1947). *Lancet*, **2**, 789.
- LEONARD, B. J. (1954) *Lancet*, **1**, 899.
- MEDICAL RESEARCH COUNCIL (1945). Special Report Series. No. 252. H.M.S.O.

- OSGOOD, E. E. (1935). *Arch. Int. Med.*, **56**, 847.
PRICE-JONES, C. (1931). *J. Path. Bact.*, **34**, 779.
PRICE-JONES, C.; VAUGHAN, J. M. & GODDARD, H. M. (1935). *ibid.*, **40**, 503.
RENBOURN, E. T. (1947). *J. Hyg.*, **45**, 455.
WALTERS, O. S. (1934). *J. Lab. Clin. Med.*, **19**, 851.
WINTROBE, M. M. (1933). *Bull. J. Hopkins Hosp.*, **53**, 118.

GUNSHOT WOUND OF THE BLADDER

AN UNUSUAL CASE

BY

Lieutenant P. J. ELLIS

Royal Army Medical Corps

Late House Surgeon, Manchester Royal Infirmary

THE following case history is of interest because of the length of time elapsing between wounding and the occurrence of symptoms.

On 16th July, 1944, in Normandy, whilst the patient was leaning with two friends against a wireless truck, it was hit by a German 88 mm. shell. One man was killed outright, the other died shortly after. The patient (W. M.) suffered multiple injuries, consisting of traumatic amputation of his left arm, extensive burns of the face and right arm, and penetrating wounds of the abdomen and left thigh.

Shortly after, at No. 24 Casualty Clearing Station, his wounds were dressed and laparotomy performed. Eight perforations of the ileum were sutured. There is no record of any injury to his bladder. Following evacuation to England he made a good recovery.

He was first seen by Mr. Thomas Moore at the Manchester Royal Infirmary on 10th November, 1955, when he stated that he had been quite well following discharge from the army, but during the previous five years he had had some discomfort in his perineum with intermittent dysuria, scalding and increased frequency of micturition. On no occasion had retention of urine occurred, but the stream was frequently poor, and on two occasions during the previous fortnight he had passed small clots of blood.

On examination his general condition was good, with a well-healed lower abdominal midline scar and a 3 in. oval scar over his left anterior superior iliac spine. Palpation over the bulb of the urethra produced excruciating pain. Two days later, whilst at home, he passed an irregularly shaped stone, which had to be extracted from his external urethral meatus.