lishes a figure of 1 to 3 mg. as usual in acute and chronic poisoning. In the Armstrong case it was only 0.45 mg. probably eight days after the first dose. Two of five cases recorded by Schwartz and Deckert (1936) showed concentration for scalp hair at 0.1 and 0.5 mg. in chronic arsenical poisoning from wine. It is of great importance to consider the presence or absence of arsenic in normal hair. Althausen and Gunther (1929) record two analyses—0.08 and 0.16 mg. of arsenic per 100 grammes of hair of known history. The locality and previous treatment are of paramount importance in this consideration. Wührer (1937) carried out thirty analyses in Berlin on both male and female hair, mainly from barbers' shops: the great majority were at concentrations between 0.015 and 0.038 mg. of arsenic per 100 grammes of hair. Bagchi and Ganguly (1937) found between 0.056 and 0.094 mg. in four normal cases in India. The results of Myers and Cornwall (1925) are much more variable and less convincing. No method of analysis is given. Twenty-one specimens of normal hair were examined, and nine were reported as negative. The twelve recorded as positive varied from 0.05 mg. up to 10.6 mg. There is a doubt whether some of these individuals were receiving or had received arsenical therapy. The question of "normal" arsenic in hair is therefore one for further investigation, but the general conclusion to be drawn tentatively is that the value is usually below 0.1 mg. of arsenic per 100 grammes of hair.

4. The presence of a trace of arsenic in bone, presumably in the form of the highly insoluble calcium arsenate, is to be expected, especially in chronic or subacute poisoning. In 1889 Brouardel, according to Webster (1930), stated: "Arsenic accumulates very sensibly in the spongy tissue of bones and becomes fixed in such manner that its presence can be detected, in the bones of the skull or vertebrae particularly, some time after every trace has disappeared from organs such as the liver, in which it is localized in greater amount." Webster says: "It would appear that this localization in the bones is less marked and the elimination is more rapid when arsenic is absorbed in quantities sufficient to cause rapid onset of symptoms of poisoning"—a point which has been brought out by Chittenden (1884-5) in connexion with differentiation between acute and chronic arsenic poisoning, the bones tending to retain arsenic in the chronic cases while, in the acute cases, arsenic may not be found in them." Even in the acute condition the presence of traces had been established in the Seddon and Armstrong cases (Willcox, 1922). Its presence in bone after such a long period in the earth is of significance in the present cases.

5. The quantities of arsenic found in the hair and bones in Case I and in the hair and adipocere in Case II, though small, indicate that more than the accepted fatal dose must have been taken before death; and the symptoms described in the two cases respectively point to chronic and acute arsenical poisoning, thus conforming with the conditions necessary for proof of death from arsenic poisoning as emphasized by Taylor (1928).

Summary

Hair, bone, and adipocere, as the remains of two individuals who had been buried for almost nine and a half years, were examined from a medico-legal point of view for the presence of arsenic. In one case—chronic poisoning—the quantities found were 0.44 mg. in hair and 0.05 mg. in bone; in the second case—acute poisoning—0.32 mg. in hair and 0.02 mg. in adipocere, per 100 grammes of dry tissue. In the acute case a concentration of 0.77 mg. was estimated in the proximal portion of scalp hair following a period of fatal illness of only thirty hours.

References

Althausen, T. L., and Gunther, L. (1929). *J. Amer. med. Ass.*, **92**, 2002.
Bagchi, V. N., and Ganguly, H. D. (1937). *Indian med. Gaz.*, **72**, 477.
Bamford, F. (1940). *Poisons*, p. 76, London.
Bergeron, G., Delens, and L'Hôte, L. (1880). *Ann. d'Hyg.*, 3rd ser., **3**, 23.
Chittenden, R. H. (1884–5). *Med.-leg. J.*, **2**, 224.
Heffter, A. (1915). *Vierteljahrsschr. gerichtl. Med. öffentl. Sanitätsw.*, **49**, 90.
Lucas, A. (1931). *Forensic Chemistry and Scientific Criminal Investigation*, 2nd ed., p. 268, London.
Myers, C. N., and Cornwall, L. H. (1925). *Amer. J. Syph.*, **9**, 647.
Savill, A. (1937). *The Hair and Scalp*, 2nd ed., p. 18, London.
Schwartz, L., and Deckert, W. (1936). *Arch. Hyg.*, Berlin, **115**, 268.
Smith, S. (1934). *Forensic Medicine*, 4th ed., p. 454, London.
—— and Hendry, E. B. (1934). *British Medical Journal*, **2**, 675.
Taylor, A. S. (1928). *Principles and Practice of Medical Jurisprudence*, 8th ed., **2**, 504, London.
Webster, R. W. (1930). *Legal Medicine and Toxicology*, p. 494, Philadelphia.
Willcox, W. H. (1922). *British Medical Journal*, **2**, 118.
Wührer, J. (1937). *Biochem. Z.*, **294**, 401.

AN ANALYSIS OF THE INCIDENCE OF "FAINTING" IN 5,897 UNSELECTED BLOOD DONORS*

BY

C. L. GREENBURY, M.B., B.S.

The object of the present investigation was to determine to what extent the incidence of fainting in blood donors was influenced by age, sex, occupation, lack of food, fatigue, and the temperature of the room in which bleeding took place. It was hoped to assess fatigue by the numbers of hours donors had worked on the day of bleeding.

Method

The necessary information was collected by the nurses who attended the donors. A card of the following pattern was given to each donor.

Age..... *Sex*.....
Occupation .....
Hours since last meal .....
Hours of work on day of bleeding.....
Hours in bed on previous night .....
Temperature of bleeding-room.....

In order to simplify sorting, yellow cards were provided for females and blue for males. If a donor fainted an "F" was put at the top right-hand corner of the card. A donor was considered to have fainted if he or she had any of the symptoms associated with fainting severely enough to necessitate interruption of the normal routine. The decision in almost all cases was left to the nurse in charge of the donor. The mildest phenomenon that was assessed as a faint was giddiness or nausea which rendered it more prudent for the donor to be rested for a minute or two on the couch after bleeding, instead of being taken immediately to the recovery room according to the regular procedure. This minimum was chosen so that all cases which caused delay in the process of bleeding might be included. No account has been taken here of donors who fainted after they had left the building.

Data were obtained from 5,897 unselected donors—1,760 males and 4,137 females—from the areas covered by the London Sectors IV, V, VI, and VII. This analysis includes two series, A and B, the sole difference being that, in the former, only the age, the sex, and the number of hours since the last meal were known. (See Tables.)

The females have been divided into arbitrary age groups —18-25, 26-35, 36-45, and over 45. The same process was originally applied to the males, but as the attack rates in the groups under age 45 differed inappreciably, the groups involved have been amalgamated for the main comparisons.

* A report to the Medical Research Council from the North-West London Blood Supply Depot.

Results

In the following results differences have been regarded as significant when Difference/Standard Error of Difference is greater than 2—i.e., when the odds are 20 to 1 against such differences occurring by chance.

Age and Sex.—The combined fainting rate for the sexes was 4.93%. The incidence declines with age for both males and females (Table I), excepting for the 36-45 age group in males,

TABLE I

Age in Years	Fainting Rate		Diff. between Male and Female Rates/ Stand. Error of Diff.
	Males	Females	
18–25	4·09% (367)	7·62% (1,246)	2·36
26–35	4·07% (540)	6·02% (1,163)	1·65
36–45	4·34% (484)	3·59% (918)	0·79
Over 45	1·63% (369)	3·58% (810)	1·82
All ages	3·64% (1,760)	5·49% (4,137)	

Figures in parentheses refer to the number of donors in each group.

but the decrease is not uniform for either sex. For males the rate under age 45 is significantly greater than that over 45, and for females the incidence under age 35 is significantly higher than that for older women, as will be seen from the following comparison:

			Diff./S.E. of Diff.
Females	Under 35 years 6·85% (2,409)	Over 35 years 3·59% (1,728)	4·21
Males	Under 45 years 4·17% (1,391)	Over 45 years 1·63% (369)	2·32

When the attack rates for the sexes are compared it will be noted that at every age, except in the 36-45 year group, the incidence of fainting is greater among females, and in the 18-25 year group the difference reaches statistical significance. In view of the dissimilar age constitution of the populations of the two sexes it is invalid to use their crude attack rates for comparative purposes. If, however, a composite figure for comparison is required, a standardized value can be obtained or, more satisfactorily, the following procedure can be employed:

The actual number of attacks among the males was 63; if they (the males) had experienced the same incidence at specific age groups as the females the expected number of faints would have been 91. The fainting rate among males is then seen to be statistically lower than that for females, since, when the test is made by the appropriate formula:

$$\frac{\text{Actual}-\text{Expected}}{\sqrt{\text{Expected}}}=\frac{63-91}{9.54}=2.9$$

the ratio exceeds 2, the usually accepted criterion of significance.

Occupation.—Classification into Factory, Clerical, Miscellaneous, and Domestic Occupations (Tables IIA, IIB), while not ideal, was the only one found to be practical. The domestic group includes ladies of leisure, part-time workers, and domestic servants. The incidence of fainting among clerical workers was unduly high in the younger age group of both series:

	Non-clerical Workers	Clerical Workers	Diff./S.E. of Diff.
Females (18–25 group)	4·77% (419)	10·89% (202)	2·85
Males (18–45 group)	3·65% (603)	7·19% (153)	1·91

Hours Elapsing between Last Meal and Bleeding.—There does not appear to be any general tendency for the fainting rate to increase when long periods have elapsed between bleeding and the last meal. It is of interest to note, however, that among female clerical workers in the 18-25 year group there is a progressive rise in fainting rate as the time between last meal and bleeding increases.

	Time after Last Meal (hrs.)		
	0–2	2–4	Over 4
Female clerical workers in 18–25 group	4·94% (81)	12·97% (86)	20% (35)

Hours of Work on Day of Bleeding.—There was no tendency in this series for the fainting rate to increase with hours of work on day of bleeding. The high rate among females between 26 and 35 years who have worked for more than eight hours is not significant, since the number (32) in the group is so small.

Temperature of Bleeding-room.—No effect of temperature is apparent in this series.

Hours of Sleep on Nights preceding Bleeding.—Since the investigation took place at a time when there were few air

TABLE IIA.—*Females*

Group	Age	Percentage Fainting in Each Age Group			
A & B	18–25	7·62% (1,246)			
	26–35	6·02% (1,163)			
	36–45	3·59% (918)			
	45+	3·58% (810)			
		Interval in Hours since Last Meal			
		0–2	2–4	Over 4	
A & B	18–25	7·30% (589)	7·28% (481)	9·66% (138)	
	26–35	6·73% (550)	5·53% (501)	4·67% (107)	
	36–45	5·06% (437)	1·95% (411)	4·17% (68)	
	45+	3·72% (376)	3·71% (377)	1·75% (57)	
		Occupations			
		Factory	Miscell.	Clerical	Domestic
B	18–25	3·90% (205)	6·25% (144)	10·89% (202)	4·29% (70)
	26–35	9·52% (126)	4·46% (112)	4·03% (124)	6·99% (229)
	36–45	6·25% (64)	4·81% (104)	0·00% (53)	4·35% (253)
	45+	0·00% (16)	3·45% (58)	2·25% (19)	3·33% (360)
		Hours of Work on Day of Bleeding			
		0–4	5–8	Over 8	
B	18–25	7·60% (171)	6·34% (284)	4·32% (61)	
	26–35	4·93% (142)	6·04% (149)	18·75% (32)	
	36–45	4·65% (86)	4·44% (90)	0·00% (18)	
	45+	Insufficient data			
		Temperature of Bleeding-room			
		–64° F.	–69° F.	–74° F.	75° F. and over
B	18–25	8·33% (84)	8·07% (223)	5·62% (89)	6·67% (45)
	26–35	7·00% (100)	9·13% (230)	4·00% (75)	0·00% (16)
	36–45	2·78% (72)	4·76% (189)	8·77% (57)	0.00% (20)
	45+	3·49% (86)	2·75% (183)	2·73% (67)	5·88% (17)

TABLE IIB.—*Males*

Group	Age	Percentage Fainting in Each Age Group		
A & B	18–25	4·09% (367)		
	26–35	4·07% (540)		
	36–45	4·34% (484)		
	45+	1·63% (369)		
		Interval in Hours since Last Meal		
		0–2	2–4	Over 4
A & B	18–45	3·91% (640)	3·45% (551)	6·15% (195)
	45+	1·04% (180)	1·04% (158)	3·45% (29)
		Occupation		
		Factory	Miscell.	Clerical
B	18–45	3·85% (286)	3·47% (317)	7·19% (153)
	45+	2·56% (39)	0·79% (126)	3·13% (32)
		Hours of Work on Day of Bleeding		
		0–4	5–8	Over 8
B	18–45	4·12% (243)	4·40% (341)	4·90% (102)
	45+	2·25% (89)	1·41% (71)	0.00% (19)
		Temperature of Bleeding-room		
		–64°	–69°	–74°	75° and over
B	18–45	3·73% (134)	4·10% (439)	1·52% (131)	3·23% (31)
	45+	0·00% (28)	2·47% (81)	2·94% (34)	0.00% (5)

Figures in parentheses refer to the number of donors in each group.

raids, the number of donors who did not have a good night's rest was too small to be analysed with advantage.

Conclusion

Though the series is not large enough for many definite conclusions to be drawn from it, it would seem that the young faint more than the old and females more than males, and that the incidence is higher among clerical workers than among other groups. With regard to the significance of hunger and fatigue, for example, the smallness of numbers is naturally most obvious at the extremes of the hours between last meal and bleeding and of the hours of work on day of bleeding, where the effects would be most evident. The figures give little information, therefore, concerning the effects of these two factors. There is, however, a strong impression at this depot that hunger and fatigue are contributory causes in the fainting of donors.

It is not improbable that the high incidence of fainting among clerical workers is due to the fact that they are a selected physical type rather than to an occupational effect. It is especially likely that because of conscription the residual male clerical workers are below the normal physical standard.

I should like to thank the nurses at the depot who collected the necessary information from donors, and Dr. W. T. Russell for his help in preparing the figures for publication.

AVITAMINOSIS IN APPARENTLY HEALTHY TRINIDADIANS*

BY

K. VIGORS EARLE, M.D., B.Ch., D.T.M.

Late Medical Officer, United British Oilfields of Trinidad, Ltd., Trinidad, British West Indies

The gross states of avitaminosis seen in the dispensaries (Deane, 1938) and hospitals (Fletcher, 1937) of Trinidad have already been described. There is also a vast amount of subclinical avitaminosis which goes untreated.

This is an account of apparently healthy men who were examined for stigmata of vitamin deficiency when they applied for work in the oilfields. Besides being of academic interest such an investigation has a practical value from the employer's point of view: the worker who suffers from avitaminosis obviously cannot be very efficient; he readily falls sick and has to be looked after, and, when injured, his recovery time is excessively prolonged.

The group investigated is, in a way, selected—by the members of the group themselves. The average work applicant does not present himself for what has the reputation of being a fairly severe medical examination unless he feels that he has a reasonable chance of success. A small proportion of men, though sick, may be driven by lack of money or a nagging wife to seek work; a still smaller proportion with gross lesions may try to slip by what they think may be a cursory examination in the hope of being able to advance fraudulent compensation claims later.

TABLE I

Race	No. Examined	Average Age	Age Limits
East Indian	168	27·99	17–50
Negro	820	28·07	14–64
Mixed creole	16	27·90	21–55
Chinese..	7	27·14	21–30

In this investigation 1,011 consecutive applicants were examined. The race and ages of these men are given in Table I.

* Abstracted from an M.D. thesis, University of Cambridge.

Signs of avitaminosis A which appear most frequently in children (e.g., Bitot's spots, xerophthalmia) would not be expected to occur very often at these ages. These men have passed from childhood without suffering from some of the more serious sequelae of avitaminosis (e.g., keratomalacia), and therefore represent a "seeded" group. Those less fortunate have either been carried off by intercurrent disease or been forced to take work in keeping with their poor physical condition. Thus it is further emphasized that the group investigated is a picked one, with health above the average.

Avitaminosis A

Growth Impairment.—Unfortunately a height-weight check was not made. Such cases as were noted under this heading were those of puny physique with a markedly under-developed musculature. Such a condition is obviously not entirely due to continued lack of vitamin A but to other factors (e.g., generalized malnutrition and cachectic states such as ankylostomiasis and malaria). Under-development of this type occurred in 15 (8.9%) of the East Indians and in 3 (0.37%) of the negroes. No instance was found among the mixed creoles or Chinese.

Bitot's Spots.—This sign occurred in one subject—an East Indian aged 23 who had also a rachitic chest, markedly carious teeth, and scaliness of the arms.

Xerophthalmia.—The incidence of xerophthalmia is shown in Table II.

Finely Scaled Skin.—The lesion is labelled thus to distinguish it from a coarsely scaled skin, which is found with vitamin B_2 and probably B_6 deficiency. Usually the skin lesions of avitaminosis A precede the objective eye changes (Mackay, 1937), but in this series one man had a finely scaled skin and Bitot's spots, and another had xerophthalmia with phrynodermia. The scaliness in question manifests itself in the dark-skinned races by a loss of the natural mat surface which is characteristic of a healthy skin in these people. The powdery scales give the impression that the skin is lighter, but this apparent hypopigmentation must not be confused with a true loss of pigment, which, I believe, is due to vitamin B_2 deficiency. This condition of fine scaliness is seen principally on the forearms, sometimes on the forehead, and less often on the shins and thighs. When seen in the last-named areas it must be distinguished from the effects of certain forms of vitamin B_2 lack. Fine scaliness has also to be distinguished from ringworm and from leprosy. The distribution of this manifestation is included in Table II.

TABLE II

	Race	No. Affected	Associated Deficiencies					Dental Caries
			A	B_2	B_6	C	D	
Xerophthalmia	E.I.	2		1			1	1
	N.	3	1	1				3
	M.C.	0						
	Ch.	0						
Finely scaled skin ..	E.I.	5	1	4	2			3
	N.	19	8	15	5			10
	M.C.	1		1				1
	Ch.	0						
Phrynodermia	E.I.	13	2	7	2			9
	N.	63	10	36	4			32
	M.C.	1						1
	Ch.	0						
Scrotal dermatitis ..	E.I.	16	3	11	1	1		8
	N.	36	7	20				14
	M.C.	0						
	Ch.	0						
Coarsely scaled skin ..	E.I.	18	7	10	6			10
	N.	149	19	45	12			57
	M.C.	1						
	Ch.	0						
Hyperpigmentation ..	E.I.	10	2	8	1			3
	N.	60	17	42	3			28
	M.C.	1						1
	Ch.	0						
Hypopigmentation ..	E.I.	8	2	7	1			3
	N.	49	13	38	5			23
	M.C.	0						
	Ch.	0						