epigastric veins, or from the external iliacs via the inferior epigastric veins.

The nature of the nodules remained in doubt until eggs were obtained by puncture with a fine needle and withdrawal of a little tissue juice by suction with a syringe. The eggs were identical with those seen in a large number of examinations of stools and urine. Some were structurally perfect, while others, especially after treatment, showed no miracidial structure and had granular contents or were opaque. Tissue was obtained by biopsy from two of these cases, but when examined later the embedded material was found not to include any of the actual tissue from the nodules.

Compared with the skin affections due to cercarial penetration, and the urticaria of the toxæmic stage, cutaneous lesions arising during the stage of established local disease and associated with deposits of eggs have attracted little attention. The lesions described here were practically symptomless, and were noticed only because the white patients, being fastidious about skin complaints in the Tropics, drew attention to them. It seems quite likely, therefore, that this condition might fail to arouse the comment of native patients. Large outbreaks of schistosomiasis among Europeans are unusual, and with an incidence of only about 3% in, for the most part, heavily infected cases under observation in hospital, this complication would no doubt be of rare occurrence in normal practice.

Summary

In a series of 130 cases of schistosomiasis in Europeans, four cases were seen with a distinctive skin lesion. In two of these the lesions appeared at about the time when eggs were first discovered in the faeces. Tissue juice, aspirated from cutaneous nodules, was found to contain eggs of *S. haematobium*, identical with those seen in the urine and faeces. The skin lesions in the other two cases appeared about two weeks after unsuccessful treatment with stibophen, which was followed by the reappearance of eggs in the excreta. The lesions were similar, but eggs were not recovered from them.

The lesions and their distribution are compared with those previously recorded, and the way in which eggs may reach the skin is discussed.

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METHODS FOR DETERMINING PLASMA PROTEINS

VALUE IN A GROUP OF BOYS AGED 14 TO 15

BY

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We have determined the plasma proteins of a group of 45 normal schoolboys aged 14 to 15. Information as to the social condition and diet of the boys is given in a previous publication (Cook, Davidson, Keay, and McIntosh, 1944). As a considerable volume of plasma was obtained there was an opportunity of testing various methods of estimation. The standard method is the gravimetric estimation, in which the total proteins are isolated and weighed. To this method all others should be subservient. It should be stressed, however, that whether plasma "proteins" can be regarded as a distinct chemical species is a moot point. Particularly is this so in the mixed form in which they occur in the blood. In view of the importance of the determination of plasma proteins in clinical medicine and in nutrition surveys we present our results with

some practical details in the hope that they will be of value to other workers in this field.

Methods

Collection of Blood and Preparation of Plasma.—Since other blood constituents such as vitamin A and ascorbic acid were to be determined it was necessary to withdraw 40 ml. of blood from each boy. As an anticoagulant potassium oxalate was used. Into a tube prepared to contain 20 ml. of blood 1.5 ml. of 6% (w/v) solution of potassium oxalate was placed. The tubes were put on a metal tray and the solution evaporated to dryness (leaving a deposit of oxalate crystals) by gentle application of heat from a Bunsen burner. Overheating, which converts oxalate into carbonate, must be avoided (Harrison, 1937). The syringe used for withdrawing blood was previously flushed out several times with sterile saline. The small amount of saline left might be regarded as a diluent of the blood, but experiments on haemoglobin determinations using a completely dry and a saline-moistened syringe show that at most a dilution altering the results by 1% is obtained. The boys were seated during the puncture of the vein, a rubber tourniquet being loosely applied round the middle of the upper arm. As soon as the vein was entered the tourniquet was slackened. It was sometimes found necessary to apply slight pressure during the withdrawal of the sample. The oxalated tube was gently rotated during the addition of the blood. In no case was there any coagulation. Haemolysis to a slight degree occurred with three samples. Within three hours the blood was centrifuged for 20 minutes at 2,500 r.p.m. and the plasma pipetted off.

The micro-Kjeldahl determinations and gravimetric estimations were carried out within 24 hours of collection. In the case of the specific gravity method the plasma had been stored for two months at -4°C .

Micro-Kjeldahl Method.—As this method, though often used, is open to a number of fallacies, we propose to describe our procedure in detail.

(i) **Total Nitrogen.**—The method advocated by Peters and van Slyke (1932) is to dilute 1 ml. of the plasma to 10 ml. with 0.9% (w/v) NaCl and then to digest 1 ml. aliquots of the diluted plasma. This procedure, in our opinion, involves unnecessary manipulation and may introduce errors. The procedure adopted was to pipette from a standardized pipette 0.1 ml. of undiluted plasma into the digestion flask and wash it in with 1 ml. of saline. Comparison of this procedure with the dilution method gave substantially the same results. Each sample of plasma was set up in duplicate. To the digestion flask were added 0.5 g. of digestion mixture described by Chibnall, Rees, and Williams (1943) and 2 ml. of conc. A.R. H_2SO_4 . In view of the findings of these writers that low N values may be obtained for proteins if the heating is not continued for a number of hours after clearing, as a normal procedure all digestions were carried on four hours after clearing, which normally took place in about half an hour. It may be added that preliminary experiments showed no difference in the results between 2, 4, 8, and 16 hours' heating. "Blank" digestion flasks containing saline, acid, and digestion mixture were set up for each 6 determinations. The liberation of the ammonia was carried out in a Parnas-Wagner type of apparatus. The NH_3 was determined by back-titration of N/100 HCl.

As a check on the apparatus and standard solutions frequent controls, using known amounts of NH_3 as a solution of ammonium sulphate, were carried out. Recoveries of 98 to 102% of theory were always obtained.

The "blank" determinations were approximately 3% of the experimental value. It would appear that this blank is largely due to carriage over of alkali from the distillation flask, as it is little altered if the digestion mixture is omitted from the flask, and becomes negligible if distilled water is substituted for the soda. As a normal procedure a constant measure of 15 ml. of 40% (w/v) NaOH was added to the flask. This stabilized the blank at a maximum value of 0.028 mg. N. All our results are corrected for the blank determination. Any results that did not agree to within 2% were repeated.

(ii) **Plasma N.P.N.**—This was determined on the Folin-Wu filtrate (see Peters and van Slyke, 1932) in 11 samples of plasma.

Gravimetric Method.—The method used was that of Guil-laumin, Wahl, and Laurencin (1929). This procedure involves considerable manipulation and is very laborious. In the series only two of the determinations were carried out in duplicate. Two ml. of plasma was used for each determination. A point that must be strongly emphasized in the gravimetric method is care in drying the coagulated protein to constant weight. This often takes a considerable time.

CuSO₄ Method of Phillips et al. (1943).—As an indication of the ease and speed of this method it may be remarked that once the saturated solution of copper sulphate had been prepared the whole procedure of making the separate dilutions and finding the specific gravities of the plasmas took only four hours.

Results

The values for the total plasma nitrogen of the 45 boys are given here in the form of a distribution diagram.

The distribution of total plasma nitrogen in a group of 45 boys.

Taking these figures and multiplying by the factor 6.25 (on the assumption that the protein contained 16% N), the values obtained by the micro-Kjeldahl method are shown in contrast with those obtained by the copper sulphate method (Table I).

TABLE I.—Total Plasma N, Protein (N×6.25) and Protein as estimated by the CuSO₄ Method in the Plasma of 45 Boys aged 14 to 15. N.P.N. in 11 Samples of Plasma is also given: Values as g. per 100 ml.

	Total Plasma N	Protein (N × 6.25)	Protein by CuSO ₄ Method
Range ..	0.95-1.26	5.80-7.80	5.50-8.25
Mean ..	1.078 ± 0.14	6.65 ± 0.42	6.97 ± 0.73

N.P.N. (11 samples): Range 0.022-0.033. Mean 0.025 ± 0.0048.

The discrepancy between the values given for N content and those given for protein (i.e., after multiplying N by 6.25) is due to the fact that the latter were obtained from N values taken to one significant place of decimals only. An error of not more than ± 2% may be assumed for the N values. We now regard these values as the more accurate expression of the protein content.

Table II shows a comparison of the results in respect of 12 specimens of plasma in which the proteins were determined

TABLE II.—Plasma Proteins (g./100 ml.) by Different Methods

Micro-Kjeldahl (Total N × 5.25)	Gravimetric	CuSO ₄ Method
7.70	6.30	6.85
7.20	6.23	6.85
6.45	7.05	6.15
6.55	6.84	7.20
6.70	7.46	8.20
6.15	6.19	7.20
6.25	6.13	6.50
6.30	6.56	7.20
6.55	6.00	7.10
7.30	6.75	7.35
7.50	7.39	7.15
7.10	7.24	7.00
Mean 6.81 ± 0.53	6.68 ± 0.48	7.06 ± 0.51

by three different methods. It will be seen that collectively the agreement is fairly good, but individually the agreement is far from perfect.

In the Tables ± is the standard deviation calculated by the method of Bradford Hill (1942).

Discussion

One of us has determined the nitrogen content of the acetone-treated heat-coagulated plasma proteins and finds it to be 15.2%. This value gives a protein factor of approximately 6.6 (Cook, 1945). The nitrogen distribution of plasma is so complex that a conversion of any part of it into protein by multiplying by a simple factor is not justifiable. For example, the view that only proteins are precipitated by acid tungstate can easily be shown to

be erroneous, because in this precipitate are brought down the N-containing phosphatides. Another important factor is that the N content of globulin and albumin may well be different. Such a state of affairs may explain the individual differences seen in Table II. The whole subject merits reinvestigation. If methods dependent on N determination are used it would be advisable to express results as g. protein N or as g. N precipitated by some particular precipitant—say acid tungstate or trichloroacetic acid. For all practical purposes, however, multiplying total N by 6.25 produces a reasonably accurate result and one that is now generally accepted as giving an exact value, even if of the pseudo variety, to the proteins of plasma. It should be stressed, however, that the final court of appeal ought always to be the gravimetric method. Probably on account of its laborious nature this will never be popular.

These experiments also indicate that, for a quick and reasonably accurate method of analysis, determination of the plasma proteins by the specific gravity method is of great value.

Summary

The plasma proteins of 45 boys aged 14 to 15 have been estimated by (a) determination of nitrogen by the micro-Kjeldahl method, and (b) the CuSO₄ specific gravity method. The values obtained are shown in Table I.

In 12 cases the results from the above two methods were compared with those of the gravimetric method. Collectively, agreement between the three methods is good, but there are considerable individual differences.

The gravimetric method is the most accurate. It is considered that if a method dependent on N determination is used the result should be stated as g. N per 100 ml.

As a rapid approximate determination the CuSO₄ method is justified.

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EARLY TREATMENT OF BELL'S Palsy

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It is said that 75% of cases of Bell's palsy recover spontaneously, and therein we think lies the cause of lifelong disfigurement for many people. It seems to be always hoped, sometimes presumed, that the particular case in hand is or will be one of the 75, in spite of the fact that there is often no means of knowing if it will turn out to be so. We should regard Bell's palsy rather from the point of view of those who do not recover spontaneously, and say that in 25% of cases the present usual line of treatment results in complete failure and the patient is permanently disfigured; this is a more arresting point of view, and is likely to result in a considerable diminution of such failures. In every fresh case of Bell's palsy we suggest that it should be assumed not that it will probably get well if little or nothing is done, but that it is possibly one of the 25 which will not recover by itself, and measures should be taken accordingly. That the treatment nowadays of any surgical condition should have so high a failure rate as 25% should of itself call for attention and inquiry. In every case of Bell's palsy the only safe procedure is to presume that it will not recover unless something more than an attitude of masterly expectancy is