Freeman, T., and Joekes, A. M. (1957). *Acta med. scand.*, **157**, 43.
Hammond, J. D. S., and Ross, R. S. (1960). *Clin. Sci.*, **19**, 119.
Park, D. C., and Swinburne, K. (1964). *Brit. med. J.*, **1**, 86.
Ropes, M. W., Bennett, C. A., Cobb, S., Jacox, R., and Jessar, R. A. (1959). *Ann. rheum. Dis.*, **18**, 49.
Swinburne, K. (1964). *Brit. med. J.*, **1**, 1541.
Wolfson, W. Q., Cohn, C., Calvary, E., and Ichiba, F. (1948). *Amer. J. clin. Path.*, **18**, 723.

PART II

BY

R. CONSDEN AND MARGUERITE SMITH

M.R.C. Rheumatism Research Unit, Canadian Red Cross Memorial Hospital, Taplow

The differential protein patterns in sera and oedema fluids have been examined by quantitative electrophoresis on cellulose acetate.

Material and Methods

Specimens.—The oedema fluids were taken from thirteen of the patients and controls studied in Part I, but were not necessarily the same samples. Details of those concerned are given in Table V. Serum was obtained at the same time as the oedema fluid. Specimens were examined as soon as possible after collection; if not tested on the same day they were stored frozen until required. As described in Part I, red blood cell counts were carried out on all oedema fluid specimens to ensure that blood contamination had not occurred.

Protein Estimations.—The total protein concentration of sera and oedema fluids was determined by the biuret method, which was scaled down to deal with the oedema fluids. Fluid (20-100 μl.), water to 0·5 ml., and biuret reagent (0·5 ml.) were mixed, and extinctions were measured at 540 mμ. in the Uvispek Spectrophotometer, employing microcells of 1 cm. path length and capacity about 0·2 ml. Standard curves were derived from human albumin (Armour and Crookes), range 0·14-2·76 mg./ml. final solution. In three cases in which the amount of oedema fluid was only about 50 μl. the total protein was derived from the electrophoresis strips as described below.

Total Protein from Electrophoresis Strips.—This method was used for those fluids which were too small in amount for analysis by the biuret method. Measured volumes of serum of known protein concentration and of oedema fluid were applied to the membranes and electrophoresis and differential determinations carried out as described below. The oedema fluid protein concentration, C_o, was then calculated from the following expressions:

$$C_o = \left(\frac{\frac{E_{OA}}{1\cdot6} + E_{OG}}{\frac{E_{SA}}{1\cdot6} + E_{SG}} \right) \frac{V_o \cdot C_s}{V_s}$$

where E_{OA}, E_{SA}, are the extinctions of oedema fluid albumin and serum albumin, respectively,
E_{OG}, E_{SG}, the sum of the extinctions of oedema fluid and serum globulins respectively,
V_o, V_s, the volumes of oedema fluid and serum,
C_s the serum protein concentration.

It was found, under the experimental conditions employed, that the amount of dye taken up by albumin was 1·6 times that taken up by the same amount of gammaglobulin. The above expression assumes that each individual globulin takes up the same proportion of dyestuff as the others.

Concentration of Oedema Fluids.—If the total protein content was less than about 1·5 g. per cent., the fluid was concentrated before electrophoresis. This was carried out by placing 0·1-0·15 ml. from a capillary

TABLE V
DETAILS OF THIRTEEN PATIENTS TESTED

Group I			Group II			Group III		
Active Arthritis at Site of Oedema			Inactive Arthritis at Site of Oedema			Other Diseases		
Patient No.	Site	Associated Feature	Patient No.	Site	Associated Feature	Patient No.	Site	Cause of Oedema
22 (Figs 3, 4)	Hand	—	19 (Fig. 4)	Feet	Amyloidosis (Still's disease)	25	Foot	Congestive heart failure On diuretics
21 (Fig. 3)	Hand	—	20	Feet	Amyloidosis (Still's disease)	24	Foot and calf	Congestive heart failure
3 (Fig. 3)	Feet	—	17 (Fig. 3)	Feet	Congestive heart failure	28 (Fig. 4)	Foot	Post-traumatic On phenylbutazone
6 (Fig. 4)	Feet	On phenylbutazone	31	Foot	Varicose veins			
7	Foot	Impaired mobility						
5	Feet	Impaired mobility						

tube on to the surface of a sheet of cellophane (previously washed and blotted) placed in close contact with an indicator tile, the indentations of which were filled with a strong solution (about 60 per cent. w/v) of polythelene glycol (Union Carbide Ltd.). The whole was covered to prevent evaporation. At intervals the fluid was sucked back into the capillary and the length of liquid measured until the desired concentration was obtained. Fluids could be quickly concentrated ten or more times in this way.

Electrophoresis and Differential Protein Estimation.—Electrophoresis was carried out on cellulose acetate membrane (Kohn, 1957). Estimation of protein was carried out by elution of the dyed bands. Serum or oedema fluid (2-3 μl.) was placed across the starting line 5 cm. from the cathode end of a membrane, 12 × 1·5 cm., and electrophoresis was carried out for about 2 hrs at 15 v/cm. in borate-buffer *p*H 8·6 of the following composition (Consden and Powell, 1955): sodium barbitone (5·15 g.), barbitone (0·92 g.), boric acid (4·81 g.) and sodium hydroxide (0·89 g. or 22·25 ml. N) per litre. The specific conductivity of this solution was adjusted, if necessary, to 3·7-3·8 × 10^3 μmho at 20° C. by additions of potassium sulphate or water. After electrophoresis the membrane was stained with Ponceau S for 20 min., and after washing with 5 per cent. acetic acid the membrane was dried between thick filter-paper sheets at 100° C. for about 1 hr. The bands were cut out and each further cut into small pieces for transference to a tube. To each tube was added 0·1 ml. ethanol (to wet out the cut pieces) followed by 0·9 ml. M/5 Na_2HPO_4. The tubes were occasionally shaken. Extraction of the dye was complete within 2 hrs, but the tubes were usually allowed to stand overnight. Extinctions of the solutions were measured at 514 mμ. Duplicate electrophoresis was carried out to provide records. For this purpose several samples could be run on one membrane.

Other Methods.—Some oedema fluids were further examined by vertical starch gel electrophoresis according to the method of Smithies (1959) and by immuno-electrophoresis on cellulose acetate according to the method of Consden and Kohn (1959).

Results

Contamination.—Only two of the oedema fluids (total protein: 0·9 and 1·6 g. per cent.) examined contained up to 5,000 red blood cells/mm.^{3}, and most contained much smaller quantities. A count of 5,000 would correspond to about 0·004 g. per cent. serum protein, which represents a negligible contamination of the fluids concerned.

Effect of Concentration.—In order to test if the concentration procedure with polyethylene glycol would affect the quantitative differential values, a serum was diluted 10-fold with saline and then concentrated to the original volume with polyethyleneglycol. On determining the differentials, the values for the treated serum were identical with those for the untreated serum.

Concentration by this means is liable to produce distortion at the cathode end of the γ globulin band (Fig. 3, overleaf) because of the presence of dialysable polymers from the polyethyleneglycol. Being neutral, these contaminants will migrate towards the cathode by virtue of electro-endosmosis, where they will cause distortion of flow because of local viscosity changes. Nevertheless, the total dye uptake by the γ globulin, as shown by the above experiment, was unaffected.

Differentials.—The results are set out in Table VI (overleaf). The final column gives the β-globulin pattern, which is discussed in more detail below. Some of the electrophoresis strips are illustrated in Fig. 3 (opposite).

Most of the fluids contained fibrin clots; collection in bottles containing "sequestrene" failed to prevent clotting, although in the fluid of Patient 20 clotting was incomplete since fibrinogen was present. In this case the colour due to the fibrinogen band would be included with that of the γ globulin, but the error is probably small. As some overlap occurs between β and γ globulins, the apparent values for the former are slightly greater and of the latter slightly lower than the true figures.

Starch-Gel and Immuno-electrophoresis.—These were carried out on the sera and concentrated oedema fluids of Patients 17 and 19. The serum of the latter, which had a high α_2 globulin content (Table VI), gave an intense α_2 macroglobulin band on starch-gel electrophoresis, whilst this band was moderately strong in the former serum. In the oedema fluids the α_2 macroglobulin bands were relatively weak, especially in the fluid of Patient 19. The other α_2 globulin constituents were less altered in the oedema fluids. The β lipoprotein bands were also relatively greatly diminished in the oedema fluids. On starch-gel, all the bands present in the sera were also present in the oedema fluids. Immuno-electrophoresis showed that all the precipitin lines given by serum against anti-whole human serum were produced by the oedema fluids. The presence of macroglobulins in the oedema fluids was demonstrated with anti-macroglobulin serum.

Discussion

The advantages of cellulose acetate over paper for electrophoresis, mentioned by Park and Swinburne (1964), make it a more satisfactory medium for quantitative work. Most quantitative clinical electrophoretic studies have been carried out on

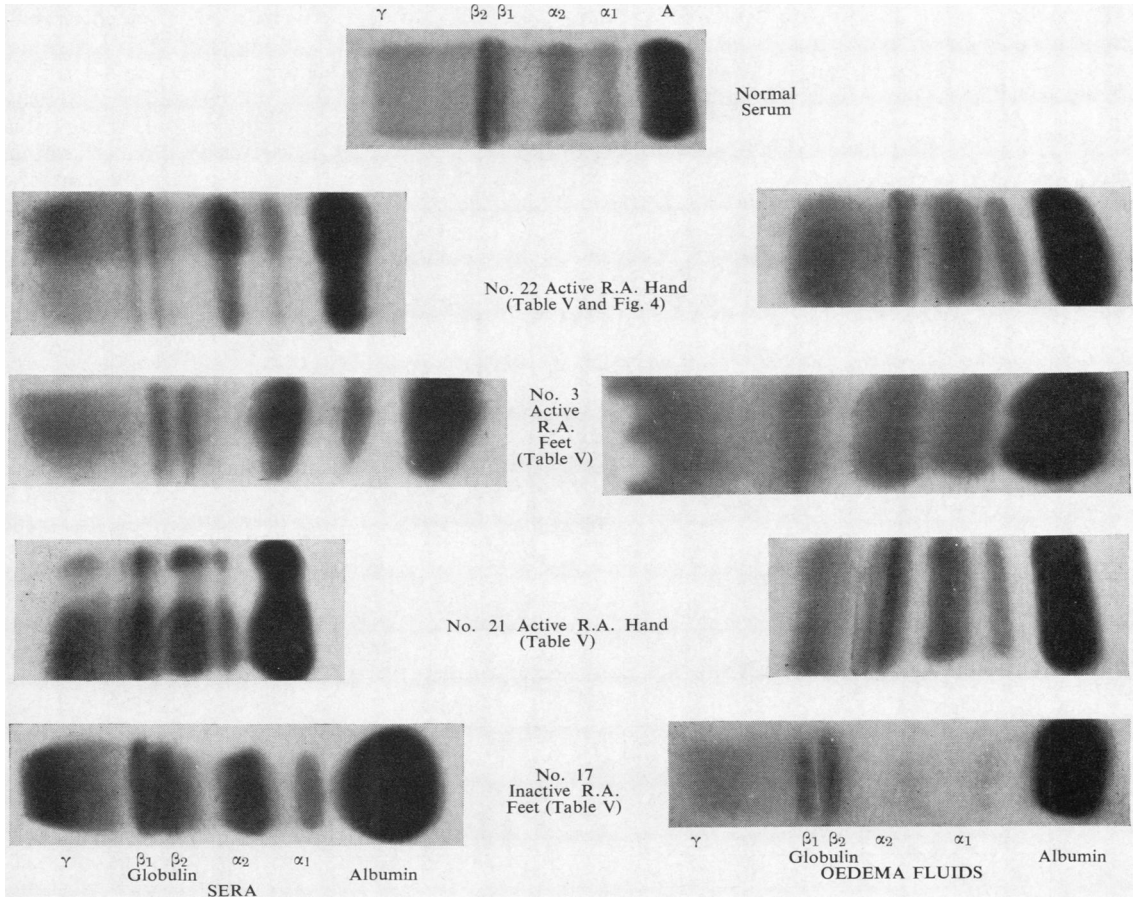

Fig. 3.—Cellulose acetate electrophoresis of sera and oedema fluids. Numbers refer to patients (see Tables V and VI). The fluids of Cases 3 and 17 are concentrates.

paper and the method used in the majority of cases has been based on scanning. The elution procedure is regarded as being more reliable than scanning, particularly for minor constituents.

It is emphasized that the differential figures in Table VI refer to colour extinction and, as the relative dye uptake by α_1, α_2, and β globulins is not known, it is possible to compare only albumin and γ globulin with reasonable accuracy, in terms of protein, since the ratio of dye uptake by albumin to that of γ globulin was found to be 1·6.

For convenience, the patients are set down in the same order in Table VI as they occur in Table V. Group I comprised six patients with active arthritis at the site of oedema, three of whom (6, 7, 5) had additional features which could have contributed to their oedema. Group II consisted of four patients with inactive arthritis. Group III was made up of three control subjects without rheumatoid arthritis, of whom Patient 28 was in normal health apart from a local foot swelling. The serum of Patient 28 may be regarded as normal and is therefore useful as a basis of comparison with pathological sera. In all the other sera the albumin was low, in some extremely so; in some the γ globulin was raised and in some the α_2 globulin was high, particularly in the two cases of Still's disease with amyloidosis (Patients 19 and 20). Though the observed changes in albumin, α_2 and γ globulins (*e.g.* in Patients 3 and 21, Table V) are not specific for rheumatoid arthritis, they frequently occur together in this disease.

Some of the differences between the oedema fluids and their corresponding sera, such as the consistent increase in albumin and diminution of α_2 globulin, appear to be general effects and have been observed in a variety of diseases by many investigators (Freeman and Joekes, 1957; Hammond, 1961; Taylor, Kinmonth, and Dangerfield, 1958; Antonaci and

Macagnino, 1957). The present figures also show that the α_1 globulin proportion is unchanged and that the β and γ globulins tend to be diminished in the oedema fluids. Antonaci and Macagnino (1957), in their study of sera and oedema fluids from patients with various pathological conditions, concluded that the percentage of the separate fractions passing through the vascular barrier appeared to depend mainly on their concentration in the serum and only secondarily on their molecular weight. The present data do not point to this conclusion for albumin, since the increase seen in the oedema fluids is not consistently in inverse proportion to the concentration in the serum, and additional factors appear to control the transport and removal of this fraction. However, as demonstrated by starch-gel electrophoresis for the α_2 globulin fraction, which is a mixture of several globulins, a raised concentration in the serum is partly due to a raised α_2 macroglobulin, and the marked diminution in the oedema fluid is largely due to the holding back of this macroglobulin portion. Of the samples examined, the highest percentage of α_2 globulins was found in the sera of the two patients with Still's disease and

TABLE VI

SUMMARY OF DIFFERENTIALS IN THIRTEEN PATIENTS TESTED

Group	Patient No.	Sera							Oedema Fluids[5]						
		Total Protein (g. per cent.)	Differentials (per cent. total extinction)					β Pattern[2]	Total Protein[1] (g. per cent.)		Differentials (per cent. total extinction)				β Pattern[2]
			A	α_1	α_2	β[4]	γ				A	α_1	α_2	β[4]	γ	
I Active Arthritis	22 (Figs 3 4)	7·1	54	5	14	10	18	III?		4·0[3]	59	4	11	6	20	I
	21 (Fig. 3)	6·9	60	5	13	12	11	III?		4·6[3]	67	4	9	9	10	III?
	3 (Fig. 3)	6·2	42	5	19	12	21	II	L	1·5	56	7	11	9	18	I
									R	1·6	57	6	11	10	17	I
	6 (Fig. 4)	6·1	49	6	15	9	22	II	L_1	1·9	55	7	9	7	22	I
									L_2	1·9	56	6	10	9	20	
									L_3	1·9	—	—	—	—	—	
									L_4	2·0	—	—	—	—	—	
									L_5	2·2	58	6	8	7	21	
									R_1	2·2	58	7	11	7	18	
									R_2	1·9	—	—	—	—	—	
	7	6·1	66	3	6	9	17	III		2·8[3]	71	2	2	5	19	I
	5	6·5	51	3	9	9	28	II	L	1·6	62	3	4	7	24	II
									R	1·0	60	3	5	8	25	
II Inactive Arthritis	19 (Fig. 4)	4·5	38	5	31	16	10	II	L	0·22	64	5	12	15	3	II?
									R	0·22	65	6	11	14	5	
	20	4·4	38	4	28	13	17	II	L_1	0·35	66	3	9	9	13	II
									L_2	0·25	—	—	—	—	—	
									R	0·25	—	—	—	—	—	
	17 (Fig. 3)	7·5	56	4	10	13	17	III	L_1	0·8	—	—	—	—	—	II
									L_2	0·8	—	—	—	—	—	
									L_3	0·9	70	4	5	10	12	
									R_1	0·9	—	—	—	—	—	II?
									R_2	0·9	—	—	—	—	—	
									R_3	0·9	69	4	5	10	12	
	31	8·0	41	4	16	14	25	II		0·76[3]	49	5	9	13	24	II
III Other Diseases	25	6·8	56	3	9	13	19	II		0·96	73	3	3	9	12	I
	24	5·8	62	5	12	13	7	III	R_1 Foot	0·44	68	4	5	13	10	II?
									R_2 Foot	0·45	—	—	—	—	—	
									R_1 Calf	0·45	69	4	5	14	8	
									R_2 Calf	0·46	—	—	—	—	—	
	28 (Fig. 4)	7·4	70	2	7	11	11	II		0·43	84	2	3	7	4	I

(1) L and R denote Left and Right. Suffix denotes number of samples. Successive samples from one site denoted by left-hand brackets.
(2) I, II, III denote single, double, and triple β bands respectively. ? denotes less sharply defined bands.
(3) Total protein derived from electrophoresis extinctions.
(4) Where β region contained more than one band, these were combined for extinction measurements.
(5) Dashes denote that differential determinations were not carried out. The electrophoretic patterns were examined only qualitatively.

amyloidosis (Nos. 19 and 20; Table VI), and there were many similarities between the sera and oedema fluids of these two patients. The finer fractionation techniques of starch-gel and immuno-electrophoresis have demonstrated that all the serum protein constituents can pass through the vascular barrier, and their presence in relatively dilute oedema fluids shows that this can occur even in the transudative process.

In Part I of this paper the high protein content of the oedema fluids of Patients 21 and 22 is regarded as evidence that the inflammatory process was a causal factor in their production. Further evidence is provided by the distribution of their protein patterns (Table VI); these patterns are closer to those of the corresponding sera than were those of more dilute fluids (Fig. 4).

A feature of general interest is that oedema fluids from different sites in the same patient (Case 5), or even from the same site (Case 20), may occasionally differ significantly in the total protein concentration, but that the differential distribution pattern of such fluids is very similar (Table VI, Case 5). The constancy of the pattern from different sites is illustrated by Case 6 in Fig. 4.

It was observed by Consden and Powell (1955) that, in fresh sera, β globulin appeared as a sharp doublet (β_1, β_2) in the paper electrophoretic pattern when borate was incorporated into the electrophoresis buffer. This also occurs on cellulose acetate (Fig. 3). In some pathological sera, a faint third band ("pre-β_1") appears just ahead of the faster β_1 component (Fig. 3). The slower β_2 component is labile; if the serum is allowed to age at room temperature, it is converted to a component having the mobility of the faster β_1, so that the β globulin appears as a single band, the extinction of which is the sum of those of the originals. Further ageing leads to the appearance of the third faster band. These observations in connexion with the doublet are paralleled by the immuno-electrophoretic and isolative procedures of Müller-Eberhard, Nilsson, and Aronsson (1960) and of Steinbuch (1964), and it appears very likely that the β_1 and β_2 bands of the doublet correspond respectively to what these investigators have called β_{1A} and β_{1C}. In the present experiments all the sera contained the β doublet at least, whilst some had also the pre-β_1 band. This is shown in Table VI, which also gives the β patterns of the oedema fluids. The triple band occurs in most of the rheumatoid arthritic sera, but the β pattern of the oedema fluids does not always correspond to that of the corresponding sera. Thus some of the fluids had only a single β band though

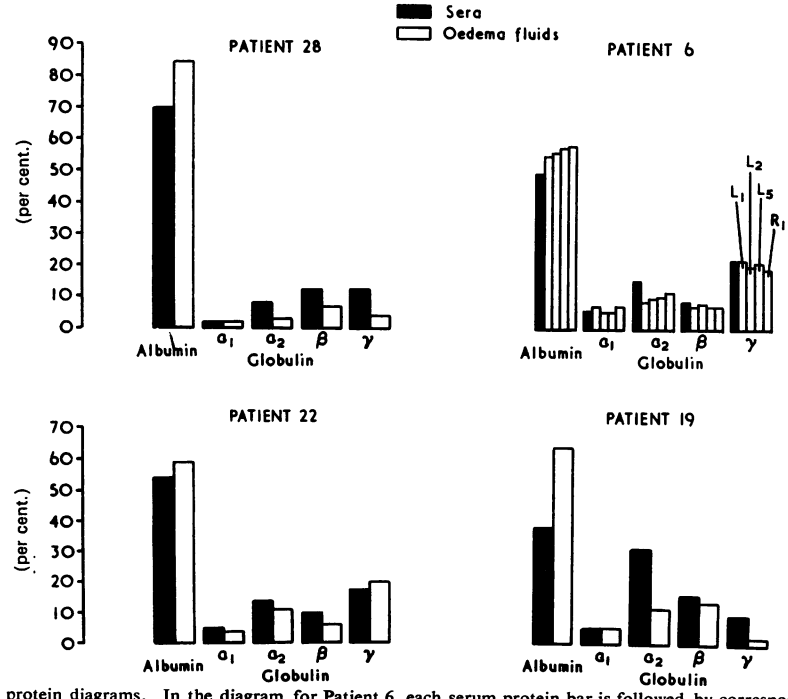

Fig. 4.—Differential protein diagrams. In the diagram for Patient 6, each serum protein bar is followed by corresponding protein bars of fluids L_1, L_2, L_5, and R_1 (see Table VI) in that order.

the corresponding sera contained the doublet or triplet (Cases 22, 3, 6, 7, 25, and 28); in only one case (Patient 21) was the triplet present in the oedema fluid, but in this case it was also present in the serum. The differences between the β patterns of the oedema fluids and those of the sera were not due to prolonged storage under freezing conditions nor to the concentration procedure. Some specimens examined again after 3 months frozen storage showed no change in the β pattern, and control experiments with concentrations of diluted sera also showed no effect. In any case, some of the altered β patterns were observed in oedema fluids collected on the same day (Patients 25, 28 and, 6). There does not appear to be any obvious correlation between the β pattern of the oedema fluid with protein content or with disease state. Nevertheless, the changes in the β pattern in oedema fluids may be of some significance. Though the alterations which are known to take place are not completely understood, it is probable that they are brought about by enzymatic processes splitting up lipid-protein complexes. A β_1-β_2 doublet is indicative of a fresh serum. If the corresponding oedema fluid shows a single β band only, this could suggest a static state and low turnover of oedema fluid proteins or alternatively a locally increased enzymic activity. If the β band in the oedema fluid was similar to that in the serum (*i.e.* double or treble) this could be indicative of relatively rapid transport across the vascular barrier and subsequent rapid removal.

Summary

Sera and oedema fluids from patients with rheumatoid arthritis were examined by electrophoresis on cellulose acetate membranes. In general, the oedema fluids contained relatively higher amounts of albumin and lower amounts of α_2 globulin than the corresponding sera. The α_1 globulin was unchanged whilst the β and γ globulins tended to be diminished in the oedema fluids. In active rheumatoid arthritis the differential pattern of the oedema fluid proteins was closer to that of the sera than was that of the more dilute oedema fluids of inactive arthritis and other diseases, thus providing further evidence that the oedema can be of inflammatory origin. Oedema fluids not infrequently showed a single β band, but there were invariably at least two β bands in the sera. The altered β pattern in the oedema fluids could indicate stasis with a low turnover of oedema fluid proteins and/or locally increased enzymic activity. Evidence that all protein constituents of the serum are also present in oedema fluid was provided by starch-gel electrophoresis and immuno-electrophoresis.

Our thanks are due to Mr. A. Howard for carrying out the starch-gel electrophoresis.

DISCUSSION

DR. V. WRIGHT (*Leeds*): This is a very careful study leading to interesting findings. I should like to know what the authors think the mechanism of this oedema to be. Most of the results fall within the mid-range of Crockett's classification, and this would suggest that there was impaired lymphatic clearance of tissue-fluid protein rather than increased capillary permeability. In fairness to Dr. Swinburne, he did not say that the oedema was never due to active arthritis but that, doubtless because of the selection of cases, there was no evidence of this in his series. He made this point in agreeing with Prof. Bywaters' observation on oedema fluid obtained from the hand. Dr. Swinburne's series included one patient with an oedema fluid protein content of 2·3 per cent., but the presence of L.E.-cells in the blood made interpretation of the result difficult.

I should like to ask how many samples had to be rejected on account of blood contamination. Was increased vascularity of the skin a problem and do the authors think that this is associated in any way with the results?

DR. GANDY: The oedema in the legs of these patients is always due to multiple causes. In Crockett's classification there was always a single cause. In our patients, if there is an active arthritis the oedema is basically inflammatory, but as these patients used their legs less than normal, there must be a contribution from venous and lymphatic sources.

As regards the number of specimens rejected, these were very few. Increased vascularity of the skin was not a problem.

DR. A. ST. J. DIXON (*Chelsea and Kensington*): One very much welcomes this sort of study, particularly in connexion with remedial surgery. I have the impression that patients with persistent high protein oedema seem to heal with rather more stiffening. Had you any patients who had a subsequent operation?

DR. GANDY: None of these cases had surgery.

PROF. E. G. L. BYWATERS (*Taplow*): I think, in general, oedema is a complicated problem and always due to multiple causes.

REFERENCES

Antonaci, B. L., and Macagnino, G. (1957). *Acta med. scand.*, **159**, 133.

Consden, R., and Kohn, J. (1959). *Nature (Lond.)*, **183**, 1512.

—— and Powell, M. N. (1955). *J. clin. Path.*, **8**, 150.

Freeman, T., and Joekes, A. M. (1957). *Acta med. scand.*, **157**, 43.

Hammond, J. D. S. (1961). *Lancet*, **1**, 137.

Kohn, J. (1957). *Clin. chim. Acta*, **2**, 297.

Müller-Eberhard, H. J., Nilsson, U., and Aronsson, T. J. (1960). *J. exp. Med.*, **111**, 201.

Park, D. C., and Swinburne, K. (1964). *Brit. med. J.*, **1**, 86.

Smithies, O. (1959). *Biochem. J.*, **71**, 585.

Steinbuch, M. (1964). *In* "Protides of the Biological Fluids: Proc. IX Colloquium, Bruges, 1963", ed. H. Peeters, p. 427. Elsevier, Amsterdam and London.

Taylor, G. W., Kinmonth, J. B., and Dangerfield, W. G. (1958). *Brit. med. J.*, **1**, 1159.

La concentration de la protéine dans la sérosité de l'oedème dans l'arthrite rhumatismale. Partie I.

RÉSUMÉ

1. On détermina le taux de la protéine dans 34 prélèvements de liquide oedémateux provenant de 24 malades atteints d'arthrite rhumatismale adulte et juvénile à un état d'évolution variable et avec de différentes complications. Dans quatre cas le liquide venait des mains qui étaient le siège d'une arthrite aiguë; le taux moyen de la protéine y fut de 4,6 g. pour cent. Dans la sérosité des pieds, le taux moyen de la protéine dans treize prélèvements des malades atteints d'arthrite considérée localement active fut de 1,6 g. pour cent et dans un cas seulment ce taux fut en dessous de 1 g. pour cent. Par contre, dans dix-sept prélèvements des malades atteints d'arthrite inactive, ce taux fut de 0,7 g. pour cent en moyenne ne dépassant 1 g. que dans un seul cas. Cela ressemble de très près les résultats obtenus chez des témoins, chez qui la moyenne (12 prélèvements) fut de 0,8 g. pour cent.

2. Plusieurs facteurs peuvent intervenir chez un malade atteint d'arthrite rhumatismale et d'oedème. A moins qu'il y ait de rares complications, telles que l'immobilité hystérique des mains ou l'interruption chirurgicale des voies lymphatiques, l'oedème des mains est presque toujours dû à la maladie articulaire inflammatoire et la sérosité contient beaucoup de protéine. Dans le pied il en contient moins et, bien que dans les cas évolutifs l'oedème soit souvent inflammatoire avec un taux de la protéine au dessus de 1 g. pour cent, d'autres facteurs, plus actifs dans l'arthrite non-évolutive, interviennent: immobilité, obstruction veineuse ou lymphatique (p.ex. par un épanchement du genou), rétention hydro-chlorurée cardiaque ou rénale, ou bien thérapie. Le taux trouvé est le résultat combiné de l'oeuvre de tous ces facteurs étiologiques; l'inflammation, en altérant la perméabilité capillaire, en est le plus important en ce qui concerne le contenu en protéine.

Partie II.

Des sérums et des sérosités de l'oedème des malades atteints d'arthrite rhumatismale furent examinés par l'électrophorèse sur membranes d'acétate de cellulose. En général, les sérosités de l'oedème contenaient des quantités relativements plus grandes d'albumine et plus petites de globuline α_2 que les sérums correspondants. La globuline α_1 demeurait la même, tandis que les globulines β et γ tendaient à diminuer dans les sérosités de l'oedème. Dans l'arthrite rhumatismale évolutive le tableau différentiel des protéines de la sérosité ressemblait plus à celui du sérum que dans l'arthrite non-évolutive et dans d'autres maladies, où la sérosité de l'oedème est plus diluée, ce qui prouve une fois de plus que l'oedème peut être d'origine inflammatoire. Assez souvent la sérosité de l'oedème donnait une seule bande β mais invariablement il y en avait au moins deux dans la sérum. Le tableau γ altéré des sérosités de l'oedème pourrait indiquer une stase avec un débit diminué des protéines de l'oedème et/ou l'activité enzymatique augmentée localement. On a prouvé que tous les contituants protéiniques du sérum se trouvent aussi dans la sérosité de l'oedème au moyen de l'électrophorèse sur gel d'amidon et de l'immuno-électrophorèse.

La concentración de la proteina en la serosidad del edema en la artritis reumatoide. Parte I.

SUMARIO

1. Se determinaron las cifras de la proteina en 34 muestras de la serosidad del edema de 24 enfermos con artritis reumatoide juvenil y adulta en varios períodos de evolución y con diferentes complicaciones. En cuatro casos le serosidad procedió de manos afectas de artritis aguda; en estos casos los valores medios de la proteina fueron un 4,6 g. por ciento. En la serosidad de los pies, la cifra media de la proteina, en trece muestras de enfermos con artritis considerada localmente activa, fué un 1,6 por ciento y en un solo caso esta cifra fué debajo de un g. por ciento. En cambio, en diecisiete muestras de enfermos con artritis poco activa, la cifra fué un 0,7 g. por ciento, rebasando 1 g. en un caso sólo. Este resultado se parece mucho al obtenido en testigos (12 muestras) donde el promedio fué un 0,8 por ciento.

2. Varios factores pueden intervenir en un enfermo con artritis reumatoide y edema. A menos que haya raras complicaciones, como la inmovilidad histérica o la interrupción quirúrgica de las vías linfáticas, el edema de las manos es casi siempre debido a la enfermedad articular inflamatoria y la serosidad contiene mucha proteina. En el pie la tasa de la proteina es menor y, aunque en los casos evolutivos el edema sea a menudo inflamatorio con cifras de la proteina de más de 1 g. por ciento, otros factores, particularmente activos en la artritis no-evolutiva, intervienen: inmovilidad, obstrucción venosa o linfática (por ej. por hidartrosis de la rodilla), retención hidro-salina cardiaca o renal, o terapia. Los valores encontrados aquí reflejan la obra de todos estos factores etiológicos; la inflamación que altera la permeabilidad capilar, es el factor más importante al determinar el contenido proteínico.

Parte II.

Los sueros y las serosidades del edema de enfermos con artritis reumatoide fueron examinados por electroforesis sobre membranas de acetato de celulosa. En general, las serosidades del edema contenían cantidades relativamente mayores de albumina y menores de globulina α_2 que los sueros correspondientes. La globulina α_1 fué sin cambiar, mientras que las globulinas β y γ tendían a bajar en la serosidad del edema. En la artritis reumatoide evolutiva el cuadro diferencial de las proteinas en la serosidad se parecía más al del suero que en la artritis non-evolutiva y en otras enfermedades, donde el edema es más diluido, lo que confirma que el edema puede tener un origen inflamatorio. Con bastante frecuencia la serosidad del edema acusaba una sola banda β pero invariablemente había al menos dos bandas β en el suero. El cuadro alterado β de las serosidades del edema puede indicar una estasis con el giro de proteinas disminuido en el edema y/o la actividad enzimática localmente aumentada. Se confirma, por medio de electroforesis sobre gel de almidón y de inmuno-electroforesis, que todos los constituyentes proteínicos del suero existen también en la serosidad del edema.