

was markedly diminished in 2 studies. Banthine depressed gastric secretion in a manner similar to atropine, but side effects were less pronounced. 100 mg of Banthine produced

no undesirable side effects other than dryness of the mouth.

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Effect of Cortisone and Adrenocorticotropin Therapy on Serum Proteins in Disseminated Lupus Erythematosus. (17962)

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The serum proteins in patients with *disseminated lupus erythematosus* have been investigated electrophoretically. They appear to have a characteristic protein pattern. About 800 sera from patients with a great variety of diseases have been examined in our laboratory, and except for an occasional specimen from an unrelated condition, we have found no consistent duplication of this particular protein pattern (Fig. 1).

The serum was diluted with barbiturate buffer of pH 8.6 and an ionic strength of 0.1, and dialyzed either with mechanical stirring at room temperature(1), or without stirring for 48-72 hours in the refrigerator. An Am-inco-Stern electrophoresis apparatus equipped with the cylinder lens-diagonal diaphragm optical system of Philpot-Svensson was employed. Both the ascending and descending boundaries were recorded, but for the sake of simplicity, only the ascending boundaries are shown (Fig. 1 and Table I). While the total protein content of the sera is generally within normal limits(2), the albumin concentration is decreased; the α_2 - and γ -globulins are increased, but the α_1 and β -globulin fractions remain in the normal range. This causes a reversal of the A/G ratio.

The γ -globulin may be increased to 50% of the total protein content. Hyper- γ -globulinemia is usually encountered either in infectious diseases or in some involvement of the liver *e.g.* cirrhosis. As the condition of the patient improves temporarily either

under treatment or during a spontaneous remission of the disease, the amount of γ -globu-

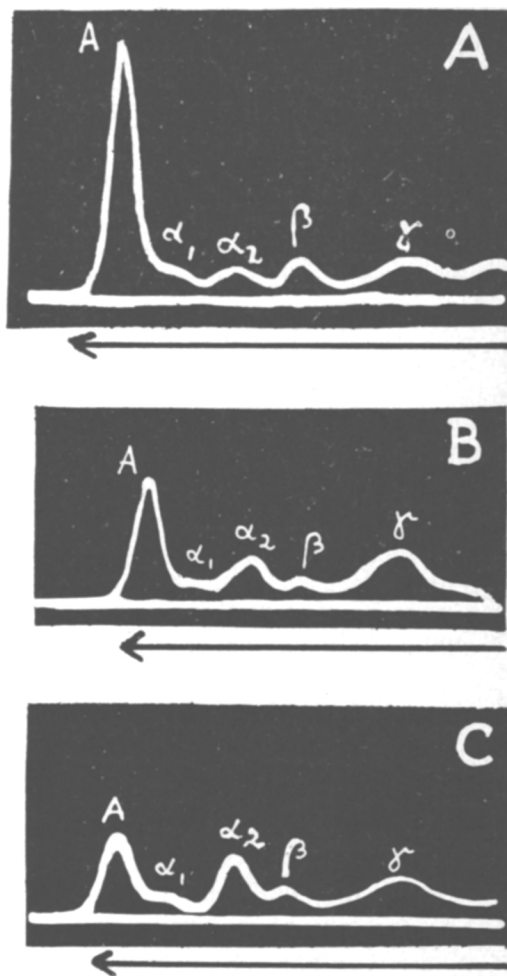


FIG. 1.

Representative electrophoretic patterns of normal serum (A), and of 2 sera from patients with *disseminated lupus erythematosus* (B, C).

1. Reiner, M. and Fenichel, R. L., *Science*, 1948, v108, 164.

2. Reiner, M., Fenichel, R. L., and Stern, K. G., *Acta Hematol.*, 1950, v3, 202.

TABLE I.
Electrophoretic Distribution of Serum Proteins in *Disseminated Lupus Erythematosus*.

No. of cases	Total protein (g %)	Albumin globulin A/G ratio	Relative % of total protein				
			Albumin	Globulins			
				Alpha ₁	Alpha ₂	Beta	Gamma
Normal(2) (Avg of 60)	7.22 ± 0.48	1.3	56.8 ± 3.0	7.2 ± 1.2	8.7 ± 1.5	12.8 ± 2.3	14.4 ± 2.4
Dis. lup. erythem. (20 cases) untreated	6.90 ± 0.27	0.5	33.4 ± 1.5	7.3 ± 0.3	15.4 ± 1.2	12.8 ± 1.0	31.1 ± 1.8

TABLE II.
Electrophoretic Distribution of Serum Proteins in *Disseminated Lupus Erythematosus* Before and After Cortisone and ACTH Therapy.

No. of cases	Total protein (g %)	Albumin globulin A/G ratio	Relative % of total protein				
			Albumin	Globulins			
				Alpha ₁	Alpha ₂	Beta	Gamma
5 patients (Before treatment)	7.07 ± .32	.6	34.7 ± 3.9	8.1 ± .3	12.5 ± 0.9	15.1 ± 2.0	29.6 ± 3.2
5 patients (After treatment)	6.11 ± .48	.8	43.9 ± 1.0	7.2 ± .6	12.7 ± 1.5	16.6 ± 0.8	19.5 ± 2.3

lin will decrease and the albumin will increase.

It is noteworthy that while the α_1 protein concentration is normal, the α_2 -globulin content is increased to twice the normal amount. This fraction, during remission or after treatment, very rarely returns within normal limits.

In a study of the effect of adrenocorticotropin (ACTH) administration in two healthy male subjects, Sayers *et al.*(3) report that the serum protein content was unchanged. After one subject received 100 mg of ACTH, samples of blood were taken at 0, 3, 6, 12, 24, 48 and 96 hours. The second subject received 50 mg and samples were withdrawn at 0, 3, 6, 12 and 24 hours. The serum was equilibrated against veronal buffer at pH 8.6 and an ionic strength of 0.1. The electrophoretic distribution of the serum protein was normal and there was no significant

change in either case following the injection of ACTH.

The sera of 5 cases of *disseminated lupus erythematosus* under therapy at Mount Sinai Hospital(4) at this time were examined before and after treatment with cortisone and ACTH for a period from 2 to 6 months. The average protein values are shown in Table II. It will be noted that following treatment, the albumin concentration increased from 34.7 to 43.9% while the γ -globulin decreased from 29.6 to 19.5%. The α_2 -globulin remained remarkably constant at the elevated level of 12.7%. Further studies on this fraction are in progress.

Electrophoretic diagrams recorded in a typical case (M.F.) before and after treatment with a total of 2 g of cortisone and 3.5 g ACTH over a 3 months period are reproduced in Fig. 2.

Coburn and Moore(5) have presented the

3. Sayers, G., Burns, T. W., Tyler, F. H., Jager, B. V., Schwartz, T. B., Smith, E., Samuels, L. T. and Davenport, H. W., *Jour. Clin. Endocrin.*, 1949, v9, 593.

4. Baehr, G., Soffer, L. J., Boas, N., Levitt, M., and Gabrilove, J. L., paper delivered at Ass. Am. Physicians, Atlantic City, May 1950 in press.

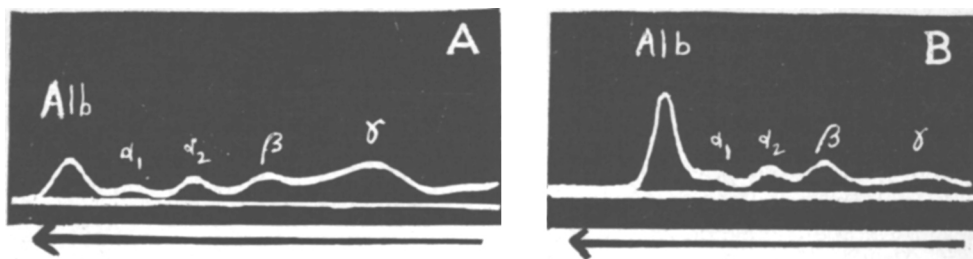


FIG. 2.

Electrophoretic diagrams of the serum proteins of one patient with *disseminated lupus erythematosus* before (A) and after therapy with cortisone and ACTH (B).

electrophoretic patterns obtained from the plasma of 2 cases of *lupus erythematosus*. Their data are somewhat difficult to interpret, since there seem to be some printing errors in their tables listing the protein composition of the plasma. Since phosphate buffer of pH 7.4 was used, they obtained no separation of the α_1 -component from the albumin fraction. Due to turbidity they had difficulties in securing satisfactory diagrams.

In this study it was also found that occasionally the β - and γ -globulin boundaries were somewhat obscured, probably due to the presence of lipids or lipoproteins, even though the sera were not frankly lipemic. After high-speed centrifugation at low temperatures, a creamy layer rose to the top, leaving clear serum underneath, making it possible to obtain a well-differentiated electrophoretic

diagram.

Summary. The electrophoretic distribution of the serum proteins of 20 patients with *disseminated lupus erythematosus* showed a lowered albumin content with a considerable increase in the α_2 - as well as γ -globulin concentration. The sera of 5 patients were studied before therapy with cortisone and adrenocorticotropin (ACTH). After a clinical remission had been produced by these agents, it was found that the albumin and γ -globulin components progressed towards normal levels whereas the α_2 -globulin fraction remained unchanged.

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5. Coburn, A. F. and Moore, D. H., *Bull. Johns Hopkins Hosp.*, 1943, v73, 196.

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Achromotrichia Due to Copper Deficiency. (17963)

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A purified diet, similar to diets used in many other laboratories has been employed in this laboratory as a presumably adequate diet for the albino rat. Recently it was observed that black rats on this diet developed an achromotrichia which could be prevented by liver or yeast. Further investigation disclosed that the activity of these substances

was due to copper. Achromotrichia due to copper deficiency has been described previously(1-6). In most of these studies the ach-

1. Kiel, H. L., and Nelson, V. E., *J. Biol. Chem.*, 1931, v93, 49.

2. Gortner, F. J., *Nature*, 1935, v136, 185.

3. Free, A., *Proc. Soc. Exp. Biol. and Med.*, 1940, v44, 371.