hemolytic activity, also inhibits phagocytosis. Unless, of course, the inhibition of phagocytosis produced by mumps virus is due to some property entirely different from that of influenza virus causing a similar inhibition. This question awaits further elucidation. One obvious implication of these studies is the possible relationship of inhibition of phagocytosis by these viruses to the development of secondary bacterial infections during the course of diseases caused by them. The significance of these findings must await parallel demonstration of such activity for those viruses in natural or experimental infections before any such conclusions can be drawn.

Summary. Mumps virus and influenza A virus (PR8) have been shown to reduce the phagocytosis of bacteria by the polymorphonuclear leucocytes of the guinea pig *in vitro*. This inhibitory effect is destroyed by mild heating of the viruses which leaves their hemagglutinating capacity intact. Mumps antiserum prevents the inhibition of phagocytosis by mumps virus but has no effect on the inhibitory action of influenza virus.

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A Note on Electrophoresis in Hypothyroidism.* (18006)

DONALD H. ATLAS, A. ROBERT GOLDFARB AND PETER GABERMAN. (Introduced by P. P. Foa)

From the Departments of Medicine and Biochemistry, Chicago Medical School and Mount Sinai Hospital, Chicago.

A number of investigators have reported a moderate elevation of total protein in hypothyroidism and have attributed this to hemoconcentration(1-4). With adequate thyroid therapy the total protein concentrations returned to normal. Lewis, McCullagh and Clark(3) included six cases of hypothyroidism in their electrophoretic analyses of the plasma proteins in thyroid disease, and have described a pattern which they consider consistent. These authors worked with a phosphate buffer at pH 7.8 which was the condition under which sera had been studied at that time. However, at the present the general practice is to work in a veronal buffer of pH 8.6 and we have studied several cases under these conditions. Our results differed somewhat from those reported by Lewis *et al.*, and the differences probably are due to this variance of conditions.

Material and methods. The material was obtained from 3 females with spontaneous myxedema and 1 male with post-operative myxedema. In 2 of these patients samples were taken after treatment with desiccated thyroid. One of these latter cases was unable to tolerate adequate doses of thyroid (patient P) because of progressive heart disease. No attempt was made to differentiate pituitary from spontaneous hypothyroidism. The case histories of the patients follow: Case R, a 65-year-old white female housewife, noticed apathy, weakness and dryness of the skin one year prior to admission. Her physical appearance was typical of advanced myxedema *viz.* coarse dry skin, slow hoarse voice, puffy eyelids and absent axillary and pubic hair. The essential laboratory findings were BMR-21, EKG rate 60 with low voltage and flattened T waves, X-ray chest—diffuse

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3. Lewis, L. A., McCullagh, E. P., and Clark, J., *Am. J. Med. Sci.*, 1944, v208, 727

4. Moore, D. H., Levin, L., and Smelser, G. K., *J. Biol. Chem.*, 1945, v157, 723.

cardiac enlargement, cholesterol ranged from 820 to 1000 mg % in the serum with the esters comprising 60 to 75% of the total. RBC 2,900,000, WBC 5,200. A remarkable improvement was noted on thyroid extract up to grains II daily with complete amelioration of symptoms. The EKG, blood picture and cardiac configuration returned to normal limits.

Case P, a 64-year-old white female housewife had symptoms of coronary insufficiency with episodes of acute left ventricular failure for 4 years prior to admission. She presented typical myxedematous facies, voice and personality. The BMR was -29, the total serum cholesterol 595 mg % with 450 mg % esters, the RBC 2,780,000, the WBC 5,900 and the hemoglobin 9.3%. The EKG pattern was compatible with hypothyroidism in addition to left ventricular strain. The heart on X-ray configuration was markedly enlarged to right and left. She was unable to tolerate more than one grain of thyroid daily without further anginal symptoms and cardiac embarrassment. She suffered an acute myocardial infarction and expired 6 months after beginning therapy with thyroid.

Case O, a 70-year-old white female housewife complained of symptoms suggestive and diagnosed as coronary insufficiency for 12 years prior to admission to the hospital. She also complained of weakness and severe pain and stiffness of all joints. Her appearance and manner were classical for advanced myxedema *viz.* wax pallor and coarseness of skin, puffy eyelids, slow hoarse voice, and absent pubic and axillary hair. The BMR was -30, the EKG revealed a rate of 58 with flattened T waves. The serum cholesterol was 510 and the cholesterol esters 400 mg %. The RBC was 2,700,000, WBC 4,600 and hemoglobin 10%. A dramatic complete recovery was effected on thyroid extract up to grains II daily with complete cessation of all symptoms including those of coronary insufficiency. She was converted from a vegetative existence to a normal life.

Case S, a 72-year-old retired male tailor underwent a thyroidectomy for symptoms of hyperthyroidism in 1934, and subsequently developed symptoms and signs of thyroid deficiency *viz.* weakness, apathy, dry, coarse skin, severe constipation, absent pubic and axillary hair and a typical myxedematous appearance and manner. The BMR was -32, the EKG revealed a rate of 40 with normal T waves and voltage. The roentgenogram of the heart showed a moderate left ventricular hypertrophy. The serum cholesterol was 310, the esters 215, the RBC 3,560,000, WBC 5,900 and hemoglobin 11%. His response to thyroid up to grains III daily was only fair, but he continued to live a normal life.

The sera were prepared and stored in the frozen state for 1 to 3 days. Five to 6 ml of sera were diluted with 2 volumes of veronal buffer (N/10 and pH 8.5 to 8.6) and dialysed for 24-48 hours at 2°C against 2 liters of buffer. The electrophoresis was carried out in the Tiselius apparatus as modified by Longsworth(5). The field strength was about 5.8 volts cm^{-1}, the time about 14000 sec and the temperature 1.2°C. The patterns were magnified 2.5 to 3.0 times and the relative protein concentrations determined on the descending patterns according to Tiselius and Kabat(6). The chemical A/G ratios were determined by the Howe procedure using the quantitative biuret method for protein determination.

Results and discussion. The results are summarized in Table I. The albumin fractions were low to a varying degree. This is partly in agreement with the findings of Lewis, *et al.* In case R, the administration of thyroid caused a satisfactory clinical response and the albumin rose to the normal range. In case P, the patient was unable to tolerate a therapeutic dose *(vide supra)* and the albumin remained quite low. Although the clinical findings in the other 2 cases, O and S, indicated hypothyroidism of a severity equal to that of the other 2 cases, the albumin values were only slightly depressed. It would seem, therefore, that a low albumin is not an invariable finding in hypothyroidism. Alpha-1 globulin was normal or very slightly

5. Longsworth, L. G., *Chem. Rev.*, 1942, v30, 323.
6. Tiselius, A., and Kabat, E. A., *J. Exp. Med.*, 1939, v69, 119.

TABLE I.
Clinical and Chemical Data on Patients.

Patient	Total protein	Alb., %	Alpha 1, %	Alpha 2, %	Beta, %	Gamma, %	A/G	
							Electrophoretic	Chemical
R1	7.1	49.0	3.7	12.4	17.6	17.5	0.96	1.84
R2*	6.7	57.4	3.5	10.3	16.1	12.6	1.31	—
P1	7.3	41.9	4.5	12.1	19.1	22.2	0.72	1.15
P2*	9.1	39.0	6.2	15.6	11.9	27.2	0.64	—
O	8.0	57.5	3.2	14.8	11.9	13.5	1.36	2.48
S	7.0	55.5	2.5	8.5	18.8	15.1	1.23	1.69
Normal†		63 ±3	5 ±1	7 ±1	13 ±2	12 ±3		

*Following treatment.
† Moore, Dan H., *J. Biol. Chem.*, 1945, v161, 21.

lowered. Under the conditions of their experiments Lewis *et al.* reported no alpha-1 component. The alpha-2 component in 3 cases of "spontaneous" hypothyroidism were high. In the fourth case, the value was normal and, it should be noted, the hypothyroidism resulted after thyroidectomy. This is in marked contrast to the low values for alpha globulin reported by Lewis and co-workers. These authors, however, used a phosphate buffer of pH 7.8 and under these conditions the alpha component is the same as our alpha-2 component. Comparing the values for alpha-2 globulin before and after treatment with thyroid it is seen that in the patient who responded to treatment (R) the alpha-2 component returned to normal whereas in the patient that did not tolerate adequate treatment the value continued to rise.

In 3 out of 4 cases the beta globulin fraction was elevated and in the fourth case (S) the value was normal. Lewis *et al.* reported high values for this component also. Since Beta globulin fraction is generally believed to consist of lipoprotein complexes, and hypercholesterolemic and hyperlipemic conditions have been reported to give increases in this fraction(7). In view of this possible correlation, it was felt desirable to compare the beta globulin values with the total cholesterol values. Case O had a high cholesterol and a normal beta globulin. On the other hand, in case S, the beta globulin was very high and the total cholesterol was only slightly elevated. Case R, with a total cholesterol of 1000 mg % had a beta globulin fraction of 17.6%, whereas in case P with a lower total cholesterol (595 mg %) the beta globulin fraction was higher (19.1%). It appears, therefore, that in our cases there was no consistent correlation between beta globulin and cholesterol. In view of the results of Kunkel and Ahrens(7), a study of other blood lipids would have been of value but was not done.

The gamma globulin values in 2 cases were elevated and in the other 2 were normal. This is in agreement with the general findings of Lewis *et al.* As in the case of all the other components, the high value of gamma globulin before treatment changed to a normal value following treatment. It is worthy of note that the one case which could not be adequately treated (P) the gamma globulin showed a continued rise to extremely high values. This also happened in a terminal case of Gaucher's disease which we studied, where the gamma globulin rose to a value of about 40% of the total protein 3 days before death.

In conclusion, we feel that no characteristic electrophoretic pattern can be assigned to hypothyroid disease in general on the basis of available data.

Summary. The electrophoretic patterns of the sera of 4 hypothyroid patients were

7. Kunkel, H. G., and Ahrens, E. H., Jr., *J. Clin. Invest.*, 1949, v28, 1565.

8. Longsworth, L. G., Shedlovsky, T., and MacInnes, D. A., *J. Exp. Med.*, 1939, v70, 399.

studied, 2 before and after thyroid administration. The results have been compared with those of other authors. On the basis of all the available data there does not appear to be a characteristic distribution of protein fractions in hypothyroid disease.

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