brain suspension of the injected area injected intracerebrally into a *Macacus rhesus*. This monkey did not develop the disease.

TABLE I.

No.	Species	Sex	Weight Kg.	Volume Suspension cc.	Max. Temp. F.	Paralysis days	Death days
1	*Macacus Rhesus*	♀	2.8	1.00	104.0°	5	7
2	" "	♀	3.8	0.75	105.8°	9	10
3	" "	♀	3.5	0.50	105.2°	6	6
4	" "	♂	2.9	0.10	106.1°	6	9
5	*Ateles ater*	♀	3.3	0.50	100.4°	Second dose 1 cc. virus suspension 10 days after first.	
6	" "	♂	3.6	1.00	101.6°	Second dose 1 cc. virus suspension 10 days after first.	
7	" "	♀	4.1	1.50	102.8°	Second dose 1 cc. virus suspension 10 days after first.	

Conclusions. The spider monkey, *Ateles ater,* like other new world varieties, is naturally refractory to experimental inoculation with poliomyelitis virus (monkey passage).

8378 C

Albumin-Globulin Ratios in Synthetic Solutions from Specific Gravity and Relative Viscosity Measurements.

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Nugent and Towle[1] have reported specific gravity values for 33 solutions of beef serum albumin, serum globulin and mixtures of the 2 in the range from 0 to 12% total protein. In all cases the solution contained 0.9% sodium chloride and was adjusted to pH 7.3 to 7.5. Under these conditions, the specific gravity of a solution was shown to be a measure of its total protein content in accord with the finding of Moore and Van Slyke[2] that the specific gravity is a useful measure of total plasma protein in nephritis, more useful in fact than the refractive index, the physical property which has been most widely used in this connection.

At the same time relative viscosity values were obtained for a sim-

[1] Nugent, R. L., and Towle, L. W., *J. Biol. Chem.*, 1934, **104**, 395.

[2] Moore, N. S., and Van Slyke, D. D., *J. Clin. Inv.*, 1930, **8**, 337.

ilar series of solutions which have not previously been reported. The solutions for the relative viscosity measurements were prepared and their specific gravity, salt content and pH value controlled in the same manner as previously described. The relative viscosity measurements were made with a 1 cc. Ostwald viscometer at 25° in a water bath thermostat. Since the relative rates of flow of water and protein solutions through capillary tubes may vary with the applied pressure[3] the values obtained may well be specific for an instrument of the dimensions employed. An instrument of convenient dimensions was therefore indicated since it must serve as a model for others to be employed in checking or utilizing the results. The one chosen for use* required a small volume of solution in accord with the amounts of serum usually available in routine clinical work, and was of a type which could be reproduced by an amateur glass blower. (Fig. 1.) The upper and lower bulbs contain respectively 0.6 and 0.9 cc. and their centers are 70 mm. apart. The capillary tube is 67 mm. long and 0.50 mm. in diameter. At 25° using a total

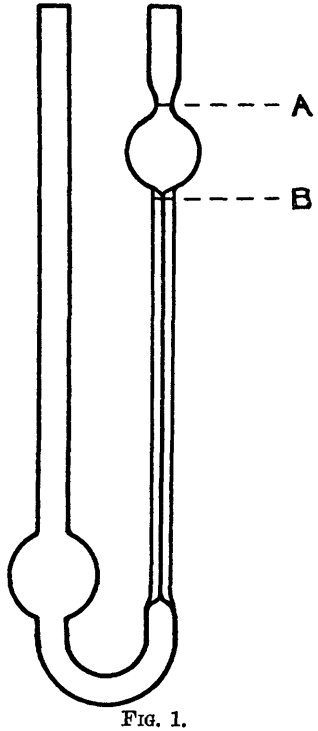

FIG. 1.
An Ostwald viscometer of the type employed.

[3] Kruyt, H. R., (translated by van Klooster, H. F.), New York, 1930, 182.

* A type which has been used by S. DeW. Ludlum and his associates.

volume of 1.0 cc. of distilled water, the time required for the level to drop from A to B is 36.7 seconds as measured with a stopwatch. The tubing for the rest of the instrument has an internal diameter of 3 mm. The relative viscosity of a protein solution is given by the equation, relative viscosity $= T_p \times d_p/36.7$, where T_p is the time required for the level of the protein solution to drop from A to B, and d_p is the specific gravity of the protein solution.

The relative viscosity values are plotted against the total protein percentages in Fig. 2, which shows that smooth curves are obtained for each of the 6 albumin-globulin ratios, varying regularly from

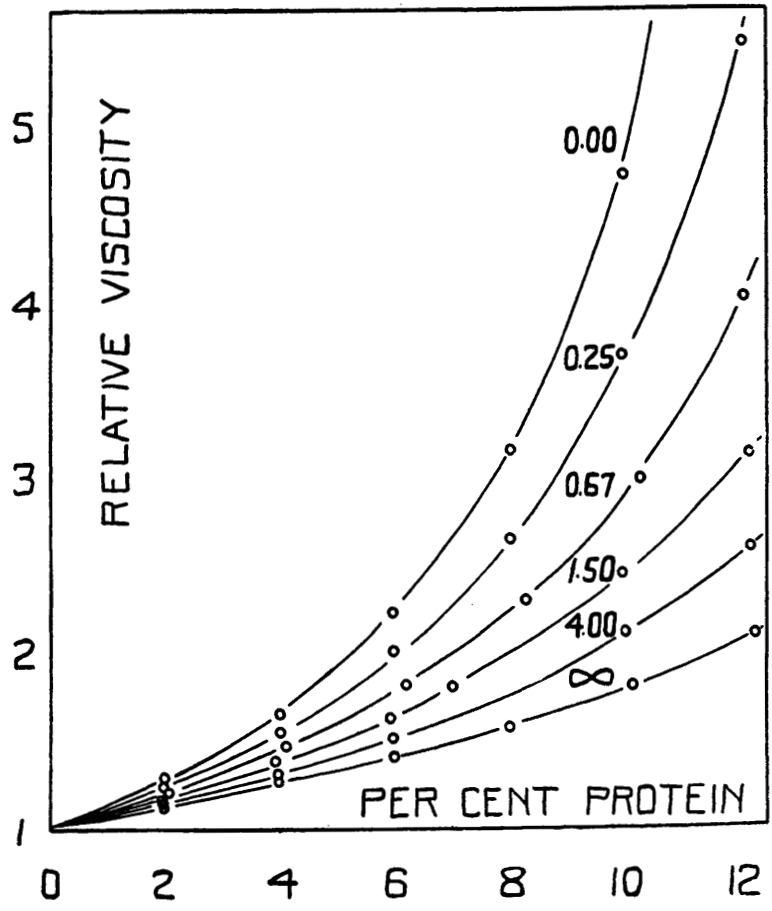

FIG. 2.

The relative viscosity values for synthetic solutions of beef serum albumin and serum globulin plotted against the corresponding specific gravities. The number to the left of each curve indicates the albumin-globulin ratio of the solutions represented by that curve.

the very slightly convex curve for 100% albumin to the markedly convex curve for 100% globulin.[4]

It is apparent that having determined the total protein content by means of a specific gravity measurement it should be possible to estimate the albumin-globulin ratio by determining the relative viscosity and plotting the point on the diagram. The method is entirely analogous to the refractive index-relative viscosity method of Heyder,[5] Rohrer[6] and Bircher.[7] However, the salt contents and pH values of the synthetic solutions employed by these workers were not carefully controlled, and they did not point out the possibility of the advantageous use of a simple standard viscometer of the Ostwald type. In addition, as has been mentioned, there is reason to believe that the specific gravity of plasma is a better measure of total protein than the refractive index. The application of the method described here to blood serum was originally suggested by Ludlum, Taft and Nugent.[8]

In testing the method, solutions were prepared by one of the authors and analyzed by the other with results as shown in Table I.

With the exception of solution No. 2, which was apparently subject to gross experimental error, the total percentages agree to within about one part in a hundred. Eight of the nine albumin-globulin ratios obtained are in satisfactory agreement with the actual values.

TABLE I.

Comparison of Actual Total Protein Values and Albumin-Globulin Ratios of a Series of Mixed Solutions of Serum Albumin and Serum Globulin with Those Determined by the Specific Gravity-Relative Viscosity Method

Solution No.	Actual total protein %	Total protein found %	Actual albumin-globulin ratio	Albumin-globulin ratio found
1	10.00	10.00	0.11	0.09
2	7.00	7.14	0.11	0.08
3	3.50	3.55	0.11	0.09
4	9.55	9.53	1.00	0.89
5	7.00	7.03	1.00	1.00
6	4.50	4.53	1.00	0.89
7	10.00	10.00	9.00	9.00
8	7.00	6.96	9.00	7.33
9	4.50	4.44	9.00	10.11

[4] Lloyd, D. J., Chemistry of the Proteins, Philadelphia, 1926, 160.

[5] Heyder, E., Estimation of the Refractivity and Viscosity of Globulin and Albumin Solutions and Their Mixtures, Tubingen, 1915.

[6] Rohrer, F., *Deutsch. Arch. f. klin. Med.*, 1916, **121**, 221.

[7] Bircher, M. E., *J. Lab. Clin. Med.*, 1921, **7**, 134.

[8] Ludlum, S. DeW., Taft, A. E., and Nugent, R. L., unpublished discussion.

In general, the results indicate that the method is useful with synthetic solutions under controlled conditions. Its accurate application to blood sera would require in any case corrections for effects of varying concentrations of sodium chloride, glucose and urea upon both the specific gravity and relative viscosity values and of possible abnormal serum proteins upon the relative viscosity in various pathological conditions.

8379 C

Ultrafiltration of the Virus of Equine Encephalomyelitis.

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Meyer, Haring, and Howitt[1] were the first to show that the virus of equine encephalomyelitis passes readily through Berkefeld V and N filters. Olitsky, Cox and Syverton[2] reported that the virus passed through Seitz filters in a relatively high concentration. Krueger, Howitt and Zeilor[3] filtered the virus through acetic acid collodion membranes and found that it passed through 3%, but was retained by 3.5% membranes. From these results they estimated the particle size of the virus to be approximately 500 mμ. It was considered of interest to determine the size of this virus more accurately by filtration through finely graded collodion membranes of relatively uniform porosity.

The collodion membranes used in our experiments were prepared according to the method of Elford[4] with certain modifications adopted by Bauer and Hughes.[5] The filtration technique described by Bauer and Hughes[6] in their study of yellow fever virus was closely followed. All filtrations were conducted under positive pressure of nitrogen of 100 cm. Hg. The effective filtration area of the membranes comprised about 5 cm.^{2} and the amount of filtrate collected through such an area varied from 8 to 10 cc.

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1 Meyer, K. F., Haring, C. M., and Howitt, B., *Science*, 1931, **74**, 227.

2 Olitsky, P. K., Cox, H. R., and Syverton, J. T., *J. Exp. Med.*, 1934, **59**, 159.

3 Krueger, A. P., Howitt, B., and Zeilor, V., *Science*, 1933, **77**, 288.

4 Elford, W. J., *J. Path. and Bact.*, 1931, **34**, 505.

5 Bauer, J. H., and Hughes, T. P., *J. Gen. Physiol.*, 1934, **18**, 143.

6 Bauer, J. H., and Hughes, T. P., *Am. J. Hyg.*, 1935, **21**, 101.