sharp rise, but in the patients with Addison's disease, the curve remained elevated, and had not returned to basal level in 4 hours, whereas in the normal controls, it had reached basal level again within 3 hours. 3. It is suggested that the delay in the disappearance of the accumulated lactate from the blood seen in patients with Addison's disease may be due to a sluggishness on the part of the liver to convert lactic acid to glycogen. 4. The blood sugar and blood lactate curves, following a single intravenous injection of adrenalin in adrenalectomized dogs, are both lower and tend to remain elevated longer than in the same dogs before removal of the second adrenal gland.

8369 C

Suspension Stability of Erythrocytes in Solutions of Globulin.*

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Fahraeus[1] showed that the most rapid sedimentation of erythrocytes took place in solutions of fibrinogen, less rapid in solutions of globulin, and least rapid in solutions of albumin. He concluded that the rapidity of sedimentation and the increased percentage of serum globulin and fibrinogen occurring coincidentally "stand in direct causality."[2] In confirmation of the thesis of Fahraeus, Westergren[3, 4] obtained the following coefficients of correlation between the *sedimentation rate* and fibrin, globulin, and albumin:

$$r_{SR\text{-}F} + 0.82,\ r_{SR\text{-}G} + 0.50,\ r_{SR\text{-}A} - 0.46, \text{ and } r_{SR\text{-}FGA} + 0.87$$

Using a modification of the Linzenmeier[5] technique, Lucia and coworkers[6] obtained a correlation coefficient of —0.27 between *sedi-*

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1 Fahraeus, R., *Acta. Med. Scand.*, 1921, **55**, 1.

2 Fahraeus, R., *Physiol. Rev.*, 1929, **9**, 255.

3 Westergren, A., Theorell, H., and Widstrom, G., *Z. f. d. g. Exp. Med.*, 1931, **75**, 668.

4 Westergren, A., Juhlin-Dannfelt, C., and Schnell, R., *Acta. Med. Scand.*, 1932, **77**, 469.

5 Linzenmeier, G., *Arch. f. Gynaekologie*, 1920, **113**, 608.

6 Lucia, S. P., Blumberg, T., Brown, J. W., and Gospe, S. M., to be published.

mentation time and serum globulin.† They concluded that a cause and effect relationship cannot be said to exist between these factors. This hypothesis was put to trial by testing the effects of various solutions of serum globulin *in vitro* on the sedimentation time of erythrocytes.

All sedimentation experiments were done using the Friedlander tube and recording the time necessary for the column of erythrocytes to settle 18 mm. A 20 cc. sample of venous blood was withdrawn and oxalated. A sedimentation test was done directly on this sample, using the Linzenmeier technique. The remainder of the sample was separated by centrifugalization and the corpuscular moiety washed with 3 changes of Locke's solution. Then 0.2 cc. of washed corpuscles were resuspended in 0.8 cc. of the following menstrua: plasma, Locke's solution, and dilutions of globulin in plasma and in Locke's solution. The resulting cell volumes were 20% or 2.15 ± 0.15 million corpuscles per cmm. The globulins were prepared by electrodialysis.‡ In all resuspension experiments the syringes were rinsed in 10% potassium oxalate solution.

In 3 experiments in which increasing concentrations of beef blood pseudoglobulin was suspended in Locke's solution, the sedimentation time was prolonged beyond that of the control. The same phenomenon was observed in 2 experiments in which beef blood globulin was used.

In 2 experiments in which a liquid solution of human blood pseudoglobulin was diluted with Locke's solution, the sedimentation time was also prolonged beyond that of the control. In 7 experiments in which powdered globulin from the same source, and ranging in concentration from 1 to 5% in Locke's solution, produced a progressive diminution of the sedimentation time when compared with the control. There were 4 experiments in which this same powdered globulin was dissolved in blood plasma and in which the sedimentation time was prolonged beyond that of the control.

In 5 experiments in which a faintly bile-tinged solution of globulin prepared from human ascitic fluid and ranging in concentrations up to 12% in Locke's solution was used, there was noted a progressive diminution in the sedimentation time. In 5 experiments a powdered globulin, from the same source, diluted in Locke's solution markedly prolonged the sedimentation time. This latter

† A negative correlation between sedimentation time and globulin is similar to a positive correlation between sedimentation rate and globulin.

‡ Courtesy of Dr. D. M. Greenberg of the Department of Biochemistry.

product acted similarly, but to a lesser degree, in 4 experiments in which it was dissolved in plasma.

Summary. An analysis of the effects of 6 different types of globulin, dissolved in Locke's solution, upon the sedimentation time of erythrocytes, reveals that in 12 experiments 4 of the types prolonged the sedimentation time, and that in 12 experiments the remaining 2 types shortened the sedimentation time. In 8 experiments in which 2 of the types of globulin were dissolved in plasma, the sedimentation time was prolonged.

Conclusion. These experiments indicate that a consistent relationship cannot be established *in vitro* between the sedimentation time of erythrocytes and the globulin content of various solutions of serum globulin.

8370 P

A Comparison of the Tar Tumors of Rabbits and the Virus-Induced Tumors.

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By tarring the ears of domestic and cottontail rabbits tumors have been procured for comparison with others experimentally induced with the Shope virus.[1] The tarred rabbits were strictly isolated.

The growths caused by virus regularly developed from the surface epidermis and were papillomas varying little in structure, whereas not a few of those consequent on tarring originated from the skin appendages, with result in a wider morphological variety. The tar papillomas were scattered, discrete and often punctate in origin; so too were the papillomas due to virus when this had been appropriately inoculated. The growths due to tarring appeared only after it had been repeated often enough to cause general hyperplasia of the epithelium, together with complex connective tissue alterations; and many of them retrogressed after tarring was stopped. The virus tumors, on the other hand, arose on the basis of the slight epidermal trauma incident to inoculation, and their progression was followed, not preceded, by connective tissue changes. The virus evidently needed no help,—though the growths it caused could be stimulated to rapid enlargement by connective tissue disturbances experimentally

[1] Shope, R. E., *J. Exp. Med.*, 1933, **58**, 607.