tivity to demonstrate lethargy if it occurs following throidectomy. An apparatus has been constructed by which the cretin's capacity for muscular exertion can be compared with that of the normal lamb. It is essentially an inclined plane the angle of which can be altered at will. It is not difficult to induce the sheep to ascend the incline and so strong is the flock instinct that a sheep too weak to follow the others will continue its attempts until exhausted.

165 (1912)

The deleterious effect of sodium citrate on the blood with particular reference to the H-ion concentration.

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Experiments were undertaken to determine whether the effects recently reported by Unger[1] to result from the action of sodium citrate on the blood when added in the proportions used in transfusion might not be related in some way to the hydrogen-ion concentration of the solution used. These effects, as given by Unger, included the formation of a substance derived from the stroma of the red cells which is anticomplementary in the Wassermann reaction, the red cells being at the same time rendered more fragile, together with a direct interference with the action of complement, a practical destruction of the phagocytic activity of the leucocytes, and a reduction in the effect of opsonin.

Three sodium citrate solutions (2 per cent.) having P_H values of 4.1, 7.25 and 9.56 were added to blood in ratios of 1 : 2 and 1 : 9. With but an occasional exception the citrated plasmas thus obtained showed no anticomplementary power. With both whole blood and plasma a varying amount of precipitate usually appeared, which increased on inactivation. It was not present in citrated serum. The citrated extracts of washed red cells were not anticomplementary. Repeated tests of the citrated blood for red-cell fragility were negative, as indeed were the phagocytic indices of leucocytes exposed to citrate. In the main our results were diametrically opposite to those reported, regardless of the P_H of the solution

[1] Unger, L. J., *J. A. M. A.*, 1921, lxxvii, 2107.

used. These results indicate that the reactions attending the use of citrate must be sought by other criteria. They may be associated with the disturbance of equilibrium causing the precipitate above mentioned.

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The antigenic properties of red-cell globulin.[1]

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Three theories have recently been advanced relative to the nature of the antigen which, on repeated injection of foreign red cells, gives rise to a specific hemolytic sensitizer in the blood stream of the immunized animal. Balls and Korns[2] have come to the conclusion that the antigen is contained in the stroma of the red cell and that it is neither a globulin nor an albumin but probably a nucleoprotein. While the presence of nucleic-acid residues in non-nucleated red cells cannot be denied, the careful work of Bloor[3] indicates that within the limits of experimental error of his method the presence of nucleoprotein in red cells appears doubtful. The experiments of Wooldridge[4] on the constituents of the stroma of red cells shows that although a protein combined with a molecule containing phosphorus (this may be lecithin) is present in small quantities, the greater part of the protein fraction consists of paraglobulin.

While it is not to be denied that immunization with stroma does lead to the appearance of a hemolytic sensitizer, the experi-

[1] Aided in part by a grant from the Research Board of the University.

[2] Balls, A. K., and Korns, J. R., *Jour. of Immunology*, 1918, iii, 375.

[3] Bloor, W. R., *Jour. Biol. Chem.*, 1918, xxxvi, 49.

[4] Wooldridge, L., *Arch. f. Anat. u. Physiol.* (Physiol. Abt.), 1881, p. 387.