1×10^{-3} gm./kg. would always arrest a convulsion, sometimes proving lethal. (We have found the control lethal dose of this preparation of acetylcholine in the cat ranges between 0.01 and 0.09 gm./kg.[2]) 4. While acetylcholine blocks the clonic element in such convulsions, it does not affect the element of tonic extension.[3]

From these experiments, it becomes apparent that acetylcholine has an action upon the same cells of the central nervous system as those upon which camphor monobromide acts to produce clonic convulsions.[3]

8669 P

Significance of Loss of Serum Protein in Therapy of Severe Burns.

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That large amounts of blood plasma are lost into burned areas has long been known; its measurement, experimentally, has shown that it may be very extensive. It is also generally realized that it is the prime, if not the only factor in the blood concentration of burned patients. But its significance in therapy has not been sufficiently emphasized.

In a series of 40 patients with severe burns, many of them fatal, the degree of blood concentration was roughly estimated by the erythrocyte count. It was found that very rapidly, often within an hour or two, the red cells increased with few exceptions to values of over 6,000,000 and in 2 cases to over 8,000,000 per cmm. Comparison of venous and capillary counts in many instances revealed significant differences only in the severe cases; in them, moreover, the counts often had to be made in venous blood because capillary blood was unobtainable. The blood was often so viscid that aspiration of a sufficient amount for chemical study even from a large vein was difficult or impossible. Nevertheless the serum protein of such blood when examined soon after admission was usually normal or low; in only one instance was

[2] Coombs, H. C., and Cope, O. M., *Am. J. Physiol.*, 1936, **116**, in press.

[3] Coombs, H. C., and Pike, F. H., *Am. J. Physiol.*, 1931, **97**, 92.

the value above 7%, in most of them it was between 6 and 7%, in 2 it was under 6%. This in itself indicated an actual or relative loss in blood protein when one considers the marked concentration as shown by the high erythrocyte count. The degree of this loss in serum protein is apparent if we compare the average figure of about 6% in burned patients with a serum protein of 10% or more which occurs in the concentrated blood due to extreme dehydration from vomiting, diarrhea, etc. Moreover, in several patients we noted after several days of treatment still lower values for the serum protein, *i. e.,* as low as 4%. In a number of patients treated with large amounts of saline and glucose solutions we noted a falling serum protein with little or no corresponding reduction in the red cell count, thus indicating no correction of the essential concentration of the blood. The eventual return of the serum protein to normal following the usual forms of treatment was slow, requiring weeks. The albumin-globulin ratio was also determined in all patients; while 2 showed a normal value. most of them revealed a high ratio *i. e.,* between 2.9 to 3.2 indicating a loss of relatively more globulin than albumin. As the patient recovered the value returned to normal.

In many, the patient exhibited a subcutaneous edema of the unburned skin, which was especially marked when large amounts (5 to 8 liters) of parenteral fluid were given daily. In most of the serious burns there was a failure of the kidney to put out more than 10 to 20% of the amount of fluid administered.

In a number of severely burned patients intravenous acacia or blood plasma was given. Under the influence of this treatment the concentration of the erythrocytes was rapidly reduced and subcutaneous edema relieved. In several instances the red cell count dropped rapidly within 4 to 8 hours after the injection of 500 to 1000 cc. of acacia or plasma. In one patient the count fell from 8,200,000 to 6,000,000 within 4 hours after the use of 500 cc. of 6% acacia in glucose plus 500 cc. of physiological saline. Such a prompt relief of concentration was never observed following the use of saline or glucose alone.

These observations indicate that loss of serum protein is a serious result of extensive burns, and that the store of body protein is not sufficient to restore rapidly this loss when only water, glucose, and electrolyte are administered. In severe burns, therefore, large amounts of protein are needed; the injection of blood plasma is apparently more efficacious than whole blood because of the excessive concentration of red blood cells already present. In

addition to its direct effect in correction of the lost protein, it is probable that the injection of blood plasma aids the body in its resistance to infection, which is an ever-present danger in serious burns. The administration of too large amounts of water, electrolyte and glucose alone as ordinarily carried out seems not only ineffective but may, if excessive, lead to deleterious results by producing generalized edema thus lowering tissue resistance. It is possible that the process of protein replacement would be accelerated by a high protein diet particularly if beef protein and a soy bean meal were used; these proteins were found to be very rapidly converted to blood protein in experiments reported by McNaught, Scott, Woods and Whipple.[1]

The serum protein was determined according to the method of Howe.[2]

8670 P

Intestinal Absorption of Amino Acids.

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From the investigations of Nagano[1] and of Cori[2] it is well known that intestinal absorption of the monosaccharides is far from being a simple process of diffusion. The different sugars introduced in equal amounts of equimolar solutions leave the intestinal cavity with very different speed, more physiological substances like glucose or galactose being absorbed much more rapidly than mannose or even the pentoses. From more recent papers of Magee and Reid,[3] Wilbrandt and Laszt,[4] Lundsgaard,[5] Wertheimer,[6] Verzár[7] it can be concluded, that special cellular factors are re-

1 McNaught, J. B., Scott, V. C., Woods, F. M., and Whipple, G. H., *J. Exp. Med.*, 1935, **63**, 277.

2 Howe, Paul E., *J. Biol. Chem.*, 1921, **49**, 93.

1 Nagano, J., *Pflüger's Arch. f. d. ges. Physiol.*, 1902, **90**, 388.

2 Cori, C. F., *J. Biol. Chem.*, 1925, **66**, 691.

3 Magee, H. E., and Reid, E., *J. Physiol.*, 1931, **73**, 163.

4 Wilbrandt, W., and Laszt, L., *Biochem. Z.*, 1933, **259**, 398.

5 Lundsgaard, E., *Biochem. Z.*, 1933, **264**, 209, 229.

6 Wertheimer, E., *Pflüger's Arch. f. d. ges. Physiol.*, 1933, **233**, 514.

7 Verzár, F., *Biochem. Z.*, 1935, **276**, 17.