

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 Nagano¹ and of Cori² 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 Verzár⁷ 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.

sponsible for the higher rates of absorption. This paper reports experiments leading to the conclusion that there exists still another group of substances of great physiological importance, the amino acids, which likewise leave the intestine with greater velocity than could be expected from simple diffusion.

The experiments were carried out with starved rats under nembutal anesthesia. In each experiment, a loop of the small intestine was isolated by ligatures and filled successively with equal volumes of equimolar solutions of a number of indifferent lipid-insoluble organic substances. After identical intervals the loop was emptied and rinsed with Ringer. After precipitation with tungstic acid the organic residue was determined, mostly by the Kjeldahl method, since the majority of the experiments dealt with amino acids as compared with amides.

If membrane diffusion is the only factor in intestinal absorption, the absorption rates of substances of the same molecular volume (m.v.) would be the same, while those of substances of different m.v. would decrease in the order of rising volumes. An illustration of the latter is found in the following experiment, in which 3 amides: acetamide (69), lactamide (98) and succinamide (126) were compared. The numbers in brackets are the m.v. calculated by applying the formula of Kopp. The percentages of absorption were found to be: 69, 30 and 5.

In experiments concerned with the comparison of amino acids and other organic compounds it must be taken into account that the diffusion coefficients of the amino acids fail to correspond to the calculated m.v., the diffusion rate being definitely smaller than expected. The reason is that the "Zwitterions" of the amino acids are strong dipoles, which, by exerting a vigorous pull on the surrounding water dipoles, form a more or less stable shell of water around the molecules. From diffusion experiments with collodion membranes carried out at our suggestion by Schmengler⁸ it can be concluded, that, for instance, glycine (76.5) penetrates the collodion membrane nearly as slowly as malonamide (104.4), alanine (98.5) as slowly as xylose (153.4), asparagine (134.2) much more slowly than xylose (153.4), leucine (164.5) slower than mannitole (189.2). If the amino acids behave in a similar manner in absorption, alanine ought to pass the intestinal wall much more slowly than malonamide. But such is not the case, since, for example, the percentage absorption of alanine (98.5) is 59.1, of malonamide (104.4) 25.6. Still more striking is the fact that as-

⁸ Schmengler, F. E., *Pflüger's Arch. f. d. ges. Physiol.*, 1933, **232**, 591.

paragine (134.2), in spite of a higher calculated m.v., penetrates the intestinal wall far more rapidly than malonamide (104.4), the percentages of absorption being 61.6 and 16.8 respectively. In another experiment, in which succinamide (126.4), asparagine (134.2) and xylose (153.4) were alternately placed in the same loop, the percentages of absorption were found to be 9.2, 46.2 and 7.7. Finally, when a mixture of malonamide plus xylose is compared with asparagine plus xylose, the following percentages of absorption are observed: malonamide plus xylose 11.7 and 13.3 respectively, asparagine plus xylose 65.6 and 10.7 respectively.

These results as well as others suggest that the amino acids, like some hexoses, exhibit preferential intestinal absorption. It may be that, in both cases, specific cellular mechanisms favoring the entrance of particularly useful substances into the body are involved. This also seems to be true of the reabsorption of substances by the kidney tubules, which, at least in the case of the frog, have been shown to retain selectively Cl ions, some hexoses (chiefly glucose and galactose) and amino acids.

The next step in our investigation will be directed towards the elucidation of the mechanism effective in the selective absorption.

8671 P

A New Rapid Method for Direct Typing of Pneumococcus in Sputum of Pneumonia Cases.

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The diagnostic laboratory is not lacking in reliable methods for the typing of pneumococcal pneumonias.^{1, 2, 3} Most noteworthy, perhaps, is the Neufeld method⁴ which affords direct typing of pneumococci in the sputum by a "Quellung" or swelling of the bacterial capsule in the presence of the type-specific antiserum. In this preliminary report we shall briefly outline the technique and the merits of a new method.

¹ Avery, O. T., *J. Am. Med. Assn.*, 1918, **70**, 17.

² Kohn, L. A., *J. Am. Med. Assn.*, 1925, **84**, 1733.

³ Rosenthal, L., and Sternberg, B., *J. Lab. and Clin. Med.*, 1929, **15**, 78.

⁴ Cooper, G. M., and Walter, A. W., *Am. J. Pub. Health*, 1935, **25**, 469.