the tissues or endocrines. The reduction in vitamin C in the cerebrum was too small to be significant. There were no changes in the heart, and the results on the thyroid and pituitary are too irregular to warrant any conclusions at this time. In the adrenals there was a reduction of 42 to 44%; in the thymus, 54 to 58% reduction; in the liver 30 to 50% reduction; and in the kidney 47 to 52% reduction in ascorbic acid. These calculations were made from results obtained on fresh tissue.

When there was gain in body weight in presence of thyroxine because of the additions of the B vitamins, there was only 10% reduction in vitamin C content of the adrenals. In the case of the thymus, liver, and kidney, however, the protective action of the B vitamins against vitamin C losses was only partial. Possibly the entire protection against vitamin C losses in the latter endocrine and tissues can be achieved only by vitamin C additions to the rat's diet. Such work is in progress.

It is of interest to note that Aszodi of Hungary has recently found changes in hemoglobin, red blood cells, and differential count in scurvy in guinea pigs to be identical with that of hyperthyroidism produced in the same animal.[3] Harris and Ray[4] reported extreme losses of ascorbic acid in the adrenals of scorbutic guinea pigs. Our similar findings indicate that in experimental hyperthyroidism produced by feeding toxic doses of thyroxine we have produced a vitamin C disturbance in the rat encountered by other investigators in scurvy in the guinea pig. Detailed results will appear *in extenso* elsewhere.

9677 P

Protective Effects Against Lethal *Streptococcus hemolyticus* of Glutamine and Various Sulfonamide Compounds.

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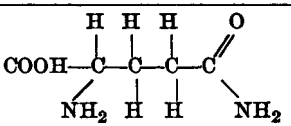
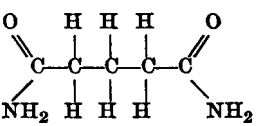
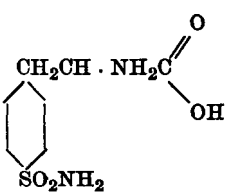
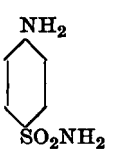
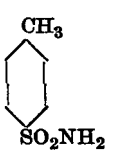
A total of 72 rabbits were inoculated with 1.0 cc. of a suspension of *Streptococcus hemolyticus,* sufficiently virulent to produce lethal effects within one week or less. Animals weighing approximately

[3] Aszodi, Z., *Klin. Wochenschrift,* 1937, **20**, 715.

[4] Harris, L. J., and Ray, S. N., *Biochem. J.,* 1933, **27**, 303.

2 kg. each were used; all had the same diet; droppings were screened, and cages, screens, and pans were sterilized daily. The animals were divided into 6 groups of 12 each, and 48 hours after inoculation, the first 5 groups were given initial intravenous injections with 1.0% solutions of para-amino-glutamine, D-glutamine, phenyl-alanine sulfonamide, sulfanilamide (prontylin), and para-tolyl-sulfonamide, respectively, *i. e.*, one drug to each group. The sixth group was used as a control. In the first 5 groups 2.0 cc. doses, given intravenously, were administered 4 times daily for 6 days, and the deaths and survivals were recorded for each group.

TABLE I.

Group*	Drug (administered 48 hrs. after inoculation)	Chemical Formula	Effect of daily dosage 1% solution in 8 cc. per animal for 6 days		
			No. of animals given drug	Deaths	Survivals after one month
1.	D-glutamine		12	12	0
2.	Para-amino-glutamine		12	12	0
3.	Phenyl-alanine sulfonamide		12	0	12
4.	Sulfanilamide (Prontylin)		12	3	9
5.	Para-tolyl-sulfonamide		12	6	6
6.	None—Control		0	12	0

* There were 12 animals in each group, and all 72 in all 6 groups were inoculated with ordinarily lethal doses of *Streptococcus hemolyticus.*

Tabulation of the relative protective action of these drugs against ordinarily lethal doses of *Streptococcus hemolyticus* shows the following (Table I).

The Prontylin and para-tolyl-sulfonamide were selected because of the former's (NH_2) and the latter's (CH_3) groups. The results in these experiments show that in these drugs the substitution of the (CH_3) for (NH_2) in sulfanilamide reduced, to a definite extent, the protective action of this drug. Phenyl-alanine-sulfonamide was found to protect rabbits from ordinarily lethal inoculations of *Streptococcus hemolyticus* even more completely than sulfanilamide; this substance did not show any toxicity in the doses given while sulfanilamide definitely showed some toxicity. The acid amide group ($CO.NH_2$) has no protective action compared with the glutamine structures.

Conclusions. 1. The protective action induced in rabbits against the lethal effects of *Streptococcus hemolyticus* infections depends chiefly on the presence of the SO_2NH_2 group, not so much on the free NH_2 group. 2. Phenyl-alanine-sulfonamide was found to exert a more complete protective action against ordinarily lethal inoculation in rabbits of *Streptococcus hemolyticus* suspensions than the better known sulfanilamide.

9678 P

Absorption of Insulin by Yeasts.

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The absorption experiments were performed in the following manner: a cake of fresh yeast (Fleischmann) was suspended in 40 cc. of physiological salt solution, vigorously shaken for a few minutes, and centrifuged. The supernatant fluid was discarded. This procedure was repeated in order to remove extraneous matter present in the cake. The washed yeast cells were tested on a slide for viability by mixing a drop of the yeast suspension with a drop of Loeffler's methylene-blue solution and examining microscopically. Viable cells remained unstained, while dead cells readily took up the dye. Usually, only about 5-10% of the cells were stained. If the percentage of dead cells was higher, the cake was not used.

The washed yeast cells were suspended in a mixture of 20 cc. of