soy bean contains very little carbohydrate and even the small amounts present are used up by the fungus, in the process of development, for energy purposes, the extract is practically free from sugars and can be introduced into diabetic cookery.

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Specific immunological reactions of Bence-Jones proteins.

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A Bence-Jones protein which crystallized spontaneously from the urine of a patient (R.) at the Mayo Clinic in 1920 furnished material unusually well suited to the investigation of some of the problems associated with Bence-Jones proteinuria. With this specimen of the protein, which was purified by recrystallization, immunological studies were undertaken to discover, if possible, (1) a difference between various specimens of Bence-Jones protein, and (2) a difference between Bence-Jones protein and the proteins of human blood serum.

In the past, the few immunological studies on Bence-Jones protein have been directed solely toward the differentiation of human serum proteins from Bence-Jones protein. With the exception of Massini (1911), who was able to show by complement fixation tests specific distinctions between human serum and Bence-Jones protein in different zones of dilution, these investigations have apparently indicated that Bence-Jones protein and human serum proteins are immunologically indistinguishable. As in Abderhalden's (1905) experiment, these results have been attributable undoubtedly to the use of mixtures of proteins. Recently, Hektoen (1921) has published a preliminary note on his experiments which prove that by the absorption of precipitins specific reactions can be obtained even when mixtures are used, which sharply differentiate Bence-Jones protein from the proteins of human blood serum.

The work to be reported here was completed before the appearance of Hektoen's paper.

Studies were made upon 13 preparations of Bence-Jones protein from various sources and prepared in various ways. Comparative studies of these preparations and of human serum were carried out by the use of precipitin, complement fixation and anaphylactic reactions.

Precipitin Reactions.—Rabbits were injected intravenously with solutions of the crystalline Bence-Jones protein, an ammonium-sulphate preparation of a non-crystallizable specimen of this protein from another source, and with human serum. After immunization, the serum of these animals contained precipitins which flocculated the homologous antigens in high dilutions. In the series of comparative precipitation tests, all the solutions of Bence-Jones proteins were used in a concentration of 4 per cent., and from this dilutions were made. The hydrogen-ion concentration of the fluids and the environmental conditions were uniform. Readings of precipitation were made by the ring tests after 1 hour at room temperature, and again after 24 hours at 37° C. The antiserum to the crystalline Bence-Jones protein precipitated a 1 to 1,000,000 dilution of a 4 per cent. solution of this preparation, affected only slightly or not at all the other preparations from other sources, and gave no trace of precipitate with human serum. By the use of this purified preparation of Bence-Jones protein, therefore, it was possible to show at once that there are differences between various Bence-Jones proteins as regards their precipitability by an antiserum to one substance of this class, and that there is a sharp immunological distinction between Bence-Jones protein and human serum. Corroboration of these findings came next through the use of the antiserum to the non-crystallizable Bence-Jones protein. This serum did not precipitate the crystalline Bence-Jones protein, variously affected the solutions of the other preparations, and gave a precipitate with human serum at 1 to 1000. Antihuman serum did not precipitate the solution of the crystalline Bence-Jones protein, but gave precipitates with the urines of several patients with Bence-Jones proteinuria, and with all of the salted-out preparations of Bence-Jones protein.

Complement Fixation Reactions.—The usual antisheep amboceptor system with guinea pig complement was used and all controls were made with quantities of solutions double those used in

the tests. In general, complement fixation tests like the precipitin reactions, showed differences between the various preparations of Bence-Jones protein, a cross-reaction between human serum and the salted-out specimens of non-crystallizable Bence-Jones protein, and a complete difference between the crystalline Bence-Jones protein and blood-serum.

Anaphylactic Reactions.—It was difficult to sensitize guinea pigs to the crystalline Bence-Jones protein, though not to the other preparations, indicating again an antigenic difference in that respect. Guinea pigs were sensitized actively by the intravenous injection of 0.25 c.c. of a 6 per cent. solution of the various Bence-Jones proteins, and by 0.25 c.c. of human serum. Some animals were passively sensitized by the intraperitoneal injection of the antiserum to the crystalline preparation. Three weeks after the first injection of protein or human serum in the series of actively sensitized animals, these guinea pigs were tested in two ways for specific sensitivity. The reaction of the animal as a whole was used when the intoxicating dose was given intravenously or intraperitoneally, and the method of Schultz and Dale was used with the uterine horns of the guinea pigs to provide graphic records of the experiments. These reactions also demonstrated (1) differences between the various Bence-Jones proteins, (2) a mixture of human serum proteins and Bence-Jones proteins in the preparations made in the attempt to salt-out Bence-Jones protein from the urine, and (3) complete difference between the crystalline Bence-Jones protein and human serum. (Demonstration of charts of precipitin and anaphylactic reactions.)

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On the influence of tissue enzymes on the bacteriophage principle.

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I have previously reported before this Society the isolation of a lytic principle active against typhoid and dysentery bacilli obtained by the d'Hérelle technique from the filtrate of a stool from