water or ammonia solutions, they readily form the sheaf-like bundles so characteristic of tyrosin.

They are soluble in boiling water, N/10 ammonia, and dilute mineral acids, slightly soluble in dilute acetic acid and relatively insoluble in cold water, cold and hot absolute alcohol, ether, toluene, acetone, benzine, carbon disulphide, glycerine and chloroform. They are not decomposed in aqueous solution by heating in the Arnold sterilizer at 100° C. or in the autoclave at 15 lbs. pressure for 1 hour.

They give Pirie's, Hoffmann's and Denige's tests.[1]

The senior author is now engaged in perfecting the method of extraction and in studying the crystal formation of other anaërobes.

23 (1770)

A method for the preparation of cystin.

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A number of years ago Folin[2] described an improved method for the preparation of cystin which has come into general use. It is based on the fact that the solubility of cystin is a minimum in solutions possessing an acidity between P_H 4–5. To obtain the optimum acidity for the precipitation of cystin, the HCl used to hydrolyze the protein is neutralized by the addition of sodium acetate. Although good yields of the amino acid are obtained by this method it nevertheless is not economical for the production of cystin in quantity since large amounts of relatively expensive materials are required. Neutralization of HCl with sodium acetate results in the simultaneous precipitation of humin which later necessitates the repeated use of large quantities of charcoal to effect its removal.

In the method described below the HCl is in large part recovered by vacuum distillation. Use is then made of commercial finishing lime to neutralize the remaining HCl, to precipitate

[1] Hammerstein-Mandel, "A Text-book of Physiological Chemistry," J. Wiley & Sons, N. Y., 1912, p. 150.

[2] Folin, O., *J. Biol. Chem.*, 1910, viii, 9–10.

the humin[1] and to hold the cystin in solution. The advantage in the use of lime lies in the fact that it is comparatively insoluble, gives a solution of low alkalinity, thus minimizing the destruction of cystin, and is cheap.

Human hair or wool which has been freed from oil by extraction with gasoline is hydrolyzed by heating at 100° C. with twice its weight of concentrated HCl. It requires about 12 hours to effect complete hydrolysis. The mixture must not be heated for any length of time beyond the point at which the biuret test is either negative or feebly positive since, as Van Slyke[2] has shown, cystin is destroyed during the process of hydrolyzing the protein. The greater part of the protein is removed by distilling in vacuo at a temperature between 60–70° C. and the original volume of the solution is restored by the addition of water. A thick aqueous suspension of commercial finishing lime is now slowly added, care being taken to avoid any considerable rise in temperature, until the mixture has acquired a chocolate color. It is then filtered by suction through a Buchner funnel and the residue washed a number of times with distilled water. The filtrate should be clear and possess a light brown color. Hydrochloric acid is now added to partially neutralize the alkaline solution and it is finally acidified by addition of acetic acid. On standing over night in the ice chest, sedimentation of the crude cystin takes place. This is filtered off and is dissolved in a minimum quantity of 5 per cent. HCl. The solution is decolorized by boiling for several minutes with a small quantity of charcoal which has been previously boiled with HCl to remove the calcium phosphate, and the cystin is precipitated by the addition of sodium acetate to the hot solution until a drop of the solution ceases to turn congo red paper blue. The mixture is filtered at once and the cystin is washed a number of times with hot water to completely remove the last traces of tyrosin. Typical hexagonal plates of cystin are obtained.

To compare the relative yields of cystin by the method of Folin and the above-described method, 1.3 kilos of human hair were hydrolyzed and divided into two equal parts. The yield of

[1] Hanke, M. T., and Koessler, K. K., *J. Biol. Chem.*, 1920, xliii, 521–526.

[2] Van Slyke, D. D., *J. Biol. Chem.*, 1911, x, 38.

cystin isolated by the Folin method was 7 per cent., while the lime method gave a yield of 6.3 per cent.

24 (1771)

A globulin as the principal protein of the pecan nut: Its chemical and nutritive properties.

By F. A. CAJORI (by invitation).

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Pecan meal, prepared by removing the oil from the whole shelled nut, was extracted with 10 per cent. sodium chloride solution. This extract containing the proteins of the meal was subjected to fractional precipitation with ammonium sulfate and fractional coagulation by heat. The results indicate that the large part of the protein of the pecan nut is a globulin. This globulin has been isolated and purified and the distribution of its nitrogen determined by the Van Slyke method. Large amounts of basic amino-acids were found to be present in this globulin. It gives a strongly positive test for tryptophane. In general the analysis agrees fairly well with the recently published results of Dowell and Menaul [1] on mixed pecan proteins.

Normal growth has been observed in young rats on diets in which the protein of the ration was derived from the pecan nut, indicating that this nut furnishes adequate quantities of those nitrogenous complexes necessary for growth. In order to render pecan nut diets suitable as rations for rats, it was found necessary to remove the outer layer of the nut since this layer contains large amounts of tannin. Previous failure to observe normal growth in rats on pecan nut diets may be ascribed to the injurious or distasteful effect of the tannins that were present in those diets, and not to an inadequacy of amino-acid yield of the protein of this nut.

[1] Dowell, C. T., and Menaul, P., *J. Biol. Chem.*, 1921, xlvi, 437.