United States Patent Office 3,698,912 Patented Oct. 17, 1972

3,698,912

PROCESS FOR MAKING NUTRIENT COMPOSITION

Milton Winitz, Palo Alto, Calif., assignor to Morton-Norwich Products, Inc., Chicago, Ill.

No Drawing. Continuation-in-part of abandoned application Ser. No. 705,299, Feb. 14, 1968. This application July 1, 1969, Ser. No. 838,338

Int. Cl. A23l 1/42

U.S. Cl. 99—14 23 Claims

ABSTRACT OF THE DISCLOSURE

A process for making palatable nutrient compositions for human consumption which contain all of the essential amino acids plus non-essential amino acids in nutritionally balanced relationship. Aqueous solutions of acid- or enzyme-hydrolyzed proteins provide a starting point for the process.

This application is a continuation-in-part of my application Ser. No. 705,299, filed Feb. 14, 1968, now abandoned.

This invention relates to amino acid formulations designed for human consumption to supply essential amino acid requirements, and more particularly to processes for making palatable amino acid formulations from protein hydrolysates.

Proteins are high molecular weight, highly complex polymers composed of a variety of the so-called essential and non-essential amino acids. Utilization of protein by the animal organism requires that the protein be degraded by the proteolytic enzymes of the gastrointestial tract to the constituent individual amino acids because the amino acids can be absorbed through the gastrointestinal tract only in the free, uncombined form. The essential amino acids, of which there are considered to be ten in number (leucine, isoleucine, valine, methionine, tryptophan, phenylalanine, threonine, arginine, lysine, histidine), are a vital requirement of the animal species. For a dietary regimen to be considered adequate for the support of all normal physiological functions, it should contain these essential amino acids in the appropriate levels and in the proper proportion of one to the others. The function of the non-essential amino acids is to provide a source of metabolizable nitrogen required by the animal organism for the biosynthesis of proteins, purines, nucleic acids, and other metabolites. Examples of non-essential amino acids include alanine, cysteine, cystine, glycine, proline, glutamic acid, tyrosine, aspartic acid, and serine. Proper nutritional balance requires that these non-essential amino acids be provided in sufficient quantity and within a range of proportions to each other that is less restrictive or critical than the balance required for the essential amino acids.

Amino acids (except glycine) contain one or more asymmetric centers and thus may exist in two or more stereoisomeric forms. Nutritional experience has shown that only the L-isomer of an amino acid can be utilized by the animal organism and that the animal organism has only a vey limited capacity for enzymatically converting some amino acids to the L form from the D form. In addition, an over-supply of D-amino acids can be deleterious and can lead to an inhibition of the normal physiological function. All proteins found in nature contain their constituent amino acids in the L configuration only.

This invention is concerned with processes for the preparation of palatable and nutritionally balanced protein hydrolysates for nutritional support of humans and

suitable for admixture with other nutritional ingredients such as carbohydrates, minerals, vitamins and fats. Synthetic foodstuffs containing such protein hydrolysates are of particular use in the nutritional support of infants who possess food allergies, of people who cannot chew because of oral surgery, of patients who are unable to digest proteins because of pancreatic insufficiency or other gastrointestional conditions which impede protein digestion, of patients who must be fed via naso-gastric tube, and of people who suffer from severe protein malnutrition. In the formulation of such synthetic foodstuffs containing protein hydrolysates, it is necessary to ensure that they possess both a high degree of nutritional adequacy and are sufficiently palatable to the human taste to permit their ingestion over a prolonged period of time.

Since the turn of the century, a good deal of research has been directed toward the development of an amino acid-based dietary regimen that would be both nutritionally balanced and palatable to the human. Such efforts were concerned almost exclusively with the use of protein hydrolysates as the source of amino acids. (Protein hydrolysates are mixtures of amino acids derived through hydrolysis of proteins, e.g., casein, lactalbumin, soy bean protein, by employing alkali, a strong mineral acid, or a proteolytic enzyme as the hydrolytic agent). Amino acid-based diets prepared with such protein hydrolysates have invariably been found to possess highly objectionable taste properties, which classically have been erroneously attributed to the amino acids themselves, rather than to certain degradation products which arise during the process of hydrolyzing proteins.

It has been found that the palatability of amino acid mixtures can be significantly enhanced if the concentrations of certain of the components in these mixtures are kept below certain levels. These components include glutamic acid and its salts, the sulfhydryl group of certain amino acids, and the lower alkyl mercaptans which are associated with or arise from the degradation of methionine.

It is an object of the present invention to provide a process for preparing palatable nutrient compositions using protein hydrolysates as the starting materials. It is a further object to provide simple and expedient processes for utilizing readily available protein hydrolysates in the formation of palatable aqueous solutions or dry mixtures containing balanced amounts of all of the essential amino acids plus non-essential amino acids. These and other objects of the invention will be apparent from the following detailed description of processes embodying various features of the invention.

It has been found that a formulation containing amino acids is unpalatable if it contains lower alkyl mercaptans, such as methyl mercaptan, in such a total amount that an aqueous solution of the formulation would have a concentration greater than about 15 milligrams of such mercaptans per liter of solution, when the pH of the solution is about 3.7. The tolerance level decreases slighaly with increasing pH, with the tolerable concentration being about 7.5 mg./liter at a pH of about 5.7. It has also been found that the sulfhydryl group of the amino acid cysteine likewise detracts from palatability, and there should not be present a sulfhydryl group concentration greater than about 0.05 gram per liter of solution at a pH of about 5.7. The tolerable sulfhydryl concentration decreases at lower pH's, and at a pH of about 3.7 it is about 0.038 g./liter. It has further been found that glutamic acid, or the salts thereof, imparts a strong characteristic flavor to an amino acid formulation, which flavor can render a formulation unpalatable. The flavor is also incompatible with the taste of the other ingredients likely to be used in chemical diets and renders the