MSG Fact from Fiction

Monosodium Glutamate, monosodium glutamate, MSG, glutamate, glutamic acid - separating MSG-fact from MSG-fiction

ON THE SUBJECT OF MANUFACTURED VS. NATURAL GLUTAMIC ACID

OVERVIEW - There are a number of straightforward bold faced lies used by the glutamate industry in defending its contention that exposure to free glutamic acid found in processed food does not cause adverse reactions such as hives, asthma, seizures, and migraine headache; could not possibly cause brain damage, learning disorders, or endocrine disturbances; and could not possibly be relevant to diverse diseases of the central nervous system such as addiction, stroke, epilepsy, schizophrenia, anxiety, depression, and degenerative disorders such as ALS, Parkinson's disease, and Alzheimer's disease.

Central to their argument is the lie that the processed free glutamic acid used in processed food is identical to the glutamic acid found in unprocessed, unadulterated food and in the human body.

The truth of the matter is that the glutamic acid found in unprocessed, unadulterated food and in the human body is composed of one form of a single amino acid, L-glutamic acid, and nothing else. In contrast, the processed free glutamic acid used in processed food is *always* composed of two forms of glutamic acid (L-glutamic acid and D-glutamic acid) and a variety of other chemicals commonly referred to as contaminants. In addition to the D-glutamic acid, contaminants may include, but are not limited to, pyroglutamic acid, mono and dichloro propanols, heterocyclic amines, and peptides. Mono and dichloro propanols and heterocyclic amines are carcinogenic. The consequences of the interactions of these various chemicals are unknown.

Make no mistake. Since processed free glutamic acid (MSG) used in processed food and in plant "growth enhancers" is *not* identical to glutamic acid found in unprocessed, unadulterated food and in the human body, there is no reason to believe that the product called "glutamic acid" by the glutamate industry will be functionally equivalent to pure L-glutamic acid, or to believe that their excitotoxic effects will be identical.

Closely associated with this boldfaced lie are a number of deceptive statements. The first states that all glutamic acid is metabolized identically. From that statement we are encouraged to conclude that processed free glutamic acid (MSG) and the L-glutamic acid found in unprocessed, unadulterated protein are metabolized identically. The truth of the matter is that while the L-glutamic acid portion of processed free glutamic acid (MSG), and the L-glutamic acid found in unadulterated protein may be metabolized identically, metabolism of processed free glutamic acid (MSG) includes metabolism of *all* of the contaminants associated with processed free glutamic acid (MSG). The fact that L-glutamic acid and L-glutamic acid are metabolized identically becomes irrelevant.

There is also the issue of amino acid balance. Metabolism of amino acids, regardless of the source from which they come, is followed by uptake of those amino acids by the body's amino acid transport system. One might think of individual amino acids waiting at the side of a river of

blood for "vehicles" that will transport them to parts of the body where they will be put to work. However, the "vehicles" on which the various amino acids are transported out of the stomach and intestines have a limited capacity. So when unusually or relatively large amounts of one or a small group of amino acids present themselves for transport, there will be competition for the available space, and not all of the amino acids will be accommodated. The possible deleterious effects of this phenomenon, including too much of one amino acid or too little of another, have been ignored by the proponents of the safety of processed free glutamic acid (MSG).

Deceptive, also, is the often-repeated excuse that both processed free glutamic acid (MSG) itself, and the components of processed free glutamic acid (MSG) are "naturally occurring." By FDA definition, any ingredient or constituent of an ingredient that comes from a plant or animal source is "naturally occurring." Thus, arsenic and hydrochloric acid are both naturally occurring. You will not, however, find them used as food ingredients. Similarly, hydrochloric acid in the human body is essential to normal body function. We don't, however, ingest hydrochloric acid.

Then there is the claim that "just a little won't hurt anyone." Yet, in truth, a little arsenic will harm some people. The peanut residue left on a knife that had been wiped "clean" with a towel was enough to kill a child who was allergic to peanuts. The corn starch or maltodextrin used as binders and fillers in some vitamins, minerals, and medications will cause MSG reactions in acutely MSG-sensitive people. Indeed, no study to determine the least amount of processed free glutamic acid (MSG) needed to trigger an MSG-reaction in MSG-sensitive people has ever been done.

Again. Any small amounts of free glutamic acid that might be found in unadulterated, unfermented, produce will be L-glutamic acid, only, and will not typically cause adverse reactions in MSG-sensitive people. This should not be confused with the glutamic acid that occurs in or on food as a consequence of manufacture, which typically causes adverse reactions in MSG-sensitive people providing that they ingest amounts that exceed their tolerances for MSG. The fact that there may be some unadulterated, unfermented free glutamic acid in processed food or in produce is irrelevant to the fact that processed free glutamic acid (MSG) causes adverse reactions in MSG-sensitive people.

GLUTAMIC ACID (also referred to as glutamate) is an amino acid found in all protein. Following ingestion of protein, and during the course of normal digestion, glutamic acid is released from ingested protein, becoming "free glutamic acid." If sufficient amounts of free glutamic acid are not available for normal body function, the body can create glutamic acid from other amino acids. Humans do not need to eat protein in order to supply the body with the glutamic acid that it needs.

Glutamic acid can also be freed from protein by fermentation, enzymolysis, use of acids, or other manufacturing processes, prior to ingestion.

FREE GLUTAMIC ACID is glutamic acid that has been released from protein. Just as humans have two hands, glutamic acid has two enantiomers (chemically identical molecules with the L-enantiomer being the mirror image of the D-enantiomer). Just like most other alpha-amino acids, glutamic acid contains a stereogenic center and exists as the L- and D-enantiomers.

> "The word chiral, from the Greek word for hand, alludes to molecules that exist in mirror-image versions -- right-handed or left-handed. Although they appear to be identical twins, chiral molecules are fundamentally different. One molecular twin cannot be substituted for the other because they are asymmetrical. The difference is comparable to asymmetry between your right and left hand: One is a mirror image of the other, but you cannot fit your right hand into a left-hand glove."(1)
>
> "Although it has been generally accepted that the free amino acids and proteins found in higher organisms are composed exclusively of the L-enantiomers of amino acids, the mirror image D-forms are known to be present in some naturally occurring peptide antibiotics and in the cell walls of bacteria." (2)

NATURAL FREE GLUTAMIC ACID is glutamic acid that has been freed from ingested protein during digestion, or glutamic acid that has been transaminated (created) from other amino acids. It is also possible that there are some small amounts of natural free glutamic acid associated with intact, unprocessed, unfermented, unadulterated protein. NATURAL FREE GLUTAMIC ACID found in higher organisms is made of L-glutamic acid only.

> "Natural food protein, as well as protein in the human body, contains only l-forms of amino acids." (3)
>
> "Unlike amino acids derived from natural protein, which possess only the structure (S)-12, synthetic amino acids are composed of equal mixtures of (S)-12 and (R)-12." (4) Note: In this paper, (S)-12 refers to the L-amino acids and (R)-12 refers to the D-amino acids.
>
> "There were contrasting views expressed on the use of the various isometric forms (the natural L-form or the commercially available mixtures of DL-forms) of amino acids." (5)
>
> "The chemical structure of L-glutamic acid and related compounds and the chemical composition of MSG are represented in Figure 1....Two possible stereoisomeric forms of glutamic acid exist, D and L. According to Maga (1983) the L form (dextrorotary form with the L-configuration) is the predominant natural form...." (6) (7)
>
> "Because D-amino acids are rare in higher animals..." (8)

MANUFACTURED FREE GLUTAMIC ACID is glutamic acid that has been freed from protein through a manufacturing process prior to ingestion. The general term for the process used to create free glutamic acid in this way is HYDROLYZATION. HYDROLYZED PROTEINS are products that contain unspecified amounts of glutamic acid that has been freed from a protein source prior to ingestion. The amount of free glutamic acid released is dependent on the source protein used and the extent of the hydrolysis.

MANUFACTURED FREE GLUTAMIC ACID is made up of L-glutamic acid and D-glutamic acid, and may bring with it pyroglutamic acid, mono and dichloro propanols (which are carcinogenic), and heterocyclic amines (which are carcinogenic).

> "Foods contain a large assortment of xenobiotics (foreign, unnatural substances) that can have both positive and negative nutritional implications. One example is the occurrence of the uncommon D-stereoisomers of amino acids in some dietary proteins. These D-amino acids are produced from the common L-stereoisomers during food preparation and processing." (9)

In table 1 of a research report by Rundlett and Armstrong, the authors present a list of all of the processed foods analyzed by them for L and D-glutamate (glutamic acid) content. Every one of the 38 processed foods evaluated contained D-glutamate. Three of those analyzed and found to have D-glutamate content were three brands of monosodium glutamate, including Ac'cent Flavor Enhancer, marketed by Pet Incorporated. (10)

"Hydrolysis of proteins in 6 N HCl at 110 degrees centigrade for 24 h inevitably causes racemization of amino acids....Even under milder conditions of hydrolysis using lower temperatures and shorter exposure time, racemization of amino acids occurs." (11)"Savory ingredients like hydrolyzed vegetable protein... have...been produced by....extreme conditions....[that] promote a variety of chemical reactions, thus a range of unwanted by-products are produced as well." (12)

"The chemical hydrolysis with hydrochloric acid is efficient, but almost any organic substance in the raw material is hydrolyzed, resulting in desired reactions such as hydrolysis of proteins, carbohydrates, fats (triglycerides), and the unwanted formation of mono and dichloro propanols (MCP and DCP)." (12)

"Pyroglutamic acid...occurs as a breakdown product of glutamate that can accumulate in foods during storage and processing." (13)

"I have been asked to give testimony on the chemical nature of glutamates in food. The parent compound in the glutamate family is glutamic acid, an amino acid and normal component of the human body....Glutamic acid exists in two forms: (L)-glutamic acid and (D)-glutamic acid. The L and D designations indicate different spatial arrangements of the atoms of the two forms. (D)- and (L)- glutamic acid molecules are mirror images, relating to each other in the same way as a glove for the right hand relates to its mate for the left hand. Just as certain properties of the left-hand glove differ from those of the right-hand glove (e.g., the left-hand glove cannot be worn on the right hand, and vice versa), so (L)-glutamic acid and (D)-glutamic acid differ from each other in certain other properties. For example, in the body, (D)-glutamic acid is not broken down (metabolized) in the same way as the (L) form because the enzymes that recognize and work on the (L) form do not recognize, and, therefore, 'ignore,' the (D) form. Nearly all naturally occurring glutamic acid is in the (L) form." (14)

REFERENCES

1. Bruce V. Bigelow, staff writer, *San Diego Union-Tribune.* October 4, 1995. (Source K. Barry Sharpless)

2. Rundlett, K.L. and Armstrong, D.W.. Evaluation of free D-glutamate in processed foods. Chirality. 1994;6:277-282.

3. Hunter, B.T. The Great Nutrition Robbery. New York, NY: Charles Scribner's Sons, 1978, page 35.

4. Cram, D.J. and Cram, J.M. Host-Guest Chemistry: Complexes between organic compounds simulate the substrate selectivity of enzymes. Science. 1974;183:803-809.

5. Federal Register. Vol 38, No. 143--Thursday, July 26, 1973, page 20037

6. Maga, J.A.. Flavor potentiators. Critical Rev. Food Sci. Nutr. 1983;18:231-312.

7. Life Sciences Research Office of the Federation of American Societies for Experimental Biology. Analysis of adverse reactions to monosodium glutamate (MSG). July, 1995. Prepared for the Center for Food Safety and Applied Nutrition, Food and Drug Administration. Page 9.

8. Konno, R. et al. Origin of D-alanine present in urine of mutant mice lacking D-amino-acid oxidase activity. American Journal of Physiology, 1993, 265:G699-703.

9. Man, E.H. and Bada, J.L. Dietary D-Amino Acids. Ann. Rev. Nutr. 1987;7:209-25.

10. Rundlett, K.L. and Armstrong, D.W. Evaluation of free D-glutamate in processed foods. Chirality. 1994;6:277-282.

11. Konno, R. et al. Origin of D-alanine present in urine of mutant mice lacking D-amino-acid oxidase activity. American Journal of Physiology, 1993, 265:G699-703.

12. Pommer, K. (Novo Nordisk BioChem Inc., Franklinton, NC) Cereal Foods World. October, 1995 Vol 40. No 10. Page 745.

13. Life Sciences Research Office of the Federation of American Societies for Experimental Biology. Analysis of adverse reactions to monosodium glutamate (MSG). July, 1995. Prepared for the Center for Food Safety and Applied Nutrition, Food and Drug Administration. Page 32.

14. Expert Report of Paul M. Kuznesof, Ph.D., Chief of the Chemistry Review Branch in the Division of Product Manufacture and Use, Office of Premarket Approval, Center for Food Safety and Applied Nutrition, FDA. The Report was submitted on September 3, 1996 to the Federal Court in the Eastern District of Missouri re: Truth in Labeling Campaign, et al., vs. Shalala et al., pages 1-3.

Truth in Labeling Campaign, P.O. Box 2532, Darien, IL 60561

adandjack@aol.com 858/481-9333 http://www.truthinlabeling.org