

What Is Monosodium Glutamate and What Effects Could It Have

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Abstract

Sodium glutamate or monosodium glutamate (MSG) is a substance that is found naturally in certain foods but is used in the food industry to enhance flavour. It is one of the most frequently encountered non-essential amino acids and is found, among others, in tomatoes, milk, mushrooms, fish or cheese. Sodium monoglutamate is a white, odourless and crystalline powder and is known as E621 or MSG. It is the most widely used flavour enhancer. Flavour enhancers are compounds that do not have their own flavour but are activated when combined with spices or flavoured foods. The MSG is a sodium salt of glutamic acid, a naturally occurring non-essential amino acid. Glutamic acid is a monoamino-dicarboxylic amino acid (acidic character), being one of the 20 proteinogenic amino acids. Its codons are AGA and GAG. This is a non-essential amino acid.

Keywords: Sodium glutamate; monosodium glutamate; non-essential amino acids; flavor enhancer

Introduction

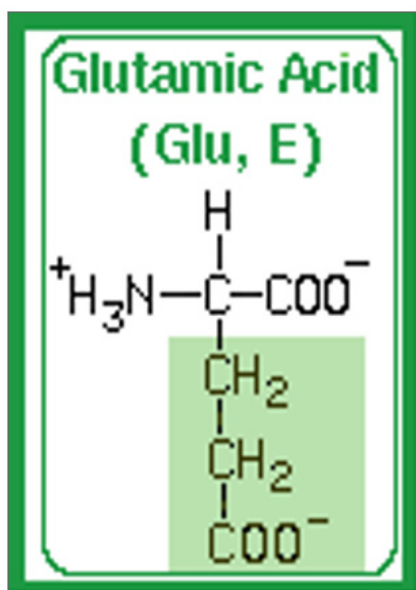


Figure 1: Structure of glutamic acid [$C_5H_9NO_4$].

L (+) glutamic acid (α -amino glutaric acid) according to figure 1, is widespread in plant proteins. Its amide glutamine, like asparagine, serves the biosynthesis of plant proteins. Glutamine is found in a free state in algae, in fruits and sugar beets, where its presence, like that of asparagine, reduces the yield of production,

because it prevents the crystallization of sugar [1]. Glutamic acid, a non-essential amino acid, derives from the transamination of glucose or by reductive amination, catalysed by glutamate-dehydrogenase. Glutamic acid can be the precursor of proline, arginine and glutamine (non-essential amino acids) [2].

Through decarboxylation catalysed by pyridoxal-phosphate, gamma-aminobutyric acid (GABA) is formed. The catabolism of glutamic acid leads to the formation of α -Ceta glutaric acid, a compound of the tricarboxylic acid cycle.

Glutamine, a non-essential amino acid, can be obtained from glutamic acid and can be converted to glutamic acid. By incorporating NH₃ into the glutamine molecule, it becomes non-

toxic and easy to transport. Glutamic acid together with L (+) Cysteine (α -amino- β -thiopropionic acid) and glycine constitute glutathione (tripeptide) [3].

The E621 was discovered at the beginning of the 19th century in Japan and is widely used in Chinese, Japanese and Thai cuisine. This additive is also widely used in other countries, as a flavour enhancer in various foods and spices. is the sodium salt of glutamic acid, an amino acid very common in nature. Since its discovery it has been produced by 3 methods:

- hydrolysis of vegetable proteins with the help of hydrochloric acid 1909-1962.
- direct chemical synthesis 1962-1973.
- bacterial fermentation – current method [4].

Much of the world's MSG production is produced using the latter method, but in some countries the other two methods are also used [5]. Glutamic acid and its salts can be found under the following names: potassium glutamate; glutamic acid; yeast extract; calcium caseinate; sodium caseinate; E 621; hydrolysed vegetable proteins; soy extract; protein isolate; sodium glutamate; monopotassium glutamate, etc.

Effects of consuming foods containing monosodium glutamate (E621)

E621 is considered a safe additive by the FDA and the EU and does not have a maximum dose per Kg of food. This dose cannot be increased very much by food manufacturers because sodium glutamate in very large amount damages the taste of food. For example, in the case of instant soups, a concentration higher than 1g E621/100 ml soup cannot be used because the soup loses its pleasant taste. I consider 1 gram to be quite a large amount though [6].

Regarding the safety of this additive, opinions are divided:

- The FDA and EU consider it safe and accept studies showing that it may cause a small number of people, 1-2%

of those who consume it, transient effects such as headache, numbness of the limbs, facial flushing, muscle constriction and fatigue. The FDA and EU reject claims of its carcinogenic potential.

- other organizations state that sodium glutamate is carcinogenic, addictive, causes obesity and affects certain brain functions in mice (in human tests this effect could not be observed).

The most common effects of are headaches, numbness of the limbs, flushing, muscle spasms, worsening of asthma and fatigue. These symptoms form a complex of symptoms called 'Chinese Restaurant Syndrome'. It is so called because the symptoms have been observed after eating food from these restaurants that use glutamate in abundance to enhance the flavour of the food [7].

It is used as a food additive and is usually sold as a taste enhancer. It has HS code 29224220 and code E621. In commerce it is also used under the names Ajinomoto, Vets in, Accent and Tasting Powder. It comes from bacterial fermentation. Sodium glutamate or is a substance that is found naturally in certain foods but is used in the food industry to enhance flavour. It is one of the most frequently encountered non-essential amino acids and is found, among others, in tomatoes, milk, mushrooms, fish or cheese. In the food industry, sodium glutamate is also known as MSG or E621. Its role is to intensify the flavour of the dishes, because it has the chemical ability to enhance the aromas. Moreover, sodium glutamate itself has no taste, but it is activated when it is combined with spices or aromatic foods [8].

MSG was originally created by the Japanese biochemist Kikunae Ikeda, and later perfected in numerous laboratories. The idea started from Ikeda's desire to highlight the flavour of kombu, edible seaweed used in Asian soups. He thus managed to obtain a substance that "tricks" the brain and makes it perceive the taste much stronger [9].

The Federation of American Societies of Experimental Biology (FASEB) carried out a study for the FDA in 1995 and established that MSG is not dangerous when consumed within the limits established by law. Certain peculiar symptoms have been observed in the case of some patients who were exposed to a dose of 3 grams of sodium glutamate in the absence of food, but the data are not considered conclusive enough to classify MSG as harmful. These symptoms were also not observed when MSG was administered with food. According to the report, there are no data confirming the role of glutamate in the occurrence or complication of chronic diseases [10]. Glutamic acid is an amino acid produced by the human body; it does not need external sources. It is used by the brain as a neurotransmitter and by the intestines as a source of energy. Some studies have highlighted a neurotoxic potential of glutamates on children and even on adults, while other studies have not. However, the neurotoxic potential is real, because glutamate (like the aspartate in Aspartame) is a neurotransmitter, and the blood-brain barrier, which protects the brain from excess toxins and neurotransmitters, is not sufficiently developed in children, and in adults it may not protect all brain areas or be damaged [11].

Thus, glutamate turns into a so-called excitotoxin, which excessively stimulates neurons, destroying them irreversibly. Glutamic acid and glutamates are the most important and intensively used additives in Japanese and Chinese cuisine. It is used to accentuate the aroma and natural taste of food. They give the taste “umami” (delicious in Japanese), considered to be the fifth basic taste, along with sweet, sour, salty and bitter [12]. They can thus be added to any food, including alcoholic or non-alcoholic drinks in a proportion of up to 1%, thus allowing the reduction of the required amount of salt. A proportion higher than 1% will not be able to accentuate the taste more, but it can distort it, which, however, will not prevent the excess. They can thus be added to any food, including alcoholic or non-alcoholic drinks in a proportion of up to 1%, thus allowing the reduction of the required amount of salt. A proportion higher than 1% will not be able to accentuate the taste more, but it can distort it, which, however, will not prevent the excess [13].

The consumption of sodium glutamate is, however, associated with the accumulation of extra pounds. A study done on rats showed that sodium monoglutamate increases the risk of obesity. Radically influences our taste and, not infrequently, we notice that the food we cook at home does not taste the same as the food at the restaurant. Avoid semi-preparations as much as possible and carefully read the ingredient lists! If you don't want to consume sodium monoglutamate, also avoid fast food. In general, fast-food products, such as French fries and even carbonated drinks served in such restaurants, contain large amounts of sodium monoglutamate.

The MSG symptom complex was originally named “Chinese Restaurant Syndrome” when Kwok reported symptoms in patients who ate Chinese food. Kwok suggested several possibilities behind the symptoms these subjects had including alcohol from cooking with the wine, sodium content, or seasoning with MSG. Despite these suggestions, the focus was on MSG and the symptoms that were occurring were associated with this food additive. A report by the Federation of American Societies for Experimental Biology (FASEB) compiled in 1995 for the benefit of the US Food and Drug Administration (FDA) concluded that MSG can be safely consumed in regular amounts [14].

Conclusion

Regardless of whether or not you believe that sodium glutamate can cause health problems, it is important to know that the more natural the food, the healthier it is. Therefore, adopt a diet as natural as possible, if possible, even based on foods of organic origin. Cook it yourself, at home, to prevent unwanted consumption of flavour enhancers or other substances. By preparing food at home, you have control over the ingredients you use, which means that you do not give the body substances of questionable quality, whose effects are still controversial in the medical field.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgement

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