

What is sodium glutamate and what effects it has on health

Abstract

Sodium glutamate or monosodium glutamate is a substance found naturally in certain foods, but it is a compound used in the food industry to enhance the flavor. The compound is a non-essential amino acid, which is contained in tomatoes, milk, mushrooms, fish or cheese. In the food industry, sodium glutamate is also known as MSG or E621. Its role is to enhance the flavor of the dishes, as it has the chemical ability to enhance the flavor. In fact, MSG itself has no taste, but it is activated when it is combined with spices or flavored foods.

Keywords: sodium glutamate, tomatoes, milk, mushrooms, glutamic acid

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Abbreviations: MSG, Monosodium glutamate; NMDA, N-methyl-D-aspartate; ALS, amyotrophic lateral sclerosis.

Introduction

Monosodium glutamate (MSG) was discovered in the early 19th century in Japan and is extensively used in Chinese, Japanese and Thai cuisine. This compound is widely used all over the world as a flavor enhancer in food and spices. MSG was located by biochemist Kikunae Ikeda (Japanese biochemist), and later perfected in many laboratories. The idea came from Ikeda's desire to enhance the aroma of kombu, the seaweed used in Asian soups. Biochemist Kikunae Ikeda has thus managed to obtain a substance that "falsifies" the brain and makes it perceive the taste much stronger. MSG is the sodium salt of glutamic acid, an amino acid that is naturally found in the plant and animal kingdom.^{1,2} Since its discovery, MSG has been produced through three methods:

- hydrolysis of vegetable proteins using hydrochloric acid 1909-1962;
- direct chemical synthesis 1962-1973;
- bacterial fermentation - the current method.^{3,4}

Much of the world production of MSG is produced using the latest method, but in some countries the other two methods are also used. Glutamic acid and its salts can be found under the following names: calcium caseinate; E621 (according to European regulations), glutamate monosodium, glutamate sodium, glutamic acid; glutamate sodium, hydrolysed vegetable proteins; potassium glutamate; sodium caseinate; soybean extract; yeast extract. It is made from molasses by fermentation, monosodium glutamate being the sodium salt of glutamic acid.^{1,5,6}

Is it dangerous sodium glutamate?

One of the circulating myths, linked to MSG, is the "Chinese Restaurant Syndrome", which occurred after a patient accused of headaches and discomfort after having consumed dishes from a Chinese restaurant where it was used substance to improve the taste of the preparations. However, no study validated this hypothesis and

the use of MSG within normal limits is not considered hazardous to health. There are, however, a small number of patients who, following the use of MSG, report symptoms such as abdominal sweating, chest pain, headaches, hot flushes, nausea, tachycardia, weakness.^{4,7}

The European Union, MSG, is a food additive E621, authorized in certain foods and subject to quantitative limits.³ A study conducted in 1995 by the Federation of American Society of Experimental Biology (FASEB) for the FDA has determined that MSG is not dangerous when consumed beyond the established limits. Some symptoms have been observed in patients who have been exposed to 3 grams of MSG in the absence of food, but data are not considered conclusive enough to consider MSG as harmful. These symptoms were also not observed when MSG was taken with food. According to the report, there is no data that confirms the role of MSG in the occurrence or complication of chronic diseases. Consumption of MSG is, however, associated with the addition of extra pounds. A study done on rats showed that MSG increases the risk of obesity. MSG radically influences taste.⁸⁻¹⁰

In general, fast-food products such as fried potatoes and even carbonated drinks served in such restaurants contain large quantities of MSG. In the past 40 years, studies have been published that describe various reactions induced by the use of MSG. These studies have raised concerns about the safety of MSG food consumption. While many studies have failed to demonstrate that eating is responsible causing major allergies or medical problems in the population, physicians allergologists are being careful to analyse patients suspected of having developed allergic reactions to MSG.^{11,12}

In the past, MSG was extracted from foods rich in protein such as algae. Currently, MSG is produced by an industrial fermentation process. It is a flavor enhancer that we find in the enamel, most of the Asian dishes, sauces, soups, spices, etc. In fact, MSG is a brain-stimulating neurotransmitter that stimulates appetite and, in large quantities, can cause symptoms that vary according to the ingested dose and the sensitivity of the individual: from a simple discomfort (generally 1-2 days after ingestion) to syncope (sudden, temporary or definitive cessation of heart function, breathing disruption and loss of sensitivity and voluntary movements). It can also pose problems for people suffering from asthma.¹³⁻¹⁵

Add MSG to the food to give it a certain flavor, but some researchers think this flavor enhancer shortens our life a few years. MSG “tickles” taste buds, but researchers think it does more than that. Many foods with low lipid content are so fading that food industry manufacturers add MSG to add flavor. Experiments have shown that people become addicted to foods that contain high levels of MSG, such as tomato paste contained in pasta sauces.^{3,16,17} Consumption of MSG has been correlated with cerebral diseases among the human population – Alzheimer’s disease, brain cancer, Huntington’s disease, hypertension, Parkinson’s disease, stroke, etc. The MSG has also been triggered by triggering allergic reactions to many people, especially those suffering from asthma. After publishing the studies, public pressure has forced child food companies not to add MSG to their products.^{7,18,19}

There is a hypothesis of MSG regarding the onset of schizophrenia (chronic mental illness characterized by progressive weakening and disintegration of mental functions and loss of contact with reality). It has been hypothesized that the hypofunction of N-methyl-D-aspartate (NMDA) glutamate receptors causes both positive symptoms (delusions, hallucinations and disorganized behavior) and negative symptoms (affective flatulence, alopecia, avulsion and anhedonia) of schizophrenia. Arguments in this regard are based on observations on the psychotogenic effects of NMDA antagonists phencyclidine and ketamine (Ketalar) as well as on the therapeutic effects (in the research environment) of NMDA glycine and D-cycloserine agonists.^{7,20–22}

Manufacturers manage to mask MSG on the labels of their products, replacing it with other names: hydrolysed vegetable protein, malt extract, meat concentrate, protein concentrate, sodium caseinate, yeast extract, etc.^{7,3} Suspicions regarding substances produced from collagen proteins and gelatin, milk, oats, soy, vegetables, wheat, whey, etc. are present all over the world. MSG can be found in dairy products, candies, chewing gum, dietary supplements, energy drinks, soft drinks, some drugs. MSG is also hidden in cosmetics, hair treatments, shampoos and soaps.^{1,23–25} MSG allergic individuals reported adverse effects on cosmetics, shampoos and soaps containing MSG under different names. Reactions include: headaches, nausea, palpitations, weakness, and burning sensations in the neck and forearm.^{1,7} Other people complain of wheezing, changes in heart rate, and difficulty breathing. An excess of MSG has been correlated with an acute syndrome called “Chinese Restaurant Syndrome”, named after the symptoms experienced by people who ate food at Chinese restaurants. MSG has been involved in triggering this syndrome, but there is no evidence to prove that this substance has induced this disease. In 1968 the first reactions to Chinese food were highlighted. MSG was thought to be the cause of these symptoms. Since then, many studies have failed to demonstrate the link between MSG and the symptoms described by some people who have consumed Chinese food. For this reason, MSG continues to be used in the preparation of certain dishes. However, some people may be particularly sensitive to food additives such as MSG.^{7,26–28}

Free glutamate and bound glutamate

There is a bound glutamic acid / glutamic acid that is naturally found in nature in many fruits and vegetables as well as other natural foods as part of a protein along with other amino acids. MSG is found in free form in foods like baked tomatoes or cheese, which gives them distinct and pleasant flavors. However, free MSG found in soy sauces or prepared foods containing MSG penetrates bloodstream much faster than protein-bound MSG that is released much slower

during digestion so that a person who consumes MSG depletes the protein, over the course of the day can increase MSG blood pressure with each meal.^{7,29–31} There are MSG receptors in many parts of the body, including the brain, the heart, the lungs, the pancreas, where glutamate is a neurotransmitter. Consuming large amounts of MSG can overload MSG receptors in the body, overshooting neurons and artificially increasing the level of free MSG in the body.^{1,32–34} This may be particularly harmful to children. The long-term use of MSG affects the body’s ability to regulate MSG, allowing it to increase concentration and penetrate the brain into areas where it would normally not have what it was looking for. By affecting the hypothalamus (the area of the brain responsible for regulating food intake), MSG can lead to obesity.^{1,35–37} By affecting the nervous transmission pathways from the brain to muscle cells in the joints or muscles, MSG can produce or aggravate neurological diseases such as Alzheimer’s, arthritis or fibromyalgia.^{3,38,39} Researchers have found that many cancers have MSG receptors. Cancers of this type include cancers of the brain, colon and breast. Small amounts of MSG used in combination with a reduced amount of salt in the course of preparing food allows for a smaller amount of salt to be used during and after food preparation.^{40–42}

Glutamate is a neurotransmitter that transmits signals to the brain and nerves in the body

MSG has an important role in brain development. The normal levels of MSG also help in learning and memory. A large amount of MSG in the brain has been associated with neurological diseases such as ALS (amyotrophic lateral sclerosis or Lou Gehrig’s disease), Alzheimer’s disease, multiple sclerosis, Parkinson’s disease, stroke, etc.^{7, 43–45} Problems related to the production or use of MSG have also been linked to a number of mental health disorders, including autism, depression, obsessive-compulsive disorder (TOC) and schizophrenia.^{46,47} Glutamate has many important functions in the brain, in addition to transmitting chemical messages from one nervous cell to another. Too much MSG can affect nerve cells and brain. There are two ways that MSG can be harmful: Too much MSG in the brain or glutamate receptors in the received nerve cells may be super sensitive, which means fewer MSG molecules are needed to excite them.^{48–50} At high concentrations, MSG can over-excite nerve cells, causing them to die. Prolonged extension is toxic to nerve cells, causing damage over time. This is known as excitotoxicity. Researchers are studying therapies that try to inhibit MSG activity for the treatment of ALS.^{51–53}

Glutamate and food

MSG is an amino acid (amino acids are monomers of biomacromolecules called proteins) that is found in many different types of foods. MSG can also be found naturally in many foods, including algae, cheeses, mushrooms, soy and tomatoes. Packaged and processed foods (frozen foods, potato chips, salty snacks, sauces, sausages and any other packaged products) may contain MSG. Because it is contained in so many products, it is almost impossible to make a list that encompasses all of them.^{7,54–56} MSG is probably best known as monosodium glutamate of food additives. MSG is used as a flavor enhancer commonly found in American style Chinese food, preserved soups and vegetables, and processed meat.^{54–56} While some researchers report adverse reactions to MSG, such as headaches, nausea or heart palpitations, others have found no connection between MSG and these symptoms.^{57–59} According to the Food and Drug Administration (FDA), MSG is generally safe at the usual levels in the typical American diet.^{60,61}

Conclusions and recommendations

MSG is one of the most studied food ingredients, and since it has been found with certainty, the World Health Organization (WHO) or Joint FAO/WHO Expert Committee on Food Additives (JECFA) have included MSG in the category of safe food additives. Despite some beliefs that MSG might cause asthma, Chinese restaurant syndrome, or migraines, there is no clinical data to support these claims. Furthermore, literature data indicate that there is no consistent evidence suggesting that individuals might be susceptible only to MSG. Researchers suspect that MSG somehow interferes with hormonal regulation of appetite. Research has revealed many negative aspects about MSG and weight gain but, however, more research is needed to confirm and validate all this information in order to accurately understand the effects and influence of MSG on the body.

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Conflicts of interest

The author declares there are no conflicts of interest.

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