



## **REVIEW ARTICLE ON MONOSODIUM GLUTAMATE(MSG) AND ITS EFFECT ON HUMAN HEALTH**

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### **ABSTRACT:**

The use of tastemakers and food seasonings to enhance the flavor of food has been increased from time to time. The constituent of these flavor -enhancers is unknown to ignorant consumers. These seasonings contain food additives like monosodium glutamate (MSG) which really spice the food. This review focuses on the toxicological effect of monosodium glutamate in seasonings, on human health. It causes neural disorder, reproductive problems, liver disorder and obesity. However, consumption of MSG can be minimized by using natural spices, and taste inducers. Locust bean has been reported to be a good alternative to seasonings containing MSG.

**KEY WORDS:** MSG, natural spices, taste inducers, Locust bean

### **INTRODUCTION**

Neurotransmitters are stored in nerve endings and are used by nerve cells to inhibit or excite other nerve cells or target cells, such as muscle or endocrine cells. Concerns were raised in the late 1960s that high doses of MSG may adversely affect brain function. The possibility of MSG-induced brain lesions through injection or force-feeding methods in rodents was also reported. The very high concentration of glutamate in the cytosol and glutamate-containing vesicles requires strict homeostatic mechanisms for the following reason. Glutamate is the major excitatory neurotransmitter, yet levels of glutamate in the extracellular fluid must be kept low ( $<100 \mu\text{M}$ ) to avoid excitotoxicity. In fact, the concentration of glutamate in the ambient extracellular fluid of the brain is normally  $0.5\text{-}5\mu\text{M}$ . This remarkable glutamate concentration gradient between the extracellular fluid and nerve cell cytosol is accomplished by powerful uptake systems for glutamate in neurons, astrocytes and synaptosomal vesicles[1].

Savoury food is inherently delicious, have you ever wondered why? In 1908 a Japanese professor pondered the question of what made kelp broth taste so good. He recognized a unique taste that was different from the four well-known tastes that are sweet, sour, bitter and salty. It turns out that

glutamate, an amino acid made by many plants and animals, was the source of this distinctive taste, which became known as “umami” in reference to “umai”, the Japanese word for delicious. The professor isolated glutamate from seaweed to produce a crystallized salt form of glutamate which combined one molecule of glutamate with the ion sodium to make it tastier. This umami seasoning is still widely used today, and is known as monosodium glutamate or MSG.[2]

Glutamate is the most abundant amino acid found in nature, and it's one of the 20 amino acids that make up proteins in the human body. Because glutamate is synthesized as part of normal metabolism, it is considered a non-essential amino acid. Our bodies synthesize about 50 grams of glutamate each day and store about 4.5 pounds of glutamate in major organs like the brain, muscles, kidney and liver. On average we eat about 10 to 20 grams of glutamate each day, mostly from protein-containing food like meat, cheese, nuts, and legumes. Whether consumed from food or MSG, glutamate is metabolized in the same way.[3]

### **DIGESTION OF MSG**

In the saliva in the mouth, MSG separates into its original two parts. Glutamate and sodium and then glutamate binds to its receptors to elicit an umami, or savory, flavor sensation. In the stomach there are more glutamate receptors, and these activate the various nerve. The vagus nerve notifies the brain that protein rich foods have entered the stomach, and then the brain tells the stomach and intestines to prepare for protein digestion. After leaving the stomach, glutamate enters the small intestine where over 95% of the glutamate ingested is used as fuel by erythrocytes, the epithelial cells of the gastrointestinal tract. The rest is absorbed into the blood stream and delivered to cells to be used for metabolism or to make proteins.[2]

### **NATURAL OCCURRENCE OF GLUTAMATE**

Within food, glutamate is either bound, or in other words, it's attached to other amino acids in the form of a protein or free by itself. The more free glutamate there is, the more umami flavour a food will have. Processes like ageing or ripening will increase the amount of free glutamate in food. Red tomatoes will have more glutamate than a pale one.

Fish sauce has 1383mg of glutamate. parmesan cheese has 1680mg, soy sauce has 1264mg, walnuts have 658mg and tomatoes have 246mg. Breast milk is also high in glutamate.[4]

## **CHINESE RESTAURANT SYNDROME**

The idea of being allergic to MSG started in 1916's to what was then called Chinese restaurant syndrome, after an American doctor wrote a letter to the New England Journal of Medicine claiming to have experienced symptoms of numbness in the back of neck, and a feeling of pressure in face and upper chest muscles. He pointed to MSG as the culprit of these symptoms as they only seem to occur after eating at Chinese restaurants. Nowadays, scientists and medical professionals have come to view Chinese restaurant syndrome as a pejorative term. They have renamed it as MSG symptom complex, with symptoms that includes headaches, sweating, flushing, numbness of the face and neck, palpitations, nausea, chest pain and sleeplessness.[1]

## **CENTRAL NERVOUS SYSTEM**

Some studies claim that MSG can lead to brain toxicity by causing excessive glutamate levels in the brain to overstimulate nerve cells, resulting in cell death. Some people may be sensitive to MSG because of a condition called MSG symptom complex. It includes weakness, flushing, numbness, muscle tightness, difficulty in breathing. Among the symptoms of MSG headache and migraine is the most common. Neurotransmitters are stored in nerve endings and are used by nerve cells to inhibit or excite other nerve cells or target cells, such as muscle or endocrine cells. Concerns were raised in the late 1960s that high doses of MSG may adversely affect brain function. [4]The possibility of MSG-induced brain lesions through injection or force-feeding methods in rodents was also reported. The very high concentration of glutamate in the cytosol and glutamate-containing vesicles requires strict homeostatic mechanisms for the following reason. Glutamate is the major excitatory neurotransmitter, yet levels of glutamate in the extracellular fluid must be kept low ( $<100 \mu\text{M}$ ) to avoid excitotoxicity. The concentration of glutamate in the ambient extracellular fluid of the brain is normally  $0.5\text{-}5\mu\text{M}$ . This remarkable glutamate concentration gradient between the extracellular fluid and nerve cell cytosol is accomplished by powerful uptake systems for glutamate in neurons, astrocytes and synaptosomal vesicles.[5]

## **OBESITY**

No proven studies are showing MSG causes obesity, but one explanation can be that as MSG increases the taste of food, people tend to eat more food and hence leading to weight gain[3]

## **NEPHROTOXICITY**

Studies show that excessive MSG intake induces kidney damage by oxidative stress. Oxidative stress is caused by excessive production of free radicals in cells, the majority of which are oxygen radicals and other reactive oxygen species. It is possible that MSG leads to the excessive production of free radicals and endogenous antioxidants are insufficient to meet the demand[6].

## **REPRODUCTIVE SYSTEM**

MSG has toxic effects on the testis by causing a significant oligozoospermia and it increases abnormal sperm morphology in a dose dependent fashion in wistar rats. It leads to male infertility by degeneration and alteration of sperm cell population and morphology.[7]

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## **CONCLUSION**

This study shows that monosodium glutamate is dangerous to the human health as it is linked to Chinese restaurant syndrome. Regular intake of MSG for long time can lead to hepatotoxicity, renal damage, fibroid, obesity etc. More awareness concerning the hazardous effects of MSG should be given to people and natural alternatives should be promoted.

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