

# Monosodium Glutamate (MSG) – The Bane of Modern Day Food

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## BACKGROUND

During May 2015, Indian food inspectors ordered Nestle India to recall a batch of 'Maggi Instant Noodles' from shops in the northern state of Uttar Pradesh saying that it contains nearly seven times the permissible limit of lead and excess levels of Monosodium Glutamate (MSG) triggering a country wide debate, testing, and analysis. The maximum FDA permissible limit for lead is 2.5 ppm (parts per million) and generally acceptable MSG limit is 3-5 gm for 454 gm of meat. Even though Nestle India, a subsidiary of Swiss-based Nestle SA denies that their noodles are unsafe or unhealthy, stating that, the company, has a strict safety and quality controls in place, The Food Safety & Drug Administration (FDA) officials in Lucknow, Uttar Pradesh, affirm that all the two dozen packets they tested were contaminated and not adhering to required specifications. In this paper, we will discuss all about MSG from a consumers perspective, and why should we be cautious in consuming MSG knowingly or otherwise by use of ready to eat packaged foods or via fast food snack joints.

## THE SENSE OF TASTE

The nuances of flavor come from inhaling aromas or exhaling them through the nose as we drink or chew our food. The taste buds on our tongues can detect the presence of, half a dozen or so basic tastes, including sweet, sour, bitter, salty, astringent, and Umami a taste discovered by Japanese researchers. Umami has a unique taste, which is different from salty, sweet, sour, or bitter. The taste is 'meaty' or 'savory' and is reminiscent of a rich and full sense of deliciousness triggered by amino acids in foods such as meat, shellfish, mushrooms, potatoes, seaweed, synthetic agent MSG / Ajinomoto and the likes. The taste buds are present on the tongue, and due to the changes occurring in the dissolved saliva, register the sensations of taste. These buds have minuscule canals, which contain extremely thin taste cells. When stimulated, by change in temperature, variation in the composition of food components, and food structure, it sends a signal to the brain. The brain translates the signal into a phenomenon of awareness, which we then recognize as hot or cold, sweet or bitter, sour or salty, hard or soft. The tongue of an average middle-aged person contains about ten thousand taste buds. Younger people have higher number of taste buds that reduce, as one grows older. The fact that we have evolved to taste glutamate, is not surprising once we realize that it is an amino acid found abundantly in food. It indicates the presence of protein, a source of amino acids we need for healthy growth and development throughout life. Specific taste receptors on the tongue recognize each of the five basic tastes. For example, when glutamate encounters the Umami taste receptors, it relays this information to the brain where the Umami taste is then recognized. Taste nutrition studies among infants show that newborn babies enjoy sweet and Umami tastes, and dislike sour and bitter tastes, as human amniotic fluid contains significant levels of glutamate. Human breast milk is also rich in free glutamate.

## TASTE AND PERCEPTION

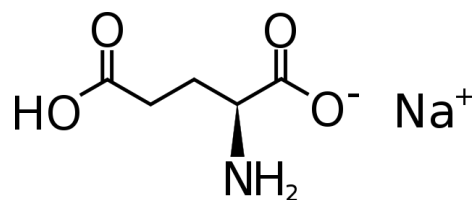
Tasty and palatable food appeals to our brain, stimulate the flow of saliva, and help in the digestive process. A

balanced diet is essential for our wellbeing, and this is possible only if, the foods we select are sensible to our taste and make us consume the food happily. To bring variety to our diet aroma and taste is essential and so all the ingredients we select for consumption should have an appealing aroma and taste. Our daily food inherently contains natural flavor ingredients. Flavors also forms during food preparation like cooking, baking, frying, etc. In case of processed food, companies use either natural flavor or artificial flavor to make it tasty. Consumers buy the product the first time largely due to packing, appearance or to promotional offers. However, repurchase of any food item normally depends on the taste of the product.

## TASTE PREFERENCES

A person during infancy and childhood forms their food preferences, similar to their personality with socialization playing a very important role in forming these preferences. Babies inherently prefer sweet tastes and dislike bitter tastes; Children learn to enjoy hot and spicy food, bland health food, or fast food, depending on what the people associated with them eat. The flavors liked during one's childhood foods seem to leave an indelible mark. On growing up adults often, return to them, without actually knowing why, as these foods give pleasure, comfort, and reassurance. Fast-food chains use this fact to their advantage, to sell their products repeatedly to consumers. Generally, food meant things cooked at one's home, as eating out was uncommon. Times have changed. Every house today, stocks pre-cooked or ready-to-eat foods. However, with this change, a feeling of awareness about the food products is not total with most people still more or less blind consumers. Even though awareness of the ingredient list and nutrition label is catching up, the health effects of various added ingredients is still unknown to most consumers.

## MONOSODIUM GLUTAMATE (MSG) OR AJINOMOTO



Monosodium Glutamate (MSG) or Ajinomoto is an ingredient that that we increasingly find in many packed ready to eat foods. Initially, associated only with Chinese food, MSG now has invaded every cuisine in the world. If we look at the pre-cooked food items on the store shelves, we are very likely to find that MSG / Ajinomoto are present in something as simple as potato wafers. Monosodium glutamate (C<sub>5</sub>H<sub>8</sub>NO<sub>4</sub>Na), also known as sodium glutamate, is the sodium salt of glutamic acid, one of the most abundantly and naturally occurring non-essential amino acids, we generally find in vegetables like ripe-tomatoes, potatoes, beet, soy sauce, parmesan cheese, mushrooms, etc.

Synthetic MSG is a white crystalline powder, with a melting point of 232° C. Discovered in 1909 by Ajinomoto Corporation, a Japanese firm, MSG is a food additive that is a very effective flavor enhancer commonly used in

Chinese food, canned vegetables, soups, and processed meats. The best part for food companies is that this effective product comes at a low price, working well for its use to multiply and spread across boundaries and seas.

### **MSG BY ANY OTHER NAME**

In Japan, MSG is labeled as 味の素 or Ajinomoto, in China - MSG = wie jing, in the Philippines - MSG = Vetsin, in Thailand - MSG = phong churot, in Germany - MSG = Natriumglutaminat, in Europe - MSG = E621, E620-625, in the US - 'Umami', MSG, glutamate, free glutamic acid, in South Africa, supermarket chains add MSG to sausages called 'boerewors' and other meats. MSG is also finding its way slowly into 'fast' foods in India, Brazil, and Vietnam, and it is getting harder and harder to avoid MSG regardless of where on planet earth we live. Although regulatory authorities classify MSG as a food ingredient, its use remains controversial making any addition of MSG in food products liable for mandatory listing on the packing labels. In order to understand the effect of MSG on our body, let us discuss a little about some basic human body functions and its associated mechanisms.

### **AMINO ACIDS**

Amino acids are the building blocks of life as many of them links together in a chain to create a protein. Deoxyribo nucleic acid (DNA) tells the body, as to how to make the chain and the order the amino acids must line up. We must eat some amino acids because our body cannot make them (essential amino acids). Our body can make some amino acids (non-essential amino acids). Yet others can be made during some times, but not always (conditionally essential amino acids). The life processes are all dependent on proteins, which play critical roles in the body as structure, messengers, enzymes, and hormones. Proteins are globular and clumpy because the amino acid chains fold in, on themselves and this is how the immune system recognizes proteins. Proteins are large and uniquely shaped, compared to single amino acids. The immune system does not recognize tiny MSG as an allergen. However, trouble can begin because the body can attack the larger enzymes like Glutamic Acid Decarboxylase (GAD), responsible for turning excess MSG into Gamma Amino Butyric Acid (GABA).

### **ENZYME**

Enzymes are proteins that help to create other proteins, and helping in breaking them down. Enzymes are not straight chains; they are globular and clumpy, because like other proteins they too fold into intricate shapes that help them create and break down other protein compounds.

### **HORMONES**

Hormones are extremely potent, protein based messengers, travelling around the body, connecting the lines of communication between various glands of the endocrine system. Glands direct important functions like metabolism, growth, sexual development, etc. Smaller amounts of hormones are more effective than larger amounts, because the body has feedback mechanisms that shut down any overdoses of hormone, as a trouble signal, by affecting the hypothalamus of the brain, which controls the master gland of the body - the pituitary. MSG may affect hormone production in the body.

## **GLUTAMATE - THE PROTEIN BUILDING BLOCK & EXCITATORY NEUROTRANSMITTER**

Glutamate is just one of many amino acids used by the body and linked into the protein chains in the body. Some amino acids are free and float around, while some link themselves into proteins to serve vital functions. Some are neurotransmitters, carrying nerve cell impulses throughout the body. Amino acid neurotransmitters are like chemical messengers carrying news, from one nerve cell to another nerve cell. Some amino acid neurotransmitters, like glutamate, trigger nerve cells to fire, while others like Taurine and GABA tell those firing nerve cells to cease firing. It is a delicate important balance. Researchers are still finding out just what happens when that balance tips. In patients who suffer a stroke, for example, an excess of glutamate in the brain causes the nerve cells to die from overstimulation. Doctors use Glutamate blocking drugs to prevent some of this damage.

### **HOW THE BODY DEALS WITH EXCESS AMINO ACIDS?**

Most amino acids if not used right away, do not get stored as such. The body changes them into other amino acids, removing nitrogen and changing the amino acids into fuel by processes as 'transamination' and 'deamination', which occur mostly in the liver. Patients with compromised livers may however, have trouble transaminating cysteines, into Taurine amino acid that acts, counter to glutamate. Similarly, an excess of the amino acid aspartate may result in excess glutamate, since the body can convert aspartate directly to glutamate. Aspartate and glutamate affect some of the same receptors. Enzyme GAD is another one that the body uses to convert excess glutamate into another neurotransmitter called GABA. In many patients with Type II Diabetes, their bodies view the enzyme responsible for turning MSG into GABA as an enemy and create antibodies to attack it so that it cannot do its job. The body then compromises in its job of getting rid of excess glutamate making it again more of a question of balance, and what tips it.

### **HOW DO THEY MAKE MSG OR FREE GLUTAMIC ACID?**

One can produce artificial MSG, by the fermentation process, very similar to making beer or yoghurt. The food industry makes free glutamic acid by hydrolyzing vegetable protein or by fermentation of glucose from starchy foods like carbohydrates from corn, beets, cassava, etc. In essence, MSG manufacturers can not only make free bound glutamic acid from foods, but also chemically produce sodium glutamate salt by combining it with 14% sodium followed by purification and crystallization for adding in foods.

### **IS MANUFACTURED MSG A PROBLEM?**

Some researchers believe that glutamate added to foods is 'bad' and only the natural glutamate present in our bodies is 'good'. However, MSG sellers argue that the synthetic one is identical to the glutamate in the human body; therefore, it is always 'good'. This is not as simple. Processed MSG has contaminants, containing not only the kind of amino acids the body is used to handling, but mirror image ones too. A good analogy we can use here is that there are right-handed amino acids and left handed ones. They are like mirror images of each other and could cause problems like say putting the wrong glove on our

hand though not quite the same. To be frank we do not exactly know what problems this may cause. A fact however, that neuroscientists believe is that even an excess of naturally occurring glutamate is a problem in many diseases. The reason food processors 'free' glutamate from its bound form is that it acts as a neurotransmitter in its free form. The food industry's claim that free glutamate is as harmless as bound glutamate is disingenuous at best. If it were indeed so, then there is no need to hydrolyze vegetable protein (split the amino acids apart)?

#### **WHY DO FOOD COMPANIES ADD MSG TO FOODS?**

- MSG tricks our tongue into making us think that a certain food is high in protein and thus nutritious.
- The food industry tries to confuse the issue by focusing on the 'fifth' taste sense they call Umami.
- The taste buds detect free glutamic acid as a simple way to signal the presence of protein in a food, just as there are fat receptors to detect fats and receptors that sense carbohydrate or sweet flavors. The purpose of taste buds is not only to help us differentiate real food from inedible stuffs, but also give an overall perception of taste and the nutritional qualities of the food we are ready to eat. The free glutamic acid is the very same neurotransmitter that the brain, ears, eyes, nervous system, pancreas, etc., of our body uses to initiate some specific processes.
- MSG stimulates the pancreas to produce insulin. MSG and free glutamic acid stimulate the pancreas to release insulin when there are no carbohydrates in the food for insulin to act on. MSG thus acts as the food industries convenient, 'anti-appetite suppressant,' to keep consumers coming back for more. The blood sugar level drops because of the insulin flood and we again become hungry, an hour later to eat MSG containing food all over again.
- The body changes excess glutamate to GABA that may be addictive as it calms, and affects the same receptors in the brain as the anti-depressant drug valium.
- The illusion created by adding MSG to a food product enables the food processor to add LESS real food. The illusion of more protein in a food allows the food producer to put LESS protein in it. The consumer perceives the product - say chicken soup - to have more chicken in it than it is actually there.

#### **ADVERSE REACTIONS TO FOODS CONTAINING MSG**

- Headache, Migraine, Flushing, Sweating, etc.,
- Facial pressure or tightness, Numbness, tingling or burning in the face, neck and other areas,
- Ringing in the ears,
- Rapid, fluttering heartbeats (heart palpitations),
- High blood pressure, Chest pain and Cardiac arrests,
- Asthma, Nausea, Weakness,
- Taurine deficiency (Diarrhea & Gall bladder attacks),
- Abdominal problems,
- Thyroid dysfunction(Rage/Panic),
- Promotes liver inflammation and dysplasia
- Magnesium Deficiency,
- Vitamin B 6 deficiency caused by poor nutrition,
- Hormonal imbalance,
- Insulin resistance, Type I & Type II diabetes,
- Edema associated with inflammation response,
- Fibromyalgia (increased nervous system sensitivity)

- Autism and Epilepsy Retina damage,
- Vitamin B 12 deficiency (Vitamin B12 protects against glutamate neurotoxicity)
- Hypoglycemia (Deficiency of fuel to protect the blood/brain barrier)
- Neurodegenerative diseases such as Parkinson's, Alzheimer's, Huntington's, and multiple sclerosis,
- Food allergies, Obesity, Addiction to MSG,
- Sterility in women,
- Pregnant women should avoid foods containing MSG.
- MSG is also unsuitable for infants.

#### **WHY IS MSG SENSITIVE?**

MSG affects nearly everyone in some way because when we eat MSG, the free glutamic acid, increases in blood concentration, and so throughout the body, functioning as a chemical messenger and neurotransmitter. Some people are more sensitive to excess amounts of free glutamic acid in the body, than an average person, who may not even notice, symptoms of excess free glutamic acid, until after many years of MSG ingestion. These persons are in fact more at risk of damage from eating MSG, than the sensitive ones. MSG is not a true food allergen, and is in use as a food additive for decades. Over the years, society has received many anecdotal reports of adverse reactions, to foods containing MSG, better known as Chinese restaurant syndrome (CRS) or MSG symptom complex.

#### **FAST FOOD & MSG**

Fast Food menu items below could contain MSG or enough free glutamate in the form of autolyzed yeast, hydrolyzed protein, or natural flavors (containing 20% free glutamate).

- Sometimes our friends and relatives' homes are the hardest places to avoid MSG. Our aunt's 'secret' recipe, created out of canned food could be with MSG and it could be best to avoid any temptation to consume the prized recipe and poison one self.
- Avoid Ultra-pasteurized dairy products, cheeses, and cream, with added half-and-half carrageen.
- Look for plain pasteurized milk to put in plain coffee.
- Avoid low fat and non-fat milk because low fat dairy products usually have dried, high-free glutamate, non-fat dried milk added to boost protein content.
- Foods connected to Umami /MSG in some way.
- Food products containing autolyzed yeast, hydrolyzed protein, hydrolyzed corn, soy, and wheat - which contains free glutamate, natural flavors that contain wheat and dairy hydrolysates - which actually contain free glutamate and act exactly like MSG.
- 'Natural flavoring' consisting of 'protein hydrolysates' containing free glutamic acid that act like MSG but does not require labeling misleading the consumer.
- Foods containing parmesan cheese could be very high in MSG, both with natural MSG and added MSG.
- Avoid anything that comes out of a can.
- Instant soup mixes & salad dressings
- Most salty, powdered dry food mixes - read labels
- *Flavored* potato chips
- Monopotassium glutamate, Glutamic acid
- Hydrolyzed gelatin - found in VACCINES - is 10% free glutamate by weight
- Hydrolyzed vegetable protein, Hydrolyzed plant protein
- Autolyzed yeast, Sodium caseinate, Textured protein

- Beet juice, it is used as a coloring, and the extract may contain free glutamic acid, Beet extract.
- Yeast extract, Yeast food or nutrient
- Soy protein isolate, Soy sauce, Worcestershire sauce
- Dry milk and whey powder
- 'Natural flavors' – may contain up to 20% MSG
- Carrageen, Dough conditioners
- Malted barley, Malted barley flour - found in many supermarket breads and all-purpose flours including
- Body builder drink powders containing protein
- Medications in gel caps - contain free glutamic acid in the gelatin
- Over-ripe tomatoes - naturally high in free glutamate
- Mushrooms - naturally high in free glutamate
- Eating other fresh whole foods can and will help.
- Restaurant soups made from food service soup base cans or with added MSG
- 'Low Sodium' or 'Sea Salt' products now often have L-Glutamate added straight (without sodium) or freed during processing to act as a salt substitute to get a 'clean label' without MSG on it. The point to note is glutamate too raises blood pressure, like salt.
- Foods labeled 'Low Sodium' or 'Now with Sea Salt' is also suspect, even though Codex Alimentarius, the global standard for food processing FAO / WHO, considers L - glutamic acid a GRAS (Generally Recognized as Safe) substitute for salt. Since it is detached from its usual sodium ion, labeling it as MSG or monosodium glutamate is not mandatory. Avoid eating anything that can raise suspicion.
- Incidentally, some shampoos and cosmetics now contain glutamic acid

#### **THUMB RULES TO IDENTIFY MSG CONTAINING FOODS**

- The more salty a processed food is, the more likely it is to contain MSG or free glutamate.
- Powdered foodstuffs that used to be regular food is likely to have added MSG because the original flavor has been degraded while powdering
- Processed concentrates could contain free glutamate.
- More the ingredients in a packaged food, the more likely for MSG is present. Read labels carefully.
- Do not trust something simply because it is in a health food store and the label states it is natural or even organic. 'Natural flavors' could include protein hydrolysates, containing up to 20% MSG by weight.

#### **SO WHAT SHOULD WE TO EAT?**

- Ideally cook one's own food without making use of ready to cook and ready to eat stuff.
- Eat food grains, pulses and nuts,
- Fresh fruits and vegetables (no seaweed)
- Cooked homemade sauces made from fresh vegetables
- Juicing fruits like carrot and apple and green vegetables (no seaweed)
- Frozen vegetables containing 'no added ingredients'
- Cooking oil – coconut, sunflower, sesame, mustard, etc. with nothing added to it.
- Consume fresh milk, homemade coconut milk, rice milk, almond milk, soymilk, etc.
- Go to restaurants that make things from scratch. Ask what is in the food and only order items without the offending ingredients. It is better to speak up before eating the wrong stuff rather, then repenting later.

- Eat unprocessed pastured meat, fresh fish, and eggs.
- Avoid breads with malted barley flour or added gluten.

#### **STATUS OF MSG NOW**

Many studies are available trying to understand the connection between MSG and Chinese restaurant syndrome (CRS) however; there is no definitive proof that blames MSG entirely for the CRS symptoms. Even though, researchers have found no definitive evidence of a link between MSG and CRS symptoms they do acknowledge, that a small percentage of people may have short-term reactions to MSG, usually mild in nature and that require no major treatment. The only one way to prevent adverse CRS is to avoid all foods containing MSG. However, a study report in 'Phytomedicine' does say that researchers find that, natural mixture of phytoestrogenic isoflavones found in red clover may protect the brain from MSG toxicity. Human cortical cells pretreated with red clover isoflavones show a significant increase in cell survival and a significant decrease in the release of an enzyme indicating cell damage thereby preventing morphological disruption due to MSG.

Two-minute noodles contain hydrolyzed groundnut protein that contains MSG as a flavor enhancer, which industry makes using Bactosoytone, itself made from soy protein using a catalyst enzyme porcine. Hydrolyzed vegetable protein could contain high levels of glutamate with the marketing pack still mentioning "NO ADDED MSG." This common practice by industry is actually misleading to consumers, as hydrolyzed protein can lead to formation of monosodium glutamate (MSG) during and after cooking.

#### **CONCLUSION**

The Ajinomoto industry is huge and regulators striking down this industry are a remote possibility as it could adversely affect countless restaurants and food chains to suffer that may lead to a major socio-economic impact globally. In fact, some noted food giants rely solely upon MSG for enhancing flavors of their products. However, unfortunate this is, it should not surprise us to hear regular updates, that internationally food companies are, only experimenting on how to put more and more MSG in the remaining MSG free foods. We can only say that, it is definitely not wise on our part as consumers, to ignore these well-known facts, and indiscriminately use or eat MSG that according to me is a very high price to pay, only for satisfying the taste buds during our limited life span.

Three friends die and go to heaven.

God says, to them, 'Heaven is a big place and you will need transportation. I will give you a vehicle, but the quality of the vehicle will depend on how loyal you were to your spouse during your life on earth.'

The first person who never even thought of cheating on his wife gets a jet airplane. The second one who cheated once gets an exotic sports car. The third one who cheated his wife without count gets an old rickety car.

The next day the third person looks depressed so the first and second friends say, 'Do not worry on account of your vehicle we will let you drive our vehicles'.

The third person says that is not the problem. My wife who died two years earlier is also in heaven, I saw her.'

The first and second friends say, 'That is very good news, so what is the problem?'

The third friend replies, 'When I saw my wife today morning, she was riding an outdated skateboard'.