



Review on Chinese Salt; Monosodium Glutamate

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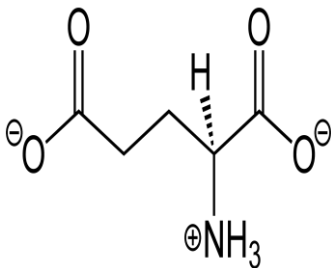
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ABSTRACT:

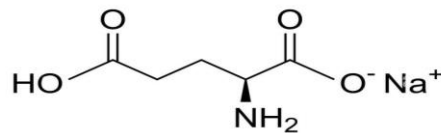
Monosodium glutamate may be a sodium salt of a non-essential aminoalkanoic acid. L-amino acid, which is widely utilised in the food industry, flavouring (MSG) is widely used as a food additive that reinforces the flavour of food and is additionally commonly referred to as a flavour enhancer in food processing, which provides Umami taste that intensifies the meaty, savoury flavour of food as present glutamate like meat soups. In this paper, we review animal and human studies during which MSG shows toxic effects on the central systema nervosum, adipose tissues, liver, and reproductive organs and health system, and we also discuss their implications for human MSG.intake. Globally, commercial MSG consumption is extremely high, increasing in Asia, and therefore the European Economic Community, classify it as a food additive. permitted in certain foods. Flavouring (MSG) plays a crucial role in the essence of the brain. functions that incorporate the formation and stabilisation of synapses, memory, learning, and cellular metabolism. Its safety was evaluated by the International organisations (EFSA, FDA) as a secure and also the limits were founded and their studies raise concerns about its side effects like obesity, asthma, migraines, headaches, etc. Ruddles, curcuma, green tea, Ginkyo biloba, and a few vitamins are the most natural.products to protect against MSG toxicity by different mechanisms. This review provides short and general information about MSG with updates on research.

INTRODUCTION

Nowadays, food additives aren't a new term anymore. Every day, a huge amount of food is needed to meet requirement of world hunger, which is increasing day by day, rapidly out of control. Food additives have an important role in handling this challenge. Monosodium glutamate (MSG) is one of the world's most extensively used food additives, and it's ingested as a component of various processed food species. Monosodium glutamate (MCG) is a sodium salt of glutamic acid. It is generally a white powder. Water ionises it into free sodium particles and glutamic corrosive, which is a natural compound with five carbon molecules. It has a carboxylic (COOH) bunch and an amino (-NH₂) bunch connected to an "Alpha" carbon molecule (a carbon particle that is joined straightforwardly to the COOH bunch). Monosodium glutamate (MSG) was found within the nineteenth century in Japan, yet it's widely utilised in Chinese, Japanese, and Thai cooking. The flavouring is generally used everywhere, globe as a flavour enhancer various foods and spices.



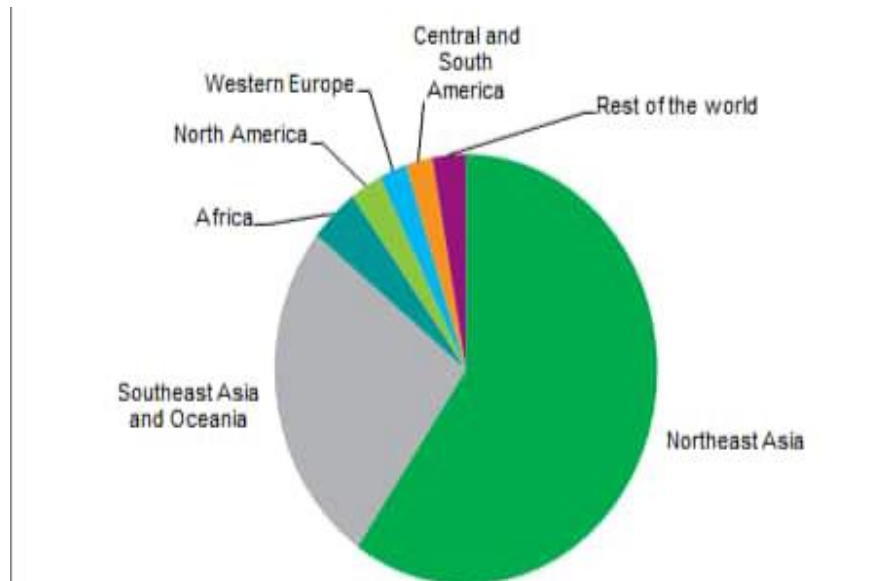
Structure of Glutamate



Structure of Monosodium glutamate

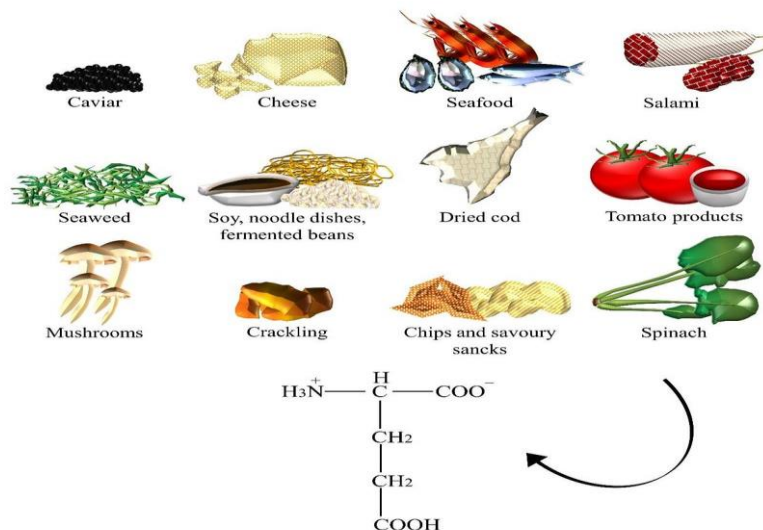
The chemical formula of MCG is C₃H₈N NaO₄ and its molecular mass is about 169.11 g/mol. MSG has the identical basic structure of organic compound glutamate, with an amino (-NH₂) and carboxylate ion is placed rather than the carboxylic group (-COO). The difference within the MSG & Glutamate structure is that one atom of the carboxylic chain has been replaced with Sodium atom, hence, the name of the compound is seasoner (MSG). MSG was first prepared and discovered in 1908 by Japan's biochemist, Kikune Ikeda, said the idea came from the Ikeda's desire to enhance the aroma and taste of kombu, which is an edible seaweed used as a base for Many Japanese soups, ramen, and Asian soups. Monosodium glutamate is generally found in stock, (bouillon) cubes, soups, ramen, gravy, stews, condiments, savoury, snacks, etc. Glutamic acids and their salts are found under the other following names, such as calcium caseinate E62 (according to European regulation), glutamate sodium, hydrolyzed vegetable protein Potassium

glutamate, soyabean, and yeast extract. It is made from molasses by the fermentation of monosodium glutamate, being the sodium salt glutamate being the sodium of glutamic acid. MSG is commonly used in cooking as a flavour enhancer with an umami taste which enhances the meaty, savoury flavour of food. The daily admission of glutamate is dependent on particular regions and countries. MSG intake was estimated to range from 0.3 to 1.0 g per day in developed countries. As opposed to Germany's daily intake of 10 g and the UK's daily intake of 0.58 g, it has recently come to light that other European countries' daily intake of MSG is closer to 1.0 g. MSG admissions in Japan range from 1.1 to 1.6 g/day and from 1.6 to 2.3 g/day in South Korea.



World consumption of Monosodium Glutamate

Although the Food and Drug Administration (FDA) reported or stated that MSG is a safe substance, but several studies in animals have indicated the negative effects after chronic consumption of MSG. The adverse effects of MSG have been shown in different organs, which include the thymus, brain, pancreas, liver, kidneys and testes, and it is also linked with several diseases such as obesity, hypertension, headaches, asthma, neurotoxicity and detrimental effects on the reproductive organ.



Common Glutamate Content in Foods

The origins and discovery of MSG :

During the year 1866, German chemist Karl Heinrich Ritthausen made the discovery of glutamic acid. He handled wheat with sulfuric acid in gluten. Then, in 1908, Kikunae Ikeda of Tokyo Imperial University separated the glutamic corrosive flavour ingredient from the ocean growth kombu by aqueous extraction and crystallisation; this flavour is now known as umami (pleasant exquisite taste). He focused on the distinctive flavour characteristics of the glutamate salts calcium, potassium, magnesium, and ammonium. Ikeda observed that the presence of additional minerals caused all of these salts to taste

metallic and umami. Ikeda gave his product the name "Monosodium Glutamate" because sodium glutamate was the most soluble, pleasant, and crystallizable of them all. Soups, gravies, stews, savoury snacks, stock (bouillon) cubes, and other foods commonly include monosodium glutamate. Then, in 1909, the Suzuki brothers started producing MSG for the market under the trade name Ajinomoto (literally, "essence of taste"). The several organs that could be harmed by MSG toxicity are schematically depicted in Figure 1. In this review, the preventive properties of natural products and medicinal plants against the toxicity caused by MSG are discussed.

□ Chemistry of MSG:

MSG was first extracted from the seaweed *Laminaria Japonica* and identified by the Japanese chemist Kikunae Ikeda in 1908. It is a sodium salt of nonessential amino acid known as L-glutamic acid.

- Molecular formula - C₅H₈NO₄Na
- Molecular weight /mass - 169.11 g/mol.
- (Anhydrous) Monohydrate :- 187.12 g/mol.
- IUPAC Name :- Sodium-2-aminopentanoate
- Melting point :- 232° c
- Boiling point :- decomposes
- PH :- Going from 6.7 to 7.
- Taste :- Umami (savory, meaty taste),
- shape :- Crystalline Solid
- odour :- odorless

In solid MSG /the glutamate ions exist in its zwitterion form - O(C=O)CH(NH₃⁺)(CH₂)₂(C=O)O⁻. MSG is

most soluble in water & sparingly soluble in alcohol & also soluble in oil or organic solvents. MSG contains 78% of glutamic acid, 22% Sodium salt & water. The major reason of using such additive is that MSG having a higher & more rapid dissolution rate against the glutamic acid.

Maggi Controversy:

In the late 19th century, the "Maggi" brand had modest beginnings in Switzerland and was originally named after the product's creator, Julius Maggi, who later introduced Maggi ready-to-use soups in 1886. And in 1947, Maggi joined the Nestle Company and currently controls more than 60% of Nestle in India, known as Nestle India Limited (NIL). NIL then launched the Maggi noodles, which have a \$1 billion market value. Maggi noodles contain "Tastemaker" flavour packets, which are designed to dissolve in water during cooking.

Sharda K. Verma, a junior analyst and the lab manager of Baba Raghav Das Medical College's campus in Gorakhpur, was in charge of the lab on March 26, 2014. He and his team of five people found the MSG remnants in Maggi. Despite the fact that they frequently reported finding MSG in a variety of commercially available foods. But the major surprise arrived in April 2015 with the reference food laboratory in Kolkata's final reports.

May 2015, likewise, the FDA delegate from the Barabanki, a locale in Uttar Pradesh, India, expressed that examples of the items Maggi (instant noodles) had bizarrely led to unnecessary degrees of monosodium glutamate (MSG). The packets stated "No added MSG", However, MSG naturally occurs in hydrolyzed peanuts, protein, onion powder, and wheat flour. Also, the Food Safety and Standards Authority of India (FSSAI) insisted that the powder itself should be tested, and their reports clearly illustrated that the presence of monosodium glutamate in Maggi leads to toxicity, which was found to be 17.2 ppm, well over the permissible limits of 2.5 ppm. They observed a total of 13 samples, which were tested by the Delhi authorities, and 10 of them had levels to content surpassing the limits. These bundles that started by the examination from Uttar Pradesh, which has led to 17.2 ppm. On June 6, 2015, the Focal Legislature of India prohibited the cross-country deals of Maggi Noodles for an endless period. And also due to the fear Maggi toxicity was almost instantaneously banned in the states of Delhi, Gujarat, Uttarakhand, Assam, Jammu, and Kashmir.

On June 26, 2015, U.T. Khader, Karnataka's pastor for welfare and family services, said during a press conference that Maggi food variants would not be outlawed, and on August 13, 2015, a decision to lift the cross-country ban on some Maggi food varieties was made near the Bombay High Court.

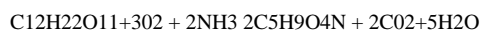
Company Response:

Occupational issues Settle India was penalised by Service of India by 640 centres (\$6.4 billion) for the existence of MSG and other hazardous substances should be avoided at all costs.

Production Of MSG:

The first biotechnological creation of glutamic acid found in 1950 with *E. coli* in tiny amounts; however, later that it was found that enormous amounts of glutamic acid can be created by different microscopic organisms, which was subsequently named *Carynebacterium*

glutamicum (c. glutamicum), from carb as per the accompanying Stereochemistry.



The worldwide yearly creation of MSG surpasses 3 million metric tonnes. The money-related worth per kilogramme of MSG shifts somewhere in the range of US\$7.30 and US\$1.8, depending upon the producer and nature of the product. The Chinese have utilised it as an added substance known as

sequenced to improve the kind of nourishment for the long term. In 1908, the flavour upgrading specialist was recognised as glutamic corrosive, which is otherwise called monosodium glutamate. Monosodium glutamate has been fabricated and delivered by following three strategies.

(a) By hydrolysis of vegetable protein using

hydrochloric acid (HCl), 1909–1962.

(b) By direct chemical synthesis, 1962–1973

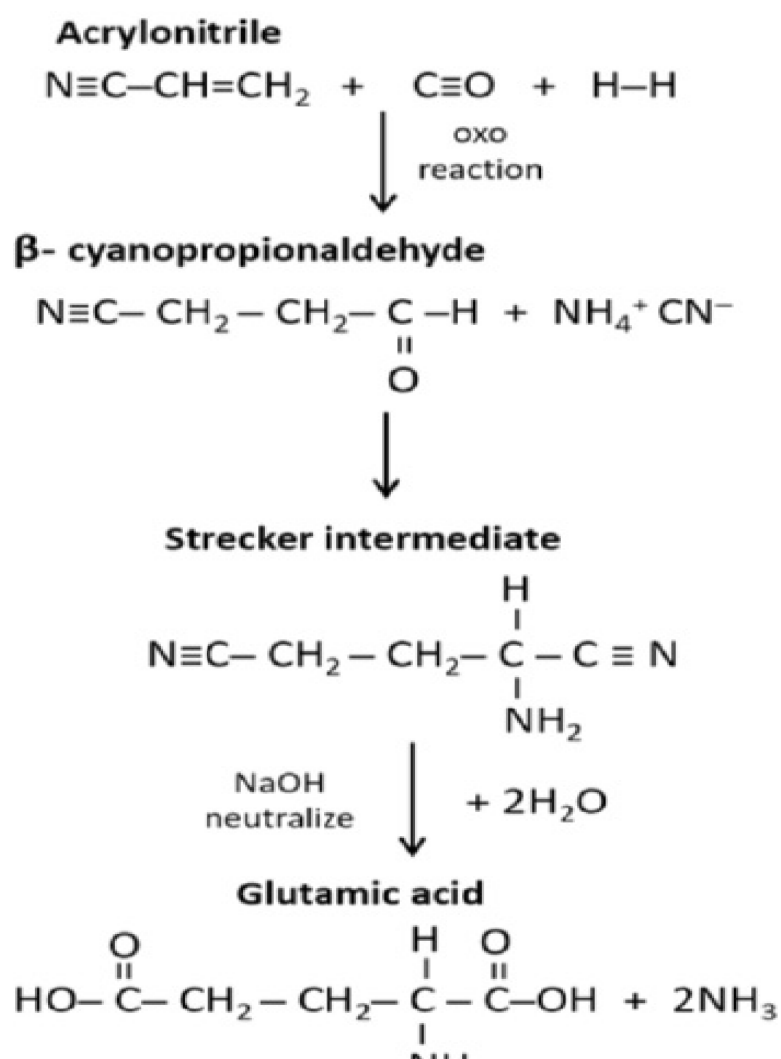
(c) By bacterial fermentation (current method)

A. By Protein Synthesis

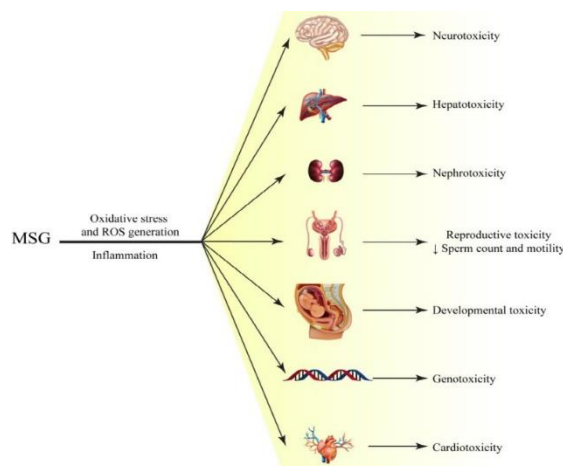
In this method, the hydrolysis of vegetable proteins with hydrochloric acid (HCl) to disrupt the peptide bonds. Generally, wheat gluten, which contains more than 30g of glutamate and glutamine in 100g of protein originally used for the hydrolysis of proteins.

B. by direct chemical synthesis

The polyacrylic fibre industry began in Japan during in the mid-1950s, and acrylonitrile was adopted as a base material to synthesise monosodium glutamate.



Synthesis of Glutamic Acid from Acrylonitrile



Schematic representation of Toxicities of monosodium glutamate

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