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Development and validation of an analytical method to detect Monosodium Glutamate in food samples and analysis of MSG in selected Sri Lankan food products

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Monosodium glutamate (MSG) is a synthetic flavour enhancer commonly used in the food industry, even though it comes from a natural source. Although MSG is commonly utilized as a food additive to improve taste, it has been linked to various health problems in humans. The potential health effects that have been associated with MSG include Chinese restaurant syndrome, asthma and respiratory reactions, migraine headaches, and allergic reactions. Researchers have conducted studies on animals to explore the effects of consuming MSG. Use of MSG in foods has been regulated in many countries. Although the food regulations of Sri Lanka clearly provide for the type of foods that MSG is not permitted, analytical facilities are not available in the country for quality assurance. In this study, a liquid chromatography-tandem mass spectrometry (LC-MS/MS) method was developed and validated to quantitatively analyze MSG and determine its presence in selected food products available in Sri Lanka based on the food regulations. The food products were purchased from supermarkets and they included seasoning cubes, seasoning powders, biscuits, chips, sauces, and soups. Separation of MSG was done using a C-18 column with mobile phase A (0.1% formic acid in type 1 water) and mobile phase B (acetonitrile) with the isocratic elution (A:B 30:70). Retention time of MSG was 2.5 min. The specific glutamate ion transitions detected were 148.00 to 84.00, 102.00, and 130.00 m/z. Key analytical parameters were validated according to the ICH guidelines. The method was linear in the range of 0.50-10.00 mg/L, with a correlation coefficient (R^2) of 0.9994 and was accurate between ±5% range from the true value. The CV% values of 4.99%, 1.71% and 0.94% for three concentration levels (0.5 ppm, 2.5 ppm and 10.0 ppm respectively) that covered the calibration series obey the accepted criteria of <5% for precision. The analytical method developed and validated was successfully employed for the analysis of MSG in various food samples. The MSG contents in the analyzed food samples varied from 0.007 g/100g to 32.11 g/100 g. Accordingly, pasta and noodle seasonings had the highest MSG content, 0.21-0.68 g/packet. Other products rich in MSG were bouillon cubes (0.26-0.86 g/cube), and seasoning powders and mixtures which contained between 0.001-13.8g/pack of added glutamate. Thus, consumption of more than two items from this list of food products can exceed the safe consumption limit of an adult (960mg/day). Tandem mass detection is a specific method to detect MSG for regulatory purposes. Thus, this LC-MS/MS method developed and validated enables the detection of added glutamate in food products, offering an opportunity to address the presence of hidden MSG through food control measures. Implementation of proper regulatory practices to control food additives by detecting and quantifying MSG in post-marketing food products provides insight to prevent health-related issues and diseases associated with excessive glutamate consumption.

Keywords: Ion transitions, ICH guideline, LC-MS/MS, MSG

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