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An Alarming portrait of Bromate & Propyle Gallate

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Abstract: ***Food decay has been a typical issue all over the world. A significant part of the decay is caused by the microorganisms. Deterioration of food by microorganisms causes misfortunes of up to 40% of all food produced for human utilization around the world. Food additives have been in use for a long time. These food additives are the substances that stop or defer the development of microorganisms and so prevent them from decay. In spite of the fact that the ADI is fixed for each preservative, their unpredictable and long- term use in various food items raise an alarm. Each and every commercial producer or manufacturer add food additives to the food during its preparation. With the incredible increment in the utilization of food additives, especially food preservatives results in development of different physical and mental issues in human beings. A number of food preservatives are delisted from the approved list of additives in many countries. Security evaluation of food additives depends on the accessible toxicological information available on animals, plants or human beings and a number of adverse effects have been encountered by their regular use. In the present study two commonly used food preservatives Bromate and Propyle Gallate have been chosen for toxicity study to make the general public aware about the harmful effects of these chemicals in our food items.***

Keywords: Food preservatives, bromate, Propyl gallate, toxicity

1. Introduction

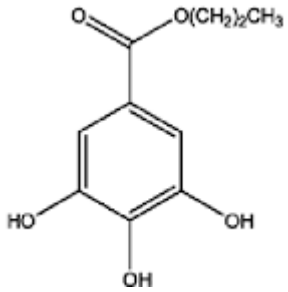
Food additives are the substances which are not consumed as a food itself, but are added to food as a typical ingredient. Food additives are substances added to food to preserve flavour or enhance taste and appearance (Marmion,1991, Branen *et.al.*2002). Out of many types of food additives, the food preservatives make an important category which are used in food to provide protection against microbes and spoilage. The food preservatives are used to enhance stability of food and less wastage. For this purpose chemicals have been used for centuries. Following the considerable increase in the use of food additives in processed foods from the mid-twentieth century, safety assessment of food additives has been conducted on a formal basis at national and international levels. Being chemical in nature they impart a number of toxic effects on regular consumption. The present paper is an effort to discuss the alarming potential of some commonly used food preservatives.

Bromates

Bromate is used in form of Potassium bromated (KBrO3). Potassium bromate is a potent oxidizing agent used as a food additive in the manufacture of white flour, bread and cosmetics. The Food and Agricultural Organization (FAO) and World Health Organization (WHO) has been evaluated the maximum level of KBrO3 to be consumed by human about 75 ppm. However, no local data are available regarding allowable amount of potassium bromate in flour and other items. Potassium bromate destroy nutrients and can induce a number of adverse effects including nausea, vomiting, diarrhoea and abdominal pain. Diarrhoea, abdominal pain and hearing loss were reported after ingesting potassium bromated. (Matsumoto *et. al.,* 1980; Kuwahara *et. al.,* 1984; Hamada *et. al.,* 1990). Renal failure was another adverse effect of ingestion of bromates (Kuwahara *et. al.,* 1984; Kutom *et. al.,* 1990; Hamada *et. al.,* 1990). In a chronic study, Kurokawa *et. al.* (1986a) reported carcinogenicity in the treated groups of 20–24 male rats with water containing potassium bromate at 0, 15, 30, 60, 125, 250, or 500 mg/L for 104 weeks. Fujie *et. al.* (1988) exposed male long-evans rats (50–100 g; 5/group) to single oral doses of 0, 129, 192, 257and 385 mg BrO3 /kg, respectively for six hours and the rats receiving the maximum dose exhibited diarrhoea and signs of sedation. Ishidate *et. al.* (1984) tested the mutagenicity of 242 food additives, including potassium bromate. The result of *Salmonella typhimurium* mutagenicity test using S9 activated strain TA100 was positive. A number of aberrant metaphase cells were observed by Fujie *et. al.* (1988) after examination of the acute cytogenetic effects of potassium bromate on rat bone marrow cells. Dose-dependent and time-dependent increases in all the treated animals were reported. Hayashi *et. al.* (1989) used the micronucleus test to evaluate the genotoxic potential of potassium bromate in two strains of mice (male MS/Ae or CD-1 mice, 4/group) and observed an increased frequency of micronucleated polychromatic erythrocytes (MNPCEs) in a dose-responsive fashion in both strains of mice. Genotoxicity assessment of potassium bromate by means of DNA image analysis on the root tip nuclei of *Allium sativum* L was done by Hoda *et. al. (*2020), they suggested that extensive use of Potassium bromated should be banned due to genotoxic effect on living cells. Sai *et. al*. (1992) found that bromate has genotoxic and carcinogenic effect on the tested biological systems.

Propyl Gallate

Propyl gallate has been employed as an antioxidant in foods since 1948 to protect fats, oils and fat-containing food from rancidity. The preservative has been used in meat products, vegetables packaged with sauce, pickles, vegetable shortening and oils and also in chewing gums. Propyl gallate is the propyl ester of 3,4,5-trihydroxybenzoic acid. Its molecular formula is $C_{10}H_{12}O_5$ and has a molecular weight of 212.20 g/mol. Its chemical name is n-propyl 3,4,5-trihydroxybenzoate and its structural formula is –



Structural formula of propyl gallate

Propyl gallate has been known as harmful preservatives as it may cause birth defects and liver damage. The cytotoxic effects of Propyl gallate and its related gallates and gallic acid have been studied in freshly isolated rat hepatocytes and found to be toxic(Nakagawa *et.al.*,1995).Synthetic phenolic antioxidant propyl gallate was investigated for inducing male infertility and found propyl gallate as a possible reproductive toxicant as it induced testicular toxicity via the disruption of mitochondrial or ER function and the inhibition of testicular development-related genes in mice (Ham *et.al.,*2019). Gulati *et. al.* (1989) reported that propyl gallate at dose levels of 5-50 µg/mL is a potent inducer of SCEs in CHO cells, with or without metabolic activation.

2. Conclusion

It has been accounted that the synthetic chemicals which are utilized as food preservatives have side effects. The response of food preservatives can be extremely gentle to perilous. So it is advisable to eat preservative-free diet at all if possible.

References

[1] Branen A.L., Davidson P. M., Salminen S.2002. Food additives :2nd edition USA CRC Press.
[2] Fujie K., Shimazu H., Matsuda M.1988. Acute cytogenetic effects of potassium bromate on rat bone marrow cells *in vivo*. Mutat. Res. 206:455–458.
[3] Gulati D.K., Witt K., Anderson B., Zeiger E., Shelby M.D. 1989. Chromosome aberration and sister chromatid exchange tests in chinese hamster ovary cells in-vitro iii results with 27 chemicals. Environmental and Molecular Mutagenesis 13(2): 133-193.
[4] Ham J., Lim W., Park S, Bae H., You, S. , Song G.2019.Synthetic phenolic antioxidant propyl gallate induces male infertility through disruption of calcium homeostasis and mitochondrial function. Environmental pollution 248:845-856.
[5] Hamada F., Ohzono S.,Yamada S. 1990. A case of acute potassium bromate intoxication. Fukuoka Igaku Zasshi 81:271-276.
[6] Hayashi M., Sutou S., Shimada H. 1989. Difference between intraperitoneal and oral gavage application in the micronucleus test: the 3rd collaborative study by CSGMT/JEMS-HMS. Mutat. Res. 223:329-344.
[7] Hoda A., Khatab N., Elhaddad S., Eissa S.2020.Genotoxicity Assessment of Potassium Bromate by Means of DNA Image Analysis on the Root Tip Nuclei of Allium sativum L. Biotechnology Journal International 24(1): 9-14. Article no.BJI.54066
[8] Ishidate M., Sofuni T., Yoshikawa K. 1984. Primary mutagenicity screening of food additives currently used in Japan. Food Chem. Toxicol. 22:623-636.
[9] Kurokawa Y., Aoki S., Matsushima Y. 1986a. Dose-response studies on the carcinogenicity of potassium bromate in F344 rats after long-term oral administration. J. Natl. Cancer Inst. 77:977-982.
[10] Kutom A., Bazilinski N.G., Magana L. 1990. Bromate intoxication: hairdressers' anuria. Am J Kidney Dis 15(1):84-85.
[11] Kuwahara T., Ikehara Y., Kanatsu K. 1984. 2 Cases of potassium bromate poisoning requiring long-term hemodialysis therapy for irreversible tubular damage. Nephron 37:278-280.
[12] Marmion D.M.1991. Handbook of U.S. Colorants: Foods, Drugs, Cosmetics and Mesdical Devices.3rd Edition USA: Wiley
[13] Matsumoto I., Morizono T., Paparella M.M. 1980. Hearing loss following potassium bromate: two case reports. Otolaryngol Head Neck Surg 88:625-629.
[14] Nakagawa Y. , Tayama S. 1995. Cytotoxicity of propyl gallate and related compounds in rat hepatocytes .*Archives of Toxicology* 69:204–208.
[15] Sai K, Uchiyama S, Ohno Y, Hasegawa R, Kurokawa Y.1992. Generation of active oxygen species in in vitro by the interaction of potassium bromated with rat kidney cell. Carcinogenesis 13(3):333-339