
Potassium Bromate in Bread in India (Carcinogenicity And World-Wide Trends For it's Use)

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ABSTRACT

In the world of food processing almost every food material is heavily flooded with chemical food additives. Some are safe and some have a degree of risk associated with them. One such chemical food additive is potassium bromate, Which was very highly and extensively used for providing volume and uniform finish for bread and bakery products in most part of the world until two decades ago. This was done because it was thought no residue of bromate is left behind while baking. But further studies found out that some of the bromate is left behind and also some of the studies concluded and linked bromate with carcinogenic properties. All these factor combined to form an unrest towards the use of potassium bromate as a flour treating agent. Today, The European Union, China, South Korea, Sri Lanka, Canada, Australia, Brazil, Peru and Columbia have banned the use of potassium bromate as a flour treatment agent and India and U.S. allow it's use but with certain constriction discussed later in the article.

Keeping this in mind , the CENTRE FOR SCIENCE AND ENVIRONMENT(INDIA) did a nationwide survey to check the levels of potassium bromate in bread and bakery products in India and the results were shocking. The agency found residues of potassium bromate in over 84% of the samples taken in Delhi. This shows that the situation here in India is alarming. This article deals with the various prospects of the use of potassium bromate as an flour treatment agent in India and the potential health degradation effects it can have on human population along with the international trend of its use.

KEYWORDS:

Flour treatment, loaf volume, food additive, carcinogenic, baking, oxidising agent, applications, JEFCA, FSSAI

POTASIAM BROMATE- INTRODUCTION

Potassium bromate in the form that is used in the bakery industry exists as white granulated powder. It is very soluble in water which makes it quite apt for using in bakery. It is very much insoluble in the inorganic solvents such as acetone and ethanol. It is used as an flour treatment agent in bakery industry. It is found to be complete carcinogenic showing both initiating and promoting activities for tumours in rats. In india is costs about Rs. 330 per kilogram , and is this cheap availability of potassium bromate that strengthens its case for use in bakery industry. Potassium bromate decomposes at temperature above 370 degree Celsius.

WHAT IS IT USED FOR?

It is generally used as a flour improver, it strengthens the dough to allow high loaf volume. It also acts as an oxidising agent for flour to be used in bakery products. If too much is added some of the residue is left behind which when consumed is proved to be carcinogenic in nature. Typically 15-30 parts per million (ppm) of potassium bromate is added to dough. Normally, baking changes its chemical composition and renders it harmless, leaving no trace in the finished product. However, if too much of the additive is used, or the bread is not baked long enough or at a high enough temperature, then a residual amount will remain

RESULT OF SURVEY DONE BY CSE IN INDIA

1. Over 84% of the samples taken in Delhi were found to be containing residues of potassium bromate in the range 1.15 to 22.54ppm.
2. Highest level of potassium bromate was found in the sandwich bread.
3. Products of all seven popular fast food outlets selling pizza and burger were found positive with potassium bromate/iodate – but at levels lower than those found in bread, pav and bun.
4. All samples of white bread, pav, bun and ready-to-eat pizza bread were found to contain potassium bromate/iodate. Over 79 per cent (19/24) samples of bread and about 75 per cent samples of ready-to-eat burger breads were also positive.

GLOBAL TRENDS FOR USE OF POTASSIUM BROMATE

1. Banned in EU since 1990
2. Banned in UK since 1990
3. Banned in Sri Lanka 2001
4. Banned in Nigeria 1993
5. Banned in Canada 1994
6. Banned in Brazil 2001
7. Banned in Peru 2002
8. Allowed in United States of America
9. Allowed in India

REGULATIONS IN INDIA

India allows the use of potassium bromate but with following constraints

1. Maximum level of use of potassium bromate and/or iodate in bread is set at 50 ppm.
2. Maximum level of use of potassium bromate in flour for bakery is set at 20 ppm.
3. Maximum level of use of potassium bromate in flour for bakery is set at 20 ppm.

Bureau of Indian Standards (BIS) provides Standards for few bread variants.

Potassium bromate and/or potassium iodate is allowed for use in white bread and wheat meal bread. For protein-fortified bread and milk bread potassium bromate is allowed. Effectively potassium bromate can be used at up to 50 ppm levels.

WHY DOES THE INDUSTRY PREFER THE POTASSIUM BROMATE

Bread and bakery product are the products with very low margin of profits so in these kind of products the economy of the raw material is at the utmost importance in creating the profits. As stated above the price per kg of Potassium bromate is less than Rs 330 which strengthens its case to be used as the premium flour improver. The cost of using potassium bromate solely is less than one sixth of using glucose oxidase and one eighth of using ascorbic acid solely. Another aspect of using potassium bromate is the quality of results it provides. It is an oxidizing agent which strengthens the dough which leads to higher rising and loaf volume and also more uniform product. It is a slow acting agent and can be used at any stage during baking. All these factors combine to forming the environment that made the Indian bakery industry to prefer the potassium bromate.

CARCINOGENICITY OF POTASSIUM BROMATE

Long-term toxicity and carcinogenicity studies in rats and mice were conducted by feeding animals with bread treated with KBrO_3 (49,50). The levels of KBrO_3 chosen for the treatment of flour were 50 and 75 ppm because it was determined that KBrO_3 was quantitatively converted to bromide during the dough-mixing process with the KBrO_3 at concentrations below 75 ppm (34). Thus, the purpose of the studies was to ascertain the safety of bread made from KBrO_3 -treated flour, in which bromate levels were presumed to be negligible. The bread made from KBrO_3 -treated flour was crumbed and dried for incorporation in the diet at a 79% concentration. Groups of 90 males and 90 females of Wistar-derived Porton strain rats and mice of the Theillers original strain (900) were fed diets made from bread treated with 75 ppm (high-dose group), 50 ppm (low-dose group), or 0 ppm (control group) of KBrO_3 for 104 and 80 weeks, respectively. Rat Study. No differences were noted in appearance or behaviour between test and control rats (49). Cumulative mortality rates at week 104 were 20.0%, 38.3%, and 26.7% in males; and 30.0%, 51.7%, and 51.7% in females in the high-dose, low-dose, and control groups, respectively. No intergroup differences were found regarding food intake in either sex. No dose-related changes in the absolute or relative organ weights were apparent. Although not pointed out in the original report, it is noteworthy that the occurrence of periarteritis in the pancreas of male rats was significantly increased in a dose-related manner. Also the various ageing pathology of the adrenals was significantly increased in the female high-dose group. No dose-dependent variation in the incidences of any tumours was apparent. Dose-related reduction in blood glucose levels were observed in treated rats of both sexes at week 104. There was no retention or accumulation of significant amounts of covalently bound bromine in the adipose tissue of treated rats. Mouse Study. General appearance and behaviour were good in both test and control groups (50). Mortality

rates at week 80 were 61.8, 65.1, and 65.1% in males; and 56.8, 48.4, and 56.8% in females for the high-dose, low-dose, and control groups, respectively. There were no significant differences in the mean body weights or food intake among groups. Normalised (weighted mean) bromine intakes derived from KBrO_3 were 2.64 and 1.76 mg/kg/day in males and 2.99 and 2.03, mg/kg/day in females for the high- and low-dose groups, respectively. Significant dose-related reduction in the absolute weights of the heart and the pituitary was found in treated males. Absolute thyroid weights were significantly higher in the high-dose males. Anaemia was prevalent in male high- and low-dose groups at 3 months. However, no histopathological differences attributable to the treatment were found between test and control males. Small amounts of bromine were detected in the adipose tissues, i.e., at a level of 1 ppm in males of the high- and low-dose groups and at a level of 2 ppm in females of the low-dose group. Ginocchio et al. concluded that there was no evidence that flour treatment with KBrO_3 affected the incidence of neoplastic and nonneoplastic lesions in the mouse study.

CONCLUSION

It is noted in the article that sufficient studies are done to show that potassium bromate has carcinogenic properties and that residues of the potassium bromate can be found in the end product. This has been only possible due to lack of strict adherence to the constraint given by FSSAI by the manufacturers who keep on using potassium bromate in huge amounts thus keeping a huge Indian population at risk. It should be noted that since other alternatives are available in the market the use of these alternatives should be encouraged which are healthy. Also a strict labelling for flour treatment agents in pre packaged bakery food should be applied so that the consumer can know what is it that he is eating. BIS should amend relevant available standards. This should ensure that both potassium bromate and potassium iodate are not allowed as improver/flour treatment agents in bread and bakery products.

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