

# TRACE ANALYSIS OF BROMATE CHEMICAL IN BAKED BREAD FROM UGHELLI URBAN IN DELTA STATE, NIGERIA

By

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## Abstract

*Trace bromate analysis was carryout on ten samples of bread using Mohrs method of determination. Bromate substance was found to exist in three samples while seven do not contain bromate. The observed quantity in the bread samples are  $0.208\text{mgg}^{-1}$ ,  $0.342\text{mgg}^{-1}$  and  $0.476\text{mgg}^{-1}$ . Similarly the bread were found to contain bromide ion respectively in the quantity of  $0.140\text{mgg}^{-1}$ ,  $0.230\text{mgg}^{-1}$ ,  $0.320\text{mgg}^{-1}$ . This represents 30% of bakeries that use bromate in making bread in Ughelli urban.*

Bread is essential stable food in Nigeria with a steady increase in consumption. Its main component is wheat flour (WF), with recent use of soya flour (SF), plantain flour (PF) or cassava flour (CF) substitute in wheat flour (WF) ranging from 0 – 15% in quantity (Edoma 2005). Besides the main component of flour, other additives are sugar, sodium chloride, butter, groundnut oil, yeast and improvers – Sodium hydrogen trioxocarbonate (IV) ( $\text{NaHCO}_3$ ) the same as baking powder, potassium bromate ( $\text{KBrO}_3$ ), Calcium propanoate ( $\text{C}_2\text{H}_5\text{COO}$ ) $_2\text{Ca}$  and sodium stearoyl lactate (Basman, 2003). The most common improver used by bakers is potassium bromate. The substance is a slow oxidizing agent that helps to strengthen the bread dough during mixing and enhance its extensibility for moulding. Besides, it helps to raise the bread in the oven contributing to loaf volume, grain and create a good texture, in the finish product (Theresa, 1997).

Apart from its use in bread making; it is used in the treatment of barley in beer making to improve the quality. It is also used to improve the quality of fish paste product. Bromate is an antiseptic and astringent in toothpaste and mouth gargle. Sometimes, chemically treated potable water may contain bromate ion. When water containing trace of bromide ion is treated with ozone, bromate ion is formed. Also, bromate ion exists as contaminant in hypochlorite solution when salt containing trace of bromide ion is electrolyzed to form the solution. Water containing bromide ion when treated with chlorine dioxide formed bromate ion especially when the water is exposed to sun light.

Bakers and industrialists for many years argued that when bromate salt is properly used in bread making especially under right conditions, it is completely used up, converted to harmless bromide ion during baking. However, when too much or the bread is not cooked enough or not at high enough temperature, then residual amount will

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remain which may be harmful when consumed. For more than 80 years Food and Drug Administration (FDA) allowed the use of potassium bromate in baking additives at variable established safety level. This was reduced to 50ppm in 1991, and 30ppm 1998. (Theresa, 1998). However, research findings about the residual value in baked food make Food Administration Organization (FAO) and World Health Organization (WHO) experts committees on Food and Adaptive in 1993 recommends that potassium bromate should not be use as additives in food product (Joint FAO/WHO committees on food and additives, 1993).

Toxicological test of potassium bromate on animal shows that the chemical induce cancer, although with evidence of substantial species different in sensitivity. Bromates chemical have significance damage effects in the body vitamins e.g. it affects the proper function of thiamine, riboflavin, while it completely destroys Folic Acid. (British Manufacturing Industries Research Association, 1980). A number of case studies of acute human intoxication with potassium bromate have been reported following accidental ingestion or attempted suicide. The principal pathological change observed was the degeneration of kidney tubule parenchyma cell leading to acute myocarditis (Kurokewa, 1982). The conversion of bromate to bromide ion during baking as argued by the users over the years posed serious health problem. Pavelka, 2004 established that excess bromate ion in the body system causes iodine deficiency leading to hormonal and enzymatic disorder that give rise to numerous diseases such as thyroid cancer, skin biopsies, metal sickness (schizophrenia), sex depression in women, renal damage, permanent deafness and kidney cancer.

Many countries in the world have band potassium bromate from food product. Europe as well as United Kingdom band its use in 1990, Canada in 1994, Sri Lanka in 2001, China, Brazil and Nigeria in 2005. To regulate the production of bread National Agency for Food and Drugs Administration Control (NAFDAC) decided to issue certificate of registration to bakeries aimed at sanctioning any bakery that may use the dangerous chemical potassium bromate in the making of bread. (Sunday Time, Thursday August 9, 2007).

Bread been a stable food is consumed by all Nigerians from child hood to old age thus the consumption of bread that contained the dangerous bromate substance will cause damage to body organs –kidney, nervous system, skin. However, there is significant increase in number of persons suffering from kidney failure, and its related problem, which could probably be related to the consumption of bromate bread over the years.

### **Significance of the Study**

In Nigerian, both young and old consume bread as stable food judging from the rate of production and consumption. However, most of these breads are made with harmful potassium bromate as many bakers do not comply to NAFDAC regulation. The aim of the study therefore is to analyze for the trace of potassium bromate in baked bread in Ughelli urban and also establish the trace quantity of bromate per mass of bread.

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The study will draw the attention of NAFDAC to the fact that some bakers are still indulge in the use of bromate in bread making and also to remind consumers and bakers of the possible health problems the consumer of such bread will encounter.

## **Materials and Methods**

### **Collection of Samples**

Ughelli urban, is the Head Quarter of Ughelli North L.G.A. in Delta State. The town has about fifty (50) bakeries located at different parts of the town. For the purpose of the study the town is divided into ten zones with each one having between 4-6 bakeries. One bakery is selected at random from each of the Zone to make the ten bakeries used for the study.

In the bakery the mixed dough is milled and used for different sizes of bread with variation in milling ingredients to differ quality where necessary. A samples of bread (a loaf of bread is purchased daily for five days from each of the ten bakeries. A mixture of the five bread formed the bulk sample from which a representative sample is taken for each bakery. Each bread is wrapped in polythene bag and stored in the laboratory refrigerator ready for the analysis.

### **Analysis of Sample**

The Mohr's method for determination of Bromate in Bread is used.

With the Mohr's method indicator colour change occur at or near the equivalence point and also highly sensitive at low pH value for low concentration of bromate ion.

- (1) Silver trioxonitrate(v)  $\text{AgNO}_3$ : 0.1M Silver trioxonitrate(v) solution is prepared by first drying the salt in the oven at  $70^\circ\text{C}$  for 1hr. Weight 17g of the dried salt is dissolved in  $100\text{cm}^3$  of distilled water, then make up to 1 litre with distilled water. The solution is kept away from light to avoid decomposition.
- (2) Eosin Indicator (Tetrabromofluorescein,  $\text{C}_{20}\text{H}_8\text{Br}_4\text{O}_5$ ): Weight 0.1g of eosin, is dissolved in  $70\text{cm}^3$  of 70% ethanol, and make up to  $100\text{cm}^3$  with ethanol.
- (3) Ethanoic Acid ( $\text{CH}_3\text{COOH}$ ): 6.0 M ethanoic acid is prepared by dissolving  $344\text{cm}^3$  of ethanoic acid in  $300\text{cm}^3$  of distilled water and then make up to 1 litre
- (4) Concentrated Hydrochloric acid (HCL). (Analytical grade).  
Weight 5g of the representative bread sample is put in  $100\text{cm}^3$  beaker and add  $20\text{cm}^3$  of concentrated Hydrochloric acid and heat until the brownish fume stopped evolving until the bread dissolves completely.

The solution is allowed to cool and suction filtered. The filtered solution is made up to  $50\text{cm}^3$  with distilled water, add  $3\text{cm}^3$  of 6M ethanoic acid followed by 10drops of eosin indicator.

Titrate with standard 0.1M solution of Silver Trioxonitrate ( $\text{AgNO}_3$ ) with constant agitation. The Silver bromide formed flocculates; red colour develops on addition of silver trioxonitrate (v) with swirling until a pronounced magenta colour is formed

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### **Results and Discussion**

The result of the trace analysis of bromate substance carried out on fifty (50) samples of bread from ten different bakeries is showed in table 1 below.

**Table 1**

Name of Bakery	NAFDAC No.	Conc. Of Bromide (mgg <sup>-1</sup> )	Conc. Of KBrO <sub>3</sub> (mgg <sup>-1</sup> )
Joy Special Bread	DT0013B/UGH	0.140	0.208
Hope in God Bread	DT002B/UGH	0.230	0.342
Ochuko Bread	DT006B/UGH	ND	ND
People's Bread	NR	ND	ND
Zion Special Bread	NR	ND	ND
God's Time Bread	DT0024B/UGH	ND	ND
Devine Special Bread	NR	ND	ND
Pat Butter Bread	NR	ND	ND
God's Will Bread	NR	ND	ND
Good God Buttered Bread	NR	0.320	0.476

ND = Not detected  
NR = Not registered

The result shows that three bakeries out of ten sampled bakeries in Ughelli urban still use potassium bromate salt in the preparation of bread. The result show that bromate concentration in Good God buttered bread is (0.476mgg<sup>-1</sup>) more than that in Hope in God bread (0.342mgg<sup>-1</sup>) and least in Joy Special, bread (0.208mgg<sup>-1</sup>). Similarly, there is correlation relation between quantity of bromate used and quantity of bromide ion present in the baked bread which support the fact that bromate actually converts to bromide ion in the bake product. These respective bromide concentrations are 0.320mgg<sup>-1</sup>; 0.230mgg<sup>-1</sup> and 0.140mgg<sup>-1</sup>. This means the quantity of residual bromate detected in the baked bread is less than the actual quantity use in the preparation of the bread dough due to the conversion. (Fuji, 1984).

### **Conclusion**

The work reveals that some bakeries are still indulge in corrupt practice of using the dangerous potassium bromate chemical in the making of bread as against the regulatory policy of the National Agency of Food and Drug Administration Control (NAFDAC) in the baking of bread in Nigeria and that such bread are widely consumed by Nigerians.

### **Recommendations**

Bread is consumed by all person from childhood to old age in large proportion, thus the presence of the harmful bromate chemical even in trace amount in bread consumed over a period of time due to bio-accumulation and magnification will have a detrimental health effect on the consumer. If the following suggested recommendation are diligently implemented it will help to save the consumer.

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1. That the National Agency of Food and Drug Administration Control (NAFDAC) should embark on regular check analysis of bread and other related baked food to ensure compliance of non usage of Potassium Bromate. Bakeries found wanting should be given appropriate sanction.
2. NAFDAC should ensure that all bakeries are duly registered, given NAFDAC registration number before operation. Bakeries should be mandated to indicate the NAFDAC registration number on the bread label.
3. NAFDAC should compel bakeries to print completely and correctly the major component and baking ingredients of bread on its label to guide consumers against their health.
4. NAFDAC should organize awareness seminar for both bakers and consumers about the possible health danger for eating Potassium Bromate bread and also the stringent penalties awaiting a baker that failed to comply with NAFDAC regulations.
5. Bread consumers should endeavour not to consume bread sold without NAFDAC registration number and the appropriate baking components on the bread label.

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