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Potential Carcinogenic Risk Evaluation of Pb in Selected Canned Foods Obtained from Superstores in Nigeria

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Abstract

This study aimed at assessing the Lead (Pb) residues in some selected canned foods obtained from some superstores in Benin City Metropolis and their health risk implications. Forty Five (45) samples of five different canned foods (chicken, corned beef, peas, mushrooms and corn) of varied brands from various industrial countries were procured from open market stores at Lagos Street and selected super markets along Ugbowo Lagos Road, Benin City with their controls. The samples were taken to the laboratory for Pb digestion. The results of carcinogenic risk for Pb, revealed slight increase in values above the threshold. Regulatory bodies such as NAFDAC (National Agency for Food and Drugs and Administration control) and SON (Standard Organization of Nigeria) should reinforce the need to control canned food brands flooded with Pb before dispatched to consumers.

Keywords: Health Risk; Canned Food; Superstores; Ugbowo; Cancer; Mushroomb

Introduction

In Nigeria, one of the fastest forms of food consumed daily by humans are canned foods. These foods might be beverages, corned beef, peas, mushrooms, chicken and corn prepared in their natural state and preserved in chemicals, engrossed and embossed with lead materials, so that their shelf life will last. This well-known carcinogenic metal Lead (Pb) is pervasive, and one of the first metals revealed by man [1,2]. It is commonly found in air, water, soil and food [3]. Lead is considered as a powerful industrial poison, and its toxicological signs are well acknowledged [4].

The toxicity of lead is commonly graded as the greatest health risk [5]. Canned foods are generally exposed to lead impurity during the process of canning. Solder used in the production of cans has been known as a basis of lead pollution [6]. Several health problems associated with lead poisoning such as damages of the haematopoietic system (the blood), the nervous system and the kidneys thus meddling with their roles [7]. These can result to antagonistic overactive behaviour and psychological delay such seizures and cerebral palsy [8]. This study investigated the potential carcinogenic risks associated with lead (Pb) in some consumed canned foods.

Materials and Methods

Forty Five (45) samples of five different canned foods (chicken, corned beef, peas, mushrooms and corn) of varied brands and various industrial countries were procured from different local superstores. The brands can be allotted sample codes and the particulars on the containers were recorded based by the methods of Erhunmwunse et al. [9]. The samples were taken to the laboratory for analysis and heavy metal (Pb) digestion. The samples were standardised according to the methods of AOAC [10]. The blank reagent was prepared with same procedure but without samples and the Heavy metal content was read off using AAS Buck Scientific (Model 210 VGP) [11].

Quality Assurance

The equipment was first calibrated using buck certified atomic absorption standards for the respective trace metals to obtain calibration curves. Reagent blanks were first run at intervals of every ten sample analysis to eradicate equipment drift. All samples were analysed in duplicates for reproducibility, accuracy and precision.

Health Risk Assessment

The methods of Wu et al. [11], Iqbal and Shah [13], Liang et al. [14] and Song et al. [15] were used to estimate the exposure dose through ingestion of the food samples in mg/l/d. The modified Carcinogenic Risk (CR) by Wu et al. [11], Iqbal and Shah [13] and De Miguel et al. [16] was used to compute the values gotten in this study. The USEPA, [17] range (1.0E-06 to 1.0E-04) of carcinogenic risks acceptable or tolerable was used in this study.

Results

The summary of the levels of carcinogenic risk via ingestion for Pb in different canned foods (chicken, corned beef, peas, mushrooms and corn) are as shown in Tables 1-5. In the canned chicken (NAPA CHICKEN, ZWAN and KIRLAND) and the control chicken, it was observed that the results obtained for the exposure via ingestion were 0.01, 0.03 0.02 and 0.00 mg/l/d and for the CR (1.17E-04, 2.22E-04, 1.87E-04 and 0.00E+00) respectively (Table 1). The values obtained from the canned chicken differed from the control. For the canned corned beef (PRINCES, EXTER and NAPA) and the control corned beef, it was observed that the results obtained for the exposure via ingestion were 0.03, 0.03 0.02 and 0.00 mg/l/d and for the CR (2.41E-04, 2.27E-04, 2.02E-04 and 0.00E+00) respectively (Table 2). The values obtained from the canned corned beef differed from the control.

Table 1: Summary of the Cancer Risk (CR) for lead (Pb) in selected canned chicken.

	Elements in mg/kg	Pb
	Samples	
Canned chicken	NAPA CHICKEN	0.01
	CR	1.17E-04
	ZWAN	0.03
	CR	2.22E-04
	KIRKLAND	0.02
	CR	1.89E-04
	Chicken (control)	0
	CR	0.00E+00

Table 2: Summary of the Cancer Risk (CR) for lead (Pb) in selected canned corned beef.

	Elements in mg/kg	Pb
	Samples	
Corned beef	PRINCES	0.03
	CR	2.41E-04
	EXETER	0.03
	CR	2.27E-04
	NAPA	0.02
	CR	2.02E-04
	Beef (control)	0
	CR	0.00E+00

Table 3: Summary of the Cancer Risk (CR) for lead (Pb) in selected canned peas.

	Elements in mg/kg	Pb
	Samples	
Peas	DOLLY'S GP	0.03
	CR	2.18E-04
	FOODTOWN PEAS	0.03
	CR	2.48E-04
	FARROW'S GIANT	0.03
	CR	2.30E-04
	Peas (control)	0
	CR	0.00E+00

Table 4: Summary of the Cancer Risk (CR) for lead (Pb) in selected canned mushroom.

	Elements in mg/kg	Pb
	Samples	
Mushrooms	DIAMOND BELL PS	0.02
	CR	1.82E-04
	TRIO W	0.03
	CR	2.50E-04
	MALINANGE CW WHOLE	0.03
	CR	2.58E-04
	Mushroom (control)	0
	CR	0.00E+00

Table 5: Summary of the Cancer Risk (CR) for lead (Pb) in selected canned corn.

	Elements in mg/kg	Pb
	Samples	
Corn	PRINCES	0.01
	CR	2.30E-04
	EXETER	0.03
	CR	2.67E-04
	NAPA	0.02
	CR	2.83E-04
	Beef (control)	0
	CR	0.00E+00

In the canned peas (DOLLY'S GP, FOODTOWN PEAS and FARROW'S GIANT) and the control peas, it was observed that the results obtained for the exposure via ingestion were 0.03, 0.03 0.03 and 0.00 mg/l/d and for the CR (2.18E-04, 2.48E-04, 2.30E-04 and 0.00E+00) respectively (Table 3). The values obtained from the canned peas differed from the control. For the canned mushrooms (DIAMOND BELL PIECE and STEM EXTER, TRIO W and MLIANGE MUSHROOM CHIOCE WHOLE) and the control mushroom, it was observed that the results obtained for the exposure via ingestion

were 0.02, 0.03 0.03 and 0.00 mg/l/d and for the CR (1.82E-04, 2.50E-04, 2.58E-04 and 0.00E+00) respectively (Table 4). The values obtained from the canned mushrooms differed from the control.

In the canned corns (GREEN GIANT, DOLLY'S SC and SUNRIPE WHOLE) and the control corns, it was observed that the results obtained for the exposure via ingestion were 0.01, 0.03 0.02 and 0.00 and for the CR (2.30E-04, 2.67E-04, 2.83-04 and 0.00E+00) respectively (Table 5). The values obtained from the canned corns differed from the control. Figure 1 shows the variations of Pb concentrations across the sampled canned food brands. The results indicated that almost all canned food brands were lower than the FAO/WHO CODEX limits exempting DOLLY'S SC (1.1 mg/kg) and SUNRIPE WHOLE (1.07 mg/kg).

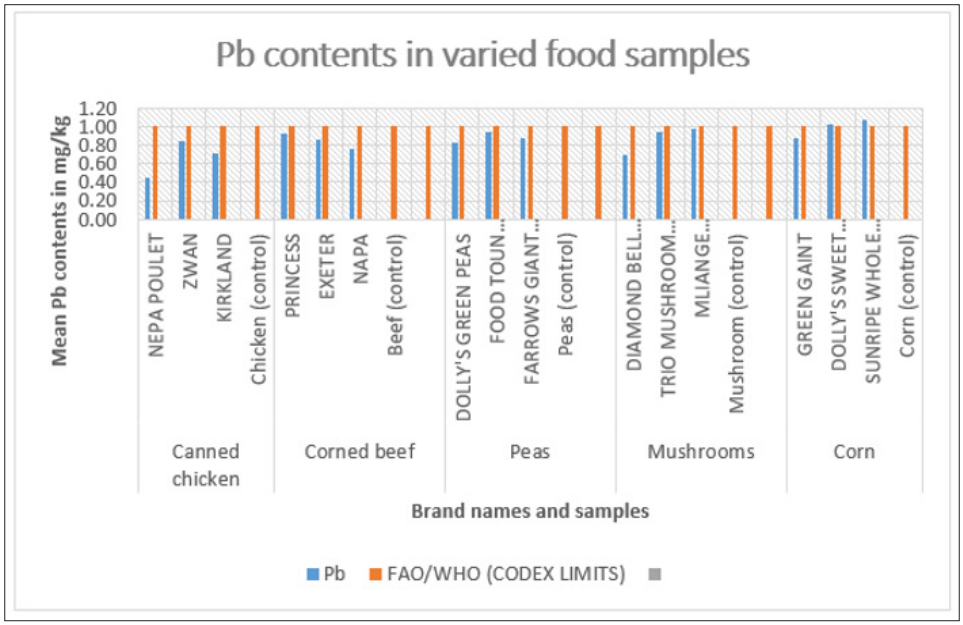

Figure 1: Comparison between the Lead (Pb) concentrations in varied canned foods with their controls and CODEX limit.

Discussion

The findings of this study revealed high concentrations of Pb in all the studied food brands exceeding the USEPA, [17] carcinogenic risks acceptable of 1.0E-06 to 1.0E-04. Been a toxic metal and at very little concentration, it can result to health threats because of its non-biodegradable nature in living organism [18]. The occurrence of Pb in canned food may due to use of Pb in product package materials or due to absorbed lead by plants in limit level [1,2,19]. Lead has been found to be carcinogenic and also a probable enzyme inhibitor [20], which interferes with fertility and causes renal damage. It has been confirmed that children under six (6) years of age and expectant mothers are most vulnerable to the serve health effects of lead [21-25]. The findings of this study also revealed that that almost all canned food brands were lower than the FAO/WHO CODEX [26] limit exempting DOLLY'S SWEET CORN and SUNRIPE WHOLE SWEET CORN. Moreover, the Pb concentration in the control corn was BDL (below detectable limits).

Conclusion

The examined canned foods are potentials for a lifetime carcinogenic risk.

References

1. Flora G, Gupta D, Tiwari A (2012) Toxicity of lead: A review with recent updates. Interdiscip Toxicol 5(2): 47-58.
2. Rahman SH, Khanam D, Adyel TM, Islam MS, Ahsan MA, et al. (2012) Assessment of heavy metal contamination of agricultural soil around Dhaka Export Processing Zone (DEPZ), Bangladesh: Implication of seasonal variation and indices. Appl Sci 2(3): 584-601.
3. Raikwar MK, Kumar P, Singh M, Singh A (2008) Toxic effect of heavy metals in livestock health. Vet World 1(1): 28-30.
4. Hezbullah M, Sultana S, Chakraborty SR, Patwary MI (2016) Heavy metal contamination of food in a developing country like Bangladesh: An emerging threat to food safety. J Toxicol Environ Heal Sci 8(1): 1-5.
5. Mertz W, Abernathy CO, Olin SS (1994) In risk assessment of essential elements. International Life Sciences Institute pp. 300.
6. Jones J (2009) Monitoring and surveillance of non-radioactive contaminants in the aquatic environment and activities regulating the disposal of wastes at sea, 1995 and 1996. Centre for Environment, Fisheries and Aquaculture Science, Ministry of Agriculture, Fisheries and Food pp. 116.
7. Bordy DJ, Pirkle JL, Gunter EW, Kramer RA, Flegal KM, et al. (1994) Blood lead levels in US population. Phase 1 of the National Health and Nutrition Examination Surveys. JAMA 272: 277-283.
8. Codex Alimentarius Commission (FAO/WHO). Joint FAO/WHO food standards programme. pp. 1- 289.
9. Erhunmwunse NO, Ogboghodo IB, Ologbosere OA (2016) Assessment of trace metals in commonly consumed canned tomatoes in benin metropolis. NISEB J 16(2): 1595-6938.
10. AOAC (1984) Official methods of analysis of the association of official analytical chemists, (14th edn). Washington DC pp. 249-252.

11. Radojevic M, Bashkin VN (1999) Practical environmental analysis, (2nd edn). RSc publishing UK pp. 457.
12. Wu B, Zhao, DY, Jia HY, Zhang Y, Zhang XX, et al. (2009) Preliminary risk assessment of trace metal pollution in surface water from Yangtze river in Nanjing section, China. Bull Environ Contam Toxicol 82(4): 405-409.
13. Iqbal J, Shah MH (2012) Health risk assessment of metals in surface water from freshwater source lakes, Pakistan. Hum Ecol Risk Assess 19(6): 1530-1543.
14. Liang F, Yang SG, Sun C (2011) Primary health risk analysis of metals in surface water of Taihu Lake, China. Bull Environ Contam Toxicol 87(4): 404-408.
15. Song S, Li F, Li J, Liu Q (2012) Distribution and contamination risk assessment of dissolved trace metals in surface waters in the yellow river delta. Hum Ecol Risk Assess 19(6): 1514-1529.
16. De Miguel E, Iribarren, I, Chacon E, Ordonez A, Charlesworth S (2007) Risk-based evaluation of the exposure of children to trace elements in playgrounds in Madrid (Spain). Chemosphere 66(3): 505-513.
17. Amirah MN, Afiza AS, Faizal WI W, Nurliyana MH, Laili S (2013) Human health risk assessment of metal contamination through consumption of fish. 1(1): 1-5.
18. Al-Thagafi Z, Arida H, Hassan R (2014) Trace toxic metal levels in canned and fresh food: A comparative study. Int J Innov Res Sci Eng Technol 3(2): 8977-8989.
19. Abdelwahab S, Fadeel Z, Farhan M (2014) Investigation for heavy elements to some canned food. Int J Recent Sci Res 5: 1002-1004.
20. Greenberg AE, Clesceri LS, Eaton, AT (1992) Standard methods for the examination of water and wastewater, (18th edn). American Public Health Association pp. 490-596.
21. Alexander FW (1974) The uptake of lead by children in differing environments. Environ Heal Perspect 7: 155-159.
22. Ziegler EE, Edwards B, Jesen R, Mahaffey KR, Fomon SJ (1978) Absorption and retention of lead by infants. Pediatric Res 12: 29-34.
23. Blake KC, Barbezat GO, Mann M (1983) Effect of dietary constituents on the gastrointestinal absorption of 203Pb in man. Environ Res 30: 182-187.
24. Gilman AG, Rall TW, Nies AS, Taylor P (1990) The pharmacological basis of therapeutics, (8th edn). New York, USA, pp. 1593-1598.
25. WHO (2010) Quantifying environmental health impacts.
26. Codex (1995) General standard for contaminants and toxins in food and feed 193-1995. p. 1-59.

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