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Assessment of the Content of Pb, Cd, Ni and Cr in Soaps and Detergents from Akure, Nigeria*

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Abstract: Assessment of Pb, Cd, Ni and Cr was carried on soaps and detergents from Akure, Nigeria using spectrophotometry method. The mean results of the nineteen samples ranged thus: 3.78, 2.20 and 1.33 mg kg^{-1} of Pb, Ni and Cr, respectively. Cd was below detection limit. There was good correlation between the metals and all the samples (r = Pb (0.969), Ni (0.835) and Cr (0.806) at 95% confidence level. Although the values obtained for the trace heavy metals determined were low, there is a cause for vigilance. It is therefore advisable to monitor the environment were the soaps and detergents were obtained. If this is ensured, the end users of the samples would be safe from environmental hazard-pollution.

Key words: Soaps, detergents, heavy metals, akare

INTRODUCTION

There has been an increased awareness about the health effects of toxic and other trace metals in relation to environmental exposure (Abulude *et al*., 2006a, b). Heavy metals are dangerous because they tend to bioaccumulate in living things any time they are taken up and stored faster than they are broken or excreted. Exposure of the either males or females to these toxic substances resulted in an adverse reproductive outcome. There is growing epidemiological and experimental evidence that male and female gonadal function and germ cells have been affected (NSW Health, 1994). Urbanization, Industrialization, agriculture and aquaculture have been reported to affect the environment due to mining, smelting and metal reclamation, fossil fuel combustion, fertilizers, contaminated sewage sludge and forestry activities (Falandysz *et al*., 2005).

Soaps and detergents are recommended for both medicinal and cleaning purposes. Environmental factors can affect soaps and detergents safety and consequently, public confidence in certain soaps and detergent industries and their supply generally.

In this research a survey of soaps and detergents sold in the market places in Akure, Ondo State, Nigeria was conducted to determine the levels of heavy metal residue such as Pb, Cd, Ni and Cr.

MATERIALS AND METHODS

A total of nineteen soap and detergent samples (Table 1) were purchased in Akure, Ondo State, Nigeria in July 2006. About 0.5 g of the samples was dry ashed in a muffle furnace at 500°C for 1 h. The ashed sample was dissolved in 2 M HCl, filtered and made up to 50 cm^3 with 2 M HCl in a volumetric flask. Pb, Cr, Ni and Cd were determined using a SP 9 Pye Unicam atomic absorption spectrophotometer. Each value was recorded at 217 nm for Cd, 262 nm for Cr, 283.3 nm for Pb and 260 nm for Ni (Mercedes, 2002). At least triplicate determinations were carried.

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Table 1: The soap and detergent samples used for the analysis

Sample	Type	Manufacturer	Package
Kasimu	Toilet soap	Local	-
Septol	Toilet soap	Imported	Cellophane
Imperial	Toilet soap	Industrial	Cellophane
Black	Hand mould	Local	-
Lux	Toilet soap	Industrial	Cellophane
Joy	Toilet soap	Industrial	Cellophane
Omo	Detergent	Industrial	
Canoe	Bar soap	Industrial	-
Premier	Toilet soap	Industrial	Cellophane
Detol	Toilet soap	Imported	Cellophane
USA	Toilet soap	Imported	Paper
Klin	Detergent	Industrial	Cellophane
Elephant Extra	Detergent	Industrial	Cellophane
Soda	Bar soap	Local	-
S.T	Bar soap	Local	-
Fash	Detergent	Industrial	Paper
Zentel	Toilet soap	Imported	Cellophane
Teepol	Liquid detergent	Imported	Plastic
	Liquid detergent	Imported	Plastic

Local: Locally made native soap, industrial-manufactured by established factories, imported-Imported soaps/detergents from foreign countries

RESULTS AND DISCUSSION

The trace heavy metal contents varied with type of soaps and detergents. The overall mean metal compositions (mg kg^{-1}) of the samples were 3.78, 2.20 and 1.33 (SEM 1.31, 0.50 and 0.61) for Pb, Ni and Cr respectively (Table 2). Cd was below detectable limits. The Pb, Ni and Cr contents were significantly higher in imperial leather, omo, premier, klin and elephant extra compared to other soaps and detergents. This is evidenced to suggest that the samples varied in the uptake of metals. However, the type of package and manufacture had no significant influence on other variable.

In lran, Ebadi *et al*. (2005) reported the findings, with regard to Pb in green leaf of tea contents similar to present results, but Cr was lower and Cd content was higher compared to this study. Similar Cd (ND) in urine, water and tissues of red deer contents was obtained by Abulude *et al*. (2006a), Duborija *et al*. (2005) and Falandysz *et al*. (2005), respectively. When compared with the current results. Mariani *et al*. (2005) observed moderately consistent results to our study with respect to Ni (1.2-2.0 mg kg^{-1}) and Cr (0.2-1.8 mg kg^{-1}). Arslan (200la) and Hossain and Khan (2001) reported higher values for Pb, Ni and Cd in street dust (3.5-45, 1.2-12.1 and 0.1-0.6 mg kg^{-1}) and shrimps and lobsters (0.8-3.8, 2.9-8.9 and 0.2-8.9 and 0.2-0.6 mg kg^{-1}) respectively when compared to the present study. Also the Cd (0.028-0.036 mg kg^{-1}) content reported for young coots from industrial and agricultural regions of North middle Poland by Szarek *et al*. (2001) was shightly higher than present result.

The reasons for the different results obtained by different authors could be due to the weather conditions, geographical locations and human activities such as traffic, industrial and agricultural activities (Arslan 2001b). Materials in industrialized areas and motorways that have high traffic volume have become contaminated with traces of heavy metals. The low heavy metal contents recorded by us could be possible from vehicular volumes and agricultural activities.

Heavy metals poisoning particularly Pb and Cd have been reported to give rise to quite a number of clinical syndromes for example, Cd accumulation is associated with hypertension, osteomalacia and itai-itai disease. Pb poisoning has been found to be associated with permanent brain damage, behavioral

Table 2: Levels of trace heavy metals (mg kg^{-1}) in samples analyzed

Heavy metals	Pb	Cd	Ni	Cr
Minimum	ND	ND	1.30	0.50
Maximum	5.80	ND	3.10	2.70
Mean	3.78	-	2.20	1.33
Std. Error of mean	1.31	-	0.50	0.61

disorders and impaired hearing (Asaolu, 2002). Humans absorb heavy metals by ingestion and inhalation through contact with heavy metal particles in soil, dust, water and air. Soaps and detergents have the potential to increase blood heavy metal levels, with the major source of contamination being either from dust, water and air.

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