THE INTERNATIONAL JOURNAL OF SCIENCE & TECHNOLEDGE

The Concentration of Lead in Some Herbs Sold in Port-Harcourt Nigeria

P. A. Odiba
Principal Lecturer, Department of Science Laboratory Technology, Federal Polytechnic, Idah, Kogi State, Nigeria
T. E. Odumakara
HND Student, Department of Science Laboratory Technology, Federal Polytechnic, Idah, Kogi State, Nigeria
I. D. Shehu
Lecturer, Department of Basic and Applied Science, Niger State Polytechnic, Zungeru, Niger State, Nigeria
I. Haruna
Principal Lecturer, Department of Maths/Statistics, Federal Polytechnic, Idah, Kogi State, Nigeria

Abstract:
This study reports the concentration of Pb in G1,G2, G3, G4, G5, G6, and G7 herbal powders, sampled from four sites in oil-mill, Port-Harcourt, Nigeria. The samples were digested using a tri-acid mixture (HNO_3, $HClO_4$, H_2SO_4 – 5:1:1). The Lead content of the digests obtained was determined by Atomic Absorption spectrometry (AAS). The results showed that 100% of the samples contained Pb in concentrations ranging from 0.034± 0.048 to 0.350 ± 0.030 mg/g with G4 recording the highest concentration and G2 recording the least. The pb concentration recorded in all the samples were above the WHO limits (0.01mg/g dry weight of drug).There was no significant difference ($P < 0.05$) in the value of Pb among the samples. This study indicated that the samples analyzed were contaminated with abnormal levels of Pb sufficient enough to expose the consumers of the products to adverse health effects of the metal.

Keywords: *Lead, concentration, herbs, WHO, contamination.*

1. Introduction

The importance of herbal medicine cannot be over-emphasized as the World health organization (WHO) estimated that 80% of the World's population presently use herbal medicine as part of primary health care (WHO, 2000).

The term herb is applied by pharmacists to any plant or plant part that posses medicinal properties (John, 2004). It is a common misperception that medicines of natural substances cannot be toxic, but according to the advanced researches it has been documented that plants not only contain toxic secondary metabolites, but they are also contaminated with environmental pollutants, especially heavy metals, which pose great health risks to all living organisms upon long term exposures (Hina, et al., 2011). In recent years, it has been discovered that some of these herbal products contain a considerable amount of toxic heavy metal such as lead (Martena et al., 2010). In 2001, 50% of 38 Asian herbal remedies purchased in the US and greater than 80% of 16 purchased in Southern Asia and China were identified to have excess lead. Third-party evaluations of several other herbal supplements sold throughout the US have also revealed the presence of high lead content (Buettner, et al., 2009). Drinking water sources in some parts of Nigeria have been reported to contain high level of Pb (Musa et al., 2008(a)). The presence of Pb and other heavy metals in plants and the water used in irrigating them, as well as in soil samples have been reported in different parts of Nigeria (Musa et al., 2008b; Oyelola and Babatunde, 2008).

High levels of lead, causes mental retardation, coma, convulsion and death. Lead and lead compounds have been shown to cause serious damage to the brain of the unborn child (USEPA, 1986; ATSDR, 2007). Kidney disease, both acute and chronic nep phropathy is a characteristic of lead toxicity (Goyer, 1988).

In view of the trend of lead poisoning, there is an increasing need to investigate common herbs that are used in Nigeria. This study was to determine the concentration of lead toxicity in some commonly administered herbal medicinal products marketed in Port Harcourt, Nigeria.

2. Materials and Methods

Seven samples of branded locally prepared herbal medicines were purchased directly from the retail outlets of the manufacturer in oil mill, Port-Harcourt. The branded names of the coded products with their manufactured, and expiry dates are shown in Table 1.

Product	Date of Manufacture	Expiry Date
G1	5/2013	03/03/2015
G2	7/2013	19/0/2015
G3	1/2013	31/12/2015
G4	2/2013	25/2/2015
G5	3/2013	03/06/2015
G6	2/2013	01/04/2015
G7	6/2013	05/07/2014

Table 1: Names of herbal products used in this study

1.1. Sample Pre-Treatment and Analysis

One gramme (1g) of each herbal preparation was weighed into an Elenmeyer flask and digested with a tri-acid mixture (HNO_3:$HClO_4$:H_2SO_4 – 5:1:1) on a hot plate under a fume cupboard at 100^0C until dense white fumes appeared (Allen et al.,1986). The flask was allowed to cool, 40 ml of distilled water was then added and digestion continued until a clear solution was formed. The solution was cooled and filtered into a 100 ml volumetric flask and made up to mark with distilled water. The digests obtained were used for the determination of lead by atomic absorption spectrophotometer (model 2380 Perkine Elmer Inc., Norwalk,CT,USA).

1.2. Calibration Curve

Standard solutions (0.25, 0.50, 0.75, 1.00, 200 µg/ml) for calibration curve were prepared by successive serial dilution of the stock solution. Lead concentrations in both standard and samples were determined using Unicam Solar AA 32 model Atomic Absorption Spectrophotometer (AAS) equipped with hollow cathode lamp, at a wavelength of 217nm and a band pass of 0.5 nm. The flame type was air/acetylene, with a stochiometric fuel flow of 0.9 – 1,2 $Lmin^{-1}$.

1.3. Statistical Analysis

The results obtained were expressed as mean $\pm$ SEM and were analyzed using one-way analysis of variance (ANOVA) on SPSS 11.5 Statistical Software.

3. Results and Discussion

The Lead (Pb) concentration in all the samples ranged from 0.034 $\pm$ 0.048 to 0.350 $\pm$ 0.030 mg/g, with G4 recording the highest concentration and G2 the least (Table 2). The concentration recorded in all the samples were above the WHO limit (0.01mg/g dry weight of plant) for Pb in plant materials (WHO, 2005). A multiple comparison of all the samples revealed no significant difference ($P < 0.05$) in their Pb content.

The results of this study showed that 100% all of the samples were contaminated with Lead. The concentration detected in all the samples exceeded the WHO limit (0.01mg/g dry weight of plant) for lead (Pb) in plant materials, which suggests that they are unfit for human consumption. The lead concentration observed were within the range of those reported in ayurredic medications (0.021 – 96mg/g) associated with toxicity in a recent US case study series (CDC, 2004). Prolonged exposure to such high levels of lead by residents of the study area may result in manifestation of adverse health effects associated with the metal.

Lead causes both acute and chronic poisoning and also poses adverse effects on kidney, liver, vascular and immune system (Jobeen et al., 2010). Lead is a non-essential trace element and has no functions in humans or in plants. They induce various toxic effects in humans at low doses. The typical symptoms of lead poisoning are colic, anaemia, headache, convulsions and chronic nephritis of kidney, brain damage and central nervous system disorders (Khan et al., 2008).

The possible sources of Pb in the sample analyzed could be the soil on which they were grown, application of fertilizers, pesticides and herbicides and/or the water used in irrigating them. Contamination may also result from unfavourable collection technique and wrong storage conditions (Rai and Mehrotra, 2005). However, this study was unable to ascertain which of these sources was responsible for the lead contamination.

Sample	Mean concentration (mg/g)
G1	0.320 $\pm$ 0.001
G2	0.034 $\pm$ 0.048
G3	0.300 $\pm$ 0.001
G4	0.350 $\pm$ 0.030
G5	0.275 $\pm$ 0.021
G6	0.304 $\pm$ 0.000
G7	0.208 $\pm$ 0.001

Table 2: Concentration of Pb in herbal preparation samples

4. Conclusion

All the herbal powders investigated in this study had lead concentrations in them exceeding safe international limit. It is evident that users of these herbal products are inadvertently exposed to lead poisoning and very importantly the regulators should intensify efforts to minimize human exposure risk.

5. References

i. Allen, S.E.,. Grimshaw, H.M and. Rowland, A.P (1986).Chemical analysis In: Methods in Plant Ecology. Moore, P.D., Chapman, S.B. (Eds.), Blackwell Scientific Publication, Oxford, London, pp 285-344

ii. ATSDR, (2007). Toxicological profile for Lead. U. S. Department of Health and Human Services, Public health Service, Agency for Toxic Substances and Disease Registry, Atlanta, Georgia 2 – 101.

iii. Buettner, C.; Mukamal, K. J.; Gardiner, P.; Davis, R. B.; Phillips, R. S., and Mittleman, M. A. (2009). Herbal Supplement use and Blood lead Levels of United States Adults. Journal of general Internal medicine 24(11)1175 – 1182.

iv. CDC (2004). Lead poisoning associated with use of Ayurvedic medications –five states, 2000 – 2003. Centre of Disease control and prevention MMWR Morb Mortal Wkly Rep, 53: 582 – 584.

v. Goyer, R. A. (1988). Lead in: Handbook on Toxicity of Inorganic compounds. Seiler H. G. and Sigel H. (eds). Marcel Dekker Inc. New York. pp 359 – 382.

vi. Hina, B, Rizwani, G. H. and Naseem, S. (2011). Determination of toxic metals in some herbal drugs through Atomic Absorption Spectroscopy Pak.J.Pharm.Sci. 24(3);353– 358.

vii. Jabeen, S.; Shah, M. T.; Khan, S. and Hayat M. Q. (2010). Determination of major and trace elements in ten important folk therapeutic plants of Haripur Basin,

viii. John, R. S. (2004). The role of weeds as sources of Pharmaceuticals. J. Ethanol Pharmacol, 92(2 – 3): 163 – 166.

ix. Khan, S. A.; Khan, L., Hussain, I.; Marwat, K. B., and Ashtray, N. (2008). Profile of heavy Metals in selected medicinal plants. Pakistan J Weed Sci Res 14(1 -2): 101 – 110.

x. Martena, M. J.; Van Der Wielen, J. C.; Rietjen, I. M.; Klerx, W. N.; De Groot, H. N. and Konings, E. J. (2010). Monitoring of mercury, Arsenic and lead in traditional Asian herbal preparations on the Dutch market and estimation of associated risks. US Nat. Lib. Med. Contr. Expo. Risk, 27:190 – 205.

xi. Musa, H.; Yakasa, I. A. and Ya'u, I. B. (2008a). The concentrations of Lead in Shallow well, Borchole and package water samples in Zaria, Nigeria. Int. J. Pure.Appl. Sci., 2(2):22 – 27.

xii. Musa, A.; Yakasa, I. A.; Garba, M. and Musa, H. (2008b) Seasonal Concentrations of manganese in water and Some vegetables cultivated around some rivers and Dam in Zaria, Nigeria. Biol. Environ.Sci J. Trop., 5(3):38 – 42.

xiii. Oyelola, O. T. and babatunde, A. I. (2008). Effect of Municipal Solid Waste on the levels of heavy metals in Olusosun dumpsite Soil, Lagos State, Nigeria. Int.J.pure.Appl.Sci., 2(1):17 – 21.

xiv. Rai, V. and Mehrotra, S. (2005). Toxic contaminants in herbal drugs. Archives of Envrinewslatter of ISEb, India 11(4): 7.

xv. (USEPA) (1986). Lead Effects on cardiovascular function, early Development Criteria for lead (1986). In: Air Quality Criteria for Lead. United States Environmental protection Agency (1): 1 – 67.

xvi. WHO (2000). Hazardous chemicals in human and environmental health: A resource Book for School, College and University Students.

xvii. WHO (2005). Quality control methods for medicinal plant materials – Revised Draft update, Working document 2A5/05.131/Rev.1, World health organization 19 – 25.