American-Eurasian Journal of Toxicological Sciences 3 (3): 124-126, 2011
ISSN 2079-2050

Evaluation of Heavy Metals in Smoked Fish Sold in Ijebu-Ode Southwest Nigeria

[1,2]*A.D. Banjo,* [1]*A.A.R. Adebambo and* [1]*O.E. Adeniyi*

[1]Department of Biological Sciences,
Tai Solarin University of Education, Ijebu-Ode, Ogun State, Nigeria
[2]Department of Plant Science and Applied Zoology,
Olabisi Onabanjo University, Ago-iwoye, Ogun State, Nigeria

Abstract: Monitoring programs and evaluation of metals in the environmental samples have become widely established because of concern over its accumulation and toxic effects, particularly in aquatic organisms. Heavy metals concentrations in fish were determined using atomic absorption spectrophotometer (AAS). The samples analyzed for this research are smoked fish of different species: *Clarias gariepinus* (from natural habitat i.e flowing stream), *Clarias gariepinus* (from concrete pond) *Citharhinus latus* (from stream/river), *Panachana* spp (from stream/river) bought from OKE-AJE market in Ijebu-Ode in Ogun State Nigeria. The analysis for Cd, Pb, Cu, Zn and Hg in the samples was significantly low. The values obtained in this work are still safe for nutritional purpose as recommended by WHO in Annon (1998) and Urseh (2001) but constant review should be carried out annually in other to ascertain and warn when the level of heavy metals is above acceptable limit for safe consumption.

Key words: Heavy metals · Smoked fish · Monitoring · Health · Nigeria

INTRODUCTION

Heavy metals are members of an ill-defined subset of elements that exhibit metallic properties, which would mainly include the transition metals, some metalloids (elements that have both metal and non-metal characteristics) *Lanthanides* and *actinides* [1]. Many different definitions have been proposed some based on chemical properties or toxicity. The term heavy metal have therefore been "meaningless and misleading" in an IUPAC technical report due to the contradictory definitions and its lack of a "Coherent scientific basis" [1].

Depending on context, heavy metals can include elements lighter than carbon and can exclude some of the heaviest metals as the "common transition metals, such as copper, lead, zinc, mercury, cadmium, manganese, e.t.c. [1]. Heavy metals have density above 5g/cm3 [2].

Heavy metals are associated with the myriad adverse health effects, including allergic reactions (e.g beryllium, chromium), neurotoxicity (e.g lead), nephrotoxicity (e.g, arsenic) [3].

The major source of human exposure to mercury compounds is through the consumption of seafood that contains high level of organic mercury compounds [2].

The fish as food forms the only supply of animal protein for a fifth of mankind. It is thus, one of the mostly eaten food items of the world. The world population is an amazing 7 billion people and more than 90% of this population, depend on fish as food [4].

Fish is one of the major sources of protein, to human being. It is expected that Nigeria need about 1.9 million tones to meet our protein requirement [5].

According to international ocean conservation report of 2009, it was stated that Kenya was the second worst polluter of the ocean in Africa after Nigeria. They release startling amount to waste in world oceans and raises new concerns over the rate of environmental degradation in marine life.

Pollutants soluble in water can enter fish through the gills via food, thus causing poisoning deformity, susceptibility to certain diseases and death [6].

In view of the role of fish as one of the major source of protein to human beings in Nigerian, there is need to study the concentration of heavy metals in the fish and its probable health implication on human due to the effect of heavy metals on these fishes.

Corresponding Author: Dr. A.D. Banjo, Department of Biological Sciences, Tai Solarin University of Education, Ijebu-Ode, Ogun State, Nigeria. E-mail: adaba55@yahoo.co.uk.

MATERIALS AND METHODS

The samples for the research were brought from the OKE-AJE market in Ijebu-Ode in Ogun State of Nigeria.

The Samples Collected Were as Follows: SAMPLE A=> *Clarias gariepinus* (from the natural habitat i.e flowing stream)

SAMPLE B=> *Clarias gariepinus* (from concrete pond)
SAMPLE C=> *Citharhinus latus* (from stream/rivers)
SAMPLE D=> *Parachana* spp (from stream /rivers)

All the above mentioned samples were smoked fish from the market, since the research was based on the effect of heavy metals on smoked fish.

The method used in analyzing the heavy metals in the samples is known as Atomic absorption spectrophotometer analysis (AAS). 5.0g each of the samples was weighed and pulverized in the laboratory using the mortal and pestle. The sample was digested in the borosilicate beaker for about 1 hour on the electro mantle at the regulated temperature of 90°C using 20ml of the nitric acid. The solution was filtered and the filtrate was collected in the 100ml volumetric capacity.

The digested samples in the concentrated nitric acid were made up to the 100ml volume with de-ionized water in a 100ml volumetric flask.

Standard: Cadmium (Cd), lead (Pb), copper (Cu), Zinc (Zn) and mercury (Hg). Solution of 0.20, 0.40,0.60, 0.80 and 1.00mg/l were made from the each of the standard heavy metals solution of 100mg/l stock solutions of the heavy metals. The set of standard solutions and the filtrate of the digested samples were analyzed by AAS. The detection limit of the heavy metals in the samples was 0.0001mg/l by means of UNICAM 929 London, Atomic Absorption Spectrometer powered by the SOLAR software. Cadmium, Lead, Copper, Zinc and Mercury cathode lamps were used for the analysis of Cd, Pb, Cu, Zn, Hg ions, respectively. Air –acetylene gas mixture used in generating flame.

RESULTS

The results of the heavy metals analyzed in each of the samples are as follows:

Table 1: Heavy metals concentration in *Clarias gariepinus* (from the natural habitat that is flowing stream)

Metals	Levels of metals (mg/kg)
Cadmium	0.0098
Lead	0.1893
Copper	0.2669
Zinc	0.3642
Mercury	0.0004

Table 2: Heavy metals concentration in *Clarias gariepinus* (from concrete pond)

Metals	Levels of metals (mg/kg)
Cadmium	0.0063
Lead	0.2007
Copper	0.3682
Zinc	0.5488
Mercury	<0.0001

Table 3: Heavy metals concentration in *Citharhinus latus* (from stream/ River)

Metals	Levels of metals (mg/kg)
Cadmium	0.0171
Lead	0.3211
Copper	0.2570
Zinc	0.3261
Mercury	0.0008

Table 4: Heavy metals concentration in *Parachana spp* (from stream/River)

Metals	Levels of metals (mg/kg)
Cadmium	0.0185
Lead	0.2884
Copper	0.3108
Zinc	0.5739
Mercury	<0.0001

Mercury concentration is the least 0.0004mg/kg while Zinc has the highest concentration of0.3642 mg/kg in *C. gariepinus* obtained from flowing stream.

The least heavy metal concentration was that of Mercury very negligible and the highest concentration was Zinc 0.5488 mg/kg in *C.gariepinus* obtained from concrete pond.

Mercury concentration of 0.0008mg/kg was the least while the highest concentration was still in Zinc 0.3261mg/kg in *C. latus* found in streams.

The highest concentration was in Zinc 0.5739mg/kg while the least<0.0001mg/kg very insignificant level was the level of Mercury Parachana spp obtained form the river.

DISCUSSION

Among all the metals analyzed in this research, Zinc has the highest level while mercury has the lowest level in all the samples.

It was observed that (C. *geriepinus*) which gotten from the concrete pond has the lowest level of metals except the level of Zinc, because there was no waste disposal into the pond which can add to the increase of the level of these metals.

Parachana species gotten from the stream/river has the highest level of metals except in mercury the reason for this highest level of metals may be due to the disposal of waste materials into the stream/River.

Essentially, it was also observed that the level of heavy metals in each of the samples varies as the level of heavy metals that the body can tolerate also varies as reported by WHO by Anon [7] and Urseh [8].

Naturally, heavy metals are toxic or poisonous to human's health when their level is too high in the consumable food, but the result of this research showed a low level.

According to the WHO by Anon [7] on the acceptable levels of some heavy metals in the body. It is reported that:

- O ppm of mercury level in food is unsafe for human consumption and that 5.0ppm is harmful while 50ppm is the level at which the risk begins in most people. 1.5ppm of zinc level is very dangerous to the health of the pregnant women and young children 1.0-1.5ppmof copper level is very harmful to human's health.

Comparing the levels of heavy metals in each of the sample taken for this research with the above level reported by WHO in Anon [7] and Urseh [8], it was observed that the level; of heavy metals in the samples are still within safe limit for human's consumption.

CONCLUSION

The main purpose of this study was to check the effect of heavy metals on smoke fishes whether they are still within the safe limit for consumption, meanwhile with respect to the result of this research, it was observed that the samples are still within the safe limit for human consumption, if compared the level of heavy metals in the samples with the acceptable level of metals reported by WHO in Anon [7] and Urseh [8].

Suggestions and Recommendations:

- In view of the low level of heavy metals gotten from the samples analyzed in this work, constant evaluation should be carried out annually in order to know when the level of heavy metals is above the acceptable limit for safe consumption.
- Government should enforce law that will put an end to the negative attitude of disposing waste products into the streams so as to reduce the river and lagoon's burden of waste which often increase the heavy metals concentrations.
- People should be encouraged to rear fish in the concrete pond for safe monitoring, since the sample from the concrete pond has the lowest level of heavy metals.

REFERENCES

1. Duffus, J.H., 2002. Heavy Metals a meaningless term (IUPAC Technical Report). Pure and Applied Chemistry, 74: 793-807. doi:10.1351/pac 200274050793.
2. Goyer, R.A., 1996. Toxic effect of metals In casarett and Doull's toxicology: Basic science of poisons ed. C.D. Klaassen. New york: McGraw-Hill.
3. Hawkes, S.J., 1997. What is heavy metals? Journal of Chemical Education, 74: 1374.
4. WHO, 2003. Fish an issue for everyone: a Concept Paper for Fish for All Summits, pp: 10.
5. Moyib, T.O., 2007. Fish as a major source of protein Mimeograph, pp: 70.
6. WHO, 1999. International for water, fourth edition, ol.6. WHO, Geneva, pp: 140-180.
7. Anon, 1998. Level at which mercury becomes harmful and mineral tolerant animals.http/ www.rochester.edu/ pr/ release/ Med/mercury. htm Journal of America Medical association.