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# ANALYZING THE TRACE METALS FOUND IN IMPORTED CANNED FISHES FOUND IN ONITSHA, ANAMBRA STATE

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## ABSTRACT

*Four different brands of imported sardines were analysed for their trace metals presence using standard methods. The heavy metals analyzed include iron, cadmium, manganese, zinc, lead and magnesium. The iron content was 0.408ppm, 0.940ppm, 0.324ppm and 0.145ppm for today's, titus, sarah and super gold samples respectively. Cadmium was 0.024ppm, 0.040ppm, 0.057ppm and 0.046ppm; manganese 0.061ppm, 0.620ppm, 0.261ppm and 0.332ppm; zinc 2.807ppm, 2.817ppm, 2.428ppm and 1.791ppm; lead 0.543ppm, 0.804ppm, 0.579ppm and 0.759ppm; magnesium 20.364ppm, 20.121ppm, 19.976ppm and 19.965ppm in the same order. The varying concentrations above WHO (2006) standard necessitate constant monitoring by regulatory agencies.*

**Keywords**: Sardines, Cadmium, Iron content, Manganese.

## Introduction

Fishes are the gill-bearing aquatic craniate animals that lack limbs with digits. They form the sister group with tunicates, together forming olfactores (Anthoni, 2006). Fishes includes the living hagfish, lampreys and cartilaginous and bony fish as well as various extinct related groups. Tetrapod emerged within lobe finned fishes, so sadistically they are fish as well. However, traditionally fish are rendered paraphyletic by excluding the tetrapods (i.e the amphibians, reptiles, birds and mammals which all descended from within the same ancestry) (Carballo, 2013).

Because in this manner the term fish is defined negatively as paraphyletic group, it is not considered a formal taxonomic grouping in systematic biology. The traditional term Pisces (also is considered as a typological but not a phylogenetic classification (Benton, 1998). Most fish are ectothermic (cold-blooded) allowing their body temperatures to vary as ambient temperatures change, though some of the large active swimmers like white shark and tuna can hold a higher core temperature. Fish are abundant in most bodies of water (Craddock, 2008). They can be found in nearly all aquatic environments from high mountain streams (e.g. char and gudgeon to the abyssal and even hadal depths of the deepest oceans (e.g. gulpers and angler fish. With 33,600 described species, fish exhibited greater species diversity than any other of group vertebrates (Mallatte and Sullivan., 1998).

Canned fish are fish which have been sealed in an airtight container such as a sealed tin can and subjected to heat. Canning is a

method of preserving food and provides a typical shelf life ranging from one to five years (Carey, 2003). Fish have a low acidity at levels where microbes can flourish. From public safety of view foods with low acidity (a pH more than 4.6) need sterilization under high temperature (116- 130°C) (Schaefer, 2006).

To achieve temperatures above the boiling point requires a method of pressurized cooking which is provided by the containment within the can. After sterilization, the containing can prevent microorganisms from entering and proliferating inside (Kohl, 1995). Other than sterilization, no method is perfectly dependable as a preservative. For example, the microorganism clostridium botulinum (which causes botulism) can only be eliminated at temperatures above the boiling point. Such preservation techniques are needed to prevent fish spoilage and lengthen shelf life (Mallatte, and Sullivan., 1998). They are designed to inhibit the activity of spoilage bacteria and the metabolic changes that result in the loss of fish quality. Spoilage bacteria are the specific bacteria that the unpleasant odours and flavours associated with spoiled fish (William, 2009).

Heavy metals are generally defined as metals with relatively high densities, atomic weights or atomic numbers in metallurgy, for example, a heavy metal may be defined on the basis of density whereas in physics the distinguishing criterion might be atomic number while chemist would likely be more concerned with chemical behavior. More specific definitions have been but none of these have been widely accepted (Lide, 2005).

The earliest knows metals, common metals such as iron, copper and tin and precious metals such as silver, gold and platinum are heavy metals. From 1809 onwards, light metals such as magnesium, aluminum and titanium were discovered as well as well known heavy metals including gallium, thallium and hafnium (Alves et al, 2012).

Iron is a chemical element with atomic number of 26. It is a metal in the first transition series. It is by mass the most common element on Earth, forming mush of Earth's outer and inner core. It is the fourth most common element in the Earth's crust. Its abundance production by fusion in high mass stars, where it is the before the violent collapse of a supernova which the iron into space (Meija, 2016).

Cadmium is a chemical element with atomic number of 48. This soft, bluish-white metal chemically similar to the two others.

## Materials And Methods

### Materials

Measuring cylinder
Digital weighing balance
Whatman filter paper
Distilled water
Volumetric flask (250ml)
Beaker (250ml)
Fume cupboard
Perchloric acid
Trioxintrate (v) acid
Tetraoxosulphate (vi) acid
Electric hot plate
Reagent bottle

Atomic Absorption spectrophotometer (AAS)

**Sample Collection and Preparation**

The canned fishes used in this research work were purchased from a different super markets at Awka metropolis in Orumba North Local Government Area of Anambra State.

**Sample Analysis**

2g of the sample was weighed with the aid of digital balance into volumetric flask. 20ml of aqua regia (a mixture of nutric acid and hydrochloric acid in 1:3) solution (65ml Con $HNO_3$, 8ml perchloric acid and 2ml $H_2SO_4$) were measured into the flask containing the sample covered and digested on electric hot plate on temperature of 60°C-65°°C till a clear digest is observed. The flask is brought down and allowed to cool and the volume made up to 100ml with distilled water, filtered with filter paper and stored in a reagent bottle for heavy metal analysis with the aid of Atomic Absorption Spectrophotometer (AAS) (AOAC, 1990).

**Principle of Operation of Atomic Absorption of Spectrophotometer.**

Atomic absorption spectrophotometer's principle of operation is based on the sample being aspirated into the flame and atomized when the Atomic Absorption Spectrophotometer's light absorbed by the atomized element in the flame. Since metal have their own characteristic absorption wavelength, a source lamp composed of that element is used, making the method relatively free from spectral or radiation interferences. The amount of energy of the characteristic wavelength absorbed in the flame is proportional to the concentration of the element in the sample (AOAC, 1990).

**Results**

The results of the analyses are shown in table 4.1 below.

Table 4.1: Concentrations of trace metals in analyzed canned fishes.

| S/n | Samples | Fe/ppm | Cd/ppm | Mn/ppm | Zn/ppm | Pb/ppm | Mg/ppm |
|---|---|---|---|---|---|---|---|
| **1** | Today's | 0.408 | 0.024 | 0.061 | 2.807 | 0.543 | 20.364 |
| **2** | Titus | 0.940 | 0.040 | 0.620 | 2.817 | 0.804 | 20.121 |
| **3** | Sarah | 0.324 | 0.057 | 0.261 | 2.428 | 0.579 | 19.976 |
| **4** | Super Gold | 0.145 | 0.046 | 0.332 | 1.791 | 0.759 | 19.965 |
| **5** | WHO Std (2006) | 1.000 | 0.010 | 0.010 | 5.000 | 0.010 | 10.000 |

**Discussion**

The results of this study are as encapsulated in table 4.1.

The iron content of the canned sardines was today's (0.408ppm), titus (0.940ppm), sarah (0.324ppm) and super gold (0.145ppm) respectively.

Titus had the highest concentration and super gold the least. When compared with WHO (2006) standard of 1.000ppm, the concentration of the four samples was below the recommended therefore poses no health risk.

The cadmium content of the samples exceeded the stipulated limit of 0.010ppm with sarah (0.057ppm) recording the highest followed by super gold (0.046ppm), today's (0.024ppm) had the least. Cadmium poses a serious health challenge because of its detrimental effect on the central nervous system (Amstock, 1997). The manganese content of the samples (except today's) was above the standard of 0.100ppm. Todays had 0.061ppm, titus (0.620ppm), sarah (0.261ppm) and super gold (0.332ppm).
Manganese intake in foods causes inflammatory response in the lungs (Lide, 2005).
Zinc intake is very beneficial to humans both male and female; it increases the body's immunity, play fertility role in males and acts as a powerful antioxidant, anti-inflammatory agent. Titus (2.817ppm) had the highest value in this category followed by today's (2.807ppm) and then sarah (2.428ppm) and super gold (1.791ppm). Their values were below the standard of 5.000ppm set by WHO (2006).

All the four samples analysed had their lead content far above the standard of 0.010ppm; today's (0.543ppm), titus (0.804ppm), sarah (0.579ppm) and super gold (0.759ppm). This could be attributed to lead contaminants in the source of these samples. Lead exposure causes mental retardation, behavioural disorder, anemia, hypertension, renal impairement (Padmanabhan, 2001).

The magnesium contents of the samples are today's (20.364ppm), titus (20.121ppm), sarah (19.976ppm) and super gold (19.965ppm), They all exceeded the standard of 10.000ppm by WHO (2006), however magnesium intake is body-friendly-it helps reduces the risk of developing hypertension, relaxes smooth muscles at the bronchial level etc (Carballo, 2013).

**Conclusion**

The heavy metal (Fe, Cd, Mn, Zn, Pb and Mg) content of the samples varied considerably above the standard of WHO (2006) except in iron and zinc.

**Recommendations**

1. Constant monitoring of these food items should be enforced by regulatory agencies like NAFDAC to avoid adverse health conditions.
2. This template should serve as a template for further studies.

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