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Quantitative Determination of Cadmium, Chromium and Lead in Selected Instant Noodles Sold in Owerri, Imo State, Nigeria

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Abstract:
The concentrations of Cd, Cr and Pb were determined in five instant noodles brands (Indomie-A, Minimie-B,Tasty tom-C, Supreme-D and Tummy-Tummy-E) sold in Owerri, Imo State, Nigeria. This was done using Atomic Absorption Spectrometry (AAS). The concentrations of Cd ranged from 0.022-0.045mg/kg. These were above the WHO permissible limit of 0.003mg/kg for Cd. The values for Cr were within the permissible limit recommended by WHO. Pb ranged from 0.03-0.05mg/kg. these values were higher than 0.025mg/kg recommended by WHO for Pb. Caution should be taken in frequent consumption of these noodles in order to avoid health issues associated with the bioaccumulation of Cd and Pb in the body over a long period of time. Monitoring agencies (NAFDAC, SON should bring in measures to ensure that only good quality noodles get to consumers.

Keywords: Cadmium, Chromium, Lead, Instant noodles, WHO permissible limit Heavy metals.

I. INTRODUCTION

Food is a basic need of living organisms and nature has made provisions for the meeting of this need. However, technological advancement in the food industry has brought about the production of various kinds of ready meals for immediate consumption. Instant noodles are ready fast food made from wheat or rice flour and eaten throughout the world. It is one of the convenience food in Nigeria. Excessive consumption of instant noodles by Nigerians, has raised concerns about its industrial production processes and health implication as regard to heavy metal content. Heavy metals are potential environmental contaminants with the ability of causing health challenges if present in excess in foods we eat such as noodles; they also get into these noodles through the use of contaminated soil, water, raw materials and during industrial processing (Odiadika, et al., 2020).

Heavy metals such as lead (Pb), Cadmium (Cd) and Chromium (Cr) are notable among those metals which have been detected in food products. They have the capacity of causing human health issues if present in excess amount in food materials. They are toxic even at very low concentrations (Jothi and Uddin, 2014). Toxic heavy metals may enter the human body through food, water, air or absorption through the skin in agricultural, pharmaceutical, industrial or residential settings. Heavy metals become toxic when they are not metabolized by the body and tend to bioaccumulate. Bioaccumulation of toxic heavy metals causes serious health issues such as renal failure, reduction in neuropsychological function, liver damage, neurological impairment, cardiovascular disease, gastrointestinal disease and even death (Emumejayeet.al., 2016).

Previous studies showed that instant noodles were contaminated with heavy metals (Jothi and Uddin, 2014, Onyemaet.al., 2014, Emumejayeet. al., 2016 and Tajder-Orang et. al., 2018) Nuret.al (2019), reported on Heavy metals (Pb,Cd,As) content in instant noodles from Malaysian market. Results showed that all seven samples were detected with heavy metals. The concentration of Pb ranged from 0.27 to 2.94mg/kg; Cd ranged from 0.03 to 0.37mg/kg. Odidika et al, 2020 reported the presence of Cd and Cr in some noodles sold in main market, Onitsha, Anambra State, Nigeria. Cd ranged from ND to 13.33ppm. Cr ranged from ND to 11.00ppm. In that study Pb was detected (0.53-2.40ppm) in all the samples analyzed. Onyema et al., 2014 reported Cd (0.001-0.008mg/kg), Cr (0.063-0.118mg/kg)and Pb (0.025-0.106mg/kg) in instant noodles sold in Nigerian market.

II. MATERIALS AND METHODS

The instant noodles bearing different brand names were purchased from various shops in Owerri. The samples were indomie, Minimie, Tasty tom, supreme and Tummy-Tummy. Each of the instant noodles was separately ground and prepared for digestion. Two grams of the ground sample was weighed into a digestion flask and 20ml of triadic mixture (prepared by mixing 650mlconc HNO3.

Heavy metals are potential environmental contaminants with the capability of causing health problems if present in excess in the food we take in. They can get into the food through contaminated soil, water, raw materials and during industrial processing. Presence of heavy metals in food is not desirable because they can cause health problems in the human body. Hence, this work is aimed at determining the concentration of cadmium, chromium and lead in selected instant noodles sold in Owerri, Imo State, Nigeria.

80ml Perchloric acid and 20ml H2S04) was added for digestion. The flask was heated on a hot plate until a clear digest was obtained. The digest was then diluted with distilled

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water to 100ml mark. A series of standard metal solution in the optimum concentration range were prepared. Heavy metal analysis was conducted using Atomic Absorption spectrometry (AAS) according to the method of APHA (American Public Health Association) working principle (APHA 1995).

III. Results and Discussion

TABLE I: CONCENTRATION OF Cd, Cr, AND Pb IN SELECTED BRANDS OF INSTANT NOODLES

Sample	Name	Cd(mg/kg)	Cr(mg/kg)	Pb(mg/kg)
A	Indomie	0.033	0.000	0.030
B	Minimie	0.045	0.000	0.030
C	Tasty tom	0.022	0.012	0.050
D	Supreme	0.039	0.020	0.045
E	Tummy-Tummy	0.022	0.015	0.040
	WHO permissible limit	0.003	0.050	0.025

Table I shows the concentration of cadmium (Cd), Chromium (Cr) and lead (Pb) in selected brands of instant noodles sold in Owerri, Imo State, Nigeria. Concentration of Cd ranged from 0.022mg/kg in samples C and E to 0.045mg/kg in sample B. The values recorded for Cd in all the instant noodles are above the permissible limit recommended by WHO for Cd which is 0.003mg/kg. (WHO, 2003) Hence such noodles could be harmful to human health if taken over long period of time since the metal will bioaccumulate. Cadmium is primarily toxic to kidney especially to proximal tubular cells. Bone demineralization is affected by cadmium toxicity directly by bone damage and indirectly as a result of renal dysfunction . The sources of cadmium in these instant noodles should be identified in order to prevent cadmium presence in the noodles.

The concentration of chromium in the noodles samples ranged from 0.02mg/kg; these are within the permissible limits recommended by WHO for chromium in foods which is 0.05mg/kg (WHO, 2003).

Lead (Pb) concentration in the instant noodles ranged from 0.03 to 0.05mg/kg. These values were a bit higher than the value of 0.025mg/kg recommended by WHO. (WHO, 2003). Caution should be taken in the constant consumption of these noodles and measures taken to reduce the presence of Pb in these noodles.

IV. Conclusion

The concentration of Cd and Pb in these noodles were above the values permitted by WHO in food substances. Therefore caution should be applied in the frequent consumption of these noodles because health problems could come up as a result of bioaccumulation of these heavy metals. We recommend that producers of these noodles should identify the sources of cadmium and lead and remove them. Also regulatory bodies such as NAFDAC and SON should embark on monitoring to ensure that producers of these instant noodles employ measures that will ensure that only wholesome noodles get to consumers.

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