



**Review of the levels of heavy metals (Arsenic, Cadmium, Chromium, Mercury and Lead) in selected beverages.**

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**ABSTRACT**

This paper aims to review the level of heavy metals content in selected beverages. The labels of selected beverages were observed from various shops due to the increase of their daily intake. The chemical components in some of these beverages have received great interest because they are related to health. This investigation showed that all the selected samples indicated some elements on the label which have received some health concerns about their use and the amount in concentration. Different brands of the same product were indicating different elements at different concentrations. Hence, a thorough finding based on experimental fact should be done because of the health hazards heavy metals pose to humans. .

**INTRODUCTION**

Beverages are widely consumed in The Gambia however, many of them are suspected to have some toxic and hazardous elements called heavy metals because of environmental pollution. Beverages are portable liquids other than water, but as tea, coffee, bear or milt. Most food crops absorb these toxic elements through pesticides and fertilizers residues and other industrial pollution as waste disposals [1]. Due to contamination from these sources, food should be properly managed to prevent harm to human health. Heavy metals are a universal problem because, they are indestructible and most of them have toxic effects on living organisms when permissible maximum concentration limits are exceeded [2].

Some metals such as cobalt, manganese, copper, zinc and iron are said to be essential components of biological activities in the human body because they are considered as micronutrients [3]. Due to this fact, beverage consumption is on the increase in many parts of the world. Most of the beverages contain some amount of essential elements, which add some nutritional value to the human body. However, when taken in excess they are also reported to be harmful to human health [3].

On the contrary, arsenic, cadmium, chromium, lead and mercury have no nutritional value in the human body, rather they play a toxic role in living organisms hence, they are said to be toxic elements because they react with biomolecules of the body, clog up receptor sites, break sulfur bonds in important enzymes such as insulin and damage DNA [3]. Therefore, heavy metal contamination is one of the most significant aspects of food quality assurance.

A heavy metal is any metallic chemical element that has a relatively high density and is toxic or poisonous at low concentration [4]. Arsenic, cadmium, chromium, lead, mercury and thallium are all examples of heavy metals [4]. All these metals are widely used in our chemical world to suit human life in many dimensions such as making of metal alloys, paints, cement, rubber and other materials especially electrical works [5]. Regardless of these benefits, they are regarded as non-essential elements because once they enter the human body; they are likely to interfere with the human immune system by causing gastrointestinal abnormalities and dermatitis [5]. Heavy metal toxicity can also disrupt mental and central nervous systems, damage kidneys, and other important organs because they cannot be degraded or destroyed [4]. Hence, they tend to bio-accumulate by means of increase in chemical concentration in a biological organism over time, in comparison to the chemical concentration of the chemical environment [4]. As a result of that, heavy metal are taken up and stored faster than they are metabolized.

An acute incident of heavy metals was reported in Japan in 1955 where sewage with mercury<sup>870</sup> was released into Minimata Bay following a bioaccumulation of mercury in sea creatures like fish-which led to Hg poisoning in the population [4]. Similar disasters occurred in Basel in 1986 and in Spain in 1998. Maximum permitted concentrations of heavy metals naturally present in beverages are as follows: arsenic 0.14 ppm, cadmium 0.10ppm, chromium 1.00ppm, lead 1.00ppm and mercury 0.50ppm respectively [6]. This paper focuses on Tin Peak Milk, Chinese Tea and Lipton Tea. However, many other beverages are also likely to be contaminated with heavy metals. All these samples contain several compounds that are essential for human health. Besides, they are all suspected to be contaminated with heavy metals based on contamination of raw material sources, inefficient preparations, and storage of raw and finished products procedures among others [1].

### **REPORTS ON HEAVY METAL CONTENTS IN TIN PEAK MILK**

Milk and milk products are the most diversified natural foodstuffs in terms of composition because milk contains more than twenty different essential elements [7]. These micronutrients play a very vital role in physiological function and their deficiencies can cause disturbance and pathological conditions [6]. However, milk and its product can be contaminated with toxic chemical elements through manufacturing and packaging processes [7]. Milk can also be contaminated through food chain of cattle grazing which is the primary source of milk [8]. Although, this paper does not find any label indication of the non-essential elements present or absent in peak milk but some findings in Saudi Arabia, Belgium and Nigeria have shown some experimental facts such as: cadmium level in Luna evaporated milk exceeded the permissible limit in Saudi Arabia [8]. Similar findings were done in Nigeria in 2017 and it was found out that none of the investigated toxic chemical elements exceeded the threshold limit [9].

Chinese green tea consumption is becoming part of culture in parts of the world because it serves as a social function. This is due to the fact that, in every gathering people prepare it or sometimes we congregate at coffee shops for dates, meetings or other social congregations. They linger over green tea ‘(attaya)’ consumption after every meal with friends, serving standardized sizes and its use is integrated into our everyday behavior especially in The Gambia [10].

Notwithstanding, green tea is suspected to be contaminated due to pesticide and fertilizer residues that is absorbed through the roots of the plants [5]. Although, this paper is based on literature review, but research in China shows that all the metals tested for, do not exceed the permissible limit except one trace essential element-copper which exceeded the threshold limit [11]. However, all the four brands of the selected green teas from The Gambian market in this paper show no indication of these elements, which is doubtful.

### **REPORTS ON HEAVY METAL CONTENTS IN LIPTON TEA**

According to Pedro and Marcos “ Economic and social interest in tea is clear from the fact that about 18 -20 billion tea cups are consumed daily in the world” [12]. This is as a result of medicinal value of tea for prevention and treatment of many health issues. Tea has the capabilities of anti-oxidative effects, effects of immune system raising, cholesterol reaction and supporting of other important organs [13]. Thus, tea consumption is on the increase because tea drinking is a traditional habit in Saudi Arabia. Due to the prohibition of alcohol, tea and coffee are becoming socializing tools because tea is consumed at all social occasions in Saudi Kingdom [12]. Hence, heavy metals consumption is likely to be elevated due to the daily intake of tea because tea plants are grown on the soil which is usually polluted with toxic chemicals by human activities especially in industrialized countries. Therefore, assessment of the nutritional value of heavy metal and to guard against any probable ill-effect they could play in human health is significant [12].

However, Lipton tea does not have any indication for any of the toxic elements in its labels,<sup>876</sup> but one of the findings in Saudi have shown that none of the metals under their study exceeded the permissible limit but one trace element-manganese [12] was found to be the highest among the investigated metals in different tea samples.

## RESULTS AND DISCUSSIONS

In this review, most of the chemical elements under study do not exceed the maximum standard except cadmium level in Luna evaporated milk in Saudi Arabia in 2013 [7] and, among the investigated metals in China, one trace chemical element-copper was found to exceed the threshold limit in Chinese green tea in 2015 [11].

One of the researches in Saudi Kingdom in 2008 showed that, among the investigated metals, manganese was found to be maximum in Tata Tea and minimum in Mansual Tea where lead was found to be maximum; whereas lead was at maximum limit in Abu Jabal tea, maximum concentration of cadmium was found in Al-Diata tea and minimum concentration of cadmium was found in Lipton tea [12]. This shows that the selected samples for that study were safe for human consumption.

## CONCLUSIONS

From the literature review, it is found out that heavy metals concentrations seldom exceed the maximum standard recommended by different International Health Organizations. However, beverages producers should constantly check the levels of the labels indicating heavy metal contents. This is due to the fact that, occurrence of heavy metals in foodstuff is unpredicted and could be disastrous to human health.

Heavy metals are teratogenic because of the serious toxicity effects they have on human health, results of numerous health implications such as inhibition of the synthesis of hemoglobin, central nervous system, peripheral nervous system causing lot of difficulties in learning, pregnancy, blood pressure, muscular and joint pain [14]. These human health risks can exert lot of pressure on the economy of a country due to medication requirement for such effects

## RECOMMENDATIONS

It is recommended that further research to be done in order to have more experimental evidence to cite such information.

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