

## A Quantitative Analysis on Cadmium and Chromium Contamination in Powdered Children's Milk Available in Metro Manila, Philippines

J.N. Solidum, S.G. Burgos, K.M. dela Cruz and R. Padilla

College of Pharmacy, University of the Philippines, Manila

**Abstract.** With the increasing number of toxicants being present in the environment the safety of people are at risk as these toxicants can contaminate even the food that the people consume. Children are particularly vulnerable to environmental toxicants because of their possibly greater relative exposure and the effects on their growth and physiological development. This research aims to assess the presence of heavy metals such as cadmium and chromium in powdered children's milk available in the Philippine market. Ten brands of commercially available powdered kid's milk were used as samples in the study. These were analyzed for the presence of cadmium and chromium using flameless atomic absorption spectroscopy. The concentration of cadmium and chromium in the children's powdered milk ranges from (0.003-0.01) ppm and (0.0008-0.001) ppm respectively. The data obtained showed that the cadmium and chromium contents of the ten milk samples tested are within the safe limits as recommended intake of these metals by the World Health Organization.

**Keywords:** Heavy metals, Toxicants, Powdered children's milk, Flameless atomic absorption spectroscopy

### 1. Introduction

Environmental pollution has been a major area of concern worldwide. Industrial and agricultural processes have caused an increased concentration of toxicants like heavy metals in the environment and as a result being taken up by plants or animals into their systems which cause further distribution of toxicants to the environment [1]. This is the case in cow's milk that is being consumed by humans in liquid or powder form. Heavy metals can contaminate milk through exposure of lactating cow to pollution or consumption of feeding stuffs and water with toxicants [2] [7]. Moreover, contamination can also be attributed to the manner of manufacturing dairy products where toxicants have the possibility to be included during the production process. [4] [9]

With the increasing number of toxicants being present in the environment the safety of people is at risk. Children are particularly vulnerable to environmental toxicants because of their possibly greater relative exposure and the effects on their growth and physiological development [6]. Powdered milk is the essential food needed by growing children. It contains both the basic and additional requirement needed by children especially during their developmental years. This milk may be contaminated by heavy metals that at certain levels may cause toxicity to consumers. This toxicity is attributed to accumulation of heavy metals in the body which are not metabolized to excretable products.

Knowing that toxic heavy metals may be present in powdered milk products, confirmation of their presence and corresponding quantities are necessary to assess if the commercial products being marketed are safe to use. The acceptable concentration limit of Cadmium in dietary supplement as proposed by the World Health Organization ranges from 0.008ppm-0.010ppm. Furthermore United States Environmental Protection Agency (US EPA) and United States Food and Drug Authority (US FDA) estimates the daily exposure to total cadmium in an average 9.2 kg infant as 1.3µg/ day. In Chromium, daily intake should not exceed 30 µg/ day.[3]

In this study, it is aimed to assess the presence of the heavy metals cadmium and chromium in powdered children's milk available in the Philippine market, specifically in the supermarkets of Metro Manila. This study also has an objective of obtaining the concentration of cadmium and chromium from the powdered milk samples. Lastly, the study aims to compare the levels of the heavy metals with the standard limits set for them.

## 2. Methodology

### 2.1. Materials

Ten brands of powdered children's milk available in the supermarkets of Metro Manila were collected. The samples were stored in their original containers and were kept at room temperature.

### 2.2. Analysis of Chromium and Cadmium

5 grams of powdered milk were digested in 10 mL concentrated nitric acid in an open glass container overnight, at room temperature, and the next day at 80° C for 5 hours. The solutions were cooled to room temperature and the volume was adjusted to 50 mL with distilled water. These were analyzed using flameless atomic absorption spectrophotometer [8].

## 3. Results and Discussion

In view of the worldwide concern regarding heavy metal contamination in the environment, heavy metal contamination of prime commodities such as food becomes a primary concern. Milk in particular is the common source of nutrient in growing children thus such commodities must be free from heavy metal contamination in order to prevent impairment of growth and development in children. In this study the concentration of cadmium and chromium was determined in ten brands of powdered children's milk. The results are summarized in table 1 and table 2. The concentration of cadmium and chromium in the children's powdered milk ranges from (0.003-0.01) ppm and (0.0008-0.001) ppm respectively. These values were found to be within the safe limits as recommended intake by these metals by the World Health Organization and U.S E.P.A.

## 4. Conclusion and Recommendation

The data obtained showed that the cadmium and chromium contents of the ten milk samples tested are within the safety limits as recommended intake by the World Health Organization and United States Environmental Protection Agency . However, chronic exposure to these heavy metals can cause health hazards to consumers and may eventually lead them to death once the maximum allowable limit of the heavy metal is reached.

Despite the conformance of the ten brands of powdered children's milk, it is still recommended to screen other milks available in the market for potential heavy metal contamination to ensure public safety especially of children.

Table 1: Concentration of cadmium in powdered children's milk

sample	Concentration (ppm)
M1	0.009115
M2	0.009492
M3	0.009434
M4	0.008912
M5	0.003774
M6	0.010160
M7	0.009725
M8	0.009783
M9	0.010160
M10	0.010305

Table 2: Concentration of chromium in powdered children's milk

Sample	Concentration (ppm)
M1	0.001136
M2	0.001135
M3	0.001129
M4	0.001126
M5	0.001131
M6	0.001129
M7	0.000913
M8	0.001125
M9	0.000836
M10	0.001122

## 5. References

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