# HEAVY METALS IN BABY FOODS AND CEREAL PRODUCTS

**Edward MUNTEAN, Nicoleta MUNTEAN, Calina CRETA**

[1]University of Agricultural Sciences and Veterinary Medicine Cluj Napoca, 3-5 Calea Manastur Str., 400372-Cluj Napoca, Romania

[2]Regional Center of Public Health Cluj Napoca, National Institute of Public Health, Romania

E-mail: edimuntean@yahoo.com / Tel. +40754074375 / www.usamvcluj.ro

## Introduction

Heavy metal surveys of baby foods are of big interest nowadays, mainly because of the need to establish limits for infants' exposure to such elements. Among heavy metals, lead and cadmium poisoning can cause brain damage and other problems especially in the case of children [1-3], hence the European Commission has proposed a regulation which sets maximum levels for these elements in foods [1]. Besides industrial emissions, car exhaust gases and soils, contaminated food is an important source of lead exposure; especially vegetables with a high leaf area, such as spinach or lettuce, can contain high lead levels when grown in a contaminated environment; cadmium is easily absorbed by vegetables, reaching quite high concentrations in wheat, rice, oysters, mussels, etc. [4]. High concentrations of these heavy metals in milk and in the milk powder can be a consequence of contaminated cattle fodder. In this research, the distribution of two heavy metals of high concern for environment and human health (lead and cadmium) was measured in several baby-food products. Infants are especially susceptible to toxicity as a result of their rapid growth, immaturity of internal organs and the vulnerability of the central nervous system during the first year of life. Infants and young children may be exposed to heavy metals via powder milk and baby foods, from which they may absorb up to 50% of dietary Pb.

## Materials & methods

**Sample pretreatment & digestion:** Baby foods samples of different brands were purchased from local supermarkets; ~0.5 g homogenized samples were weighed, then 5 mL of $HNO_3$ 65% and 3 mL of $H_2O_2$ were added. Wet digestion using a Berghoff Microwave Digestion System MWS-3+ was used in all cases, followed by sample make-up to 5 mL with $HNO_3$ 1%. To prevent contamination with lead and cadmium, all glassware was washed with nitric acid, then rinsed with ultrapure water.

**Instrument:** Measurements were performed using an AA- 6300 – Shimadzu double beam atomic absorption spectrophotometer (Shimadzu, Japan), with graphite furnace, equipped with deuterium lamp for background correction and hallow-cathode lamps for the studied elements, as well as an ASC-6100F autosampler, data acquisition and processing software. Calibration curves were prepared using five concentrations, the linear correlation coefficients obtained ranged between 0.9900-0.9958. The standard operation conditions were those recommended for each metal in the instrument's method. All measurements were carried out in triplicate.

## Results

- 63 different baby-food and cereal products were investigated for their lead and cadmium content, tables 1 and 2 summarizing the obtained results.
- Cereal based-products seem to be contributing most to infants' and small children's exposure with the studied heavy metals; in 36% from the samples were recorded levels of lead concentrations in the range 0.32-10.64 ppb, for the other 64% lead being under the limit of detection (LOD), while for cadmium more than 85% from samples ranged from 0.1 to 10.37 ppb while for less than 15% of samples cadmium was under LOD.
- For the milk powder, lead levels ranged from 0.85 ppb to 7.26 ppb, 68% samples having Pb under LOD; for cadmium, concentrations ranged from 0.1 to 4.75 ppb, 18% samples having cadmium levels under LOD.
- From the analyzed samples, both cadmium and lead concentrations were simultaneously under LOD only for 2 cereal brands, 4 milk powder brands and 1 baby food brand.

*Table 1. Cadmium concentrations [ppb] ; LOD = 0.1 ppb*

| Sample type | Average | Min | Max | Nr. of samples | Nr. of samples < LOD |
|---|---|---|---|---|---|
| Cereals | 4.21 | 0.30 | **10.37** | 15 | 3 |
| Cereals with fruits | 3.71 | **2.43** | 4.46 | 3 | 0 |
| Cereals with yoghurt | 3.21 | 1.93 | 5.29 | 3 | 0 |
| Cereals with milk | **4.40** | 2.08 | 6.88 | 3 | 0 |
| Cereals with honey | 1.89 | 1.62 | 3.79 | 4 | 1 |
| Cereals with rice | 2.92 | 0.98 | 5.23 | 4 | 0 |
| Milk powder | 1.94 | 0.10 | 4.75 | 22 | 4 |
| Baby foods (misc.) | 3.11 | 0.99 | 8.66 | 9 | 1 |

*Table 2. Lead concentrations [ppb]; LOD = 1.0 ppb*

| Sample type | Average | Min | Max | Nr. of samples | Nr. of samples < LOD |
|---|---|---|---|---|---|
| Cereals | 3.24 | **3.88** | **10.64** | 15 | 9 |
| Cereals with fruits | 2.47 | | 7.42 | 3 | 2 |
| Cereals with yoghurt | 2.87 | 0.32 | 8.29 | 3 | 1 |
| Cereals with milk | 0.63 | | 1.90 | 3 | 2 |
| Cereals with honey | 1.08 | | 4.31 | 4 | 3 |
| Cereals with rice | **5.71** | 3.16 | 9.70 | 4 | 0 |
| Milk powder | 1.03 | 0.85 | 7.26 | 22 | 15 |
| Baby foods (misc.) | 0.35 | | 3.16 | 9 | 8 |

## Conclusion

This study concluded that although most of all the investigated baby food brands may contain lead and cadmium, none of the measured concentrations is higher than the maximum allowed levels according to COMMISSION REGULATION (EC) No 1881/2006: 20 ppb for lead and 100 ppb for cadmium.

## References

1. *** EFSA, 2009, Scientific opinion on cadmium in food - EFSA Panel on Contaminants in the Food Chain. The EFSA Journal, 980, 1-139.
2. *** EFSA, 2010, Scientific opinion on lead in food - EFSA Panel on Contaminants in the Food Chain. EFSA Journal 8(4).
3. Seiler H.G., Sigel A., Sigel H., 1994, Handbook on Metals in Clinical and Analytical Chemistry, Marcel Dekker, New York.
4. *** COMMISSION REGULATION (EC) No 1881/2006 of 19 December 2006 setting maximum levels for certain contaminants in foodstuffs. OJ L 364, 20.12.2006