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ORIGINAL RESEARCH

Occurrence of major and trace elements in powdered milk from Argentina

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The concentrations of major and trace elements in Argentinean commercial powdered milk samples were determined with inductively coupled plasma mass spectrometry. Also the daily intake (DI) was calculated for adults and infants. The concentrations of B, Mg, Na, K and Ca were significantly higher in skimmed milk. Cu, Mo, Fe, Mn and Zn were significantly higher in infant formula. All the DIs were below the tolerable upper intake levels. The mean As concentration (26.0 ± 8.6 ng/g) in the powdered skimmed milk samples was slightly higher than in the others. Mean Pb concentrations ranged from 4.1 ± 2.1 to 13.5 ± 8.2 ng/g. The highest mean U concentration was 7.8 ± 2.6 ng/g for whole milk. This study contributes to the knowledge of major and trace elements in powdered milk and its contribution to the diet in Argentina.

Keywords Major elements, Trace elements, Powdered milk, Infant formula, Argentina, Daily intake, Tolerable upper intake levels.

INTRODUCTION

Dairy products are an important part of human nutrition. They provide a high content of macro- and micronutrients, mostly during childhood. In the case of infants (0–12 months), milk is the main food source, covering their basic nutritional needs (Ataro *et al.* 2008; FAO 2012). Therefore, the determination of micro- (major and trace elements) and macrocomponents (total proteins, total fat, lactose and others) is essential to provide a safe product of good nutritional quality to consumers (Closa *et al.* 2003; Salah *et al.* 2013; Pérez-Carrera *et al.* 2016a; 2016b).

Several studies have characterised the composition of bovine milk and dairy products (Chilliard and Ferlay 2004; Ataro *et al.* 2008), including trace elements (Coni *et al.* 1996; Closa *et al.* 2003; Dobrzański *et al.* 2005; Qin *et al.* 2009; Salah *et al.* 2013; Bargellini *et al.* 2018). However, only very little data exist on trace elements in such products from the Argentinian market (Closa *et al.* 2003; Sigrist *et al.* 2016; Pérez-Carrera *et al.* 2016a; 2016b), although such information would be important for consumers (Argentinian Food Code-CAA). The determination of each individual element's concentration is important due to their different nutritional characteristics. For example, major elements like calcium (Ca), magnesium (Mg), potassium (K), sodium (Na) and phosphorus (P) are required by the body for bone and teeth development and fortification, muscle contraction, nerve impulses, cationic swap, osmotic regulation and other general physiological functions (Closa *et al.* 2003; Akpanyung 2006).

Boron (B), copper (Cu), Iron (Fe), zinc (Zn), manganese (Mn), molybdenum (Mo) and possibly vanadium (V) are only present in what in low concentrations and act as micronutrients. Other trace elements such as arsenic (As), hexavalent chromium (Cr), lead (Pb) and uranium (U) are toxic; hence, the daily ingested amount should not exceed the tolerable upper intake levels (ULs; Akpanyung 2006; Qin *et al.* 2009; NA SEM 2016). Some elements, like Cr(III), Fe

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and Mn, are essential at a certain concentration, but can be harmful if they are consumed in excess (Licata *et al.* 2004; Nardi *et al.* 2009; Qin *et al.* 2009). In recent studies, the DI of dairy products is often compared with adequate intake (AI) and provisional tolerable daily intake (PTDI) levels (Salah *et al.* 2013; Bargellini *et al.* 2018).

In our study, various commercial powdered milk samples of bovine origin, taken from market shelves, were analysed for their major and trace element concentrations. The aim was to evaluate the contribution of powdered milk to the daily intake of minerals by adults and infants, especially for those elements that are considered toxic.

MATERIALS AND METHODS

Samples

Industrial milk powdered samples were taken from Argentinian primary brands on the market. The different brands were classified: 11 whole milk samples, 10 skimmed and five infant formulas, summing up a total of 26 samples, all of bovine origin (Table 6).

Sample preparation

For the determination of trace elements, the samples (three replicates per sample) were digested with 5 mL of nitric acid (65%; Carl-Roth, Karlsruhe, Germany, purified via sub-boiling in-house) in a microwave-heated autoclave (MLS GmbH, Leutkirch, Germany). The digests were diluted with ultrapure water (18.2 MΩ*cm) to 10% v/v acidity.

Determination of element concentrations

Sixteen elements were determined in all samples with inductively coupled plasma mass spectrometry ICPMS (Agilent ICP-MS 7500ce, Waldbronn, Germany) at the following mass to charge ratios (m/z): As (m/z 75), Ca (m/z 43), Cr (m/z 52), Cu (m/z 65), Fe (m/z 56), K (m/z 39), Mg (m/z 24), Mn (m/z 55), P (m/z 31), V (m/z 51) and Zn (m/z 66). B (m/z 11), Mo (m/z 98), Pb (m/z 208) and U (m/z 238) were measured without collision or reaction gas, whereas all the other elements were measured in He mode.

Quality control

Calibration standards were prepared by diluting ICP Multi Element Standard Solution VI CertiPUR® (Merck Millipore, Darmstadt, Germany) with ultrapure water and nitric acid (final acidity concentration: 10% v/v). The Reference Materials SRM 1640a (Trace Elements in Natural Water, NIST, Gaithersburg, MD, USA) and IAEA-153 (Trace Elements in Milk Powder, IAEA, Vienna, Austria) were used for quality control. IAEA-153 was digested like the milk powder samples (four replicates), whereas SRM 1640a was only diluted 1 + 9 with ultrapure water and nitric acid (10% v/v). The final concentrations were adjusted by subtracting the average values of the digestion blanks from the measured concentrations of the samples.

The stability of the ICPMS measurements was controlled by re-measuring one of the calibration standards after each 10th sample. Further, a solution consisting of Ge, In and Lu was added continuously online to the samples as internal standard.

Statistical analysis

Data were analysed using Infostat software, version 2016I. Statistical differences between the same product types from different brands were tested using one-way ANOVA (Kruskal–Wallis). Differences were considered significant at P values ≤ 0.05.

Calculations

Standardised values were used to calculate the DI for all the elements. A balanced diet of 0.06 kg/day of powdered milk was considered for an average 70 kg adult, and 0.07 kg/day of infant formula for an average weight (13.93 kg) baby/child from 0 to 8 years old (WHO 2014). The risk of As, Pb, U and V toxicity was estimated using the average daily intake dose (ADDI) equation for food (USEPA 1992; ATSDR 2005a; ATSDR, 2005b; USEPA 2017):

$$\mathrm{ADDI} = \mathrm{DI} * \mathrm{EF} * \mathrm{ED}/\mathrm{BW} * \mathrm{AT} \tag{1}$$

For the other elements, the following formula was used (USEPA 1992; Bargellini *et al.,* 2018):

$$\mathrm{DI} = \mathrm{C} * \mathrm{IR} * \mathrm{CF} \tag{2}$$

where:

ADDI, average daily intake dose (in mg/kg/d)
DI, daily intake (in mg/d)
C, concentration of the substance analysed (in mg/kg)
IR, daily intake rate (in mg/d)
EF, exposure frequency (in day/year)
ED, exposure duration (in year)
CF, conversion factor ($1/10^6$ kg/mg)
BW, body weight of the exposed person (in kg)
AT, average time correction factor [ED * 365 days for noncarcinogenetic substances; statistical duration of human life (70 years) * 365 days for carcinogenetic substances].

In order to compare calculated DI values with the tolerable daily intake (TDI) levels estimated by the United States Environmental Protection Agency (USEPA) 2017 (Non-Carcinogen TDI Values), the following equation was used:

$$\mathrm{TDI} * \mathrm{BW} \tag{3}$$

RESULTS

Quality control

Table 1 shows the quality control parameters and material reference used to ensure the data accuracy.

Major elements

Table 2 shows the concentrations determined for major elements. Mean levels for Mg found in skimmed milk powder were significantly higher than in whole milk powder and infant formula (1.09 ± 0.19, 0.79 ± 0.14 and 0.54 ± 0.23 mg/g, respectively). A similar situation was observed for the mean concentrations of Na, K and Ca (Table 2). On the other hand, no significant differences were observed for P mean concentrations within the different types of powdered milk.

The mean concentration of Na over all samples (3.7 ± 1.1 mg/g) exceeded the values reported by Akpanyung (2006), which were 0.03–0.12 mg/g, and was similar to the mean concentrations described by Nóbrega *et al.* (1997) in skimmed powdered milk (4.1 ± 0.1 mg/g). At the same time, the mean concentrations (over all 26 samples) of Mg (0.86 ± 0.27 mg/g), K (11.5 ± 3.3 mg/g), Ca (8.87 ± 2.51 mg/g) and P (4.14 ± 3.38 mg/g) found in this study were lower than that described by Akpanyung (2006) and Nóbrega *et al.* (1997). The concentration ranges reported by these authors were 1.0–1.1 mg/g for Mg, 15.0–17.5 mg/g for K, 10.8–11.5 mg/g for Ca and 6.1–9.3 mg/g for P.

Trace elements

A significant difference between the Cu, Mo and Fe concentrations was observed between the infant formula and skimmed and whole milk samples ($P < 0.05$). The infant formula showed higher Cu and Fe mean concentrations and lower Mo concentrations than skimmed and whole milk (Table 3, Figure 1a,b). In this case, it is known that Cu, Fe, Mg, Mn and Zn were added to the infant formula with 3.66 µg/g, 64.0 µg/g, 0.44 mg/g, 0.77 µg/g and 0.04 mg/g, respectively. On the other hand, the concentration of B in skimmed milk was significantly higher than in the infant formula and whole milk samples ($P < 0.05$, Figure 1B).

As and Mo concentrations were higher than the values reported by Nardi *et al.* (2009) (Table 2). The opposite was

Table 1 Limits of detection (LODs), reference data of the reference materials and the determined accuracy.

Element	*LOD (ng/g·dm)*	*NIST 1640a reference value (ng/mL)*	*NIST 1640a trueness* (n = 4) (%)	*IAEA-153 recommended value (+ 95% CI) (µg/g)*	*IAEA-153 trueness* (n = 4%)
As	1.0	8.07 ± 0.07	107 ± 9	Not certified	Not certified
B	0.1	303.1 ± 3.1	84 ± 11	Not certified	Not certified
Ca		5615 ± 21	107 ± 14	12 870 (12 540–13 170)	93 ± 3
Cr	3.0	40.54 ± 0.30	93 ± 10	Not certified	Not certified
Cu	25	85.75 ± 0.51	96 ± 6	0.57 (0.38–0.78)[a]	68 ± 15
Fe	0.1	36.8 ± 1.8	102 ± 5	2.53 (1.66–3.47)	83 ± 13
K		579.9 ± 2.3	114 ± 10	17 620 (16 480–18 760)	83 ± 3
Mg		1058.6 ± 4.1	94 ± 14	1060 (1000–1150)	87 ± 15
Mn	2.0	40.39 ± 0.36	90 ± 10	0.19 (0.12–0.26)[a]	104 ± 17
Mo	1.0	45.60 ± 0.61	100 ± 2	0.31 (0.09–0.60) [a]	78 ± 11
Na		3137 ± 31	101 ± 15	4180 (3870–4440)	95 ± 9
P		Not certified	Not certified	10 100 (9010–11 040)	87 ± 3
Pb	2.0	12.10 ± 0.05	89 ± 9	Not certified	Not certified
U	1.0	25.35 ± 0.27	95 ± 4	Not certified	Not certified
V	1.0	15.05 ± 0.25	93 ± 6	Not certified	Not certified
Zn	0.3	55.64 ± 0.35	90 ± 10	39.56 (37.66–41.23)	96 ± 11

[a]Information value.

Table 2 Major elements in powered milk samples.

	All samples (n = 26)	*Infant formula* (n = 5)	*Skimmed* (n = 10)	*Whole* (n = 11)	*Reference*
Mg (mg/g)	0.86 ± 0.27	0.54 ± 0.23a	1.1 ± 0.2b	0.79 ± 0.14a	1.0–1.1
Na (mg/g)	3.7 ± 1.0	2.4 ± 1.0a	4.7 ± 0.5b	3.4 ± 0.4a	0.02–4.06
K (mg/g)	11.5 ± 3.3	6.6 ± 2.6a	14.9 ± 0.5b	10.8 ± 0.5a	15.0–17.5
Ca (mg/g)	8.9 ± 2.5	5.1 ± 2.0a	11.4 ± 0.5b	8.3 ± 0.3a	10.8–11.5
P (mg/g)	4.1 ± 3.3	3.2 ± 1.8	5.0 ± 4.3	3.8 ± 3.0	6.1–6.9

Data: different letters show significant differences, ANOVA nonparametric (Kruskal–Wallis), $P < 0.05$.

Table 3 Trace elements in powdered milk samples.

	All samples (n = *26*) *Range*	*Infant formula* (n = *5*) *Mean* ± *SD*	*Skimmed* (n = *10*) *Mean* ± *SD*	*Whole* (n = *11*) *Mean* ± *SD*	*Reference data*
As (ng/g)	< LOD −167	20.5 ± 14.1	26.0 ± 8.6	16.3 ± 10.4	6.3 ± 0.2*
B (µg/g)	0.6–7.4	2.44 ± 1.59a	5.15 ± 1.20b	2.9 ± 0.8a	–
Cr (ng/g)	< LOD −102	28.0 ± 13.5	25.3 ± 9.8	17.3 ± 9.4	32.0 ± 4.0*
Cu (µg/g)	0.12–3.64	2.57 ± 0.63b	0.23 ± 0.05a	0.19 ± 0.05a	0.18–0.24+
Fe (µg/g)	1.5–119	67.1 ± 30.4b	2.0 ± 0.2a	1.7 ± 0.3a	99.4–118●
Mn (ng/g)	102–1002	530 ± 305b	188 ± 19.9b	141 ± 13.4a	90.0–9900◇
Mo (ng/g)	110–528	198 ± 51a	385 ± 80.6b	373 ± 57b	36.0–47.0◇
Pb (ng/g)	< LOD −45.3	13.5 ± 8.2	4.1 ± 2.1	5.1 ± 2.6	14.0 ± 0.2*
U (ng/g)	< LOD −30.7	5.5 ± 1.8	4.6 ± 2.2	7.8 ± 2.6	–
V (ng/g)	5.0–260	34.6 ± 27.8	41.2 ± 26.3	21.6 ± 11.0	29.8–35.6◇
Zn (µg/g)	23.1–62.4	43.3 ± 13.1b	36.5 ± 4.0b	27.0 ± 2.4a	4.2–226+

Data: * mean ± SD obtained with ICPMS by Nardi *et al.* (2009).

◇ Range within two determination techniques by Nardi *et al.* (2009).

● Range described by Akpanyung (2006).

+ Range within data obtained by Akpanyung 2006 and Nardi *et al.* (2009).

Data: different letters show significant differences, ANOVA nonparametric (Kruskal–Wallis), $P < 0.05$.

observed for Cr and Pb mean concentrations (Table 3). In the case of V, the average concentration found in skimmed milk exceeded the values described by Nardi *et al.* (2009), while its concentration in whole milk was below the range reported by this author (Table 2).

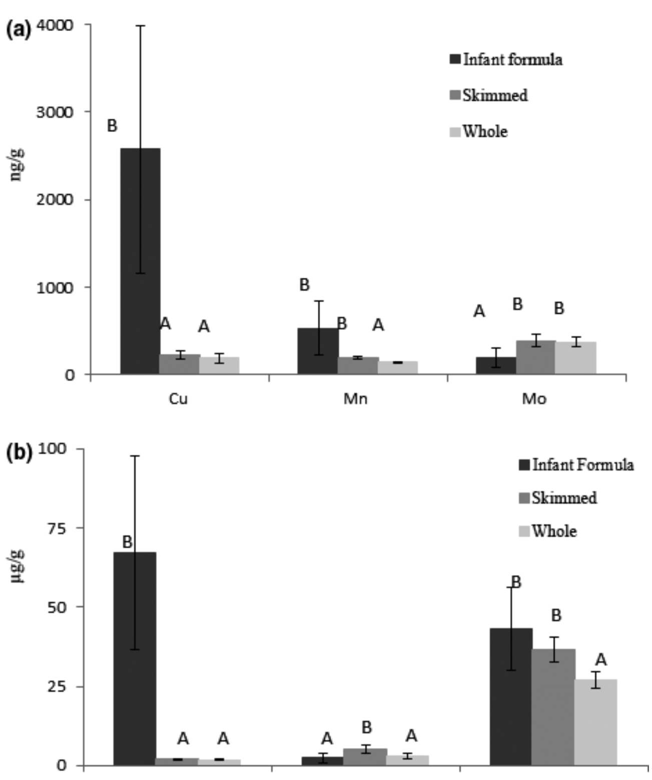

Figure 1 (a and b) Trace element concentrations in the different types of milk. Different letters indicate significant differences ($P < 0.05$), nonparametric ANOVA (Kruskal–Wallis).

As to the micronutrients determined in this work, Mn, Cu and Zn concentrations were within the range published by others authors (Akpanyung 2006; Nardi *et al.* 2009). The exception was Fe; its mean concentration was lower than the values determined by Akpanyung (2006) (Table 3).

Major and trace elements daily intake rate

Table 4 shows the DIs of major elements through consumption of powdered milk for each age group. The calculated DIs for infants are within the recommended dietary allowances (RDAs) described by the United States National Academy of Sciences, Engineering, and Medicine (NA SEM 2016). For adults, however, all major elements were below the suggested RDAs.

The DIs of the investigated trace elements are listed in Table 5. For infants and children, the DIs for Cr, Fe, Mn and Mo were within the RDAs (NA SEM, 2016), but the DIs calculated for adults for these elements were below the RDAs. In all cases, the DIs were below the ULs (NA SEM 2016). The ADDI rate was used to calculate As exposure through consumption of milk powder products. The ingestion rate calculated for infants and children (0.103 ± 0.065 µg/kg/d) was higher than the one for adults (0.018 ± 0.004 µg/kg/d). In no case, the UL used by Carignan *et al.* (2015) (2.1 µg kg/d) was exceeded. It has to be mentioned that this UL was only a provisional value and has been withdrawn in 2010 (EFSA 2014). The ingestion rate calculated for V showed that the average consumption in adults is 0.1% of the suggested UL.

Table 4 DIs of major elements, compared with RDAs and UL for infants/children and adults.

Major elements	*Life stage group*	*Mean DI*	*RDA range*	*UL*
Ca (mg/d)	Infants/children (0–8 years)Adults (>9 years)	360 ± 143585 ± 100	200–10001000–1300	ND2500
K (mg/d)	Infants/children (0–8 years)Adults (>9 years)	461 ± 165763 ± 130	400–38004500–5100	NDND
Mg (mg/d)	Infants/children (0–8 years)Adults (>9 years)	38 ± 1656 ± 13	30–130240–400	65–110350
Na (mg/d)	Infants/children (0–8 years)Adults (>9 years)	165 ± 67242 ± 48	120–12001500	1500–19002200–2300
P (mg/d)	Infants/children (0–8 years)Adults (>9 years)	223 ± 126262 ± 218	100–500700–1250	30003000–4000

Data: ND: not determined

Figure 2 shows the DI/RDA ratios of major and trace elements for both age groups. It can be observed that the ratio is higher for infants/children than for adults. This means that the contribution of powdered milk to the RDA of these elements is higher for infants than for adults.

Regarding the TDI values of the USEPA (2017), the DI/TDI ratios were within 1.9–71.8% for infants, whereas for adults, they were from 0.1 to 9.1% (Figure 3).

DISCUSSION

The analysed commercial powdered milk samples represent a high percentage (approx. 70%) of trademarks that the market provides for general public access in Argentina.

As for the major elements, significant differences in the concentrations of Na, Ca, K and Mg were observed between infant formulas and whole milk compared to skimmed milk.

Table 5 DIs of trace elements, compared with RDAs and ULs for infants/children and adults.

Trace elements	*Life stage group*	*Mean DI*	*RDA range*[a]	*UL*[a]	*TDI*[c]
As (µg/d)	Infants/children (0–8 years) Adults (>9 years)	1.4 ± 0.91.3 ± 0.3	NDND	29.2[b]147.0	4.221
B (mg/d)	Infants/children (0–8 years) Adults (>9 years)	0.2 ± 0.10.2 ± 0.1	NDND	< 6.011–20	2.8
Cr (µg/d)	Infants/children (0–8 years) Adults (>9 years)	2.0 ± 0.91.3 ± 1.1	0.2–1520–45	NDND	1500 (Cr III)3.0 (Cr VI)
Cu (mg/d)	Infants/children (0–8 years) Adults (>9 years)	0.2 ± 0.112.6 ± 3.3[d]	200–440700–1300	<30005000–10 000	557.22800
Fe (mg/d)	Infants/children (0–8 years) Adults (>9 years)	4.7 ± 2.10.11 ± 0.02	0.27–118–27	4040–45	9.749
Mn (mg/d)	Infants/children (0–8 years) Adults (>9 years)	0.037 ± 0.0210.010 ± 0.002	0.003–1.51.6–2.6	2.0–3.06.0–11.0	1.99.8
Mo (µg/d)	Infants/children (0–8 years) Adults (>9 years)	13.9 ± 3.522.7 ± 4.0	2–2234–50	<6001100–2000	69.6350
Pb (ng/d)	Infants/children (0–8 years) Adults (>9 years)	0.9 ± 0.60.28 ± 0.03	NDND	NDND	50 250
U (ng/d)	Infants/children (0–8 years) Adults (>9 years)	0.38 ± 0.120.37 ± 0.09	NDND	NDND	2.814
V (ng/d)	Infants/children (0–8 years) Adults (>9 years)	2 ± 21.9 ± 0.6	NDND	ND<1800	1470
Zn (mg/d)	Infants/children (0–8 years) Adults (>9 years)	3.0 ± 0.91.9 ± 0.3	2–58–13	4–1223–40	4.221

Data:

ND: not determined.

[a]NA SEM (2016).

[b]Reference data from Carignan *et al.* (2015).

[c]Reference values (mg/kg/d or µg/kg/d, USEPA 2017) multiplied with average body weight (13.93 kg for infants, 70 kg for adults).

[d]µg/d.

There was no significant difference in the concentration of P between infant formulas and skimmed and whole milk. It was observed that the intake rate found for those elements covered the basic needs of infants (from 0 to 12 months) described by the NA SEM. However, children (from 1 to 8 years) require complementary contributions to the diet (Table 3). The intake of Ca, Mg and P is required for bones and teeth development and fortification. In addition, these elements are also required together with Na and K for metabolic processes, such as synthesis of proteins and DNA, nerve impulses, muscle contraction and relaxation and osmotic balance, among others. For adults, all the major elements are below the range suggested by the NA SEM (2016) (Figure 2a). However, adults usually cover the daily requirements of the various elements by a balanced diet that includes all kinds of different food, not just dairy.

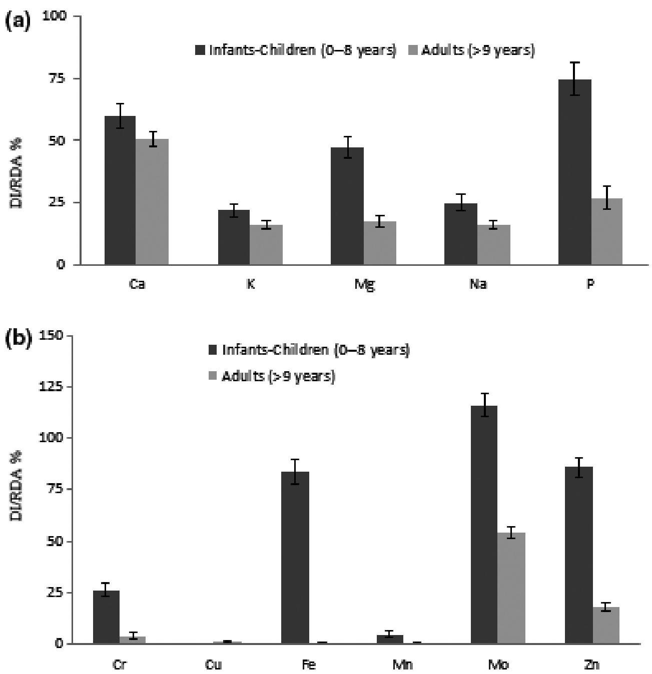

Figure 2 (a and b) DI/RDA ratios (%) of major and trace elements for infants/children (0–8 years) and adults (<9 years).

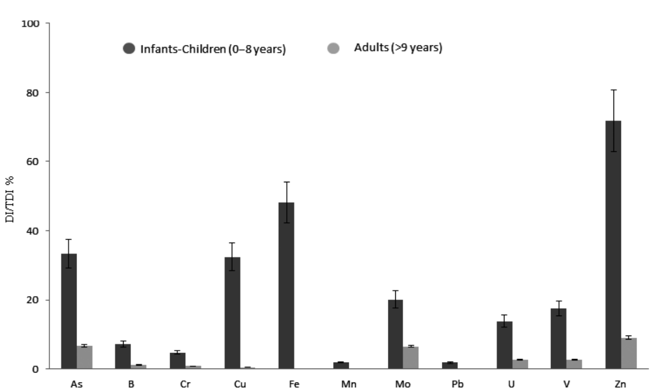

Figure 3 DI/TDI ratios (%) of major and trace elements for infants/children (0–8 years) and adults (<9 years).

Regarding the analysed trace elements, a high variability in the determined concentrations was observed. In general, the range obtained for trace elements was between the values described by other authors (Table 2). There is only very little information in literature about B and U in powdered milk.

Taking into account the DI values suggested by the Food and Nutrition Board of the Institute of Medicine of the NA SEM 2016), the DIs obtained do not exceed RDAs and ULs. Despite this, it is important to note that long-term exposure to As, Cr(VI), Pb and U can lead to health problems (Akpanyung 2006; Ataro *et al.* 2008; Nardi *et al.* 2009; Qin *et al.* 2009). In the case of Cr (assuming it is not in the hexavalent form), the calculated DI is sufficient for infants and children, but it was below the RDA range suggested for adults (Table 4, Figure 2a,b). For As, the ADDI was higher for infants and children than for adults. In no case, the (former) UL of 2.1 μg/kg·d was exceeded (Carignan *et al.* 2015) (Table 4). Regarding Pb, it is known that exposure can lead to a delay of the cognitive development of children, among other effects (Ataro *et al.* 2008). In this case, there is no RDA or UL (2016). Even so, the Pb mean concentrations found do not exceed those reported by other authors (Nardi *et al.* 2009; Abdulkhaliq *et al.* 2012). With regard to U, high concentrations of natural origin can be found in the Argentinian environment. Its concentrations in the samples analysed were low, and the exposure by ingestion is low as well. When comparing the TDI (USEPA 2017) values for Pb and U with the DI/RDA and the DI/TDI, it is possible to see differences between infant/child and adult intake. In none of the cases, shown in Figure 3, values exceed the ones suggested by the USEPA. Meanwhile, Mo levels are above the RDA (Figure 2NA SEM (2)).

CONCLUSIONS

In conclusion, this study contributes to the knowledge of toxic elements, macro- and micronutrients in powdered milk on the Argentinian market. This is important to ensure a safe and nutritive intake of this product. According to our data, an average daily consumption of 0.07 kg infant formula can cover the recommended intake levels of infants/children, whereas a daily portion of 0.06 kg powdered milk is not sufficient to cover the required amounts of major and trace elements for adults. Further, the concentrations of the (potentially) toxic elements are too low to pose an immediate health risk for consumers.

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APPENDIX

Table A1 Package basic composition described for a 200 mL of restored milk (per portion).

	Whole	*Skimmed*		*Infant formula*	
N	*11*	*9*	*1*	*4*	*1*
Basic formula	Whole milk, soy lecithin & vitamins A & D	Skimmed milk, soy lecithin & vitamins A & D	Skimmed milk, soy lecithin, vitamins B2 & B12, P & Ca	Lactose, whey protein, skimmed milk, vegetable oils, nutrients	Skimmed milk, soy lecithin, vitamins A, B & D, P & Ca
Fat (g)	6.61 ± 0.15	0.14 ± 0.05[a]		6.20 ± 0.75	7.00
Protein (g)	6.38 ± 0.46	6.46 ± 0.66[a]		3.15 ± 0.77	6.80
Vitamin A (µg)	130.3 ± 1.8	127.0 ± 1.1	ND	155.5 ± 46.4	187.0
Vitamin B2 (mg)	0.28 ± 0.01	0.27 ± 0.02[a]		0.19 ± 0.01	0.31
Vitamin B9 (µg)	0.36 ± 0.01	ND		21.5 ± 2.9	ND
Vitamin B12 (µg)	0.57 ± 0.29	0.32 ± 0.01[a]		0.38 ± 0.02	0.36
Vitamin D (µg)	2.02 ± 0.04	1.60 ± 0.35	ND	2.32 ± 0.35	1.80
Na (mg)	129.5 ± 1.7	94.4 ± 9.7	112.0	47.7 ± 11.6	92.0
Ca (mg)	226.4 ± 24.6	248.3 ± 3.14[a]		124.5 ± 28.8	245.0
P (mg)	193.0 ± 11.5	195.7 ± 4.8[a]		80 ± 37	199.0
Fe (mg)	ND	ND		1.67 ± 0.18	3.1
Mg (mg)	ND	ND		11.51 ± 1.75	22
Zn (mg)	ND	ND		1.26 ± 0.03	1.3
Cu (µg)	ND	ND		95.2 ± 9.85	ND
Mn (µg)	ND	ND		20.7 ± 6.04	ND

ND, not detailed in package.

[a]Average calculated from package.

