



SURVEY ON THE CONTENT OF TOXIC METALS OF DIETARY SUPPLEMENTS FOR SPORTSPEOPLE

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Introduction

The aim of present study was to evaluate the results of the monitoring of metal contamination levels in dietary supplements for sportspeople available on market of Vojvodina (Serbia), in years 2009-2010. There is a risk of illicitly high toxic metals and metalloids levels in dietary supplements. Toxicity depends on the level of product contamination, quantity, frequency and duration of intake.

Samples were classified as products containing caffeine, creatine, carnitine, amino acids or proteins (5, 19, 7, 37 and 20 samples, respectively), with broad scope of intended use. All analysed products were manufactured by foreign manufacturers, in different dosage forms (tablets, capsules, powder).

Methodology

Metal concentrations were determined by atomic absorption spectrometry (AAS): flame AAS for Pb and Cd; cold vapor technique for Hg (Figure 1). Level of quantification (LOQ) (mg/kg): Pb 0.1, Cd 0.02, Hg 0.01.

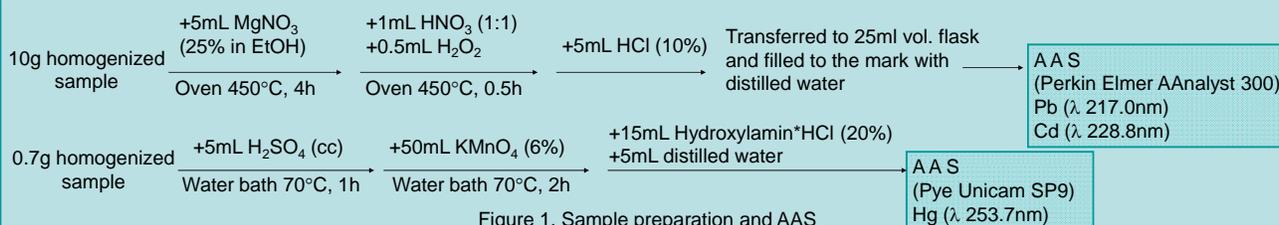


Figure 1. Sample preparation and AAS

RESULTS AND DISCUSSION

The obtained levels of metals and metalloid found in the analysed samples, expressed as mg of analyte per kg of dietary supplement, are summarized in Table 1. Concentrations determined in certified reference material (CRM BCR-185R, bovine liver) are in excellent agreement with the certified values (Table 2).

Table 1. Metal / Metalloid levels in supplements for sportspeople

Metal / metalloid	> LOQ ^{a)}	Metal level: median (range) (mg/kg)	MAL (mg/kg)	Metal level / MAL (%) ^{b)}	> MAL ^{c)}
Pb	8 (9.1%)	0.12 (0.1-0.4)	3	4.0 (3.3-13.3)	0
Cd	6 (6.8%)	0.045 (0.04-0.14)	1	4.5 (4.0-14.0)	0
Hg	1 (1.1%)	5.4 (-)	0.1	5400 (-)	1

- a) number (percent) of analyzed samples with metal/metalloid level above the LOQ
 b) ratio between measured metal/metalloid levels and MAL (median, minimum and maximum)
 c) number of analyzed samples with metal/metalloid level above the MAL

Table 2. Metal level in CRM BCR-185R (bovine liver)

CRM BCR-185R (bovine liver)	
Concentrations (mg/kg)	
	defined measured ^{a)}
Pb	0.172±0.009 0.173
Cd	0.544±0.017 0.544

- a) based on three independent measurements

The study showed that of 88 analyzed products, 12 samples (13.6%; 1 caffeine, 1 creatine, 1 carnitine, 6 amino acids and 3 protein samples) were positive for at least one of the tested analytes. The most frequently detected element was Pb (in 8 samples), followed by Cd (6 samples), and Hg (1 sample). In 3 samples (3.4%) more than one of the analyte was detected (Pb and Cd; 1 amino acid and 2 protein samples).

Determined levels of Pb, Cd and Hg were compared with maximum allowable levels (MALs), and results were expressed as ratio between measured metal/metalloid levels and MAL (median, minimum and maximum).

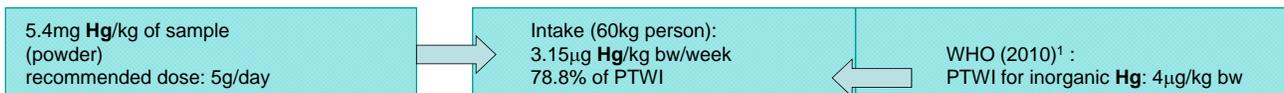
Highest amount of Pb, found in one protein sample, represents 13.3% of corresponding MAL. In case of Cd, highest amount was found in one amino acid sample, reaching 14.0% of corresponding MAL. Hg was detected just in one sample (branched chain amino acid), but in amount reaching 5400% of corresponding MAL.

Regarding legal requirements, only one of analysed products (1.1%; branched chain amino acid) violated MAL for Hg.

Further objective of the study was to estimate weekly intake of metal/metalloid from dietary supplements violating MAL, based on recommended daily dose of dietary supplement, and compare it with tolerable exposure.

Ingestion of recommended dose (portion 5g, 1 portion/day) of branched-chain amino acid with Hg content of 5.4mg Hg/kg would cause weekly intake of Hg to reach 78.8% (for 60kg person) if compared with tolerable weekly intake for inorganic Hg (4 µg/kg bw; WHO 2010)¹.

Exposure to Pb and Cd through the tested dietary supplements is not expected to affect human health.



Conclusion

Present study showed the need to eliminate low quality dietary supplements from the market, as such products present potential threat to human health. It should be taken into account that the use of dietary supplements is just one among all possible yields that contribute to daily intake of toxic metals and metalloids.

Reference

¹ WHO Technical Report Series 959. Evaluation of certain food additives and contaminants: seventy-second report of the Joint FAO/WHO Expert Committee on Food Additives. Geneva: WHO; 2011.