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FOOD SUPPLEMENTS FOR WEIGHT LOSS: MONITORING OF METALLIC AND NON-METALLIC IMPURITIES

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INTRODUCTION

Food supplements for weight loss are widely consumed, often without any control or medical supervision.

Heavy metals can accumulate in medicinal plants growing in nature and impurities may also **be incorporated in food supplements** during manufacturing, piping and packaging processes. [1]

Without any therapeutic benefit but with potential toxic effects, these impurities should be controlled within acceptable limits.

OBJECTIVES

The AIM of this study was to **monitor elemental impurities in weight loss supplements.**

MATERIAL & METHODS

SAMPLES:

25 different weight loss supplements, randomly purchased from 5 different suppliers, in a total of 75 samples (Figure 1). All dietary supplements have plant-based composition *(for confidentiality reasons, the studied products shall not be identified).*

ANALYTICAL TECHNIQUE :

Concentrations of elemental contaminants were monitored by Wavelength Dispersive X Ray Fluorescence technique (Figure 1).

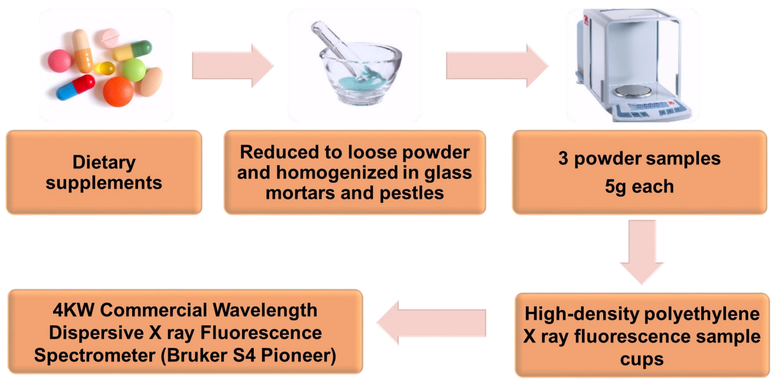
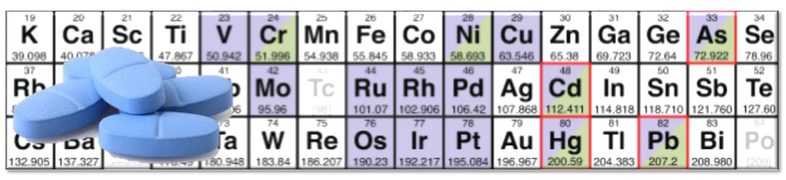


Figure 1. Sample preparation

RESULTS & DISCUSSION



Current requirements for metal impurities in plant-based food supplements imposed by European Commission (EC) and United States Pharmacopeia (USP) only **defines limits for As, Cd, Hg and Pb** (Table 1). [2,3] Although, the presence of other elements may have adverse effects and potentially put the product quality and consumer safety in jeopardy. Since USP and European Medicines Agency (EMA) establish limits for several metal impurities in drug products (Table 2), **it was decided in this study to extend the monitoring of all these elements also to food supplements**. [1,4]

Table 1. Imposed limit levels of elemental contaminants in food supplements [2,3]

Element	Concentrations (ppm)	
	EC (629/2008)	USP 36
As[a]	*	1.5
Cd	1.0	0.5
Hg	0.1	1.5
Pb	3.0	1.0

[a] inorganic; * not specified (1 ppm = 1 µg/g)

Table 2. Current EMA and USP limits for elemental impurities in pharmaceuticals (oral route) [1,4]

EMA		USP 38	
Classification of elements	Concentration (ppm)	Element	Concentration (ppm)
Class 1A		As[b]	0.15
Pt, Pd	10	Pb	0.5
		Hg[b]	1.5
Class 1B		Cd	2.5
Ir, Rh, Ru, Os	10[a]	Ir	10
		Mo	10
Class 1C		Os	10
Mo, Ni, Cr, V	25	Pd	10
		Pt	10
Class 2		Rh	10
Cu, Mn	250	Ru	10
		V	10
		Ni	50
Class 3	1300	Cu	100
Fe, Zn		Cr	*

[a] Combination of the 4 elements should not exceed the specified limit;
[b] inorganic; * not a safety concern

Figures 2 and 3 show the obtained results. In two supplements **were detected several elemental impurities above limits**: in one sample Cr and Ru; in another sample Mn, Pb and Ru.

Since supplements for weight loss are extensively and chronically consumed, the found **elemental impurities** in their composition can lead to accumulation over time, leading to **possible toxicity** [1,5,6]:

Pb
- immunological, neurological, reproductive, developmental and genotoxic effects

Cr
- some studies report some carcinogenic effects, anemia and gastrointestinal effects

Mn
- related to neurotoxicity and a neurologic syndrome similar to Parkinson's disease

Ru
- there is insufficient data about Ru toxicity

CONCLUSIONS

- **Elemental impurities were found in the analyzed food supplements above the imposed values by international regulatory bodies**;
- Other contaminants besides those regulated for food supplements were found in higher levels than the acceptable for drug products;
- It seems **important to set the same quality standards for food supplements as for pharmaceuticals;**
- According to the authors, the **extending of concentration limits to other elements than those already imposed for food supplements** should be considered, due to the pernicious effects they may have in consumer´s health.

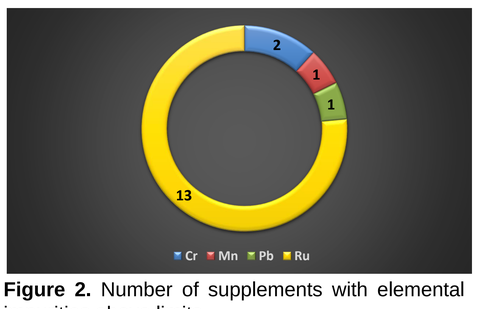
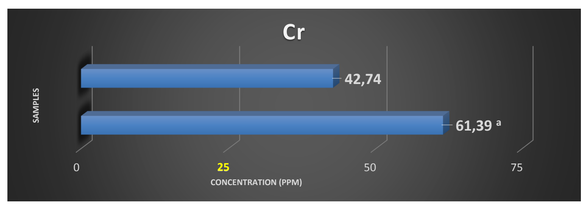
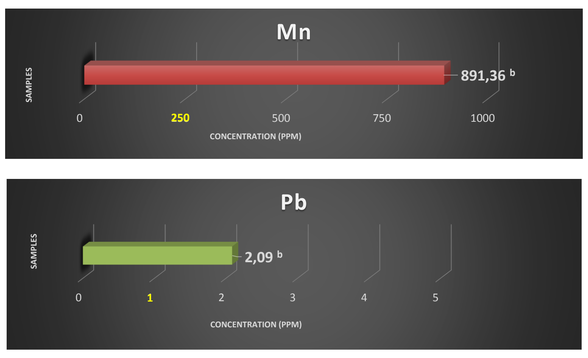
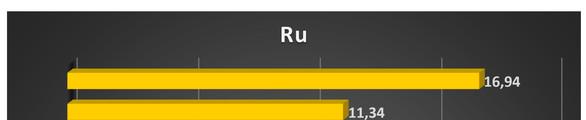


Figure 2. Number of supplements with elemental impurities above limits







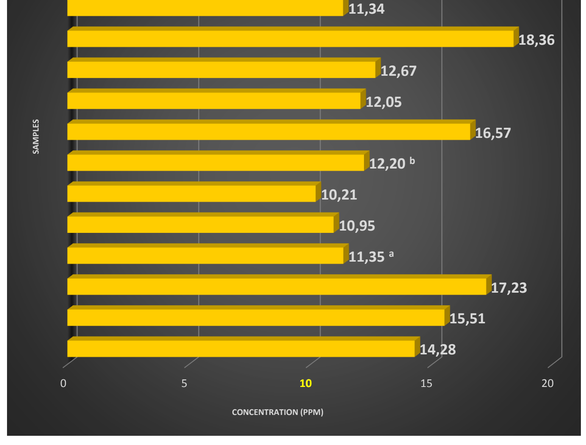


Figure 3. Obtained concentrations for Cr, Mn, Pb and Ru above the imposed limits (in yellow)
([a] and [b] represent supplements with multiple contaminants)

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