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

A. Figueiredo\textsuperscript{a,b,c}, I. M. Costa\textsuperscript{a} and J. Brito\textsuperscript{a,b}

\textsuperscript{a} Instituto Superior de Ciências da Saúde Egas Moniz (ISCEM), Monte de Caparica, Portugal
\textsuperscript{b} Centro de Investigação Interdisciplinar Egas Moniz (CiIEM), Monte de Caparica, Portugal
\textsuperscript{c} PhD student in Instituto de Ciências Biomédicas Abel Salazar (ICBAS), Porto, Portugal

E-mail: alexandra.f@netcabo.pt

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. 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

SAMPLS:

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 TECHNIE:

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

RESULTS & DISCUSSION

Current requirements for metal impurities in plant-based food supplements imposed by European Commission (EC) and United States Pharmacopoeia (USP) only defines limits for As, Cd, Hg and Pb (Table 1).\textsuperscript{1,2} 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.\textsuperscript{3,4}

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.\textsuperscript{5,6}

- 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.

| Table 1. Imposed limit levels of elemental contaminants in food supplements.\textsuperscript{1,2} |
|-----------------|-----------------|-----------------|
| Element          | EC | USP | USP<2232 |
| Cd              | 1.5 | 1.5 | 1.5 |
| Hg              | 0.5 | 0.5 | 0.5 |
| Pb              | 1.0 | 1.0 | 1.0 |

| Table 2. Current EMA and USP limits for elemental impurities in pharmaceuticals (ppm).

<table>
<thead>
<tr>
<th>EMA</th>
<th>USP</th>
<th>USP&lt;2232</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1A</td>
<td>Pt, Pd</td>
<td>10</td>
</tr>
<tr>
<td>Class 1B</td>
<td>Mo, Ni, Cr, V</td>
<td>10</td>
</tr>
<tr>
<td>Class 1C</td>
<td>Hg, Pb, Sn</td>
<td>10</td>
</tr>
<tr>
<td>Class 2</td>
<td>Hg</td>
<td>100</td>
</tr>
<tr>
<td>Class 3</td>
<td>Hg</td>
<td>1000</td>
</tr>
</tbody>
</table>

Analyzing results, it was possible to observe that some products exceed the limits for several elements, mainly for the following:

- **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

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