Trace element impurities in commercially available clays used as cosmetic products

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Cosmetic products are designed to be placed in contact with external parts of the human body. Because of their high specific surface area, optimum rheological characteristics and/or excellent sorptive capacity, clay minerals have been used in several health care formulations [1, 2].

According to the EU legislation (EU Regulation 1223/2009, Council Directive 76/768/EEC) and as reviewed in the literature [3, 4] (and references therein) clays must comply with several compositional requirements in order to be suitable for use in cosmetics. More specifically, their toxicity must be low or zero. The high adsorption capacity of clays can cause the accumulation of potentially toxic trace elements [1, 4].

The trace element content of seven commercial cosmetic clays available in herbalist's shops and pharmacies in Thessaloniki (Central Macedonia, Northern Greece) was determined by ICP-MS. According to their organoleptic characteristics, they were classified as white (WC1, WC2, WC3), green (GC1, GC2), pink (PC1) and red ones (RC1). EU Regulation 1223/2009 excludes the occurrence of Sb, As, Be, Cd, Cr, Hg, P, Pb, Se, Te, Tl, Zr, Ni and their compounds in cosmetic ingredients, including clays. Nevertheless, the chemical analyses revealed various concentrations of those elements in samples. The range of concentration for the less toxic Cr and Zr was 0.7-59.5ppm and 0.6-17.4ppm. Of those traditionally considered as toxic, Sb, Cd, Te and Tl are present in low concentrations ranging from 0.06-0.27ppm, bdl-0.27ppm, bdl-0.15ppm and 0.10-0.47ppm, respectively. The Be content of green clays is the highest among the samples, reaching 3ppm, while the highest Se concentration (5.1ppm) is exhibited by sample RC1. Samples WC3, GC1 and GC2 have the highest Hg concentrations (22ppb, 17ppb and 26ppb respectively). Ni concentrations in the latter samples are elevated as well, reaching 66.8ppm, 23.1ppm and 21.4ppm, respectively. P concentrations vary from 0.014% to 0.125%. Finally, Pb and As content is significant in all samples. White clays are particularly enriched in Pb (145.7ppm and 220.1ppm), while green clays are particularly enriched in As (43.2ppm and 37.8ppm).

Most of the samples revealed unusually high con-

tents in specific trace elements. This is attributed to mineral impurities, as trace elements can be located in the structure or absorbed by clay minerals. In any case, the toxicity of clays used in cosmetics without knowledge of their composition, may be dangerous.

References

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