

Children's play paints and cosmetics: a potential source of toxic elements (metals)?

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Toxic elements can be found in many products used in the school environment and their presence may present a potential source of hazards for young children. Children's play paints (finger-paints, gouaches, acrylics, water paints) and decorative cosmetics are commonly used as didactic products in preschool activities. These products composition include a wide range and variety of natural and synthetic substances, such as pigments, solvents, water, preservatives and fragrances, that are directly applied to human skin contributing to a local exposure. Pigments are mainly used to provide colour, opacity and certain characteristics to the paint and are generally present in large amounts in these products. The paints toxicity greatly depends on pigment type used in the colour formulation, which is normally associated with potential toxic elements such as metals. Some metals are intrinsically associated with the pigments as zinc (Zinc oxide, ZnO) and others can be retained as impurities in the pigments, for instance lead, cadmium, cobalt, copper, chromium and nickel. Though, the European Union (EU) laws for cosmetics banned some of these metals as ingredients in cosmetic products, there is no orientations when they occur as impurities. Children in preschool, under the age of 5 years, are particularly vulnerable to these elements, since they still are in a physically development stage. At this age, gastrointestinal and dermal absorption occurs more effectively than in adults.

The aim of this study was to evaluate the content of the metals: lead (Pb), cadmium (Cd), chromium (Cr), cobalt (Co), nickel (Ni), manganese (Mn), copper (Cu) and zinc (Zn) in play paints and cosmetics. Were studied 32 paints (gouaches, acrylics, finger-paints and water paints) and decorative cosmetics collected in 8 preschool establishments (21 samples) and purchased in 3 low cost stores (11 samples). The content of Pb, Cd, Co, Cr and Ni was measured using the graphite furnace atomic spectrometer (GFAAS) system and the content of Mn, Cu and Zn was measured using flame atomic absorption spectrometry (FAAS). The analyses were preceded by microwave-assisted acid digestion (nitric acid, HNO₃) of each sample.

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The results revealed the presence of Cr in all samples. In general, the products purchased in low cost stores presented higher concentrations of this metal, ranged between 0.76 and 9.40 mg Kg⁻¹. Concentration of Cu and Zn were above the concentration limits (156 mg Kg⁻¹ for Cu and 938 mg kg⁻¹ for Zn) imposed to paints as toys, in five and two samples, respectively. The values ranged between 7.05 and 1458.16 mg Kg⁻¹ to Cu and between 2.46 and 29687.46 mg Kg⁻¹ to Zn. The highest concentrations of Zn were also detected in products purchased in low cost stores. In decorative cosmetics were detected Pb, Cd, Cr and Ni, all of them forbidden by the Cosmetic Products Directive (76/768/EEC).

The presence of metals in play paints and cosmetics represent a category of potentially toxic elements that should not be neglected, taking into account, the susceptibility and vulnerability of the target group, namely children under the age of 5 years.