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Migration of toxic metals from wood and wax crayons: Exposure assessment of children in pre-school age

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Chemical exposure of children, especially from toys and crayons, as items in their every day use, is of increased concern in the last decades. In this study the concentration and migration of toxic metals from wood and wax crayons were determined, as well as their intakes which were assessed in the case of swallowing a part of crayon. Total concentration of Pb *(Lead)*, Cd *(Cadmium)*, As *(Arsenic)*, Cr *(Chromium)* and Ni *(Nickel)* were analyzed in 60 samples from 10 manufacturers of wooden and wax crayons of different colors. Microwave acid digestion followed by simulations of the saline extraction conditions was performed. Aim was to determine the concentrations of toxic metals that could leach out from the crayons during children's mouthing behaviours (chewing and sucking). Exposure assessment was conducted in accordance with methodology for toxic metals in children toys recommended by Holland institute for public health and environmental protection (RIVM). Method of evaluation was inductively coupled plasma optical spectroscopy (ICP-OES). The total concentrations of metals in the crayons ranged from 0.032-16.415 mg/kg, 4.31-614.75 µg/kg, 0.213-5.779 mg/kg, 0.163-11.174 mg/kg, 0.036-6.629 mg/kg for Pb, Cd, As, Cr and Ni respectively. Sb levels were 0.10-3.14 mg/kg and nondetectable in saliva. Availability studies showed concentrations ranging from 0.146-0.786 mg/kg, 3.73-100 µg/kg, 0.112-2.509 mg/kg, 0.084-4.037 mg/kg, 0.0112-0.4098 mg/kg for Pb, Cd, As, Cr and Ni respectively after saline extraction. For all measured values % TDI *(Tolerable Daily Intake)* for investigated metals is lower than 10% TDI, which is considered the upper limit for metal intake in this way. The obtained results have shown that in majority of tested samples the toxic metal content is below the WHO limits. The calculated levels of toxic metal intakes due to chewing or swallowing the parts of wood and wax crayons acceptable in all tested samples as well.

Speaker Biography

Nikola M is student on Faculty of Pharmacy, University of Belgrade, Serbia. Jelena T has comleted her Integrated academic studies from Faculty of Pharmacy, University of Belgrade, Serbia. They took part in 59th Serbian students' conference of biomedical sciences with international participation and in 52nd Days of preventive medicine. They presented this study which was conducted as part of a student scientific research work.

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