BEYOND COLOR: INVISIBLE HEALTH RISKS OF COLORED PLASTICS IN CONTACT WITH FOOD

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INTRODUCTION: Arsenic, cadmium, lead, chromium and mercury are all Potentially Toxic Elements (PTEs) listed as a public health concern by both the EPA (Environmental Protection Agency) and the ATSDR (Agency for Toxic Substances and Disease Registry) due to their adverse toxicological effects on humans, related to pathologies such as cancer in various organ systems, as well as neurotoxic effects. **OBJECTIVES:** The objectives of this study were: a) to determine the concentrations of As, Cd, Pb, and Hg in household plastic samples (cups, mugs, plates and bowls) using X-ray fluorescence (XRF); and b) to assess the concentrations of these potentially toxic elements that migrate into food simulant solutions. **METHODS:** The utensils were previously washed and analyzed in triplicate using a handheld X-ray fluorescence analyzer (Niton XL2 700S, Thermo Scientific). Two specific migration tests were carried out using the simulants acetic acid 3% (w/v) and deionized water: long test (10 days at 25 ºC) and rapid tests (2h at 40 ºC) to assess migrated potentially toxic elements by ICP-MS. **RESULTS:** 54 utensils were analyzed and Cd, Pb, As and Hg means were 20.9, 31.3, 10.4 and 14.45 $mg.kg^{-1}$ respectively for the XRF analyses. For the rapid tests (N = 13), migration exceeded the legal limits for Cd, Hg and Pb by 18.6, 34.5 and 5,027 times, respectively. With regard to the long tests (N = 39), Hg (twice) and Pb (twenty-two times) exceeded the permitted limits. The statistical tests showed an association between the types and colors of utensils in relation to the distributions of EPT concentrations ($p < 0.05$). **CONCLUSIONS:** Given that an individual's exposures accumulate throughout life — as proposed by the exposome concept — plastic utensils may represent a relevant pathway of exposure to these potentially toxic elements (PTEs). Moreover, although the values found for some elements are low, it is important to note that, for some of the PTEs, there is no safe exposure limit. Measures need to be taken, through coordinated actions, to protect health and guarantee food and environmental safety.

KEY-WORDS: Potentially Toxic Metals; Plastics Utensils; Specific Migration Tests.