Bioaccessibility of inorganic elements of plant-based beverages

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The growing consumption of plant-based beverages has led to the need to evaluate the composition of inorganic elements in this food category. Thus, this study evaluated the presence of 11 inorganic elements (Al, Cr, Co, Ni, As, Mo, Cd, Ba, Sb, Pb, and Hg) with toxic potential in six plant-based beverages containing cocoa (S01- rice, S02- almond, S03- oats, S04- cashew nuts, S05- soy) or Brazil nuts (S06- based on cashew nuts) in their formulation, using the ICP-MS technique, as well as their bioaccessibility (%B). The sample preparation for the total concentration was performed using an ultrasound bath and the estimation of the bioaccessibility was performed according to INFOGEST 2.0 standardized method, with modifications. The total concentrations of Sb and Hg were below the limit of quantification (LOQ) (4 µg kg-1) for all samples. For As, Cd, and Pb, the total concentrations were lower than the LOQ for most samples, except for S01 (rice and cocoa-based). Total Cr was quantified in samples with cocoa, and the concentration of Al, Co, Ni, Mo and Ba was determined for all samples. The Ba content in sample S06 (16112.8±46.1 µg kg-1) stood out and was significantly higher than the other samples (more than 100 times). In the %B evaluation of potentially toxic elements, Co, Ni, and Ba were detected in all samples, with a higher %B observed for sample S04 (cashew and Brazil nuts) and a lower %B for S01 (rice and cocoa). Co and Ni showed %B between 51 and 107% for all samples. Great differences were observed for %B of Ba, both for the total concentration and bioaccessibility. This behavior shows the importance of bioaccessibility studies, since low bioaccessibility does not necessarily represent a low element intake. The %B was also higher than the LOQ of the method for the elements Al (S04, S05), Cr (S02, S03), Mo (S03, S06). The results of this study are unprecedented and can be a relevant tool in providing data on inorganic contaminants and bioaccessibility of toxic elements in plant-based beverages.