

Dietary Manganese Exposure from the consumption of wheat—Probabilistic Health Risks to Children and Teen Populations in Las Vegas

Abstract

Manganese (Mn) is an essential element, but also a potential neurotoxicant. Therefore, the question arises whether staple crops (such as wheat) contribute to Mn-related health risk (probabilistic) among Las Vegas children population is on the low or high end. In this study, concentrations of Mn and other potentially toxic elements were determined for commonly consumed wheat flour and berries in Las Vegas, using Inductively Coupled Plasma Mass Spectrometry (ICP-MS). In addition, Monte Carlo Simulation (MCS) technique was employed to evaluate non-carcinogenic risk in four life stages (2-4 years, 5-8 years, 9-13 years, and 14-18 years). Probabilistic risk assessment can ensure a certain degree of confidence in the risk estimation. The mean non-carcinogenic risks of children aged between 5 and 8 years, and teens aged between 9 and 13 years due to wheat consumption were higher than the safe limit. The sensitivity analysis revealed that wheat had a significant probabilistic risk outcome due to the presence of Mn, exposure frequency and exposure duration. The findings of this study can aid in understanding dietary Mn exposure from the consumption of wheat to children and teens in Las Vegas and in implementing strategies to evaluate dietary Mn intake resulting from all food sources including drinking water.