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Speciation of copper in a range of food types by X-ray absorption spectroscopy

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ABSTRACT

Copper (Cu) is an essential element and the effects of diets deficient in it are well established. However, the effects of long-term high copper intake are less clear. The chemical form of copper from food sources and its resultant bioavailability is a potentially important factor in its biological activity. X-ray Absorption Near-Edge Structure (XANES) was used to determine the chemical forms of Cu in a range of foods that would make significant contributions to total copper absorption in a standard diet, as well as a chlorinated tap water sample. Analysis of the Cu K-edge XANES spectra suggested that Cu existed in both Cu(I) and Cu(II) forms, with the following five model compounds: Cu(I) acetate; Cu(II) acetate; Cu(I)-glutathione; Cu(I)-cysteine; and, Cu(II)-histidine being fitted to the sample spectra. This research suggested that the absorption of dietary copper could vary markedly dependent on the types of food consumed and the different bioavailability of the Cu species they contain.