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TRACE ELEMENTS IN FOOD: EFFECTS OF DIGESTIVE ENZYMES ON SOLUBILITY

Treatment of food with digestive enzymes can have a marked effect on the solubility of trace elements such as Cu, Zn, Fe, Pb and Cd. In some cases the change in solubility indicates enzymic release of the trace element from a previously insoluble form but in other cases solubility decreases. This may indicate enzymic breakdown of a soluble complex to release the element in a «free» state which then forms an insoluble species; alternatively it may indicate the enzymic release of a chelating agent which forms an insoluble complex with a trace element which was previously in a soluble form.

A range of foods (bread, crab, beef, liver, green vegetables) have been examined and show these effects in varying degrees which reflect compositional (and processing) differences between the foods. Changes which occur when foods are enzyme-digested together, rather than separately, can be attributed to analogous processes.

The possibility of extending this information through chromatographic separation of the soluble species has been explored in studies of the cadmium species in canned crab; these indicate release of enzymes of a Cd species with an apparent molecular weight around 500 dalton. Further extension of the work through interfacing chromatography with an ICP-MS (VG «plasmaquad») is in progress.



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ANALYTICAL DETERMINATION OF METALS IN BIOLOGICAL AND ENVIRONMENTAL SAMPLES

For the determination of trace elements in various samples there are a lot of analytical methods which are described in the literature. The application of the optimal method depends on different properties of the sample:

- 1) element to be determined
- 2) concentration range of this element
- 3) composition of the sample (matrix, interference)
- 4) amount of the sample
- 5) phase in which the sample is available.

Instrumental neutron activation analysis and X-ray fluorescence analysis are the preferable methods for solid samples, whereas atomic absorption spectrometry, atomic emission spectrometry with an inductive-coupled plasma and electrochemical methods have to be applied to liquid samples.

Obviously solid samples can be transferred into the liquid phase by dissolution or by digestion and trace elements in liquid samples can be concentrated in a solid phase by evaporation of the solvent or by separation at an ion exchanger or adsorbents.

For an optimal analysis first the right method has to be chosen and examples are summarized in the following part.

The water of the river Rhine has been analyzed by instrumental neutron activation analysis and by atomic absorption spectrometry because the con-