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Trace element distribution in human teeth by X-ray fluorescence and multivariate analysis

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X-ray fluorescence spectrometry (XRFS) was used as a multielement method of evaluation of individual whole human tooth or tooth tissues for their amounts of trace elements. Measurements were carried out on human enamel, dentine, and dental cementum, and significant differences in tooth matrix composition were noted. In addition, the elemental concentrations determined in teeth from subjects of different ages, nutritional states, professions and gender, living under various environmental conditions and dietary habits, were included in a comparison by multivariate statistical analysis (MVSA) methods. By factor analysis it was established that the trace inorganic components of human teeth varied consistently with their source in the tissue, with more in such tissue from females than in that from males, and more in tooth incisor than in tooth molar. The heavy metal concentrations in the tissue did not varied greatly from dentin to enamel or to dental cementum, whatever the age and occupation of the subject. The statistical analyses performed seem to indicate that deciduous teeth might be a suitable indicator of environmental exposure to several trace elements. The results demonstrated that XRFS supplemented by MVSA is an useful and practical approach for the investigation of trace heavy metal incorporation and distribution on the surface of teeth as well as in inner layers. The features of the approach applied to environmental monitoring are also discussed.

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