



Study of the effects of sodium arsenite exposure in rat kidney by synchrotron microscopic X-ray fluorescence analysis

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Synchrotron radiation (SR) emitted from bending magnets of powerful electron accelerators has been used as an excellent x-ray source. It can be used to excite x-ray fluorescence and this approach leads to very low detection limits on micrometric areas on very small samples. Synchrotron microscopic X-ray fluorescence analysis (μ -SRXRF), a trace-level microanalytical method, allows quantitative study of the nature and degree of heterogeneity of inorganic trace constituents in biological samples¹. This microbeam method, due to intrinsic characteristics of SR, is able to implement multielemental spectrochemical analysis with spatial resolution on the micrometer scale. It shows high efficiency for trace element determination and short time of analysis requirements. In the present work, we applied μ -SRXRF to determine the two-dimensional distribution of Cl, K, Fe, Cu, Zn, As and Br in kidney sections of Wistar rats provided with arsenical water (50ppm) during 0, 30 and 60 days. Lyophilized kidney samples sectioned from normal and treated rats were scanned with a collimated white synchrotron spectrum (300 μ m \times 300 μ m pixel area). The accumulation of arsenic and copper in rat kidney induced by arsenic exposure was corroborated^{2,3} and the spatial distributions of these elements were studied in details. While copper was restricted to renal cortex, arsenic shown changes in its spatial distribution suggesting nephron damage. A correlation between zinc and arsenic spatial distributions was observed which seems to be caused by the antioxidant effect of zinc. Chlorine and potassium also changed their spatial distributions under arsenic exposure showing a correlation probably cause by their reciprocal electrostatic attraction. There were not significant changes in iron and bromine but the patterns of their spatial distributions were clearly identified. The results obtained show that μ -SRXRF is a very well-positioned and precise technique to detect the effects of metal contamination on the spatial distributions of elements in mammal tissues.

REFERENCES

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