

Manganese distribution in healthy and osteoporotic human bone

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Osteoporosis is a degenerative bone disease characterized by low bone mass and deterioration of bone structure, which increase the risk of fractures. Osteoporosis occurs both in men and women, and according to prediction data, due to changes in population demography the number of men and women with osteoporosis worldwide will rise continuously.

It is well-known, that calcium is essential for building and maintaining bone, and according to the studies manganese is influencing fixation (or incorporation) of calcium into bones. Therefore, manganese distribution in bones, and its correlation with calcium in healthy compared to the osteoporotic bone tissue is of interest and may supply further research on mineral homeostasis in bones

Synchrotron Radiation induced confocal micro x-ray fluorescence analysis (SR- μ XRF) is an excellent technique for qualitative and quantitative analysis of sample composition, as well as spatial distribution. The data were obtained in a series of measurements at the FLUO beamline at ANKA, using beam size of around 25 μ m x 17 μ m and a depth resolution of about 35 μ m at Ti-K α (4,5 keV), with the excitation energy of 9.2 keV.

We measured 8 male bone samples (4 osteoporotic/4 controls) and 7 female samples (3 osteoporotic/4 controls). The scanning resulted in the elemental maps, demonstrating the spatial distribution of elements of interest. The subsequently obtained manganese to calcium count rate ratios demonstrate that the osteoporotic samples taken from males tend to contain less manganese as opposed to healthy controls. Analysis of bone samples taken from female patients has not displayed such correlation.