Spatially resolved manganese distribution in antler and human bone

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Manganese is an element of interest in bone research due to its putative importance in healthy bone metabolism as well as in pathological conditions, possibly influencing fixation (or incorporation) of calcium into bones. Since calcium is the main mineral constituent of bone tissue, the correlation of manganese with calcium elemental maps provides meaningful insight into the manganese distribution.

The particular meaning of manganese still not fully unraveled, however the information about manganese distribution in bone tissue may help revealing a novel mechanism leading to osteoporosis. For this purpose, the results of measurements of osteoporotic and non-osteoporotic human bone samples will be presented for comparison. Antlers, as a suitable, easily accessible experimental model for the studies of bones were analyzed in addition to human bone samples.

For the analysis of bone samples Synchrotron Radiation induced confocal micro x-ray fluorescence analysis (SR-μXRF) technique was employed being the most powerful and sufficient instrument in detection and characterization of trace element distributions in bone tissue.

The measurements were performed at the FLUO beamline at ANKA, using beam size of 25μm x 17μm and a depth resolution of 35μm at Ti-Ka, with the excitation energy of 9.2 keV, chosen as the optimized excitation conditions for manganese detection.

The scanning resulted in elemental maps of manganese and calcium; the data were subsequently processed to gain the manganese to calcium countrate ratios, which allows to compare manganese spatial distribution in antlers and human bone samples and provides the material for further discussion and analysis.