Differential distribution of trace elements in human osteosarcoma
- A Synchrotron Radiation induced confocal micro x-ray fluorescence analysis (SR µ-XRF)

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In recent studies, significant changes in minor and trace elements were found in various types of cancer. Currently there are no date data with regard to musculoskeletal tumors. The aim of this study was to characterize the spatial distribution of the traceelements zinc (Zn), strontium (Sr), iron (Fe) and calcium (Ca) of osteoblastic osteosarcoma using a high resolution Synchrotron Radiation induced confocal micro x-ray fluorescence analysis (SR µ-XRF). Six samples of a high grade osteoblastic osteosarcomas of the knee joint were obtained following surgical resection and following neoadjuvant chemotherapy according to the EURAMOS protocol. Various regions of the tumor were investigated and adjacent normal healthy bone tissue was used as an internal control. Undecalcified samples were also examined by quantitative Backscattered Electron Imaging using a pixel resolution of 1µm. Measurements were performed at the FLUO beamline at ANKA sing a beam size of 15x12 μm^2 and a depth resolution of 20 µm at Au-Lα, with primary excitation energy of 17 keV.
Our measurements revealed significant differences in the accumulation of traceelements between healthy bone and tumor tissue. Zinc levels were on average 6-fold higher in tumor tissue than normal bone and Fe levels up to 147-fold higher. Furthermore the Ca content of mineralized tumor tissues was higher than in normal bone. These findings of differential accumulation of traceelements in normal and malignant bone samples may lead to new insights into basic tumor biology of osteosarcoma.