Abstract Submitted
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Detection limits of lead (Pb) in bone phantoms using optimized L-shell x-ray fluorescence (LXRF) measurements.[1] JOSHUA JARDENIL, MIHAI GHERASE, California State University, Fresno — Lead (Pb) is a well-known toxic element. In vivo bone Pb concentration measurements assess long-term human exposure and accumulation. Development of bone Pb L-shell x-ray fluorescence (LXRF) measurements using a compact x-ray tube and detector system may lead to more practical population surveys than the established K-shell XRF method. In our lab, using a microbeam XRF system, we developed an optimal grazing-incidence position (OGIP) methodology which enhances Pb detection by mitigating the x-ray scatter. Plaster-of-Paris (poP) bone phantoms doped with Pb in concentrations of 0, 8, 16, 29, 44, 59, and 74 microg/g paired with polyoxymethylene (POM) soft tissue phantoms of thicknesses 0, 1, 2, 3, 4, and 5 mm, were used to simulate in vivo measurements. Calibration lines were produced by linear fittings of the Pb Lα and Pb Lβ peak heights versus the Pb concentration data. Detection limit (DL) was calculated as twice the standard deviation of the null concentration peak height measurement divided by the slope of the calibration line. DL values in the 2 to 36 microg/g range were found. The results are encouraging for potential clinical applications, also given that the radiation dose was estimated at 5 mSv per measurement.

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