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A novel calibration for L-shell x-ray fluorescence measurements of bone lead concentration[1] MIHAI GHERASE[2], SARAH KROEKER[3], BLAZ SERNA[4], California State University, Fresno — Lead (Pb) is a well-known neurotoxin which accumulates in the bone. Recent blood and bone Pb surveys indicate a significant reduction of Pb exposure. However, health concerns persist. In particular, low levels of Pb exposures in children were linked with cognitive developmental problems. Long-term Pb exposures are best assessed by x-ray fluorescence (XRF) *in vivo* bone Pb concentration measurements. These measurements are typically done at the mid-tibia bone site to minimize the soft tissue (ST) x-ray attenuation. Bone Pb L-shell XRF (LXRF) method could use practical compact XRF systems as survey tools. Quantification of bone Pb requires knowledge of the ST x-ray attenuation. Past studies employing ultrasound ST thickness measurements gave inaccurate results. Using a model of bone and ST attenuation of incident and emergent XRF photons, measured Kβ/Kα ratio of strontium (Sr) (an essential trace element in the bone) was used to estimate the ST attenuation of the Pb x-rays. The calibration method was validated using six Pb-doped plaster-of-Paris (poP) bone phantoms containing 1 mg/g of Sr and four overlying ST phantoms of 1 to 4 mm thickness made of three different materials: polyoxymethylene (POM), resin, and wax.

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