Abstract Submitted
for the FWS19 Meeting of
The American Physical Society

Calculations of the radiation dose in optically stimulated luminescence dosimeters irradiated by a microbeam.[1] SARAH KROEKER, MIHAI GHERASE, California State University, Fresno — Lead (Pb) is a well-known toxic element accumulating in the human bone following years or decades of exposure. In vivo bone Pb concentration measurements are achieved using the K-shell x-ray fluorescence (KXRF) method based on the excitation of 88.0 keV gamma rays from a Cd-109 source. Due to lower binding energies of Pb L-shell electrons, the alternative L-shell XRF (LXRF) could be more practical by using the excitation of a portable x-ray tube. However, despite past research efforts, lower Pb detection limits and an inaccurate calibration method hindered LXRF from becoming a viable in vivo method. Using a microbeam XRF system and soft tissue and Pb-doped bone phantoms, we developed an optimal grazing-incidence position method to enhance Pb detection by mitigating the x-ray scatter and a new calibration method based on the Sr Kβ/Kα ratio measurements. LXRF also requires a low radiation dose to the soft tissue per bone Pb measurement. We are currently measuring radiation doses using commercial optically-stimulated luminescence dosimeters. To aid the interpretation of the final results, the absorbed dose to OSLDs was calculated to be in the 6.6 mGy to 12.9 mGy range corresponding to x-ray beam attenuated by soft tissue of thickness varying from 10 mm down to 0 mm.

[1]Research was supported by the National Institute of General Medical Sciences of the National Institutes of Health under award #SC2GM121187.

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Date submitted: 07 Oct 2019 Electronic form version 1.4