RADON PROGENY EXPOSURE ASSESSMENT IN FORMER URANIUM MINERS USING *IN VIVO* MEASUREMENT OF ^{210}Pb IN BONE[*]

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Epidemiological studies of lung cancer incidence among uranium miners from various populations around the world have shown a significant variability in the relative risk per unit exposure - a range of a factor of 30. Although it is not clear how much of this variability is due to ethnic population differences, we hypothesize that a significant fraction of the uncertainty may be due to differences in the methods and quality of data used in calculating cumulative exposures, in WLM, for the various miner populations. Further, we hypothesize that *in vivo* measurement of ^{210}Pb, a long-lived radon decay product retained in bone, will provide a better measure of the exposure of individual miners to radon and progeny during their mining careers. To accomplish these *in vivo* measurements, the Lovelace *In Vivo* Bioassay Facility (LIVBF) was modified to optimize a counting geometry for measuring ^{210}Pb in the skull. The skull was selected because it is a relatively constant mass fraction of the skeleton, and it is well isolated from the rest of the body, making it ideal for positioning several directional radiation detectors. Six 5"-diameter phoswich detectors [thin NaI(Tl), thick CsI(Tl)] were placed around the head of a reclining subject (one posterior, one anterior, and four about the mid-sagittal plane), and photon emissions from the skull were measured using anticoincidence multichannel analysis electronics. After reducing background contributions from uranium-contaminated detector materials and radon progeny within the LIVBF by internal circulation/filtration of air, we determined a limit of detection of 3 Bq ^{210}Pb in the skull for a 90-min measurement. To date, *in vivo* measurements have been made on 94 former uranium miners from the Grants mining district. Each miner has a reconstructed WLM exposure from the UNM uranium miner epidemiological data base. About 90% of the *in vivo* measurements have shown detectable levels of ^{210}Pb, indicating that sufficient ^{210}Pb is available for measurement, despite the fact that the highest Rn progeny exposures occurred betweeen 1945 and 1960. When the individual ^{210}Pb data were regressed against the WLM exposures, the correlation was found to be random ($R^2 = 0.0075$). Although this indicates that such a comparison is not meaningful, the reasons for the lack of correlation have not as yet been determined.

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