

TRANSFER OF RADON FROM GROUNDWATER INTO HOMES AND THE CONTRIBUTION OF SHOWERING TO INDOOR RADON: POLICY IMPLICATIONS FOR UNREGULATED PRIVATE WELL OWNERS AT THE INTERSECTION OF GEOLOGY AND HEALTH IN THE NORTH CAROLINA BLUE RIDGE

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Crystalline rocks in the Blue Ridge of the southeastern USA contain relatively high levels of naturally occurring U- and Th-series radionuclides, including radon-222. A recent survey of homes in the Blue Ridge Mountains in western North Carolina (NC) documented high levels of ^{222}Rn in indoor air (up to 22 picocuries per liter) and private well water (up to 45,600 pCi/L). The highest levels were associated with granitic gneiss, with lower, but still elevated, activities in meta-sedimentary rocks. The study area is experiencing rapid housing growth, including the drilling of private wells in areas not served by public water systems. In NC, private wells undergo no required testing and face no mandatory water quality standards. Our goals are 1) to characterize the extent of elevated radon in the study area and its relationship to geologic factors; 2) to quantify the radon contribution caused by aerated water use such as showering to indoor radon; and 3) to develop recommendations for private well users on the possible significance of high radon in well waters for overall exposure.

In order to quantify the contribution of radon from well water to indoor air, we intensively sampled at houses across a range of radon activities. Radon was determined in well water, bathtub tap water, aerated shower water, and indoor air using multi-day tests and /in situ/ counting of bathroom air before, during, and after experimental showers.

Preliminary data show a slight to moderate loss of radon (758-3618 pCi/L) from well water to the indoor tap (bathtub). Radon is significantly degassed during showers, as indicated by both the difference between bathtub tap and shower waters and high airborne radon measured during the experiments. The data show a direct relationship between radon levels in water and bathroom air after a shower. Degassing of radon-rich shower water results in airborne Rn in bathrooms at levels as high as 74 pCi/L within 30 minutes of a shower.