

Article

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Assessing exposure to granite countertops—part 1: Radiation

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Abstract

Humans are continuously exposed to low levels of ionizing radiation. Known sources include radon, soil, cosmic rays, medical treatment, food, and building products such as gypsum board and concrete. Little information exists about radiation emissions and associated doses from natural stone finish materials such as granite countertops in homes. To address this knowledge gap, gross radioactivity, γ ray activity, and dose rate were determined for slabs of granite marketed for use as countertops. Annual effective radiation doses were estimated from measured dose rates and human activity patterns while accounting for the geometry of granite countertops in a model kitchen. Gross radioactivity, γ activity, and dose rate varied significantly among and within slabs of granite with ranges for median levels at the slab surface of ND to 3000 cpm, ND to 98,000 cpm, and ND to 1.5E-4 mSv/h, respectively. The maximum activity concentrations of the ^{40}K , ^{232}Th , and ^{226}Ra series were 2715, 231, and 450 Bq/kg, respectively. The estimated annual radiation dose from spending 4 h/day in a hypothetical kitchen ranged from 0.005 to 0.18 mSv/a depending on the type of granite. In summary, our results show that the types of granite characterized in this study contain varying levels of radioactive isotopes and that their observed emissions are consistent with those reported in the scientific literature. We also conclude from our analyses that these emissions are likely to be a minor source of external radiation dose when used as countertop material within the home and present a negligible risk to human health.

Keywords:

radiation dose, building materials, granite