Experiments to Determine Radon Levels in Household Water and Measure the Effectiveness of Mitigation Options

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Sedimentary rock layers found in eastern Pennsylvania, including Berks County, are known to have uranium deposits. Radon-222 is a naturally occurring radioactive gas that is a daughter element in the uranium-238 nuclear decay chain. It is well known that radon gas can seep from the ground into houses and create a respiratory health hazard. Less well-known is that radon also dissolves into the groundwater, which is then pumped from wells into our homes. Radon dissolved in water can affect our health in two ways: (1) Radon gas can be released from the water into the air and then breathed into our lungs, especially when aerosolized by showering. (2) When we drink water containing radon, the radon may undergo nuclear decay inside our body. The decay process releases harmful alpha particles, beta particles, and gamma rays. After a series of steps, the radon decays into a radioactive isotope of lead (Pb-210), which can remain in the body and is a potential long-term source of radiation exposure. This project, (1) measured the radon levels in drinking water, (2) applied mathematical modeling to the dynamic processes of diffusion and radioactive decay, and (3) measured the effectiveness of mitigation on the removal of radon from water. This research highlights a public health concern and suggests practical actions that homeowners can take to mitigate the risk of radiation exposure to themselves and their families.

Awards Won:

First Award of $5,000

NC State College of Engineering: Alternates (not read aloud)