Radiation in Yolo County

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Abstract

In today's post-nuclear age, there are many man-made sources of radioactivity, in addition to the natural background we expect from cosmic and terrestrial origins. While all atoms possess unstable isotopes, there are few that are abundant enough, energetic enough, and have long enough half-lives to pose a significant risk of ionizing radiation exposure. We hypothesize a decreasing relative radiation measurement (in detected counts per minute [CPM]) at nine locations that might pose occupational or environmental hazard:

1. A supermarket produce aisle (living tissue has high concentration of ^{40}K)
2. A hospital (medical imaging uses X-rays and radioactive dyes)
3. The electronics section of a superstore (high voltage electronics have the potential to produce ionizing radiation)
4. An electrical transformer (similar reasons)
5. An antique store (some ceramics and glazes use radioisotopes that are now outlawed)
6. A gasoline pump (processing and terrestrial isotope contamination might leave a radioactive residue)
7. A fertilized field (phosphate rock contains uranium and thorium, in addition to potassium)
8. A house (hopefully mild background, but potential radon contamination)
9. A school (should be radiologically neutral)

We tested the hypothesis by measuring 100 minutes of counts on a self-assembled MightyOhm™ Geiger counter at each location. Our results show that contrary to the hypothesized ordering, my house was the most radiologically active. We present possible explanations for the observed radiation levels, as well as possible sources of measurement error, possible consequences of prolonged exposure to the measured levels, and suggestions for decreasing exposure and environmental impact.