



CALIFORNIA STATE SCIENCE FAIR 2004 PROJECT SUMMARY

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Project Title Localized Gamma-Ray Spectrometry Measurements of Schools in the PVPUSD, Palos Verdes Estates, California	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The first objective was to quantify soil uranium concentrations at school in the Palos Verdes Peninsula Unified School District (PVPUSD) for comparison with classroom radon levels and geologic subunits that comprise the peninsula. A second objective was to sample uranium concentrations of similar soils in Los Angeles County to estimate the potential for elevated indoor radon in those areas.</p> <p>Methods/Materials Two portable gamma-ray spectrometers were used to measure the equivalent uranium, thorium, and potassium concentrations at each school in the PVPUSD and at selected areas of Los Angeles County. Six to seventeen ground measurements and representative soil samples were taken from each school site. The portable spectrometers were calibrated against a much larger, fixed gamma-ray spectrometer located at the United States Geological Survey (USGS) headquarters in Reston, Virginia. Ground measurements from other areas of Los Angeles County were then compared with the indoor radon and soil uranium results from Palos Verdes.</p> <p>Results The average uranium concentration at the seventeen schools ranged from 1.4 to 10.4 ppm, and for those schools with average readings greater than 2 ppm, there was a high probability of finding at least one classroom exceeding the US EPA action level of 4 pCi/L. Ground measurements taken from similar soils in central Los Angeles County ranged from 3.1 to 8.0 ppm, indicating a significant potential for elevated indoor radon in those areas.</p> <p>Conclusions/Discussion For schools with average soil uranium concentrations of 2 ppm or less, none had classrooms that approached the US EPA action level of 4 pCi/L. In contrast, the majority of schools with uranium concentrations greater than 2 ppm were found to have at least one classroom with levels exceeding 4 pCi/L. The current data demonstrate that a boundary value of 2 ppm soil uranium can be used to separate sites of higher and lower measurement priority, and that site-localized gamma-ray spectrometry can serve as a tool to rapidly identify sites with the potential to generate excessive indoor radon. Furthermore, zip code population statistics combined with gamma-ray field measurements in central Los Angeles County alone indicate that over 700,000 residents could be exposed to elevated indoor radon.</p>	
Summary Statement Soil uranium concentrations were compared with a radon database for the PVPUSD resulting in a 2 ppm priority measurement level and indicating that over 700,000 residents in Los Angeles County may be exposed to elevated indoor radon.	
Help Received Used gamma-ray spectrometer under supervision of Dr. Joseph Duval; PVPUSD provided access to all school sites; father helped edit presentations.	