House Dust: What is it and where does it come from?

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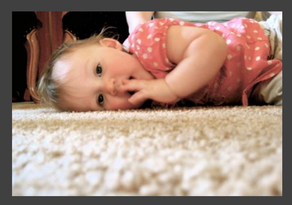
Introduction

Indoor particulate matter, widely known as dust, can be found almost anywhere. It surrounds us in our day- to-day lives. Whether it be outside, at work, or at home, particulate matter is present. What is dust composed of? Where does it come from? These are important questions that need to be answered to assess the exposure to dust in indoor air.



In this experiment, we use radionuclides that have different sources to look at the origin of indoor dust . Samples were taken from homes , streets and soil around Vancouver. This variation enables us to understand which components are most often tracked indoors.

Radioactive Isotopes are present all around us and some give off high energy gamma rays when they undergo radioactive decay. These gamma rays can then be identified and measured using a gamma spectrometer.

Procedure

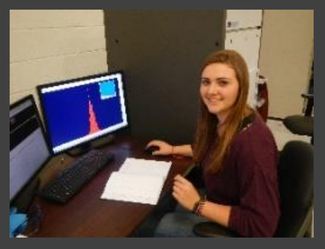
Dust was collected then sieved to remove large objects.

Samples were capped and labelled.

Samples were measured by Gamma spectrometry

Sample being placed in the gamma spectrometer.

The germanium crystal within the gamma spectrometer.



Data is analyzed. (Shown is a Cs-137 peak).

Results and Discussion

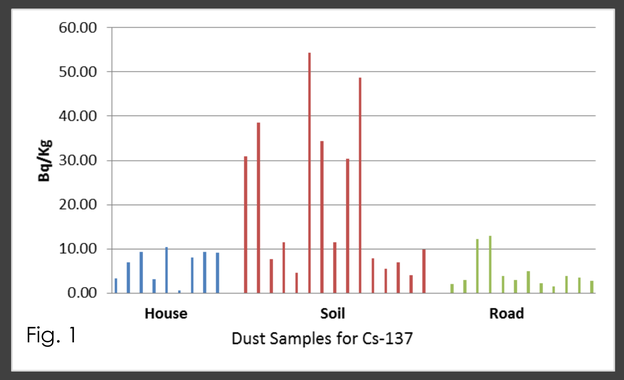


Fig. 1

Cesium comes from the atmosphere and therefore there is no source of this isotope from within the house. The amount found in the dust samples demonstrates that there is Cesium being brought into the home (fig. 1) from the outdoors most likely attached to soil particles.

Radium comes from the soil. The radium found in the house dust must come from soil or road origins (fig. 2).

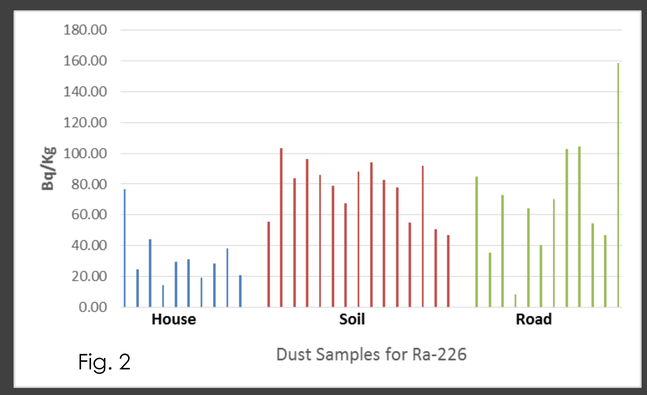


Fig. 2

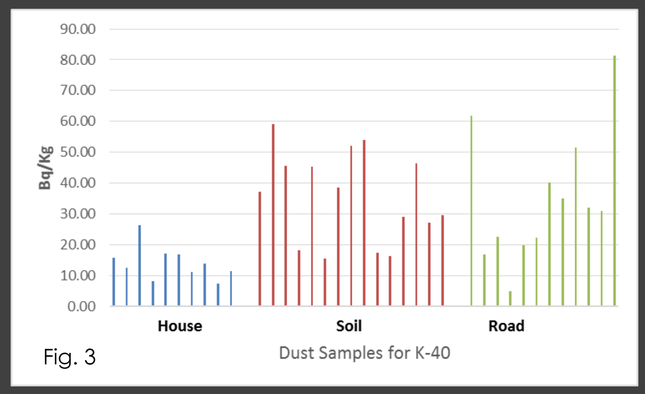


Fig. 3

There are many sources of potassium from within the household. We are surprised that the there is such a low amount of K-40 within the house dust samples compared to those of the soil and road dust (fig. 3).

The isotope Lead 210 is a product of the radioactive decay of Uranium. There was a significant amount of Pb-210 in the Road dust samples (fig. 4). This is because Pb-210 is often found in sediments which road materials are often composed of.

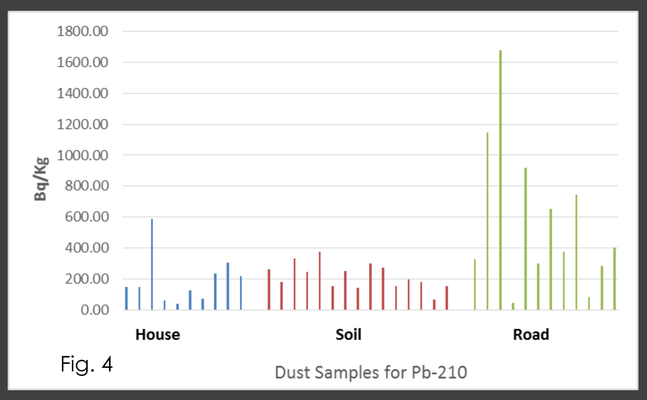


Fig. 4

References

Butte, W., Heinzow, B. 2002. Pollutants in house dust as indicators of indoor contamination, Rev. Environ. Contam. Toxicol. 175, 1–46.

Calabrese E.J., Stanek, E.J. 1992. Distinguishing outdoor soil ingestion from indoor dust ingestion in a soil pica child. Reg. Tox. Pharm 15(1), 83-85.

Doyle, J.R, Cornett, J. Blais, J.M. Zhu, J. White, P.A. 2016. Discrimination of sources of indoor settled house dust using elemental and stable isotope tracers. Submitted to Science of the Total Environment.

Murray, A., R. Marten, A. Johnston, and P. Martin. 1987. Analysis for naturally occurring radionuclides at environmental concentrations by gamma spectrometry. Journal of Radioanalytical and Nuclear Chemistry 115, 263-288.

Conclusion

Therefore, Cesium-137 is being transported to the indoor environment via soil particles, Radium-226 is being transferred into the indoor environment comparatively higher by road and dust particles. Potassium-40 is being brought indoors through road or dust, there are even known sources that generate potassium-40 from within the home. Lead-210 is being brought into the household by road particles, much lower concentration in comparison to the other isotopes.