

AN OPEN STATEMENT ON LUNG CANCER RISK ATTRIBUTABLE TO RADON EXPOSURE

Dear leaders, staff, and other key stakeholders in Public Health

In response to a query for information on radon induced lung cancer risk posed to us by Mr. Greg Baytalan of BC Interior Health, we would like to provide the following statement of current medical, biological, and epidemiological evidence (facts) based upon the peer-reviewed literature as of December 2023. *We emphasize that the points below are statements of facts based on currently understood scientific knowledge, and are distinct from any value- or policy-oriented statements that might be made by either ourselves or others based on this information.*

- Radon (^{222}Rn) is a radioactive gas classified as a Category 1 Carcinogen by the *International Agency for Research on Cancer* (IARC)¹, which means that it is absolutely known to cause cancer in both humans and animals based on evidence from large, world-spanning studies from the past 75 years (summarized by multiple organizations²⁻⁴).
- Radon and its decay products emit ionizing alpha particle radiation, which possesses sufficient energy to strip atoms of molecules it interacts with⁵⁻¹². As radon and its decay products are inhaled as a component of air, this radiation is typically emitted inside our lungs, damaging the genetic material (DNA) of lungs in a way that produces genetic mutations that substantially increase lifetime risk of lung cancer¹³⁻¹⁶.
- The radiation emitted by radon and radon decay products in air is measured in a unit called the Becquerel (Bq) per metre cubed of air (m^3), where 1 Bq/m^3 equates to one alpha particle (radioactive) emission per second. Repetitive exposure to air containing 100 Bq/m^3 of radon has been demonstrated to increase a typical adult's lifetime relative risk of lung cancer by 16%. Data on the relationship between residential radon exposure and lung cancer risk by 16% was obtained from epidemiological studies of residential radon exposure carried out in Europe, North America, and East Asia that were published in 2005, backed up by the outcomes of studies into occupational radon exposure during the 1950-1990s in uranium mines and, most recently, reinforced by the outcomes of the "One Million Person Study" of population-level radiation exposure reported at the 2023 *International Meeting of the Radiation Research Society*. ***In short, the scientific evidence indicating that radon exposure at or over 100 Bq/m^3 increases lung cancer risk (in a statistically significant manner) is unquestionably robust***^{13,17-23}.
- For people, the risk of cancer from radon exposure is dictated by the absorbed radiation dose (to the lungs) from radon, which is a function of both how much radon is present in the air (measured in Bq/m^3) and how much time a person spends breathing that air (hours per year)^{2,3,24,25}. ***In a given 24-hour period, the typical work or school day of 6-8 hours in duration over a multiyear period is sufficient to be a substantial absorbed radiation dose if the radon levels are at or exceed 100 Bq/m^3*** . For the typical adult, exposures below 100 Bq/m^3 have not been found to alter lifetime risk of lung cancer significantly. Recent Canadian studies have documented these exposures, and how doses accumulate if no action is taken to test for and, if high, reduce radon exposure²⁴⁻²⁷.
- As no human sense can detect radon, the only way to determine if a house, school, workplace, or daycare is high for radon is to perform a valid long-term test, meaning a Canadian National Radon Proficiency Program-approved test conducted for more than 90 days. Such testing is easy, practical, and generally cost efficient. High radon can also be easily and permanently remediated in the overwhelming majority of buildings^{26,28-37}.
- Younger people (especially little children and babies) have an innately increased vulnerability to the negative health consequences of radon exposure early in life^{19,38}. This is because children (1) breathe faster than adults as they have little lungs, (2) their bodies are undergoing rapid cell growth that makes them innately sensitive to ionizing radiation exposure, (3) they have the most life 'left' within which to develop lung cancer, (4) their little bodies mean actual absorbed doses are higher relative to the larger mass of an adult, and (5) they are not in control of their environment or able to make informed choices about their personal exposure.

The above statement is supported by the scientific literature outlined in detail at the end of this document. The above statements are verified collectively (as being rooted in currently understood evidence) by the scientists, clinicians, epidemiologists, and other experts who have put their signatures on page two. We hope this helps.

A Value/Policy Statement: Based on the scientifically-informed evidence detailed above, we recommend that all those in a position to do so ensure that the indoor air environments of all young Canadians contain less than 100 Bq/m^3 radon gas. The 6-8 hours per weekday spent at school or a workplace is sufficient time within which to absorb sufficient cancer-causing radiation dose from radon inhalation to increase lifetime risk of lung cancer substantially.

January 8, 2024

SIGNATORIES TO THIS STATEMENT

We the undersigned support the scientifically-informed statement of facts made on page one (1) of this document as of our collective date of signature, which is January 8, 2024.



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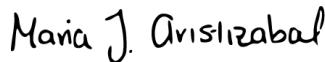
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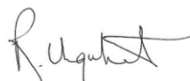
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Any questions for any member of our team may be sent to Dr. Goodarzi at radon@ucalgary.ca, who will ensure it reaches the appropriate person.

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