Smoking and radon in British Columbia: Overlapping risks of lung cancer

Radon is a carcinogenic gas released during the decay of uranium that exists naturally in soil and bedrock. It has no smell, taste, or color, and it accumulates indoors, where it and its radioactive progeny are inhaled and directly impact lung epithelium. Radon is a leading environmental cause of lung cancer, with risk increasing with exposure time and magnitude.[1] Fortunately, testing indoor levels is easy and inexpensive. In British Columbia, the BC Centre for Disease Control (BCCDC) collects indoor radon measurements and displays them on an interactive public map (https://reporting.bccdc.ca/bcradonmap/) to promote testing and awareness.[2]

Radon levels in BC

Uranium levels in soil and bedrock vary dramatically across BC, with the highest levels found in the Interior and Northern Health regions. This pattern is clearly visible on the BCCDC's interactive radon map, where an estimated one-third of homes in the Interior Health region had radon concentrations exceeding Health Canada's guideline of 200 Bq/m^3. However, radon levels vary on the background of these general patterns. Local geographic features can increase radon levels, and some homes have construction elements that promote radon accumulation (e.g., poor ventilation, below-grade basements, foundation cracks, gaps around pipes, porous walls). For example, 10% of measurements collected from some municipalities in the Vancouver Coastal Health region exceeded 200 Bq/m^3, despite the area on average having very low indoor radon levels. This is why Health Canada and the BCCDC recommend that every home be tested for radon.

Radon, lung cancer, and smoking

Exposure to radon increases the risk of lung cancer, but this increase in risk is not equal in everyone. Radon and tobacco smoke interact synergistically. Smokers who are exposed to high radon levels face a much higher risk of lung cancer than would be expected if radon and smoking acted independently to increase risk. In fact, the lifetime risk of lung cancer among nonsmokers exposed to high radon levels is about 2 per 100, compared with about 15 per 100 among smokers exposed to high radon. Consequently, about 85% of radon-attributable lung cancers are in smokers.[3] Whether former smokers or those exposed to secondhand smoke have the same increased risk from radon as current smokers is not yet known.

Routine radon testing is warranted

Importantly, areas of BC with higher smoking rates overlap with areas with higher radon measurements. In 2023–24, about 12% of the population in high-radon health regions (Northern Health and Interior Health) reported smoking daily, compared with 7% to 8% of the population in other health regions.[4] These risks compound; therefore, radon poses a higher risk to the population than it might otherwise.

However, awareness of this risk is low. In a 2023 national survey, only 60% of BC households had heard of radon, and, of those, only 7% reported testing their homes.[5] We do not have good insight into whether smokers are aware of their increased risks.

Physicians and other health care providers can help raise awareness about radon, particularly among smokers, and discuss radon testing while encouraging smoking cessation. Patients with a smoking history should be made aware of their additional risk and the steps they can take to reduce radon exposure. This includes providing education on the health risks of radon exposure, encouraging regular screening for radon at home, and sharing available

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resources, such as those found in the Box, with patients so they can test their homes and take mitigating steps where possible. ■

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BOX. Additional information about radon.

- **Radon, BC Centre for Disease Control:** www.bccdc.ca/health-info/prevention-public-health/radon.
- **Radon and smoking, Take Action on Radon:** https://takeactiononradon.ca/smoking-and-radon/.
- **Test kit information, Take Action on Radon:** https://takeactiononradon.ca/provinces/british-columbia/.
- **Find a professional, Canadian National Radon Proficiency Program:** https://c-nrpp.ca/find-a-professional/.

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BC moving to simplified IV N-acetylcysteine protocol for acetaminophen overdose

The BC Drug and Poison Information Centre (DPIC) will be transitioning to a standardized pan-Canadian protocol for IV N-acetylcysteine (NAC) for the treatment of acetaminophen overdose.

The current three-bag regimen will be replaced by a single concentration given in two steps. DPIC is prepared to launch the provincewide transition to the revised protocol by 1 November 2026, although individual health authorities may launch at earlier or later dates. The goal is for all BC health authorities to complete the transition by the end of 2026.

The change is in response to safety concerns raised by the Institute for Safe Medication Practices Canada, which identified inconsistent protocols and complex dosing stages as contributors to NAC infusion errors.[1] The traditional three-bag regimen required three separate preparations and concentrations, and medication errors have been reported in up to 33% of cases.

The new regimen uses a standardized 3% (30 mg/mL) solution, and the simplified protocol involves administering a loading dose of 150 mg/kg over 1 hour, then reducing the infusion rate to 15 mg/kg/hour as a continuous maintenance infusion for at least 20 hours. The total dose of NAC delivered over the first 21 hours is 450 mg/kg, compared with 300 mg/kg with the three-bag protocol, providing greater protection in cases of massive overdose or established hepatotoxicity. In addition, the revised protocol no longer requires ad hoc dose adjustment in massive overdoses or for patients on hemodialysis.

The new protocol also includes clearer stopping criteria, with the infusion continued until all of the following are met:

- Acetaminophen is below 66 µmol/L.
- Alanine aminotransferase and/or aspartate aminotransferase is normal or declining by more than 25% from peak.
- INR is below 2.0 and falling (without the use of fresh frozen plasma).
- The patient is clinically well, without evidence of encephalopathy.

Order sets, infusion references, and monographs in each health authority will be aligned with the revised protocol. Clinicians who manage acetaminophen overdose are encouraged to review the changes and the order sets at their local institutions.

DPIC is available 24 hours a day at 1 800 567-8911 for advice on suspected or confirmed acetaminophen overdose and for questions about the transition.

For more information from DPIC, see the N-acetylcysteine (NAC) 2 Dose for Acetaminophen Toxicity Resource Page: www.dpic.org/content/n-acetylcysteine-nac-2-dose-acetaminophen-toxicity-resource-page.

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Reference

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