



**Radiation Safety  
Institute of Canada**  
Institut de radioprotection du Canada

## Radiation Safety & Wellness Webinars

November 30, 2021



# Radon

RSIC Presenters: Lynn MacDonald & Dr. Rachid Zitouni

Invited Guests: Pam Warkentin (CARST)

Kelley Bush (Health Canada)

Theresa Meikle (Mindful Pathways)

**Good Science in Plain Language®**



- Audio and video
  - During the presentation, from the presenters only
  - Use computer or telephone (call in)
  - Computer seems to give the best sound quality
- Use the “Chat” feature to enter comments and questions
- Posted on webinar page
  - Video, answers to questions, copy of the slides
- Follow up email will be sent
  - Topics covered, time of attendance
- It may be possible to change your Zoom view if the controls are hiding the closed captioning.



- Overview of what radon is
  - Properties
  - Where it is found
  - How long it is present
  - What happens when it is inhaled
- Interview of guests
  - Pam Warkentin (CARST)
  - Dr. Rachid Zitouni, PhD
- Question and Answers
  - Kelley Bush (Health Canada)
  - Time permitting





# What is Radon?

## Uranium Decay Series

## Generation of Radon

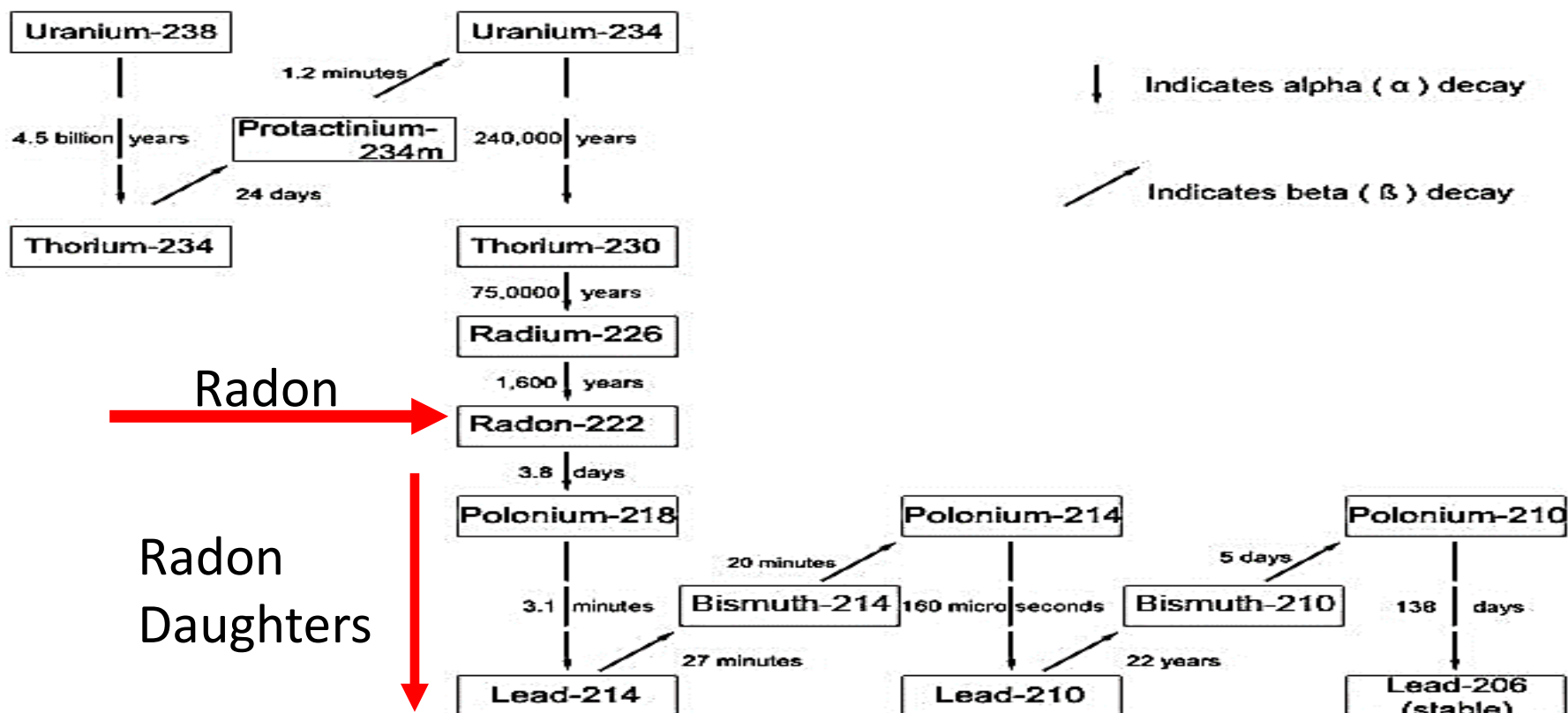


Image Source: <https://doi.org/10.3133/sir20075037>

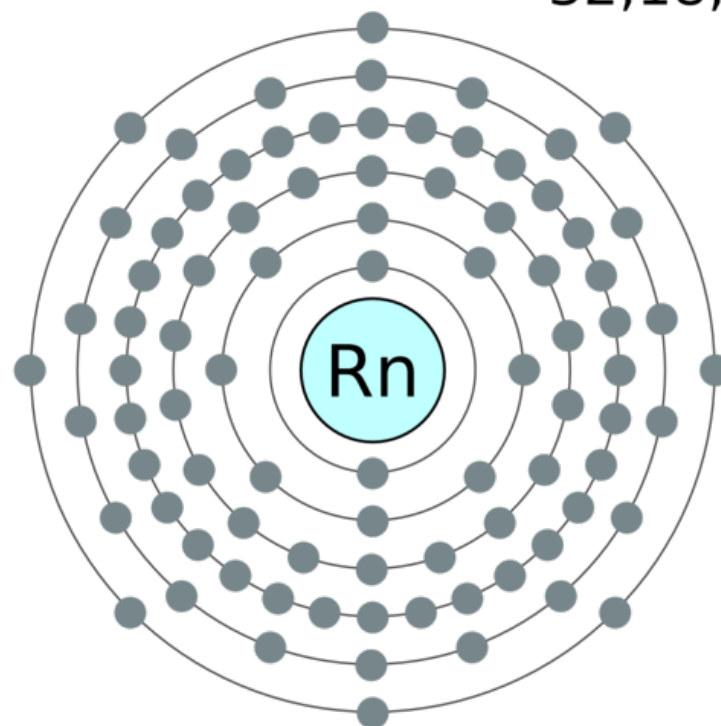


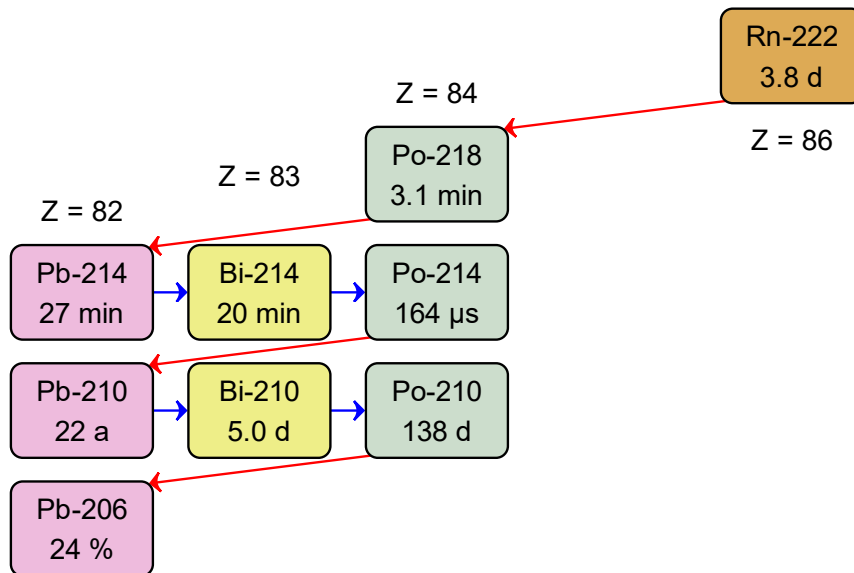
# Radon Properties

- Radioactive gas generated by the decay of Radium-226, itself a decay product of natural Uranium.
- Chemically inert, colorless, odorless, tasteless; has **no electrical charge**
- Emits high energy alpha particles ( ${}_2\text{He}^4$  nuclei)
- Physical half-life: **3.8 days**

86: Radon

2,8,18,  
32,18,8





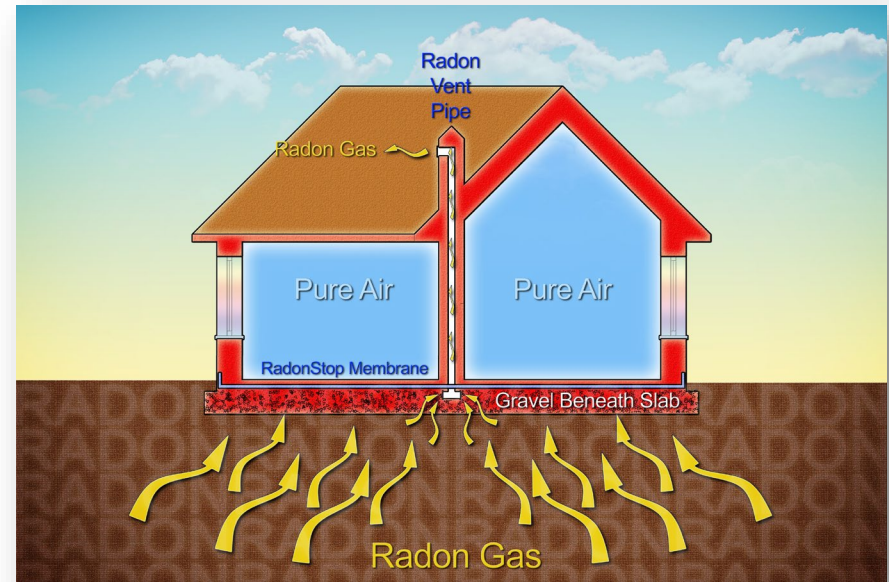
- Decays into several alpha and beta emitters
- Alpha emitters such as Polonium-210, Polonium-214, and Polonium-218 cause the most internal tissue damage
- Radon progeny are electrically charged
  - attach easily to dust and aerosols





# Where is Radon Found?

- Builds up if not sufficiently ventilated
- Enters dwellings from the ground





# Where is Radon Found?



- Radon can enter homes dissolved in water
  - Agitation releases it
- Very small amounts in
  - Building materials
  - Natural gas





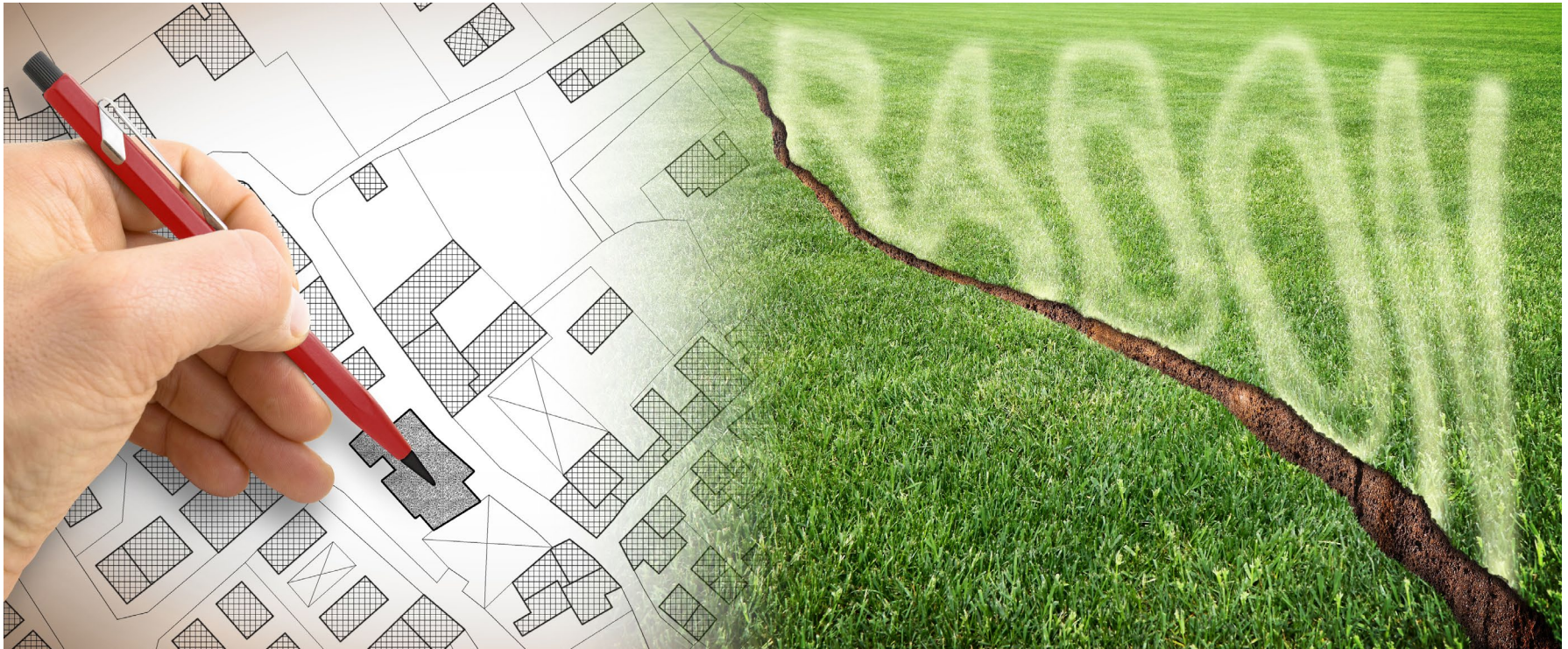
# Where is Radon found?

- Highest levels generally in lowest level
- Concentration depends on
  - Uranium and radium content of soil and rocks in the region
  - Construction of the foundation
  - Ventilation in the home
  - Location in the home





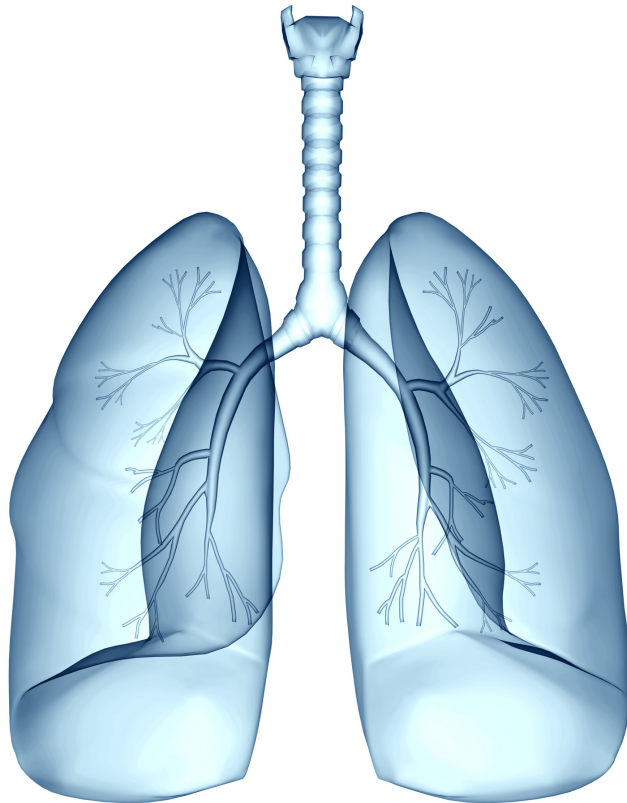
# How Long Does Radon Remain Inside?



**Radon is permanently present inside dwellings.**



# What Happens When Radon Is Inhaled?



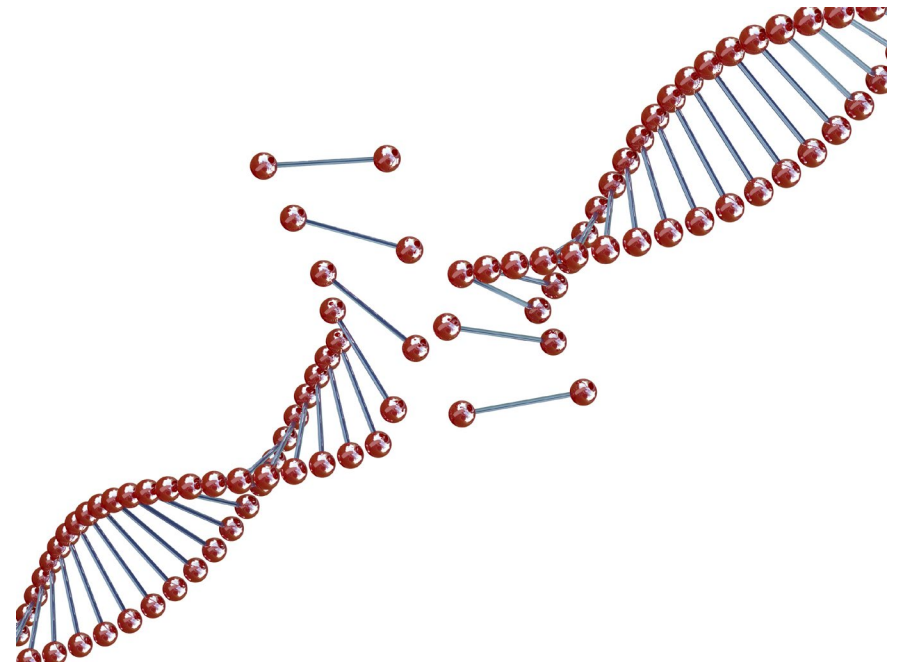
- Radon is inert
- Progeny are not
- Most radon will be exhaled
- Progeny will remain in lungs
- Progeny will emit alpha radiation internally
  - Damaging to living tissue
  - Carcinogen





# What Happens When Radon Is Inhaled?

- Internal alpha radiation can break DNA
- If incorrectly repaired, could lead to tumour formation
- Malignant tumours = cancer
- Lung cancer can spread to other parts of the body





# How Hazardous Is Radon to the Lungs?

Radiation Type	Radiation Weighting Factor (ICRP 103)
Alpha (internal)	20
Beta	1
Gamma	1
X-ray	1

- Po-210, Po-214, and Po-218 emit alpha particles
- Alpha emitters deposit large amounts of energy in living tissue
- Internal alpha is 20 times more hazardous than gamma photons, x-rays, or beta radiation
- Second leading cause of lung cancer after smoking



# How Hazardous Is Radon to the Lungs?

- Activity measured in decays per second: bequerel (Bq)
- Radon concentrations measured in  $\text{Bq/m}^3$
- In low concentrations, the risk is low
- The higher the concentration, the greater the risk
  - Proportional
- More time spent means increased risk







- CARST Represents, supports and assists radon professionals and other stakeholders
- Provides outreach and awareness to all Canadians



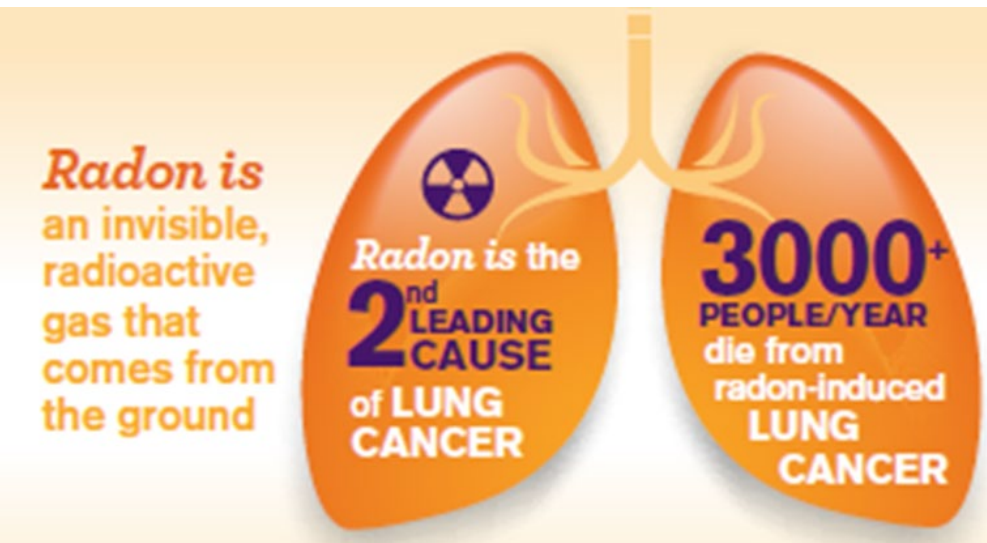
- C-NRPP is Canada's national certification program that establishes guidelines, standards of excellence and best practices for radon measurement, mitigation and new construction.



Health  
Canada

Santé  
Canada

- Created National Radon Program
- Conducted the Cross-Canada Survey on Radon Concentrations
- Developed guidance on measurement and mitigation
- Established the C-NRPP
- Maintains communication and provides input on direction



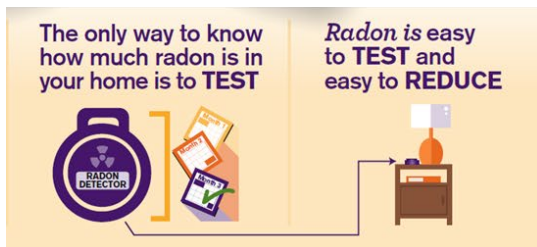
- In a Public Opinion Poll done in 2018, 35% of people surveyed had never heard of radon.
- Yet, 3,000 people a year are dying of radon related lung cancer

This is equal to 8 people per day are dying of radon-related lung cancer.



- Children are more sensitive to ionizing radiation than adults.
  - Cells multiplying rapidly
- ICRP 126 states
  - No specific indicators or advice for children
  - Significant presence of children
    - Strengthen awareness
    - Implement preventative and mitigating actions as a priority



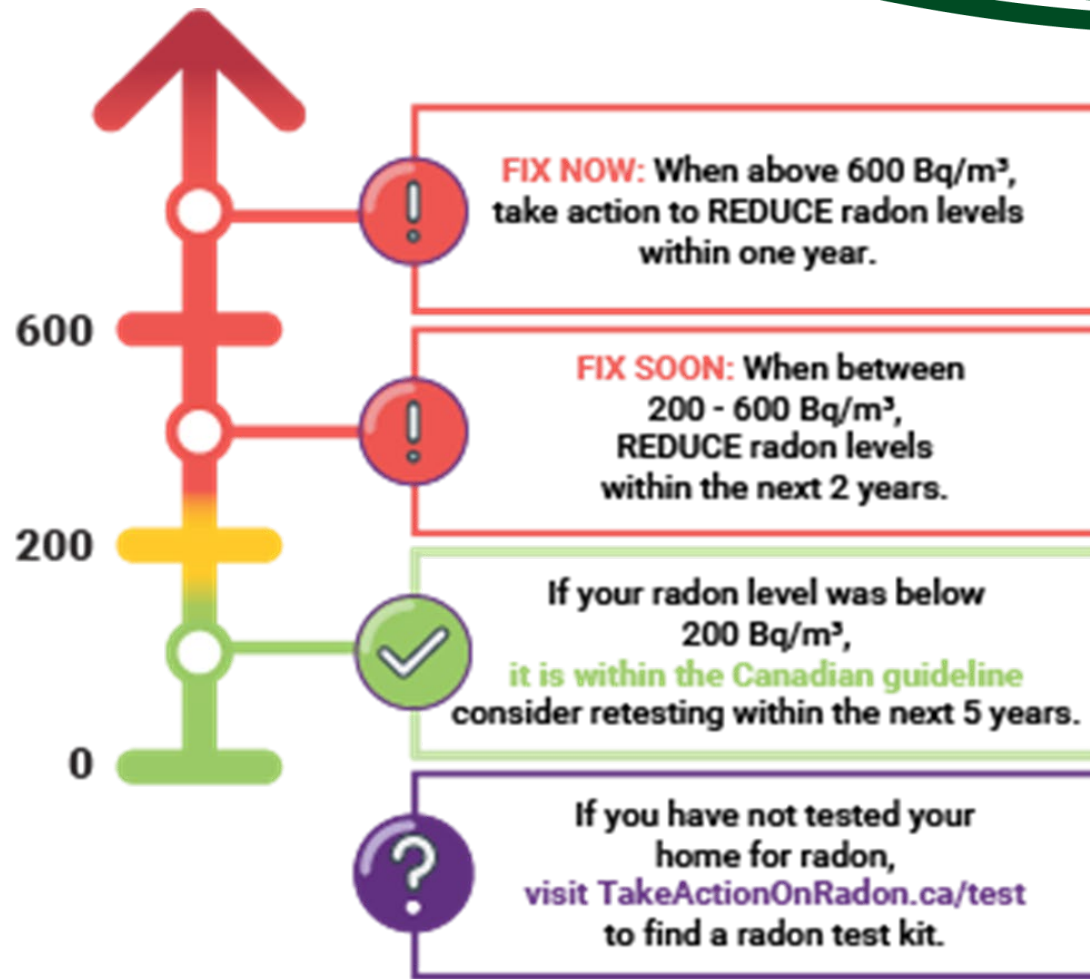


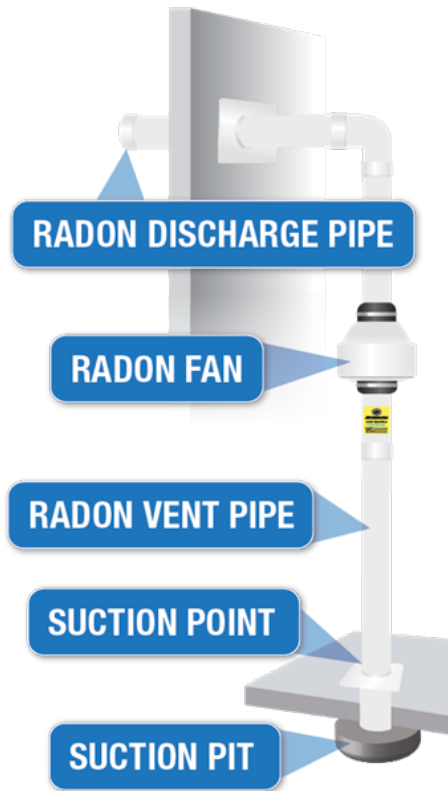
Test for minimum 91 days in the winter.  
Find a long-term radon test online here:

<https://takeactiononradon.ca/test/radon-test-kits/>









- **What if your level is above the Guideline level of 200 Bq/m<sup>3</sup>?**
- **If radon levels are high, they can easily be lowered.**
- Radon gas levels are reduced the most by installing a radon mitigation system.
- A radon mitigation system is the most effective way to reduce radon
- A radon mitigation system is simple to maintain





**Crawlspace  
mitigation**



**Research shows that certified radon professionals can reduce levels by over 90%.**



## Canadian National Radon Proficiency Program (C-NRPP)



- **Radon Measurement Professional** –deploys and retrieves radon detectors and provides a report of the associated measurement results
- **Radon Mitigation Professional** –determines the most effective way to reduce radon concentrations within buildings
- **Controlling Radon in New Canadian Homes (CRNCH) Installer** – designs and installs radon control systems within new constructed residential structures

<https://c-nrpp.ca/find-a-professional/>



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# Take Action on Radon

*Take Action on Radon* is a national initiative, funded by Health Canada, to bring together radon stakeholders and raise awareness on radon across Canada.

Our goal is to recruit, motivate, engage and bring together stakeholders to increase radon awareness and to promote radon action month

**Radon awareness is a team effort.**



Current leads for the Take Action on Radon Project:



Canadian  
Cancer  
Society



CAREX  
CANADA



Helping Canadians reduce RADON risk.



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# For More Information



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Lunch, Learn, & Dance  
Wellness Webinars

## Radon

**April 22, 2021**

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**FACT SHEET**

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<sup>86</sup>Rn Radon Gas

**WHAT IS RADON GAS?**  
Radon is a radioactive gas that cannot be detected by our human senses. It is colourless, and has no taste or smell to it.

**WHERE IS RADON FOUND?**  
Radon occurs naturally from the breakdown of uranium in soils and rock, and can be found all over Canada. Being a gas, radon can move through cracks and spaces in the rocks and soil, and can also "hitch a ride" with water flowing through the rock where it is created.

**WHAT ARE THE HEALTH RISKS?**  
Radon gas is radioactive. As radon gas decays, it forms tiny radioactive solids that tend to stick to existing dust particles in the air. We can breathe in these radioactive particles, and they tend to get trapped and stay in our lungs. The decay of these particles results in the release of alpha particles, which interact with the lung tissues and can cause damage to the cells, increasing a person's long-term risk for lung cancer. The higher the radon concentration and the longer the exposure, the



- Questions posted in the chat room
- To ask a question verbally
  - use “raise hand” button
  - When asked, press spacebar or unmute to speak
- Questions we do not get to
  - Answers will be posted to our website and link to resources emailed out







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***“Good science in plain language”<sup>®</sup>***

***Thank you for listening!***

[www.radiationsafety.ca](http://www.radiationsafety.ca)

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