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RADON

Many epidemiological studies of uranium and other underground miners have shown that miners exposed to high levels of radon are at higher risk of developing lung cancer. Recently, a radon map for Canada according to health regions has been developed by Jing Chen et al. Results of the map showed that the radon levels are the highest in some health regions of the Central and East Canada. Remedial actions are required in dwellings having radon levels higher than the action levels (200 Bq/m3) set by the Health Canadian. People living in dwellings are also at risk from radon and a combined analysis of the residential radon studies in Europe and North America have shown that there is a significant risk of lung cancer at residential radon levels.

Radon is a naturally occurring radioactive gas which is colorless, odorless and tasteless. It can not be detected in the air unless tested. Radon is formed by the breakdown of Radium in the soil. After radon formation, it comes above the surface and further breakdown to radon daughters. These radon daughters are mainly responsible for adverse health effects of radon. Radon is present in small amounts everywhere in soil, air and water. However, high levels of radon are present in radium enrich soil. Radon in water (from surface source) has negligible adverse health effects as compare to radon in air. A problem with radon in water is usually associated with Ground water e.g. private well

It can be present anywhere in the air because it is naturally present in the soil. People living in houses, workers in public buildings, workers in industries and mine workers are all at risk of exposure. However, mine workers in uranium and other underground mining are at greater risk. People living in basements with poor ventilation are also at greater risk. Risk of radon related adverse health affects usually increases with the decrease in ventilation rate.

Because Radon is a gas, it moves up through the spaces in the earth to the above air. Radon is then decays into radon daughters which are solid particles. These solid particles are suspended in the air or attached to the dust particles. Radon daughters alone or with dust particles can enter into deeper lung tissues when we breathe. Radon daughters are mainly responsible for adverse health effects of radon. Radon could be present in houses, public buildings, workplaces and mines. However, it is found in much higher concentration in mines as compare to houses and other buildings. Radon level is usually higher in indoor air (houses and other buildings) as compare to outdoor air due to low ventilation rate indoor.

Radon in indoor air comes from the ground on which a building is built and building materials such as plaster concrete and bricks. Radon from building material rarely cause radon related adverse health effects. Indoor radon level is also high in low ventilated places such as sealed buildings and basements. Radon can enter a house or a building in the following ways:

- Cracks in floor
- Cracks in walls
- Gaps in suspended floors
- Gaps around service pipes
- Cavities inside walls
- The water supply

Radon daughters suspended in the air penetrate deep into lungs when we breathe. In the lungs they are further breakdown to release energy. This energy damages lung tissues and cause cancer. Time between radon exposure and the occurrence of lung cancer may be many years. Miners and smokers are at greater risk of lung cancer from radon exposure. Although radon level is usually low in houses but the risk of adverse health effects still exist. Determining factors of risk are amount of radon, length of exposure and smoking habits. For example, the risk of lung cancer is 0.3% (3 deaths in 1000) in case of lifelong low exposure of 20 Bq/m^3.

Testing is the only way to know if radon is present or not. Radon testing is easy and simple to do. There are two types of radon testing: Short-term and Long-term.

Short-term testing: It is the quickest way to test radon and it can take from two days to ninety days depending on the devise. There are different types of detectors commonly used such as charcoal canister, electret ion chamber, continuous monitors, and charcoal liquid scintillation. Short term testing is less likely to detect annual average radon level because it changes from season to season and day to day. Long-term testing is preferred to check annual average radon level.

Long-term testing: Long-term testing takes more than ninety days to complete. It can detect annual average radon level by using alpha track and electret detectors.

When doing radon level testing following factors should be considered:

- Follow the instructions on the testing kit
- Place the testing kit in the most frequently used or lived-in portion of the house
- Keep the windows and outside doors closed as much as you can during the testing
- For two to three days testing close windows and outside doors 12 hour before starting the test
- Avoid bringing outside air in the house by operating fans and other machines

- Place the testing devise 20 inches above the ground and away from drafts, high heat, high humidity and exterior walls

RECOMMENDATIONS

Radon can be present anywhere and can not be detected unless tested. Radon test kits are easily available and easy to use. It is possible to prevent radon exposure or to reduce it to a safe level if appropriate measures are taken.

- Test radon to assess the risk associated with radon exposure
- If radon is present in air or ground water above or at action level corrective actions should be taken by:
  - Sealing walls and floors
  - Improving the ventilation of the house
  - Improving ventilation in the basement
  - Installing a radon sump system
  - Installing a positive supply ventilation system (creating positive pressure in the house)
  - Radon in water should be removed before its use (at point of entry or point of use)

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