

# Cancer In PA: Radon Awareness

 #PACancerTrends

## Radon Webinar Q&A Session

1. We are starting to hear about more cases of lung cancer in non-smokers, particularly female, non-smokers. Could this be related to radon exposure?

**Dr. Moritz:** Yes, whereas there are other potential causes of lung cancer in the non-smoking population, such as second hand tobacco smoke, diesel exhaust, and other environmental air pollutants, radon exposure also must be considered. In fact, EPA estimates that of the estimated 21,800 radon-attributable lung cancer deaths in the U.S. annually, about 2,900 of those occur in non-smokers.

2. Can we determine a radon induced lung cancer from a smoking or other non-radon induced lung cancer?

**Dr. Moritz:** No, at this time there have not been determined any biological or cellular markers that distinguishes a radon induced lung cancer from a smoking induced lung cancer. Even looking at the histological type of lung cancer does not distinguish between the two.

3. Where is the best area to place the radon kit to measure the highest radon in the home?

**Dr. Peterson:** The test kit should be placed in the lowest lived-in level of the home. For example, the basement if frequently used, otherwise the first floor. The place of highest radon risk is closest to the earth where it arises. The radon test kit will have instructions on how and where to place the test kit.

4. What is the best source(s) for ensuring the choice of qualified/certified radon services and products?

**Robert Lewis:** In PA, I first always tell people to consult PA DEP (either the 800 237-2366 or the website) for the regularly updated list of certified radon service providers. The state does not certify or endorse certain products.

5. Have areas been identified in PA (Easton, Bethlehem, Allentown), NJ (Phillipsburg) with increased radon pockets?

**Robert Lewis:** Yes, the three areas mentioned in PA are all within a physiographic region known as the Reading Prong. We have known for many years now that this area does indeed have higher radon levels than other areas of the state. The reason for the higher levels is the underlying geology. However, there are also many others areas outside of the Reading Prong that have equally high radon levels. We now know from the large amount of radon test data collected over the past years that there are also many other areas, outside of the Reading Prong with equally high radon levels.

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## 6. How do I explain the risks associated with radon exposure?

**Dr. Moritz:** Basically, the risk is a function of both the length of exposure and the concentration to which you were exposed. The longer one is exposed and the higher the concentrations, the greater one's lung cancer risk. There are other risk factors to consider, such as smoking status, time since exposure, exposure rate, and attained age.

## 7. How can a family doctor or primary provider know that I or my family is at risk?

**Dr. Peterson:** There is no blood test and a chest x-ray only is abnormal well after the cancer has formed. The best thing a primary care provider can do is remind their patient to get your home checked/tested for radon. This can be done with radon test kits purchased from local hardware stores or by hiring a certified radon tester. Have your patients contact the Radon Division of PA DEP 1-800-237-2366 to obtain more information.

## 8. If you rent a home and you do a radon test several times and it's above 40 BUT the owner refuses to fix it, what can you do?

**Robert Lewis:** I assume that the question means above 4.0 pCi/L and not 40.0 pCi/L. The one option is to move and find another property. Since the EPA guideline of 4 pCi/L is a voluntary guideline there may not be much that can be done. The Environmental Law Institute does have a booklet addressing tenants. They say that "rental property owners are usually responsible for keeping their properties in a safe and fit condition." However, I don't know that this has been tested in the courts as of yet.

## 9. How often should radon levels be checked once a mitigation system has been installed?

**Dr. Peterson:** A post-mitigation test must be performed no sooner than 24 hours nor later than 30 days following completion and activation of the mitigation system. Thereafter it is recommended to re-test every two years to make sure that the system is performing as designed.

## 10. Are the risks from radon exposure equal across the entire population?

**Dr. Moritz:** No, the lung cancer risks in smokers and former smokers are about six times greater than in non-smokers. Children may also be at a slightly higher risk which is why Dr. Peterson discussed the Newborn Program which provides a certificate for a free test kit in the take home kit for families when they leave the hospital with a newborn.

## 11. Is radon more of a problem in the country than in the city?

**Robert Lewis:** I am not aware of an association between radon and whether one lives in the city or the country. Homes in the city can have high radon and homes in the country low radon and vice versa.

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## 12. Is there evidence for radon exposure causing other types of cancer, besides lung cancer?

**Dr. Moritz:** No, there is no other consistent evidence that radon exposure causes anything except lung cancer. Because of the mechanism of how uranium breaks down and the byproducts from the radiation decay are inhaled. The alpha particles that are emitted don't travel a very long distance so they are able to damage those cells in the lining of your airway and lungs so it really is only a risk factor for lung cancer.

## 13. Are there any data bases of measured indoor radon levels for Pennsylvania residences, office buildings, and/or schools?

**Robert Lewis:** Yes, as required by regulation the state certified radon testers and labs are required to submit all testing data performed in PA to the Department. This testing data is contained in an Oracle database and currently has about 1.5 million records. This does not mean that 1.5 million homes have been tested in that some homes have multiple test results for one reason or the other. The database also contains school and building test results.

## 14. Is granular activated carbon really at risk of becoming a low-level radioactive waste when used to treat groundwater for radon?

**Robert Lewis:** No. By definition this would not be considered LLRW. However, the GAC filters will accumulate radioactive materials over time, depending on what the concentrations of Uranium, Radium, and Radon are in the ground water that the GAC filter is treating. To help alleviate this problem one should have a regular maintenance program to change out the carbon possibly ever two to three years.

## 15. Radon increases risk of lung cancer, but is there a safe threshold of radon exposure that is actually beneficial (radon therapy)?

**Dr. Moritz:** No. Obviously if radon damages your DNA and can cause a malignancy, even one alpha particle could potentially begin a cancer so there really is no safe dose. The odds of that occurring are low but not zero. There are radon spas throughout the world that claim some therapeutic benefit which I learned in preparation for this webinar. I was amazed to find that out. I highly encourage you not to visit one of those radon spas. They claim to work for osteoarthritis, rheumatoid arthritis, and some other autoimmune type diseases, but I would say the avoidance of radon is in your best interest.

## 16. Is 4 pCi/L really safe in a high-use area of a home?

**Robert Lewis:** If by "safe" one means "absolutely zero chance of harm," then there is no known "safe" level of radon exposure. As Dr. Moritz described above in Question #15, it is theoretically possible (though highly unlikely) that a single alpha particle could cause mutations that would lead to malignancy.

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Look at the EPA risk chart to estimate lifetime exposure risks, and ballpark the risks from shorter periods of exposure by proportion. Then ask, “Is this (non-zero) level of risk ‘acceptable?’” Different people will answer that question differently, but may it suffice to say that people routinely express concern about actual levels of risk from other hazards that are much lower (even orders of magnitude lower) than the risk from lifetime exposure at 4 pCi/L.

Using the EPA risk chart for a non-smoker and a lifetime exposure at 4 pCi/L results in approximately 7 out of 1,000 people getting lung cancer. So, I would say that 4 pCi/L in a “high-use” area is not safe. And for environmental carcinogens it even carries a fairly high risk, relatively speaking. Many environmental carcinogens are regulated at 1 in 100,000 or 1 in 1,000,000.

## 17. How often should I get a chest x-ray to look for lung cancer if I know or feel I may have I spent years living in a high radon area?

**Dr. Moritz:** I know of no guidelines in this case that suggest an x-ray or CT scan for lung cancer solely on the basis of radon exposure. There is moderate risk factor according to the National Conference of Cancer Network if you have 20 pack years of smoking, which is equivalent to smoking a pack a day for 20 years, and you have an additional risk factor. Radon is listed as one of the additional risk factors. An x-ray is currently not recommended.

## 18. Does radon affect my in-home animals?

**Dr. Peterson:** There has been research showing increased risk of lung cancer in dogs due to radon exposure. As has been said elsewhere, if you have a pet with lungs, then lung cancer can happen. It makes sense that radon could cause cancer in other mammals. These animals also live closer to the floor where radon levels are usually higher.

## 19. I would like to see geospatial maps for the state of radon exposure and radon induced cases of lung cancer.

**Robert Lewis:** Although it is possible to create such maps, it is critical to recognize that lung cancer is primarily caused by smoking and that small differences in smoking prevalence can wash out or even overwhelm relatively larger proportional differences in radon exposure that would act in the opposite direction. Difficulties in controlling for factors such as smoking history, personal mobility, and other sources of bias are what make geographic (ecological) radon studies so hard to perform well, and what make maps that could be assembled so likely to be misleading.

The understanding that radon causes lung cancer even at levels often found in homes is recognized by well-respected national and international people such as American Lung Association, American Medical Association, Health Physics Society, American Public Health Association, American Cancer Society, U. S. Surgeon General, International Agency for Research on Cancer, World Health Organization...

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Although it is not possible to be 100% certain what causes any particular individual's lung cancer, there are many well-designed studies that carefully match subjects with lung cancer and those without lung cancer (using age, gender, smoking history, etc.), and then look to see what their radon exposures may have been. These are called case-control studies and they clearly show the relationship between radon exposure and lung cancer risk. Factors developed from such studies are what the National Academy of Sciences and EPA have used to estimate national or statewide estimates of radon-related lung cancer deaths.

## 20. How are radon levels affected in homes without basements?

**Robert Lewis:** All structures that are in contact with the ground can have a potential for having indoor radon problems. It may be expected that a home with a full basement, being in contact with the source material on five sides may have a more significant indoor radon problem than a slab-on-grade structure with only one side of the building in contact with the source material. However, each type of building structure should still be tested for radon.

## 21. Should a low level for example 5.5, be acted upon?

**Dr. Peterson:** Yes, it should be remediated. As has been said there is no safe level. Even at levels of 2 there is some risk. At 4 or above is the action level. If one is elderly and is not expected to have a long remaining life, it might not be reasonable to remediate it, but remember if a young family moves in later, they would be at risk with a 5.5.

## 22. Are there any specific recommendations for testing private well water for radon, especially with respect to how often testing should be performed, reference values, and treatment options?

**Robert Lewis:** In Pennsylvania we have advised homeowners who have initially tested their indoor air and found elevated levels of radon to also test their well water to see if that could be a contributing factor to the indoor air levels. The significant issue with radon in water is that since it is a gas it off-gasses from the water once it is in the home due to aeration via showers, washing machines, water spigots, etc. There is no recommendation as to how often the water should be tested after the initial test.

The EPA has a proposed standard for radon-222 in public drinking water supplies of 300 pCi/L. This value has yet to be officially promulgated.

There are two treatment options for the reduction of radon in drinking water, aerations systems and granular activated charcoal systems. They both have their pros and cons. They are both also very effective.

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## 23. Besides lung cancer, what are other effects of Radon exposure in adults or children?

**Dr. Moritz:** I am not aware of any other issues such as COPD or emphysema. I do not believe the alpha particles would damage the lung in the similar way that smoking tobacco would or some other exposure from carbon emissions or other pollutant. It seems to be primarily a lung cancer related health effect.

## 24. Is there something that causes the Radon levels to increase?

**Robert Lewis:** There are certainly a number of factors that cause radon to vary. Most of these factors are related to the house dynamics and environmental conditions, primarily the weather. Indoor radon levels can increase due to low pressure fronts that move through an area, unbalanced heating systems that take excessive air out of the basement, or opening second floor windows while all the other windows in the house are closed.

## 25. Radon levels can change over time in a home is this correct? For example if a home had been tested when first moved into should it be tested again?

**Robert Lewis:** Answer: Yes, radon levels can change over time. If you initially tested a home you recently moved into and the radon levels were low you may want to re-test again sometime later, particularly if you have had some structural change to the home or had a major heating system change or upgrade. Even without these changes a subsequent test would be prudent.

## 26. Is there a link between Radon exposure in mothers and autism related disorders in children?

**Dr. Moritz:** I am not aware of a link between radon and autism.

## 27. Why aren't radon mitigation systems required in the building code for residential homes?

**Robert Lewis:** The International Residential Code for One and Two- Family Dwellings has Radon Control Methods contained in one of its appendices, Appendix F. It provides for various measures during new home construction to have at least the passive part of a radon mitigation system installed. There is also a radon industry standard RRNC 2.0, Reducing Radon in New Construction of 1 & 2 Family Dwellings and Townhouses, designated ANSI/AARST CCAH-2013. This document also provides for various methods to install a passive or active radon mitigation system during new home construction. However, at this time most states have not adopted these practices into actual building code. At least in Pennsylvania they must be adopted into code at the township or municipal level.

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**28. If radon level is between 2-4, some still recommend action but is it cost effective at that level or are you reaching a point of diminishing returns?**

**Robert Lewis:** Radon at these levels still carries some risk. If these levels are in an unfinished basement that is used infrequently then the need to reduce radon is less important than if these levels were found on one's first floor where people tend to spend maybe 70% of their time. The risk from radon exposure is a function of both concentration and time exposed. The EPA does provide risk estimates for various concentrations and individual homeowners can make decisions about their family health in part by using the risk estimates.

**29. Are there any studies that show the impact that fracking will have on the release of radon?**

**Robert Lewis:** There are three that I am aware of. Predictors of Indoor Radon Concentrations in Pennsylvania, 1989-2013, by J. Casey, et. al. 2015. Potential Radon Release during Fracking in Colorado, by J. Burkhart, et. al., 2015. The final one is the TENORM study conducted by the PA Department of Environmental Protection.

**30. Is there a blood test for radon?**

**Dr. Moritz:** There currently is not a blood test for radon.

**31. Cost to fix a house w high radon?**

**Robert Lewis:** For a typical active sub-slab depressurization system price can range from approximately \$800 to \$2,000. Basements plus crawl spaces or basements with slab on grade structures can cost somewhat more due to the need of additional suction points or possibly another fan.