



dba **Bill Brodhead**
2844 Slifer Valley Rd.
Riegelsville, Pennsylvania 18077
(610) 346-8004 Fax: (610) 346-8575
www.wpb-radon.com
wmbrodhead@hotmail.com

The Health Effects of Radon in Layman's Terms

HOW DOES RADON CAUSE LUNG CANCER?

There is uranium in the soil throughout the world. Uranium changes to different elements as it decays down to its final element of lead. All of the elements it changes into are solids except one, radon. Radon is a gas that does not stick to other particles. Being a free agent (noble gas), it floats freely in the soil and is easily drawn into the lower level of homes by the the natural flow of air, upward through a house. As it moves up through a house, it will change (decay) back into a solid particle (radon decay products). These solid particles easily attach to dust. Some of the inhaled radon and radon decay products attached to dust particles can decay or change in the lungs. The damage from the energy given off by the decay can genetically affect the lung cells. At some later date these damaged cells can become the beginning phase of lung cancer. Exposure to radon, no matter how much exposure, does not mean you will get lung cancer.

The EPA review of the scientific literature indicates that the risk from exposure (at the levels you might likely receive) is linear which means if you are exposed to four times more radon than someone else, you would have four times more risk. The EPA guideline of 4.0 pCi/l is not a safe level but a recommended level at which action should be taken to reduce your exposure. In fact, the EPA was mandated by congress to have a goal of reducing indoor radon levels to outdoor levels. The average outdoor radon level is considered to be 0.4 pCi/l. You cannot eliminate exposure to radon but you can reduce your exposure.

WHAT DO SCIENTIFIC GROUPS SAY?

In every underground mine that was studied by two scientific committee groups (BEIR IV and [BEIR VI](#)) there was increasing lung cancer as the radon levels increased. Numerous residential studies have found that increased indoor radon levels were connected with increased lung cancers.

Go to www.wpb-radon.com to get copies of the different radon studies.

There is no controversy about the connection between radon and lung cancer. There is in fact world wide acceptance that radon does indeed increase the risk of lung cancer. The question is how much increase risk is there. The EPA in 2003 reviewed all the scientific studies and revised the risk table in there pamphlet "Citizen's Guide to Radon". A copy of the "Citizens guide to Radon" is available as a PDF from the [EPA website](#).

HOW DOES RADON COMPARE TO OTHER CANCER CAUSING AGENTS?

Other pollutants are regulated by the EPA to reduce the risk to only 1 additional cancer in a million people that are exposed over a lifetime to the pollutant. Radon at 4 pCi/l for a lifetime is estimated to cause 7 additional cancers in a group of just a 1000 people. Radon is easily classified as a "Class A" carcinogen and far and away the worst environmental risk.

HOW MUCH RADON ARE YOU BREATHING?

The true health risk from radon is not the levels in your basement but what are the levels in the areas of the house you spend most of your time in. Radon arrives predominately from the soil so the highest levels are almost always in the basement or lowest level of the home. If you have a basement and there is a door between the basement and the upper floors then the upper floors will likely have significantly lower levels. Often the basement is 3 or 4 times higher than the first floor. In other words if you had 12.0 pCi/l in your basement it may only be 3.0 or 4.0 pCi/l in the first and second floor. This will vary depending on the season, heating system and separation of basement and first floor.

THIS IS THE 2003 REVISED EPA EXPOSURE RISK TABLE

Average lifetime radon level	If a thousand people were exposed to radon levels listed in the left column then the following additional Lung Cancers would take place	
pCi/L	Never Smokers	Current Smokers

20	36 (3.6%)	260 (26%)
10	18 (1.8%)	150 (15%)
8.0	15 (1.5%)	120 (12%)
4.0	7.3 (0.7%)	62 (6.2%)
2.0	3.7 (0.4%)	32 (3.2%)
1.25	2.3 (0.2%)	20 (2.0%)
0.4	0.73 (0.1%)	6.4 (0.6%)
<p>Example: If you were a homemaker in a house for 18 years (1/4 lifetime) that had an average 8 pCi/l in the living areas, it would equal a lifetime risk of 2 pCi/l and a 0.4% risk of getting Lung Cancer as a non-smoker or 3.2% as a smoker.</p>		

CALCULATING RISK USING THE EPA RISK TABLE

If I used the table above I could calculate my families risk to radon. We have lived in our present home for 25 years. Before I installed my radon mitigation system I measured 15 to 30 pCi/l in my basement. I have an oil fired hot water heating system in the basement. The basement has a door separating it from the first floor. If the average radon in the basement was 22 pCi/l and the first floor was 4 times less than there would be about a 5.5 pCi/l average upstairs. My 25 years in the same house is a third of a lifetime. To convert my 25 years to the lifetime averages of the table above, I need to divide my 5.5 pCi/l level by 3 to make it the equivalent of an average lifetime (70 years). This makes my equivalent lifetime average about 1.83 pCi/l or about a lifetime average of 2.0 in the table above. I do not smoke. Although I was not in the house 75% of the time, my wife was, as she raised our three boys. Using the table above my wife would have had a 0.3 % chance of getting lung cancer from radon if I had not installed our radon mitigation system. Some people would consider that an acceptable risk for themselves. I do not think they would consider it an acceptable risk for their loved ones.

The British Medical Journal in December of 2004 published a European study that combined the data from 13 European case control studies that included 7148 cases of lung cancer. If you factor in the use of lifetime exposure in the EPA table presented above you will find that the smokers risk from radon was very similar to the EPA numbers. The Europeans found the non-smoking risk still significant but about 40% smaller than what the EPA table indicates for non-smokers.

The Epidemiology Journal in March of 2005 published a study that combined 7 North American case control studies on radon and found the risk of radon was very much in agreement with BEIR VI conclusions.

Go to www.wpb-radon.com to get copies of the different radon studies.

The table below gives the percentage of survivors from different cancers after five years. Unfortunately the five year survivor rate for Lung Cancer has only improved from 13% to 15% in the last 25 years we have records for.

5 Year Cancer Survivor Rate

Type of Cancer	1974 to 1976	1983 to 1985	1992 to 1999
Breast	75%	78%	87%
Prostrate	67%	75%	98%
Colon	50%	58%	62%
Lung	13%	14%	15%

More people die from Lung Cancer than Breast, Prostrate and Colon combined.