Radon Action Month
Webinar
January 16, 2013

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Robert Lewis, 717 783-9485 or rolewis@pa.gov
www.dep.state.pa.us
Radon Division – What Does it Do?

• Radon Monitoring Section
• Radon Awareness and Outreach
  – Public service announcement, newspaper, radio, home shows, TV, website, phone calls, presentations
• Technical support
• Inspections
• Radon Certification Section
• Certify testers, mitigators and laboratories
• Reporting issues
• Enforcement
Is Radon a Problem in Pennsylvania?

• Pennsylvania is unique!
• The geology and the soil contribute to Pennsylvania having some of the highest radon levels in the country
• Pennsylvania homes average about twice the EPA guideline of 4 pCi/L
• Approximately 40 percent of radon test results are greater than the EPA guideline
Pennsylvania - EPA Map of Radon Zones

The purpose of this map is to assist National, State and local organizations to target their resources and to implement radon-resistant building codes.

This map is not intended to determine if a home in a given zone should be tested for radon.

All homes should be tested, regardless of zone designation.

IMPORTANT: Consult the publication entitled "Preliminary Geologic Radon Potential Assessment of Pennsylvania" (USGS Open-file Report 83-252-C) before using this map. http://energy.cr.usgs.gov/radon/rgpinfo.html. This document contains information on radon potential variations within counties. EPA also recommends that this map be supplemented with any available local data in order to further understand and predict the radon potential of a specific area.

Zone 1  Zone 2  Zone 3
# Statewide Radon Levels

<table>
<thead>
<tr>
<th>Radon Category (pCi/L)</th>
<th>Statewide Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 4 pCi/L</td>
<td>60.8%</td>
</tr>
<tr>
<td>4 to 10 pCi/L</td>
<td>22.7%</td>
</tr>
<tr>
<td>11 to 20 pCi/L</td>
<td>9.2%</td>
</tr>
<tr>
<td>21 to 50 pCi/L</td>
<td>5.3%</td>
</tr>
<tr>
<td>51 to 100 pCi/L</td>
<td>1.3%</td>
</tr>
<tr>
<td>&gt; 100 pCi/L</td>
<td>0.44%</td>
</tr>
<tr>
<td>% &gt; 4 pCi/L</td>
<td>39%</td>
</tr>
<tr>
<td>Sample Size</td>
<td>878,600</td>
</tr>
</tbody>
</table>
Matt Shields, 717 783-9484 or mshields@pa.gov
www.dep.state.pa.us
Discussion

- Radon risk in perspective?
- Actions if high radon levels found?
- What is radon mitigation?
- Access to radon mitigators
- Radon in water
Pennsylvania Annual Radiation Dose

- Terrestrial: 77%
- Internal: 17%
- Cosmic: 2%
- Medical: 2%
- Consumer: 1%
- Occpl & Ind: <0.1%
- Radon: 1%
Annual Doses

- Pennsylvania: 1730 mrem/yr
- US: 620 mrem/yr
- TMI Accident: 8 mrem once in 1979
Typical Radon Distribution

- 100%
- 50%
- 40%

Neutral Plane
Radon Mitigation Systems

New

Inside System

Existing Home

Outside System

Suction Pit

Fan
Certified Radon Mitigators

- Search “PA radon mitigator”
- 800-23RADON

Radon in Water

- Not regulated
- Risks mainly from off-gassing into air
- Removal by using:
  - Charcoal filters
  - Aeration systems
Kevin M. Stewart
Director of Environmental Health
Why should you be concerned about radon?
Most People Know That:

Smoking is the #1 Cause of Lung Cancer
Most People DON’T Know That:

Radon is the #2 Leading Cause of Lung Cancer
Indoor Radon gas is a national health problem. Radon causes thousands of deaths each year. Millions of homes have elevated Radon levels. Most homes should be tested for Radon. When elevated levels are confirmed, the problem should be corrected.

-- U. S. Public Health Service
Radon is Recognized as a National Health Problem!

- American Lung Association
- American Medical Association
- American Cancer Society
- American Public Health Association
- U. S. Environmental Protection Agency
- U. S. Surgeon General
Approximate United States Lung Cancer Mortality Risk at 4 pCi/L

- **Current Smoker**: The highest risk, with an additional radon risk of approximately 16% plus base risk.
- **Former Smoker***: A significant risk, with an additional radon risk of approximately 4% plus base risk.
- **Never Smoker** ****: The lowest risk, with an additional radon risk of approximately 2% plus base risk.

* At United States EPA Radon Action Level of 4 pCi/L. Individual risks vary according to personal exposure and other factors.

* Smoked minimum of 100 cigarettes in lifetime, but has not smoked in past year.
** Smoked fewer than 100 cigarettes in lifetime, and has not smoked in past year.

U.S. Average Risk Category at Diagnosis
## Annual U. S. Lung Cancer Deaths

<table>
<thead>
<tr>
<th>Category</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking Alone</td>
<td>116,000</td>
</tr>
<tr>
<td>Smoking and Radon</td>
<td>18,000</td>
</tr>
<tr>
<td>Radon Alone</td>
<td>3,000</td>
</tr>
<tr>
<td>Other</td>
<td>21,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>158,000</strong></td>
</tr>
</tbody>
</table>

- The rate of lung cancer deaths due to radon depends on smoking rates.
How does radon cause lung cancer?
• Answer lies in
  – How the lungs work, and
  – The nature of radon decay products
Cast of human lungs—Anatomical Institute, Bern, Switzerland
The lungs are the most external organs of the body

- Living cells are in contact with the outside world
- Most of the body’s airways have a thin mucus layer 5-7 µm (microns) thick; the lungs produce about a quart a day
- The mucus traps air pollution and particles
- If the lungs didn’t produce this mucus, you would die
• The cells lining the lungs have hair-like structures called cilia
• Cilia beat 25 strokes per second – moving mucus and trapped particles out
• It takes up to 36 hours for the mucus from the deepest parts of the lungs to reach the top of the trachea (windpipe)
Where Does Radon Come From?

Radon Decay Chain

- **LEAD-206** (stable)
  - Alpha decay to **LEAD-210** (22 years)
    - Beta decay to **BISMUTH-210** (5 days)
      - Beta decay to **POLONIUM-210** (138 days)
        - Alpha decay to **POLONIUM-218** (3 minutes)
          - Alpha decay to **RADON-222** (3.8 days)

**Gas**

- Short-lived radon progeny (principal hazard to uranium workers)
- Long-lived radon progeny (principal hazard from fallout)
How Does Radon Cause Cancer?

• Radon decay products are short-lived isotopes that are suspended in the air, often attached to fine particles.

• When inhaled deep into the lungs, they usually decay further before the lungs can sweep them out.

• The alpha particles emitted can directly or indirectly damage DNA in the cells of lung tissue, thus increasing the risk of developing lung cancer.
• There is no confirmed “safe level” of radon exposure
• Demonstrated lung cancer risks to underground miners occur at radon levels that clearly overlap with exposures frequently experienced in Pennsylvania
• Pooled residential studies published in 2004 to 2006 confirm an increase in lung cancer risk on the order of 10 percent at the 4 pCi/L level – *not* a safety standard
• The EPA has estimated that one in seven lung cancer deaths (about 21,000) are radon-related
Radon Work in Pennsylvania

• Public health education via media
• Distribution of radon test kits and information through school-based programs around the state
• Distribution of radon test kits and information through our on-line request portal
• Collaboration with civic, business, health, education and local government entities to distribute radon test kits and information
• Two Principal Criteria for Identification of Candidate Counties
  – Counties with greater likelihood of homes with elevated radon
  – Counties with history of being under-tested in comparison with statewide testing rate
Three-Year Approach

- **Year 1** - NE Quadrant (4500 test kits)
- **Year 2** - SW Quadrant (6000 test kits)
- **Year 3** - NW Quadrant (TBD)

Proposed County Groups for Radon Outreach Years 1, 2, and 3

**NOTES:**
Groups of counties are proposed as starting points for structuring future work, not necessarily as final sets.
American Lung Association in PA
Kevin Stewart, 717 541-5864 ext 36 or kstewart@lunginfo.org
www.lunginfo.org/freeradonkit
QUESTIONS?

Please type questions into the chat window.