



**POLONIUM IN CIGARETTES:  
A MAJOR SOURCE OF  
RADIATION EXPOSURE**

**NC-VA CHAPTER  
MEETING**

**New Bern, NC  
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March 12, 2009**

# ORIGIN OF THE PROBLEM



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- The Earth Contains Uranium and Radium Which Decay
- Radon is Subsequently Released into the Air and, in turn, Decays into  $^{210}\text{Po}$ , which is Electrically Charged
- The  $^{210}\text{Po}$  adheres to the Leaves of the Tobacco Plant

# TOBACCO PLANT LEAVES

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# CIGARETTES IN THE “HARMLESS” FORM



# CIGARETTES THAT HAVE CAUSED CANCER





# MAGNITUDE OF THE PROBLEM

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- Lung Cancer is the #1 Cause of Cancer Deaths in the United States
- According to the American Cancer Society, 161,840 Members of the U.S. Public Died of Lung Cancer in 2008 (44% women)
- 85% to 90% of these deaths (142,000) were due to cigarette smoking
- According to EPA, 3,000 of these were due to second-hand smoke; a few were “natural”

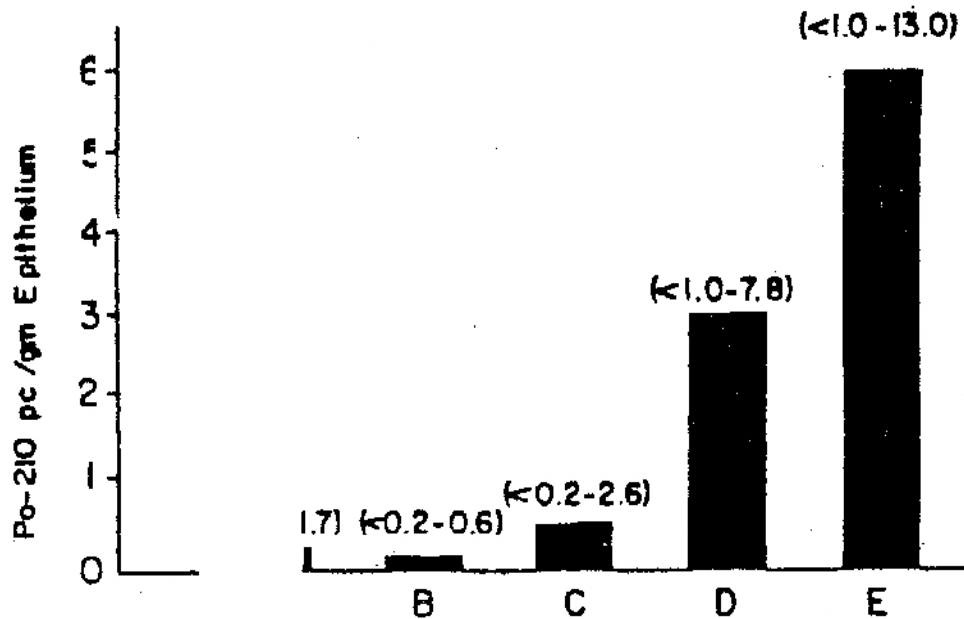
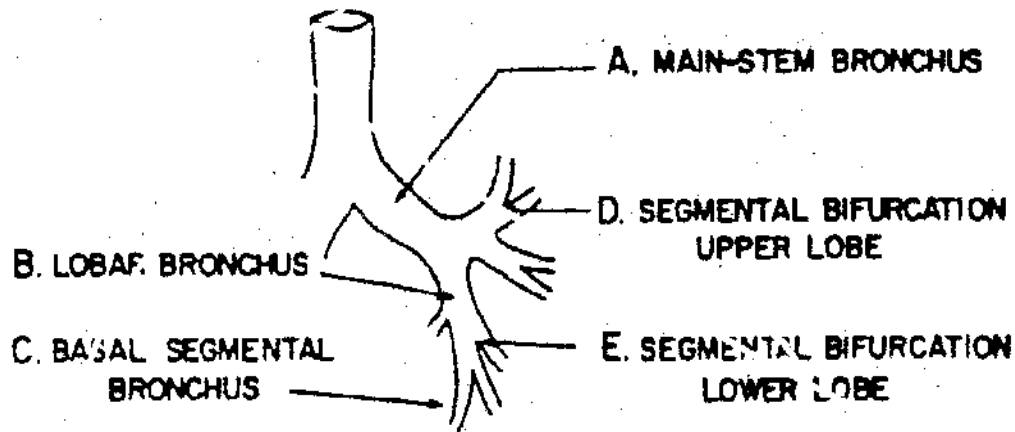


# SOURCE OF THE PROBLEM

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- The initial discovery that Tobacco contained  $^{210}\text{Po}$  was made by scientists at the Harvard School of Public Health in 1964
- Subsequent analyses (based on tissue samples from lungs removed from smokers who died of Lung Cancer) revealed that the annual dose to the Bronchial Epithelium was 160 mSv (16 rem)
- Although  $^{210}\text{Po}$  was also present in the lungs of non-smokers who died of lung cancer, the concentrations were far less

# WHY DOES $^{210}\text{Po}$ DEPOSIT IN THE BRONCHIAL EPITHELIUM?





# PROVIDING PERSPECTIVE

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- To yield the same dose to the bronchial epithelium would require a person to have 2,000 chest x-ray examinations each year (more than 5 each day)



# PROVIDING PERSPECTIVE

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- Applying a  $w_T$  of 0.06, the Effective Annual Dose would be 9.6 mSv
- This is almost 10 times the annual limit (1 mSv) for members of the public and almost half of the average annual limit for radiation workers (20 mSv)

# PROVIDING PERSPECTIVE



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- Based on a total of 45 million smokers, the annual collective dose to the U.S. population from cigarettes is 480,000 person-Sv
- This is more than 1,000 times the collective dose to the workers at our 104 nuclear power plants, all our DOE nuclear installations, and the crews of all the nuclear-powered submarines and surface vessels of the U.S. Navy



# PROVIDING PERSPECTIVE AND HARVARD CONCLUSIONS

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- The collective dose from  $^{210}\text{Po}$  is also almost half of the latest estimate (900,000 person-Sv) of that from diagnostic medical radiation examinations to the entire U.S. population (Mettler, 2008)
- On the basis of their 1965 investigations, the Harvard scientists concluded that:  
“We believe that that  $^{210}\text{Po}$  may be an important factor in the initiation of bronchial cancer in man”



# SYNERGISM

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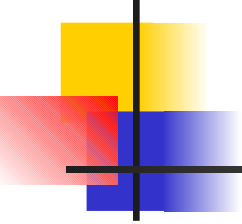
- In 2003, EPA concluded that the **highly carcinogenic alpha radiation** from radon & its decay products have a major synergistic effect with the chemical carcinogens in cigarette smoke, **increasing the lifetime risk of lung cancer by a factor of 8.3**
- A more recent evaluation (Darby et al. **2005**) estimated **this factor to be 25**

# LATEST CONCLUSIONS



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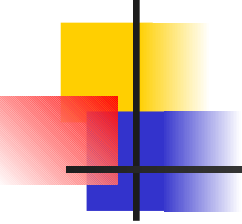
- On the basis of these and other recent observations, the British Journal of the Royal Society of Medicine (Tidd, 2008) reported that:  
“Smokers are killed by alpha-radiation, what-ever its origin. *Arguably, a significant part of this mortality is a result of Po-210 in tobacco.*”



# WHAT IS OUR RESPONSIBILITY?

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- It is to bring this problem to the attention of the Radiation Protection Profession, the Media, and the Public
- Fortunately, the process for initiating this action is readily available
- Let's join together and request that the HPS Board of Directors issue a Position Statement on this issue



# PROPOSED STATEMENT

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- The Health Physics Society Recommends that Polonium be removed from Cigarettes and/or the Accompanying Smoke
- A filter for Accomplishing the latter step has been in existence for 40 years (Bretthauer and Black, 1967)



# A SPECIAL REQUEST

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- Let me share a suggestion with you
- This is an opportunity for the HPS to Apply its Expertise and Knowledge in a Constructive Manner
- We have power: More than 5,000 members located in the United States and 54 other Countries



# A SUGGESTION AND A PLEA

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- A draft letter to Dr. Richard E. Toohey, HPS President, is available for members of each Chapter to sign
- I hope you will support this initiative and that it will lead to similar such actions in the future
- Let's lead the parade!