POLONIUM IN CIGARETTES: A MAJOR SOURCE OF RADIATION EXPOSURE

NC-VA CHAPTER MEETING
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ORIGIN OF THE PROBLEM

- 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
CIGARETTES IN THE “HARMLESS” FORM
CIGARETTES THAT HAVE CAUSED CANCER
MAGNITUDE OF THE PROBLEM

- 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”
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 $^{210}$Po DEPOSIT IN THE BRONCHIAL EPITHELIUM?
PROVIDING PERSPECTIVE

- 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)
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)
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.
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

- 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.
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?

- 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.
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

- 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

- 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!