公共衛生學院
社會醫學系暨行為科學組
SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF COMMUNITY MEDICINE
& UNIT FOR BEHAVIOURAL SCIENCES

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Dear Honorable Legco Members,

We recently submitted a letter to the *Leaders & Letters* columns in the *South China Morning Post,* which was published on 27-Mar-2011, titled "Smokers are at risk from radioactive element in tobacco". The content of the letter together with an additional technical note is provided here for your information and consideration.

Smokers are at risk from radioactive element in tobacco

There has been public concern that the contamination of the environment by the Fukushima nuclear power plants may extend to eastern and southern China, including Hong Kong. While the radiation hazard created by the earthquake damage in Japan is an emergency, it is important we take a consistent and comprehensive approach to the prevention of cancer due to radiation.

Tobacco is radioactive

It has been reported since the 1960s that tobacco smoke contains the radioactive element polonium-210 (^{210}Po), and this isotope emits high-energy alpha radiation which causes cancer. It has been documented that the tobacco industry has unsuccessfully tried to remove ^{210}Po from tobacco products over more than 40 years. A detailed review of the scientific literature on ^{210}Po in tobacco was published in the *American Journal of Public Health* in 2008, titled "*Waking a Sleeping Giant: The Tobacco Industry's Response to the Polonium-210 Issue*". This review points out that smokers of 1.5 packs of cigarettes a day are exposed to as much radiation as they would receive from 300 chest X-rays a year.

Radioactive Polonium in tobacco smoke

The presence of ^{210}Po in tobacco plants is the result of farmers enhancing the tobacco flavour by repeatedly applying phosphate-rich fertilizer produced from phosphate rock. The rock contains natural radium isotopes which decay to ^{210}Po. This polonium isotope is known to be completely volatile at the temperature of a burning cigarette. Alpha particle radiation is emitted from ^{210}Po and carried by fine particles in tobacco smoke. While there are many cancer causing chemicals in tobacco smoke, the accumulation of this radioactive material in the lungs of smokers is also capable of damaging the tissues in the respiratory system in a way which leads to lung cancer.

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A public health approach to cancer prevention

It is vitally important that all avoidable exposures to radioactive and other agents responsible for cancer are prevented. We can begin by ensuring that:

(i) Smokers are helped to quit by providing effectively funded, staffed and distributed smoking cessation services;

(ii) Children are not enticed to smoke by tobacco companies; and

(iii) Everyone is protected from breathing secondhand tobacco smoke.

Essential public health action in Hong Kong

The proposed increase in tobacco duty in the 2011 Budget will predictably reduce the current and future prevalence of smoking and exposure to cancer causing agents. The beneficial health gains will be greatest among young people, including children and adolescents, through prevention of both active and passive smoking. It will also motivate and help many adult smokers to quit.

Quitting and reduction in new cases of nicotine addiction among youth will predictably reduce harmful exposures, to radioactive and cancer causing substances, through prevention of both active and passive smoking.

Yours faithfully,

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TECHNICAL NOTE

Radiation hazards from Fukushima compared with tobacco smoke

One chest X-ray is equivalent to 50 to 100 micro Siverts (μSv) of radiation dose.[1] If 1.5 cigarette packs a day for one year is equivalent to 300 chest X-rays,[2] then the total amount of radiation dose would be 15000 to 30000 μSv. This level of radiation exposure is 6 to 13 times the natural annual radiation dose of 2400 μSv.[3,4]

The estimated radiation dose from 1.5 pack-years cigarette smoking is equivalent to the total dose for staying 50 to 100 hours at the worst No. 3 Fukushima nuclear reactor where the hourly radiation was 283.7 μSv after the smoke was seen.[5]

Human exposures to radioactive polonium are important from a public health perspective because ^{210}Po, as an alpha-emitting radioisotope, can cause many times more damage to living cells than an equivalent dose of beta and gamma emitting radioisotopes due to the high relative biological effectiveness.[6]

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Tobacco smoke and air pollution kill
Support tobacco control and clean air policies