The Strange Case of the Alpha Ray

December 15, 2012

Background:

Nuclear proponents and regulators often refer to "natural background radiation" as if it is a benign, possibly even beneficial experience.

In fact background radiation kills many thousands of people every year.

The article reproduced here deals with radon gas, one of many natural radioactive byproducts of uranium that is extremely harmful to health.

Radon harms the lungs in particular. The U.S. Environmental Protection Agency estimates that between 20,000 and 30,000 Americans die every year from lung cancer caused by breathing radon gas in their homes.

Like radium-226 and polonium-210 -- two extremely hazardous radioactive materials that were identified by Marie Curie over a hundred years ago -- radon gas gives off a non-penetrating but exceptionally damaging form of atomic radiation called "alpha rays" or "alpha particles".

Like radon gas (aka radon-222), radium-226 and polonium-210 are also natural -- but deadly -- radioactive byproducts of uranium. Every atom of radon-222, or radium-226, or polonium-210, starts out as a uranium atom.

Radium killed so many people in the 20th century – by pernicious anemia, bone cancer and cancers of the head – that it went from being the most expensive material on earth in 1920 ($100,000 per gram!) to being discarded as a waste byproduct from uranium mills nowadays.

Polonium-210 is thought to be responsible for about 90 percent of the deaths attributed to cigarette smoking – lung cancer, heart attacks and strokes. It was also the material used to murder Alexander Litvinenko in London England in 2006. Polonium-210 is estimated by the Los Alamos Nuclear Laboratory to be 250 billion times more toxic than cyanide.

The nuclear industry does little or nothing to educate people – even their own workers – about the dangers of alpha radiation. They will say, for example, that alpha rays "cannot pass through a sheet of paper". Although this is true, it is profoundly misleading -- unless you add that it is the most dangerous kind of atomic radiation when inside the body, in contact with living cells.

In fact the word "radiation" is a misnomer when applied to "alpha radiation", since alpha “rays” are in no sense waves, or photons, but

particles of matter – very dense electrically-charged particles that smash into living cells and break chemical bonds randomly.

If a beta particle can be described as a kind of subatomic bullet, then an alpha particle can be described as a subatomic cannonball.

Alpha radiation is about 20 times more effective in causing biological damage (leading to cancer, mutations and blood diseases) than beta radiation or gamma radiation, per unit of energy delivered to living tissue.

But since each alpha particle is about 10 times as energetic as a beta particle or a gamma photon, alpha radiation is about 200 times more damaging per radioactive disintegration.

Because a "Becquerel" refers to one radioactive disintegration occurring every second, it follows that each Becquerel of alpha radiation is about 200 times more damaging than a Becquerel of beta or gamma radiation.

Any alpha-emitting material is exceedingly dangerous stuff. The most commonly encountered alpha emitters are radium, radon, polonium, plutonium, americium -- and uranium itself.

Gordon Edwards

Radon Gas 'Targets Everyone'

Jaclyn Tersigni, The Toronto Star, December 1, 2012
http://tinyurl.com/cvyg232

The second leading cause of lung cancer isn't second-hand smoke or genetics. It's an invisible, odourless, naturally occurring gas called radon.

Health Canada estimates that 16 per cent of all lung cancer deaths in Canada are related to radon exposure.

"It's one of the most significant environmental health risks that exists today", says Kelley Bush, a radon spokesperson for Health Canada.

Radon is produced from decaying uranium in soil, rock or water. If a home is built on bedrock or soil containing uranium, radon can seep through foundation walls and floor cracks and any gaps around pipes and cables.

Radon is present in every home, but the levels vary. While radon in open

air is usually in small and safe amounts, it can accumulate to high and harmful amounts in enclosed or poorly ventilated spaces.

“[But] at the end of the day, from my perspective, it’s a good news story, Bush says. There’s solid science behind the understanding of what radon is and what the health risk is.”

And there is something that Canadians can do to find out if it’s an issue for them. If it is an issue for them, then there are actions they can take to reduce their risk.

Health Canada is urging Canadians to measure radon levels in their home with a do-it-yourself kit (available at hardware stores) or by hiring a certified professional. It’s recommended that testing be done in the fall or winter, when levels may be at their highest, over a minimum of three months to ensure an accurate, long-term reading.

“The levels [of radon] vary quite significantly hour to hour, day to day. . . . You don’t get lung cancer overnight. You want to know what your long-term exposure is”, Bush says.

The current radon level guideline is 200 Bq/m3 (radon radioactivity is measured in becquerel units). Results from a two-year Health Canada study released in March found that 6.9 per cent of Canadians live in homes with radon levels above that guideline. The highest levels of radon have been found in homes in Manitoba, Saskatchewan, New Brunswick and the Yukon.

Those who find high levels of radon in their home can have a radon reduction system called active soil depressurization installed.

Simply put, it’s a four-inch [10-centimetre] PVC pipe that’s put through your foundation floor. “It’s piped outside with a fan on it,” says Bush. “It draws the radon away from the home before it gets in, and pushes it back outside where it gets diluted.” Bush says the system is between 90- and 95-per-cent effective.

Not everyone who is exposed to radon will develop lung cancer. Risk depends on how high the levels of radon are in the air a person breathes, and the length of time a person is exposed. Smokers, however, do face an increased risk of developing lung cancer when exposed to high levels of radon.

Health Canada says the time between exposure and the onset of cancer is usually many years and occasional exposure doesn't cause symptoms such as headaches or coughing.

Bush often receives calls from Canadians who suspect their lung cancer might be related to radon exposure.

Their comments to me are always the same, says Bush. "I didn't know about radon. I wish I had, I would have tested or I heard about it but I didn't think it was going to happen to me."

Making sure people know about radon and encouraging them to test for it in their homes is the focus of Bush and her colleagues work and its a challenge.

Radon is the most difficult health risk to get people to react to, says Bush. "If you cant blame someone for it or it's not targeting a particular group of people . . . if it's not an immediate health risk or it's not tangible, then people tend to believe it's not going to happen to them.

[But] radon targets everyone."