

Doctors urged to use diagnostic alternatives to reactor-produced isotopes

The Canadian affiliate of International Physicians for the Prevention of Nuclear War is urging doctors to use diagnostic alternatives to procedures that require reactor-based ionizing radiation, because of links between the way medical isotopes are produced and the nuclear weapons industry.

Canada is “hindering non-proliferation efforts” because of the continued use of highly enriched uranium to produce molybdenum-99 at the aging Chalk River, Ontario, facility, mathematician and physicist Gordon Edwards told an Apr. 17 conference sponsored by Physicians for Global Survival.

Highly enriched uranium, also called weapons-grade uranium, is the only grade of uranium from which it is possible to produce a plutonium bomb directly. Edwards, a professor at Vanier College in Montréal, Quebec, and consultant on nuclear issues, says that makes the uranium a potential target for terrorists in search of material to build a nuclear bomb. “Now I know that most doctors don’t think there’s a connection between medical isotopes and bombs, but unfortunately there is,” Edwards, who is also president of the Canadian Coalition for Nuclear Responsibility, told *CMAJ*.

The connection is that molybdenum-99 is broken down into technetium-99m, that is used in about 1.5 million nuclear medicine procedures in Canada annually, Edwards earlier said to about 40 physicians at St. Paul’s University in Ottawa, Ont.

Canada could be using low-enriched uranium to produce isotopes instead, Edwards added, as other countries, including Argentina, already do.

But instead of designing the next generation of reactors to use low-enriched uranium, the flawed MAPLE reactors (Multipurpose Applied Physics Lattice Experiment) that Canada developed to replace the Chalk River research reactor would still have required highly enriched uranium, Edwards said. “It’s a sign that Canada is not only not



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Canadian physicians are “hindering” nonproliferation efforts by relying too heavily on medical isotopes for diagnostic purposes, claims Canadian Coalition for Nuclear Responsibility President Gordon Edwards.

helping nonproliferation efforts, it is actually hindering nonproliferation efforts,” he said.

The federal government scuttled the over-budget, overdue and overdesigned MAPLE reactors because of persistent technical problems and economic impediments (*CMAJ* 2008;178[13]:1648 and *CMAJ* 2008;178[7]:813-4).

Edwards urged doctors to support the use of alternative technology to produce these isotopes, such as cyclotrons that do not need highly enriched uranium.

A Task Force on Alternatives for Medical-Isotope production, convened by the TRI-University Meson Facility and the University of British Columbia, with the support of the federal department of Natural Resources, urged that accelerator-driven photo-fission could be used to generate molybdenum-99 to meet medical demand in Canada and abroad (*CMAJ* 2009;180[2]:162).

Although Edwards was careful not to endorse the TRIUMF technology, he called for further research on it and

also pointed to the TRIUMF facility’s claim that within 5 years, it will be able to produce the isotopes with an accelerator using photons rather than nuclear fission.

But Dr. Christopher O’Brien, the president of the Ontario Nuclear Medicine Association, says radiology can’t absorb all of the tests and treatment that nuclear medicine currently performs using reactor-produced isotopes. Computed tomography (CT) scans, magnetic resonance imaging scans (MRIs) and ultrasounds pick up diseases at much later stages, and expose patients to more radiation, he says. While positron emission tomography (PET) scans are a good alternatives, there are not enough of them in Canada to meet the patient need.

“If you stopped using reactor-produced isotopes, your ability to treat a disease such as thyroid cancer would disappear,” O’Brien says.

In addition to the significant cost to replace nuclear medicine departments with CT scans, MRIs or PET scans, ad-

ditional doctors and technologists would be required to run all the new equipment required, O'Brien points out. But he believes the solution to the issue is likely to be a blend of existing nuclear medicine and regional PET capability, as well as switching to reactors that produce low-enriched uranium.

O'Brien agrees with Physicians for Global Survival that using low-enriched uranium is a possibility and says the Maple II reactor could be converted to a low-enriched core. "It's worth exploring," he says. "We do have the issues of 2 old reactors (at Chalk River and in the Netherlands) so we do need a solution within the next 3 years to get us over the hump until we get to the next generation of technology."

Dr. Nancy Covington, past president of Physicians for Global Survival, said the group wants doctors to be aware of the issues involved in producing medical isotopes and to explore alternatives.

"We recommend that health care professionals explore nonionizing and nonreactor based ionizing radiation im-

aging technologies, and also explore the feasibility of avoiding ionizing radiation altogether, or utilize nonreactor isotopes," she says.

Covington points to principles drafted by International Physicians for the Prevention of Nuclear War, which call on clinicians to use ultrasounds, MRIs, PET scans or conventional radiographs whenever they serve patient care. "One of the viable solutions would be to see if there is a will so the Maple II reactor can be converted to a low-enriched core."

Edwards also told the conference that although technetium-99m has a half-life of just 6 hours, it breaks down into technetium-99, an element that remains radioactive over a half-life of more than 200 000 years. The element still poses a hazard through beta radiation when it is expelled from the body through urine and ends up in sewer systems and rivers, he added. — Laura Eggeertson, *CMAJ*

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Briefly

Health funding: Canadian spending for health research and development fell \$276 million to just over \$6 billion in 2006, according to Statistics Canada. With the exception of a small spike in 2005, health research funding was essentially unchanged over the 5-year period ending in 2005, states the report *Science Statistics: Estimates of Total Spending on Research and Development in the Health Field in Canada, 1997 to 2008*. Spending intentions for 2008 are projected at \$6.2 billion.

Youth cancer rates: The incidence of epithelial cancers is rising among young Canadians, largely as a result of more diagnoses of thyroid cancer among young women, according to the Canadian Cancer Society. Thyroid cancer rates among females aged 15–29 are 4 times that of male counterparts and account for 19% of all new cancer diagnoses in young women, states the report, *Canadian Cancer Statistics 2009*. That's primarily attributable to improved diagnostic practices and imaging technologies, which allow doctors to better detect the cancer in its early stages.

Green card: Females aged 11–26 emigrating to the United States must now be vaccinated against human papillomavirus before they can become permanent, legal residents. The requirement was recommended by an immunization advisory committee to the Centre for Disease Control and Prevention, says Chris Rhatigan, a spokesperson for United States Citizenship and Immigration Services. — Claire Biddiscombe, Ottawa, Ont.

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