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Report Identifies Method for Making Medical Isotopes without Nuclear Reactors

(Vancouver, B.C.) — TRIUMF, the University of British Columbia, and Advanced Applied Physics Solutions, Inc. (AAPS) released a report today proposing a uniquely Canadian method for producing select medical isotopes which avoids using weapons-grade uranium and nuclear reactors. Global concern about the reliable supply of key medical isotopes has grown in the recent past, heightened last year in Canada when the Chalk River nuclear reactor encountered regulatory challenges and was shut down for an extended period.

"This report takes a close look at an alternative to using nuclear reactors to make these medical isotopes. The new technology is based on high-power accelerators, an area in which TRIUMF is a global leader." said authoring committee co-chair and TRIUMF director Nigel S. Lockyer. "As a public research institution, we felt it important to take a close look at Canadian solutions to this potential problem."

Presently, 80-85% of all nuclear medicine procedures use a medical isotope known as Technetium-99 (Tc-99), which is prepared from a parent radioactive atom, Molybdenum-99 (Mo-99). There are about 40 million such procedures worldwide per year, of which 20 million are performed in North America and about 1.5 million of those in Canada. Canada supplies about half of the world market for this isotope with the Chalk River reactor operated by Atomic Energy Canada, Ltd.

The key physical process is the fission of a uranium nucleus. The present-day technique uses a neutron to split the weapons-grade uranium, while the alternative solution examined in the report uses a photon instead to fission natural uranium nuclei in a process called photo-fission. The technology exists to build a particle accelerator capable of driving enough photo-fission to supply much of Canada's need for the Mo-99 isotope. A system of a half-dozen machines would enhance reliability and ensure Canada's competitiveness in the North American market.

"This novel method is certainly of great interest to private enterprise," said Phillip Gardner, president and CEO of AAPS. "Our company's mission is to research, develop and commercialize innovative technologies from TRIUMF and other advanced physics research with potential for the social and economic benefit of Canadians. With all the aging reactors around the world experiencing technical issues, it is critical that we explore a new approach with experts in the field and with commercial partners."

The report was authored by a task force of more than 20 experts from across North America. Lockyer co-chaired the task force along with Thomas J. Ruth, a senior researcher at TRIUMF and the BC Cancer Agency. Lockyer explained, "This report doesn't propose that TRIUMF become a medical-isotope factory. Rather, it demonstrates that a new technology developed in basic physics research has real-world applications." The photo-fission accelerator technology arises from a new project at TRIUMF in a collaboration led by the University of Victoria.

The Task Force on Alternatives for Medical-Isotope Production was convened by TRIUMF, the University of British Columbia, and Advanced Applied Physics Solutions, with support from Natural Resources Canada. Additional information available at URL http://admin.triumf.ca/facility/5yp/comm/isotope-task-force.php.

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TRIUMF
4004 Wesbrook Mall
Vancouver, B.C. V6T 2A3
Canada
Phone: +1 (604) 222 1047
Fax: +1 (604) 222 1074
Web: www.triumf.ca

MEDIA CONTACTS

TRIUMF
Dr. Timothy I. Meyer
Head, Strategic Planning & Communications
TRIUMF
Phone: + 1 604 222 7674
E-mail: tmeyer@triumf.ca

AAPS, Inc.
Ann Fong
Corporate Secretary
AAPS, Inc.
Phone: + 1 604 222 7471
E-mail: awfong@aapsinc.ca

FOR EDITORS:

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Advanced Applied Physics Solutions (AAPS) is a not-for-profit corporation established by TRIUMF, and funded in part by the Canadian federal government through the Networks of Centres of Excellence. Its mission is to commercialize advanced physics technologies for the social and economic well-being of Canadians, and to advance the development of physics applications for the benefit of people around the world. See http://www.aapsinc.com.

Medical isotopes are produced using nuclear reactions at either nuclear reactors or accelerator facilities. The basic setup involves using a *beam* of particles (from the reactor core or the accelerator) to strike a *target*. Nuclear reactions within the target then create the medical-isotope atoms from the atoms of the target material. After irradiation by the beam, the target is then removed to *recover* the medical isotopes of interest using mechanical and chemical procedures. A *refinement* step then isolates and purifies the medical isotope so that it is ready for transport. It can then be combined with the relevant biomolecules to form the specific *radiopharmaceutical* for administration to a patient.