Team aims to produce medical isotopes without nuclear reactor

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Producing medical isotopes safely, cheaply and reliably without using a nuclear reactor or weapons-grade uranium is the aim of a research project led by the Canadian Light Source (CLS) along with the National Research Council of Canada (NRC), NorthStar Medical Radioisotopes and medical researchers from the University of Ottawa Heart Institute and Toronto's University Health Network.

The CLS Medical Isotope Project will receive $10 million from the Government of Canada and $2 million from the Province of Saskatchewan to study the technical and economic feasibility of producing medical isotopes using high energy X-rays from a particle accelerator.

The project, one of four being funded by Natural Resources Canada's Non-reactor-based Isotope Supply Contribution Program (NISP), was announced by Minister of Natural Resources Christian Paradis at an event in Sherbrooke, QC and by Mr. Brad Trost, M.P. for Saskatoon-Humboldt, and Saskatchewan Innovation Minister Rob Norris at the CLS in Saskatoon.

"The Government of Saskatchewan is pleased to partner with the Government of Canada to support this leading edge research in nuclear medicine," says Minister Norris. "Saskatchewan's investment represents a return by our province to the forefront of R&D in nuclear medicine at the University of Saskatchewan where the first use of cobalt-60 for cancer therapy was pioneered 60 years ago."

“We are grateful to the Government of Canada and the Province of Saskatchewan for their leadership and support of our project,” says Mark de Jong, CLS Director of Accelerators and the project’s principal investigator. “This is an outstanding example of how the CLS and NRC, partnering with research and development leaders from industry and the academic community can solve problems of critical importance to the health of Canadians.”

The project will use a high energy linear accelerator to bombard coin-sized discs of molybdenum-100 with X-rays to produce molybdenum-99 isotope. The molybdenum-99 decays into technetium-99m, the isotope used in approximately 5500 diagnostic medical procedures in Canada every day.

“The National Research Council of Canada has a long history of solving critical S&T problems for Canadians”, says NRC President John R. McDougall. “This initiative holds the promise of a reliable, stable supply of medical isotopes for the needs of Canadians at an affordable cost. This is an excellent example of how partnerships between the private and public sector can drive innovation and pave the way to technological breakthroughs.”

The proposal calls for the construction and testing of a prototype production facility at the CLS to assess the technical and economic feasibility of the approach. NRC will provide design expertise as well as theoretical modeling and technical support, using an automated radionuclide separator from NorthStar to harvest the isotopes. Finally, clinical validation studies will be conducted by researchers with the University of Ottawa Heart Institute and the University Health Network in Toronto.

"The Heart Institute's significant expertise as a national medical research facility will be put to work evaluating radiotracers labelled with

technetium-99m produced with this new technology for its application in effectively diagnosing heart disease," said Dr. Terrence Ruddy, Chief of Cardiology at the University of Ottawa Heart Institute. "Our advanced technology in nuclear imaging will enable researchers to carry out preclinical and clinical validation studies leading to widespread application in patients."

“Currently, there are only a handful of nuclear reactors globally that generate medical isotopes. With the breakdown of Chalk River’s nuclear reactor in 2009 there was a world-wide shortage,” notes Dr. Kieran Murphy, the University Health Network’s Deputy Chief of Radiology. “With high-energy particle accelerators we could produce medical isotopes in a much cheaper, cleaner and more efficient way. It would change the economics of nuclear medicine - not only in Canada or North America, but all over the world.”

The team’s preliminary calculations indicate that three facilities similar to the prototype to be built at the CLS would meet all of Canada’s demand for technetium-99m.

Provided by Canadian Light Source