

Isotopes: Canada's opportunity to lead in the fight against cancer and disease around the world with some of the rarest drugs on earth.

For more than 60 years, Canada has been a leader globally in the research, development and production of medical isotopes and radiopharmaceuticals. The world has always counted on Canada, but the fragility of our efforts has threatened the critical supply of these materials.

THE CANADIAN SITUATION

Canada's nuclear isotope program pioneered a new era in cancer-fighting treatments, and research and development around health care. Without champions, however, Canada risks not only ceding that leadership role but living in a future world where people have no access to life-saving cancer treatments. 2018 marked the end of an era for medical isotope production in Canada, as the National Research Universal (NRU) reactor was taken out of service after six decades of supplying medical isotopes to the world's health-care community. This has happened as new advances are quickly being made in the field of targeted therapeutics for the treatment of cancer.

The landscape of medical isotope production in Canada is diverse, due in part to the long-standing and world-class research into reactor and accelerator technologies. Canada is a leader in the development and production of medical isotopes that have been used globally for the past several decades. Canada relies on both domestic production and the global supply chain to provide medical isotopes to our hospitals.

To find solutions and guarantee future production and advancements of medical isotopes, the Canadian Nuclear Isotope Council (CNIC) was created.



The Canadian Nuclear Isotope Council (CNIC)

The CNIC is an independent organization consisting of representatives from various levels within the Canadian health sector, nuclear industry and research bodies, convened specifically to work with governments and advocate for our country's role in the production of the world's isotope supply.

The CNIC represents organizations across Canada and around the globe.



WHAT CANADIANS THINK

Canadians want to remain at the forefront of research and development, commercializing, and supply of medical isotopes. Two-thirds of respondents in a national survey expressed concern that Canada was losing its leadership position in isotope supply with nearly one-third of respondents being seriously concerned. This support goes so far that a further 63 per cent of Canadians support the provincial and federal governments adopting a Pan-Canadian strategy to secure the global supply of isotopes. Taken together, these two indicators clearly demonstrate that isotope leadership is important to Canadians, and they are largely in favour of government playing a critical role in pushing that forward.

Canadian policymakers should be acutely aware of the previous challenges faced by Canadians and global citizens during a past isotope supply shortage and take measures to ensure this doesn't happen again.

These results, generated from a survey of n=1804 adult Canadians, was conducted online by Innovative Research between July 26-31, 2019. The results are weighted to n=1,200 based on Census data from Statistics Canada.

THE FUTURE OF MEDICAL ISOTOPES IN CANADA

Nuclear medicine is rapidly following the trends in personalized medicine. One example is the combination of therapy and diagnostics, called "theranostics", which is an emerging application of medical isotopes. Theranostics allows the treatment to be targeted and modified for maximum effectiveness and the fewest possible side effects.

Dozens of clinical trials using medical isotopes are currently underway in Canadian hospitals. A new Lutetium-177-based drug that targets metastatic prostate cancer is being investigated. The medical grade isotope is used to destroy cancer cells while leaving healthy cells unaffected. Another is the first-ever clinical trial of an Actinium-225-based TIRT agent known as [225Ac]-FPI-1434 was launched in Canada in 2019. This investigational drug targets a receptor that is common to many solid tumours, and therefore has potential for treating a range of cancers.

Patients fighting cancer and other medical conditions all over the world rely on Canada for the safe and stable supply of medical isotopes. This presents a major challenge — and opportunity — for Canadian leadership in the training, research, development, deployment and export of medical isotopes for the global market.

Global Isotope Needs

ISOTOPE	Number of procedures using medical isotopes worldwide in 2017	Expected trend in the next 10 years
Technetium-99 (Tc-99)	35 million	+
Iodine-131 (I-131)	1 million	=
Radium-223 (Ra-223)	10,000	++
Xenon-133 (Xe-133)	100,000	--
Yttrium-90 (Y-90)	20,000	+
Holmium-166 (Ho-166)	400	++
Lutetium-177 (Lu-177)	15,000	+++
Alpha emitters (Ac-225, Ra-223 etc.)	2,000	+++
Strontium (Sr)/Rhenium (Re)/Samarium (Sm)	10,000-20,000	---
Iodine-125 (I-125)	120,000-140,000	+
Iodine-123 (I-123)	1,000,00	+
Iodine-111 (I-111)	100,000	+

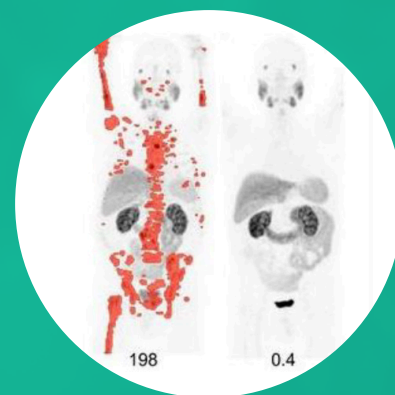
Drafted based on data from the OECD, IAEA and RG

63% of Canadians

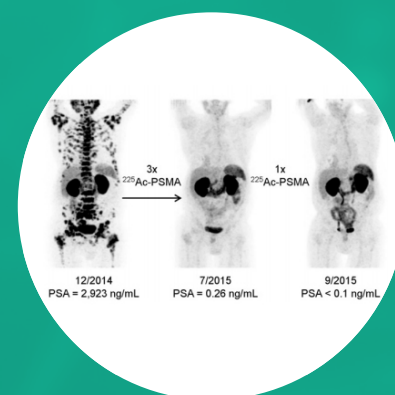
support the development of a national strategy for isotopes to ensure Canada remains at the forefront of this sector.

66% of Canadians

are concerned about ceding our leadership position in isotope production and research and development



68 Ga PSMA11 PET images at baseline and 3 months after 177 Lu PSMA617 showing significant response. J. Nucl. Med 2018; 59: 531



New targeted radiotherapy Reference: C Kratochwil et al, J Nuc Med (2016) doi:10.2967/jnumed.116.178673



Worldwide there are over
40 million
nuclear medicine
procedures

performed each year using isotopes, with approximately 36 million for diagnostic nuclear medicine and four million for therapy.

Nuclear
technology
saves lives

through the use of isotopes for screening, diagnosis and treatment of a wide variety of medical conditions.



60%

of the world's market of iodine-125 is produced at The McMaster Nuclear Reactor at McMaster University.



Canada has
45 approved
radiopharmaceuticals

23 currently approved radioisotopes, and is the world's leading supplier of two key medical isotopes.

WHAT CANADA MUST DO

Recognizing the opportunity presented by continued Canadian leadership in isotope development, the CNIC has seven recommendations:

1. Develop a Pan-Canadian Strategy for Isotopes

There's an opportunity with the support of the federal and provincial governments, through a forum such as the Council of the Federation, to adopt a Pan-Canadian strategy which integrates and supports Canada's leadership role in the supply, distribution and development of isotopes for medical and industrial applications.

2. National Supply Infrastructure Framework

Designate the supply of isotopes as a key element of strategic national infrastructure for domestic and international use, allowing the same access to funding and other tools as is the case with roads, bridges, energy projects and many other initiatives.

3. Federal Strategic Innovation Fund (SIF)

Designate Canada's isotope community as a key focus area within the SIF to help Canada leverage its infrastructure advantage and strong network of researchers, clinicians and entrepreneurs to position our country as a global leader in medical isotope innovation.

4. Break down barriers within Canada and abroad

Removing regulatory red tape will help to accommodate new treatments and new clinical trials to give patients easier access, and support the interprovincial trading and international export of critical isotopes.

5. Technology Applications for rural, northern and remote Regions

Deploy new technologies accessible to Canadians in rural, northern and remote communities that will reduce travel requirements, improve outcomes and equality around the standard of care.

6. Promote Canadian isotope leadership abroad and continue with international co-ordination

Canada's focus should be on the promotion of exporting our products, allowing for affordable and reliable cancer care.

7. Secure Canadian talent and expertise by supporting our isotope research institutions

With government support, we can ensure the right projects are being funded and facilitate partnerships with the private sector to continue leading isotope innovation.

Support of these recommendations would demonstrate a firm commitment to Canada's role as a leader in nuclear medicine, and dramatically bolster the country's capacity to innovate while delivering substantial economic and societal benefits to both Canadians and patients around the globe. With the size of the global isotope market projected to grow to more than \$17.1 billion (US) by 2023, Canada stands on the edge of a tremendous opportunity to bolster this industry.

FIND OUT MORE AT WWW.CANADIANISOTOPES.CA

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