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LE SEUL MAGAZINE DE TOUS LES PROFESSIONNELS DE LA SANTÉ

LA MÉDECINE NUCLÉAIRE

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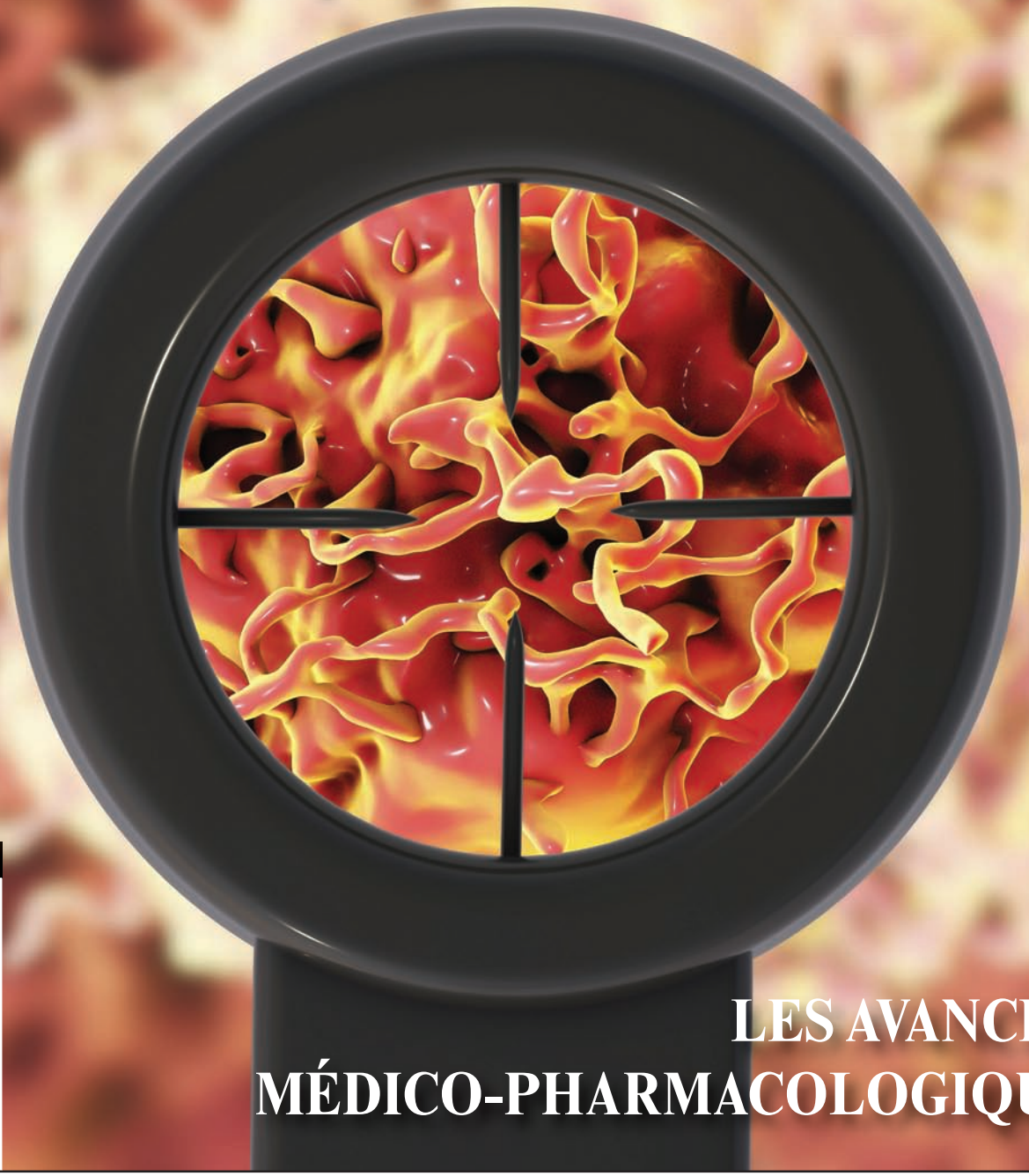

LES AVANCÉES MÉDICO-PHARMACOLOGIQUES

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TECHNEGAS®

Kit for the preparation of technetium Tc 99m-labeled carbon inhalation aerosol

FULL PRESCRIBING INFORMATION

The wait is over... Cyclomedica is proud to bring its innovative technology, Technegas®, to the United States.

Technegas®, referenced in both the European[1] and Canadian[2] Associations of Nuclear Medicine guidelines for diagnosing Pulmonary Embolism, is now available to patients in the USA.

Join us in our advance into a new era and experience nuclear pulmonary imaging with Technegas®!

info@cyclomedica.com

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HIGHLIGHTS TO PRESCRIBING INFORMATION[3]

These highlights do not include all the information needed to use TECHNEGAS safely and effectively. See full prescribing information for TECHNEGAS.

INDICATIONS & USAGE

TECHNEGAS®, when used with sodium pertechnetate Tc 99m in the Technegas® Plus System, provides technetium Tc 99m-labeled carbon inhalation aerosol (Technegas® Aerosol), a radioactive diagnostic agent for use in adults and pediatric patients aged 6 years and older for:

- visualization of pulmonary ventilation
- evaluation of pulmonary embolism when paired with perfusion imaging

DOSAGE & ADMINISTRATION

- For adult patients, the recommended activity of sodium pertechnetate Tc 99m injection to be loaded in the Technegas Crucible is 400 MBq to 1,000 MBq (10.8 mCi to 27 mCi) to achieve a lung count rate between 1,500 counts per second (cps) and 2,500 cps at the end of the last respiration. (2.2)
- For pediatric patients aged 6 years and older, a sufficient amount of Technegas Aerosol should be inhaled to achieve between 500 cps and 1,000 cps at the end of last respiration. The radioactivity to be loaded in the Technegas Crucible is a fraction of the recommended activity for adults adjusted by body weight. (2.2)
- Administer as soon as possible following preparation and complete inhalation within 10 minutes of preparation. (2.2)
- For drug handling, breathing techniques, preparation, and dosimetry information, see the full prescribing information. (2.1, 2.3, 2.4, 2.5)

DOSAGE FORMS & STRENGTH

TECHNEGAS (kit for the preparation of technetium Tc 99m labeled carbon inhalation aerosol) is a 1.25 gram single-use black to dark grey oval shaped graphite carbon crucible (Technegas Crucible). Upon addition of sodium pertechnetate Tc 99m injection, USP to the Technegas Crucible, the Technegas Plus System provides Technegas Aerosol for oral inhalation. (3)

CONTRAINDICATIONS

None. (4)

WARNINGS & PRECAUTIONS

Decreased Oxygen Saturation: Monitor oxygen saturation with continuous pulse oximetry. If clinically indicated, allow patients to breathe room air throughout the procedure and consider administration of supplemental oxygen before and at any time during the procedure. (5.1)

Radiation Exposure Risk: Ensure safe handling and preparation procedures to protect patients and health care providers from unintentional radiation exposure. (2.1, 5.2)

ADVERSE REACTIONS

The most common adverse reaction (≥ 1%) was hypoxia. (6.1)

To report SUSPECTED ADVERSE REACTIONS, contact Cyclomedica Australia Pty Ltd at toll free phone number 1-888-8-586-4396 or FDA at 1-800-FDA-1088 or www.fda.gov/medwatch.

USE IN SPECIFIC POPULATIONS

Lactation: Temporarily discontinue breastfeeding. A lactating woman should pump and discard breastmilk for at least 4 hours after Technegas Aerosol inhalation to minimize exposure to the breastfed infant. (8.2)

[1] Bajc M, et al. Eur J Nucl Med Mol Imaging (2019) 46:2429–2451

[2] Leblanc M, et al. CANM Guidelines for V/P SPECT in PE. CANM Nov 2018

[3] https://www.accessdata.fda.gov/drugsatfda_docs/label/2023/022335s000lbl.pdf

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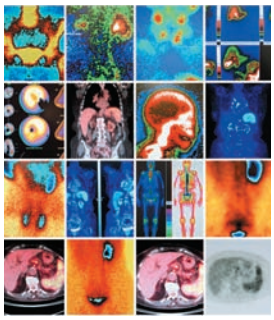
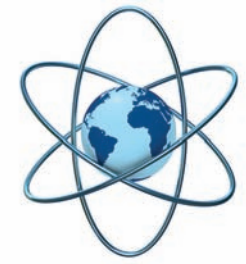
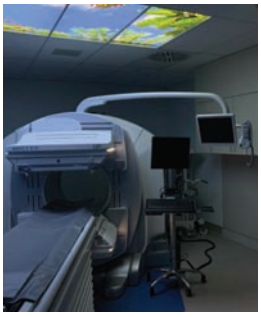
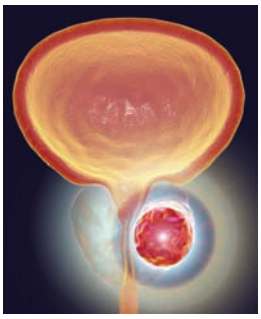
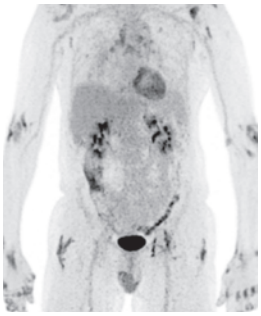
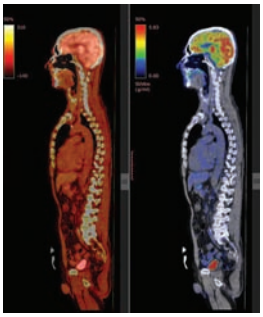












François Lamoureux,
M.D, M.Sc., FRCP(C), ABNM

LES AVANCÉES MÉDICO-PHARMACOLOGIQUES

LES TROIS AVANCÉES MARQUANTES DE LA MÉDECINE NUCLÉAIRE

Qui un jour aurait pu imaginer que la radiation, un élément qui peut être pour l'être humain très toxique et même mortel, serait un jour mise à contribution pour prolonger la vie de l'homme.

La Médecine Nucléaire met maintenant cette Avancée à la disponibilité des êtres humains.

Depuis les années 1940, la Médecine Nucléaire a permis d'investiguer différentes pathologies de l'homme, il s'effectue aujourd'hui dans le monde plus de 50 millions de ces examens.

Un élément radioactif sous forme de traceur est introduit dans le corps par voie orale ou veineuse par exemple. Par la suite au moyen d'une caméra reliée à des ordinateurs on débusque différentes pathologies dont leurs localisations sont souvent obscures. On obtient aussi au besoin une évaluation de l'ensemble du corps. Tout s'effectue sans douleur ou effet secondaire significatif. On établit une réelle carte géographique de l'étendue d'une atteinte pathologique et le tout rapidement en quelques minutes et de façon générale en externe, pas besoin d'hospitalisation.

Mais comme il s'agit d'examens de routine que sont donc ces trois nouvelles avancées marquantes.

En premier la mise au point de détecteurs (caméras) de nouvelles générations tomographiques comme à technologie CZT (tellurure de cadmium et zinc). Avec ces caméras ont réduit de façon significative le temps d'examen ou on peut davantage réduire la dose de radioactivité utilisée tout en améliorant la qualité des images obtenues. C'est un premier grand plus pour les patients.

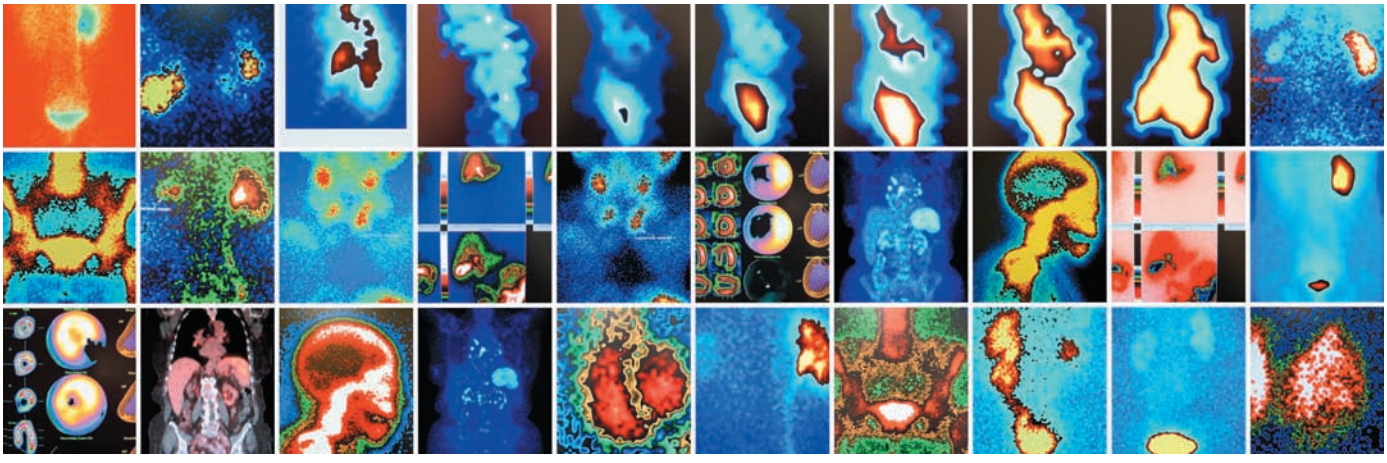
En deuxième Avancée, c'est bel et bien l'utilisation en support de l'Intelligence Artificielle. À la suite de la fin de l'acquisition des images, la technologue et ou le médecin nucléiste procède à une première évaluation des données et dans un deuxième temps confronte ses résultats obtenus aux évaluations que les programmes d'Intelligence Artificielle lui proposent mais toujours c'est l'interprétation finale du spécialiste qui est retenue. L'intelligence Artificielle c'est une aide et non une remplaçante mais combien une partenaire de grand apport pour la technologue ou le médecin spécialiste.

La troisième avancée existe aussi depuis les années 1940 mais c'est aujourd'hui son développement exponentiel qui en fait une avancée si importante. C'est la théranostique c'est-à-dire l'utilisation de radiotraceurs à dose plus élevée avec des ligands pour aller traiter par exemple l'ensemble des lésions agressives de types tumorales à l'intérieur d'un corps humain.

Dès les années 1940 on utilisait l'Iode-131 à des fins diagnostics mais aussi à des fins thérapeutiques. Mais aujourd'hui grâce à de nouveaux radioligants comme du PSMA (antigène membranaire spécifique de la prostate) on attaque en Médecine Nucléaire des lésions tumorales malignes comme dans certains cancers agressifs de la prostate, de tumeurs neuroendocrines et bientôt aussi dans certains cancers du sein.

La vie est et sera prolongée pour de nombreux patients souffrant de cancers grâce à ces trois avancées. C'est également en général une thérapie douce. Oui la Médecine Nucléaire offre de grands espoirs pour une plus longue et une meilleure survie pour de nombreux patients attaqués par des tumeurs malignes. Quelles avancées marquantes et ce n'est qu' un début. ■

« Oui la Médecine Nucléaire offre de grands espoirs pour une plus longue et une meilleure survie pour de nombreux patients attaqués par des tumeurs malignes. »



Découvrez la MorePETs Coalition

Nous veillons à ce que les patients aient accès au plein potentiel des examens de tomographie par émission de positrons (TEP) en Ontario.

LE PROBLÈME?

Les examens TEP sont sous-utilisés dans le système de santé de l'Ontario.

LA SOLUTION?

Action Cancer Ontario a élargi et simplifié le processus de demandes d'examens TEP.

La Coalition veille à ce que les médecins soient au courant de ces changements.

MÉDECINS DE L'ONTARIO :

Visitez **www.morepets.ca** pour obtenir des renseignements qui vous aideront à mettre à profit les appareils de TEP pour vos patients.

François Lamoureux,
M.D, M.Sc., FRCP(C), ABNM

MEDICAL AND PHARMACOLOGICAL ADVANCES

THE THREE MAJOR ADVANCES IN NUCLEAR MEDICINE

Who could have imagined that radiation, an element highly toxic and even deadly to humans, would one day be harnessed to extend human life? Nuclear Medicine now offers this advancement to humanity.

Since the 1940s, Nuclear Medicine has been used to investigate various human pathologies. Today, more than 50 million such examinations are conducted worldwide. A radioactive element, known as a tracer, is introduced into the body orally or intravenously, among other methods. Using a camera connected to computers, this technique uncovers hidden pathologies and provides a full-body assessment when needed. This process is painless, with no significant side effects. It provides a detailed map of the pathological spread, usually within minutes, and is often done on an outpatient basis without the need for hospitalization.

However, given that these routine exams are common, what are the three major advances?

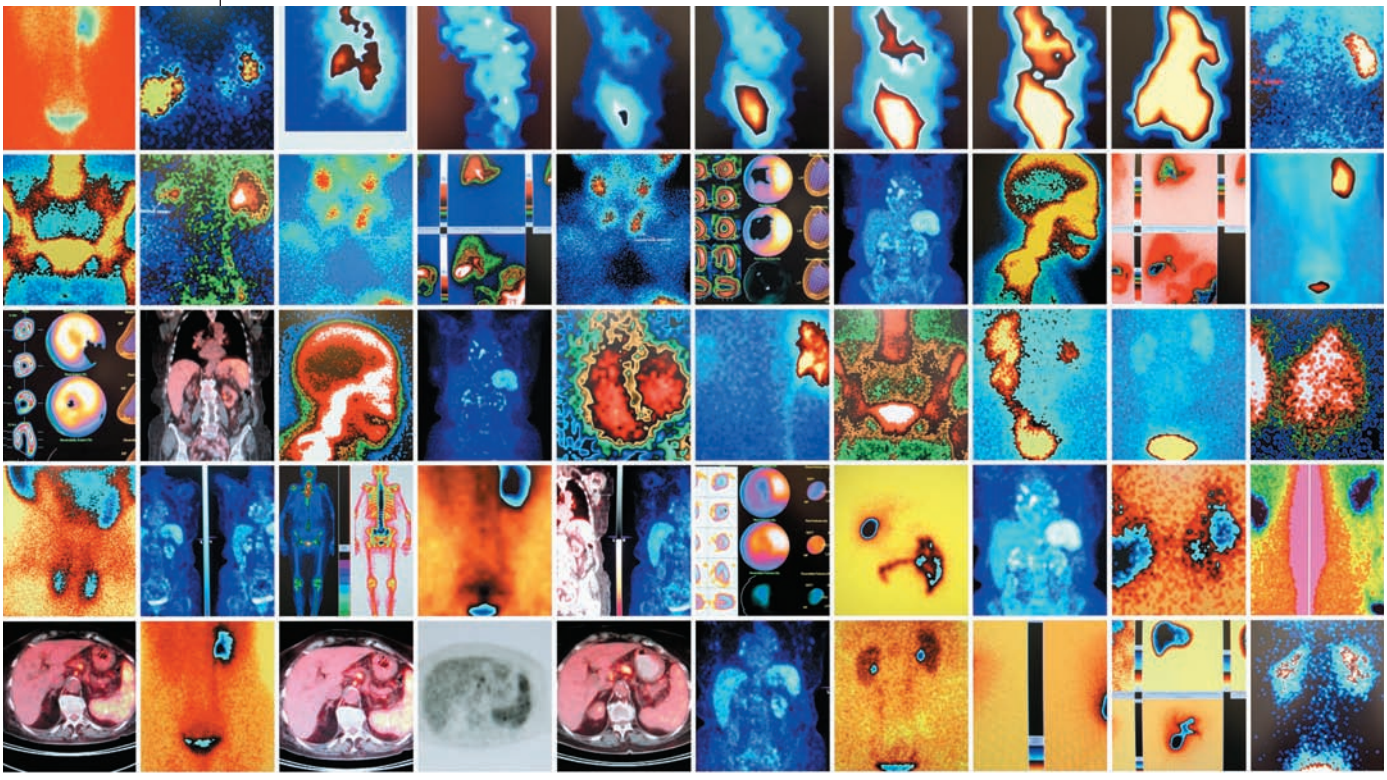
1. New Generation Tomographic Detectors: The development of new-generation tomographic detectors, such as CZT (cadmium zinc telluride) technology, has significantly reduced examination times. It also allows for reduced doses of radioactivity while improving image quality, a major benefit for patients.

2. Artificial Intelligence Support: AI has become a valuable tool in Nuclear Medicine. Once image acquisition is complete, the technologist or nuclear physician conducts an initial evaluation of the data, then compares it to assessments provided by AI programs. The final interpretation is always made by the specialist. AI is a partner rather than a replacement, offering significant assistance to technologists and specialists.

3. Theranostics: Theranostics has been around since the 1940s, but its exponential growth makes it a vital advancement today. It involves using higher doses of radiotracers with ligands to treat all aggressive tumor lesions in the human body. In the 1940s, Iodine-131 was used diagnostically and therapeutically. Today, new radioligands like PSMA (prostate-specific membrane antigen) are used to target malignant tumors, such as aggressive prostate cancers, neuroendocrine tumors, and soon, some breast cancers.

Thanks to these three advances, many cancer patients may live longer.. Nuclear Medicine offers significant hope for a longer, better survival for many patients battling malignant tumors. What remarkable advances—and this is just the beginning. ■

"Nuclear Medicine offers significant hope for a longer, better survival for many patients battling malignant tumors."



Meet the MorePETs Coalition

Working to ensure patients in Ontario have access to the full potential of PET scans.

THE PROBLEM

PET scans are underused in Ontario's healthcare system.

THE SOLUTION

Cancer Care Ontario has expanded and simplified the process for ordering PET scans.

The Coalition is ensuring doctors are aware of these changes.

ONTARIO DOCTORS:

Visit **www.morepets.ca** for information to help put PET scans to work for your patients.

UNE CAMÉRA À TECHNOLOGIE DIGITALE POUR L'HÔPITAL PIERRE BOUCHER

Hani Hassoun, MD, FRCPC
Nuclear Medicine
Spécialiste en médecine nucléaire à l'Hopital Pierre Boucher et Associé au Centre universitaire de santé McGill.

Le service de Médecine Nucléaire de l'hôpital Pierre Boucher est un service à haut débit avec de longues listes d'attente. Ainsi, lorsque le moment est venu de remplacer l'une de nos caméras SPECT-CT, nous avons pris la décision judicieuse d'adopter une technologie de pointe en optant pour l'achat d'une caméra à technologie digitale, plus précisément la NM CT 870 CZT de GE Santé.

Le choix de cette machine s'est avéré évident, en raison des multiples avantages promis par le manufacturier :

• Un SPECT/CT 100% numérique de 3e génération basée sur la technologie CZT, offrant une résolution énergétique améliorée de 6,3% contre 9,5%.

• La haute résolution spatiale intrinsèque du système de 2,46 mm.

• Une haute résolution pour une détection améliorée des petites lésions, avec une résolution spatiale améliorée de 2,8 mm (CZT) contre 4,3 mm (NaI) avec collimateur.

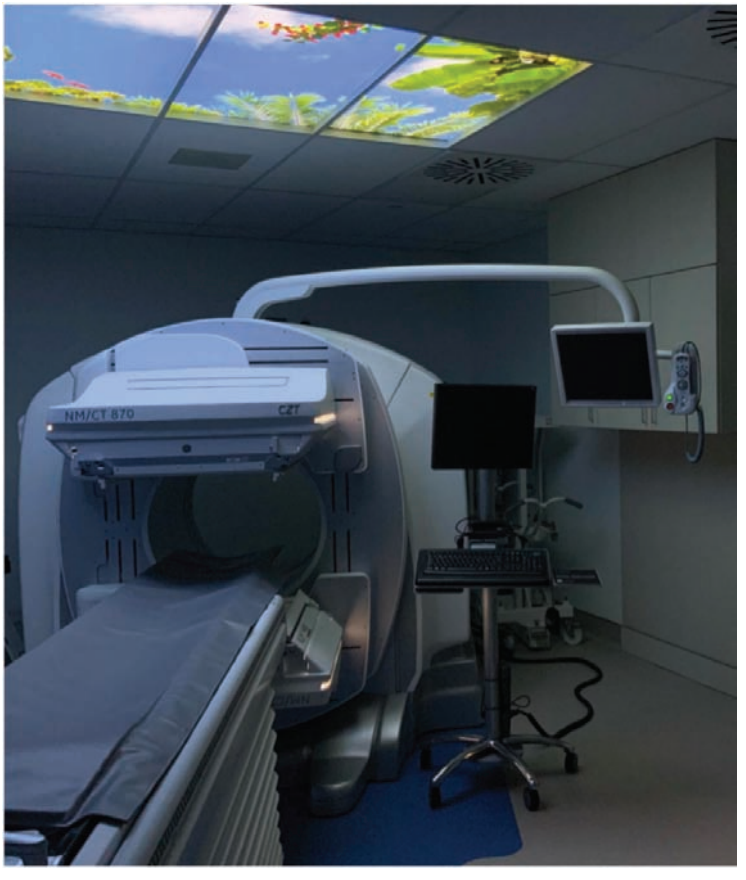
• Une amélioration du rapport contraste/bruit de plus de 40% pour les examens de SPECT.

• Une augmentation de la sensibilité de 58% grâce au nouveau collimateur et à l'épaisseur de 7,25 mm pour les acquisitions avec les isotopes de moyenne énergie.

• Un taux de comptage 1,4 fois plus élevé qu'avec la technologie traditionnelle.

• Une réduction de la dose injectée ou de la durée d'acquisition jusqu'à 75%.

• Caractéristiques spéciales pour améliorer le confort du patient (FOV débute à 2.5 cm) vs 7.5 cm sur les détecteurs NaI.



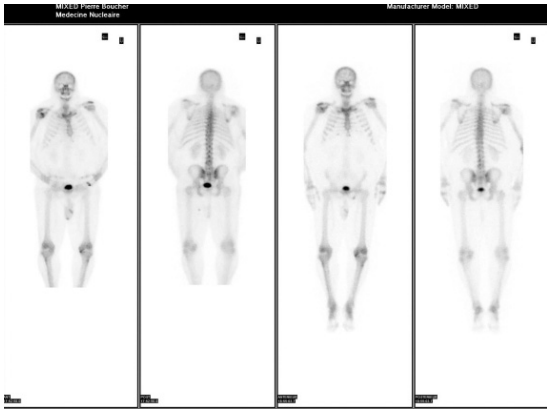
Voici un bref aperçu de notre expérience avec cette caméra après un peu moins de 3 mois d'utilisation :

D'abord, il y a eu une courte période d'ajustement pour notre équipe de médecins nucléistes d'environ une semaine, nécessaire pour habituer l'œil à une image où le rapport contraste/bruit est grandement amélioré : les lésions sont ainsi beaucoup plus nettes et claires. L'ajustement est surtout nécessaire lorsque vient le temps de comparer 2 études osseuses d'un même patient: l'une réalisée sur notre caméra à détecteur traditionnel (NaI) et l'autre sur la caméra CZT. Certaines lésions pouvant parfois apparaitre plus actives avec cette nouvelle technologie, il faut les analyser avec réserve tout en gardant en tête l'ensemble des données cliniques du patient.

Une fois maîtrisée, notre nouvelle caméra nous a permis d'améliorer notre service sous divers aspects.

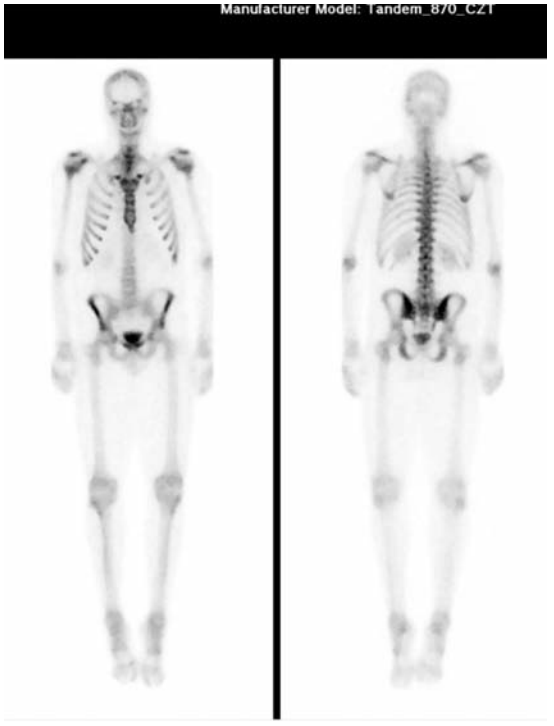
Dans notre pratique quotidienne, la NM/CT 870 CZT, avec ses avantages, a entraîné des changements significatifs. À titre d'exemples :

Les temps d'acquisition ont significativement été réduits, tout en maintenant ou améliorant la qualité des images. Par exemple, nos scintigraphies osseuses pan-corporelles, qui nécessitaient 16 à 18 minutes sur notre caméra traditionnelle, sont désormais effectuées en 7 à 8 minutes. Pour nos images 3D (tomographie), on passe de 20 secondes/projection à 11 secondes/projection (pour un total de 330 secondes).



Étude de gauche fait sur la caméra NM/CT 870 CZT avec temps d'acquisition écourté. À droite même patient quelques mois plutôt mais fait sur camera traditionnel NaI.

Les examens cardiologiques ont également vu leurs temps d'exécution abrégés, passant d'environ 12 à un peu moins de 8 minutes. Pour nos images 3D cardiaques, on passe de 20 secondes/projection à 8 secondes/projection (pour un total de 240 secondes). Ces réductions de temps d'acquisition nous ont déjà permis d'écourter considérablement nos listes d'attente de plusieurs types d'examen, ce qui nous a permis d'entrer dans les délais prescrits par les médecins traitants.



Exemple d'un étude osseuse fait sur la NM/CT 870 CZT.

Les avantages pour nos patients sont également significatifs :

La durée écourtée de nos examens est appréciée par nos patients de façon générale, et ceci est d'autant plus vrai pour nos patients claustrophobes.

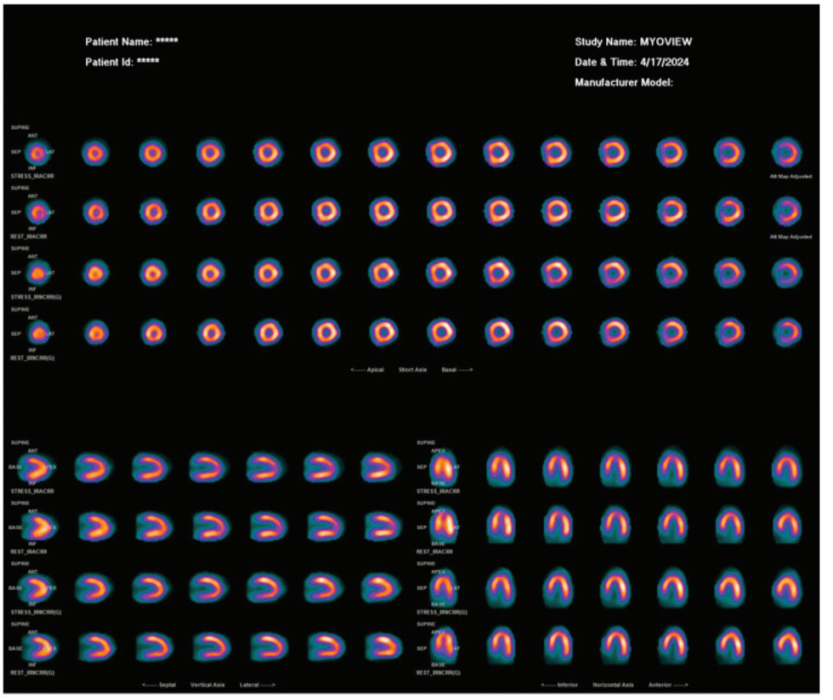
Pour nos patients âgés ou hospitalisés, souffrant souvent de douleurs chroniques ou aigües, cette rapidité d'acquisition est encore plus ressentie et appréciée.

Pour le patient, une liste d'attente plus courte se traduit en un diagnostic plus rapide, et conséquemment une prise en charge accélérée du patient par son médecin traitant.

En ce qui a trait aux patients pédiatriques, cette technologie permettrait de réduire significativement les doses de radio-traceurs injectées, limitant ainsi l'exposition aux radiations tout en conservant la qualité diagnostique des images.

En somme, à près de trois mois d'utilisation de la caméra NM/CT 870 CZT, les bénéfices observés se révèlent déjà de manière significative au sein de notre service de médecine nucléaire, influençant positivement l'expérience des nombreux patients qui y sont accueillis.

« Les temps d'acquisition ont significativement été réduits, tout en maintenant ou améliorant la qualité des images. »



Exemple d'une étude cardiaque fait sur la NM/CT 870 CZT.

THERA(G)NOSTICS IN PROSTATE CANCER -"PROSTAGNOSTICS"

Kalevi Kairemo, MD, PhD, MSc(Eng),
Professor
Consultant in Nuclear Medicine, Clinical Chemistry, Pharmaceutical Medicine & Health Care Administration
President 2024-5, World Association of Radiopharmaceutical and Molecular Therapy
WARMTH

"Theranostics has rapidly developed into a viable option for the simultaneous implementation of cancer diagnostics and customized treatment (precision oncology). Theranostics is based on labeling the same molecule with both a diagnostic (most often positron-emitting) and a therapeutic (beta-emitting) isotope."

Theranostics is a giant leap forward in nuclear medicine. What is theranostics? Theranostics simply means combining therapy and diagnosis.

Theranostics has rapidly developed into a viable option for the simultaneous implementation of cancer diagnostics and customized treatment (precision oncology). Theranostics is based on labeling the same molecule with both a diagnostic (most often positron-emitting) and a therapeutic (beta-emitting) isotope. In this case, the treatment dose can be tailored exactly according to the patient, and the actual treatment dose can also be imaged.

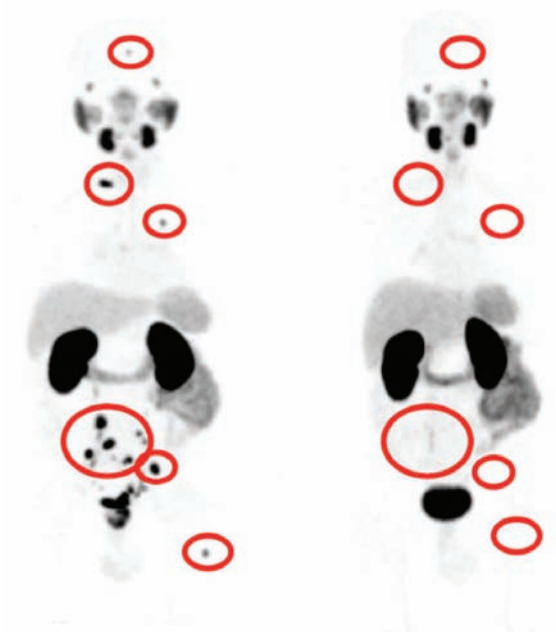
Of course, this concept is not new to nuclear medicine. Rather, it has been used for decades to treat thyroid diseases; the first radioiodine therapy was given in 1940's. In recent years, however, theranostics have been successfully used for a whole range of other tumor diseases. These primarily include neuroendocrine tumors and prostate cancer. The effectiveness of the therapy of neuroendocrine tumors with radioactively labeled analogues of the peptide hormone somatostatin was definitely demonstrated in the randomized study, which got the FDA approval in 2017.

The effectiveness of the therapy of neuroendocrine tumors with radioactively labeled analogues of the peptide hormone somatostatin was definitely demonstrated in the NETTER-1 registration trial. This study led to the approval of the ligand ^{177}Lu-DOTA-TATE in Europe and the USA (LutaThera®).

Theranostics (or theragnostics) refers to a close connection between diagnostics and the resulting therapy. In principle, any combination of diagnostics and therapy can be used, e.g. a laboratory value and the resulting consequences for drug therapy. However, the term theranostics is increasingly being used specifically for nuclear medicine imaging and therapy using the same or two very similar radiopharmaceuticals. In parallel, positron-labelled somatostatin analogues ^{68}Ga-DOTA-TATE and 68Ga-DOTA-TOC were approved for neuroendocrine tumor imaging and patient selection for radionuclide therapy.

The VISION and TheraP trials with the aim of approving a radioactively labeled PSMA ligand for the treatment of metastatic prostate cancer were completed in 2021. After these phase III studies on the diagnosis and treatment of prostate cancer using PET/CT and radioactively labeled PSMA ligands, the therapeutic compound ^{177}Lu-PSMA-617 got its approval by 2022 both in Europe and the USA.

The prostate-specific membrane antigen (PSMA) has recently been established as a predictive biomarker for the staging of prostate cancer, as the expression of PSMA correlates with the severity of the disease. At the same time, its extracellular domain (i.e. surface structures) offers an excellent target for the radiopharmaceutical development of PSMA-targeting inhibitors, which can be used for both diagnostic imaging and therapeutic purposes. The abbreviation PSMA stands for prostate-specific membrane antigen. Like PSA, it is a protein (an enzyme) that the body can produce itself and therefore a known substance to the human organism. The PSMA uptake also occurs on the surface of healthy prostate cells, but only in small quantities. Significantly more PSMA - around 1000 times more - can be detected on prostate cancer cells and metastases. The more aggressive a man's prostate cancer is (the higher the Gleason score), the greater the amounts of PSMA are on the cancer cells. In the rest of the body, however, the protein is almost non-existent.



On the left, ^{68}Ga-PSMA-PET image before any treatments (first visit) and on the right the same study three months later. The patient was treated with ^{177}Lu-PSMA targeted therapy (2 cycles). This prostate cancer patient had metastases in lymph nodes, lungs and bones and primary tumor in the prostate. All the metastatic sites were visually disappeared because of ^{177}Lu-PSMA treatments (metastatic sites encircled).

By using positron emission tomography (PET) method, nuclear medicine physicians can visualize regions in the body where metabolism is particularly active. This is the case with cancer cells, for example. They require a lot of energy because they divide and reproduce quickly. PET works with radioactively labeled drugs, called tracers or radionuclides. Examples are 68-gallium (^{68}Ga) or 18-fluorine (^{18}F). They are injected into the vein, distributed throughout the body via the bloodstream and attach specifically to the PSMA protein.

^{68}Ga-PSMA-617 compounds have got their FDA approval as well as a few ^{18}F-PSMA-compounds. There is no practical difference in diagnostic accuracy between these tracers. The ^{68}Ga-PSMA-617 tracers are used as commercial radiopharmaceuticals Illuccix® and Locametz® and ^{18}F-PSMA-compounds are e.g. known as Posluma® and Pylarify®.

The abbreviation CT means computer tomography - an imaging procedure that uses X-rays. Radiologists break the body "into slices" and obtain high-resolution cross-sectional images of the inside of the body. CT is a standard procedure that is used in the diagnosis of many medical conditions.

For every PET/CT examination, radiologists carry out both a PET and a computer tomography (CT). There are now devices that can do both. The binding of the tracer to the PSMA can be made visible in this way. This makes it possible to distinguish very precisely between healthy and malignant cells in the prostate and to spatially assign the findings using CT.

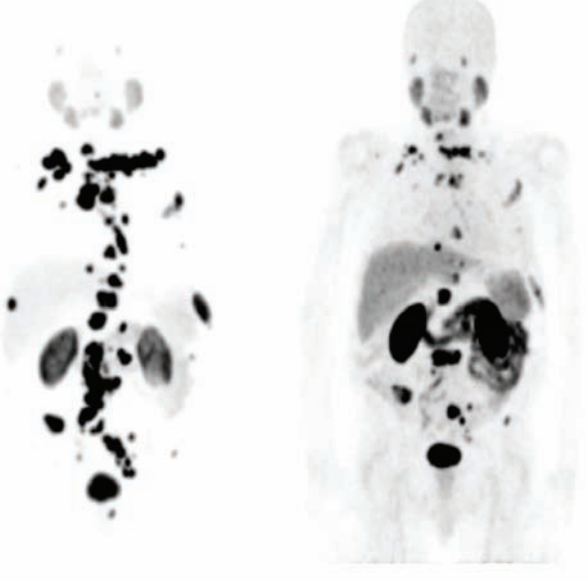
PSMA-PET/CT allows very precise conclusions to be drawn about a relapse of prostate cancer and any metastases that may be present. Doctors use them, for example, when the PSA level increases inexplicably after cancer treatment, such as surgery, radiation or hormone therapy. The method has greater accuracy in detecting prostate cancer metastases than e.g. the combination of computed tomography and bone scintigraphy.

The cancer patients are cared for and treated by teams of doctors from various disciplines, multidisciplinary teams. The diagnostic indications of using PSMA-PET/CT may vary locally.

PSMA-PET/CT is suitable for diagnosing the spread of men with: a Gleason score from 8 to 10, cancer stage of T3 or T4 or serum PSA value greater than 20 µg/l.

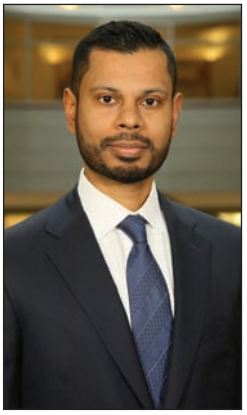
At these values, the risk of metastases is very high. Therefore, these men are now entitled to a PSMA-PET/CT right from the start to determine the spread of the prostate cancer. But from wide international experience it is known, the much lower values give positive imaging results. Both ^{68}Ga- and ^{177}Lu-PSMA-compounds are available for diagnosis and therapy in Canada. ■

"By using positron emission tomography (PET) method, nuclear medicine physicians can visualize regions in the body where metabolism is particularly active. This is the case with cancer cells, for example."



On the left, ^{68}Ga-PSMA-PET image before ^{177}Lu-PSMA treatments and on the right the same study seven months later. This patient with prostate was treated with six cycles of ^{177}Lu-PSMA. He had multiple and large metastases in lymph nodes and bones which all decreased in size in a large extent (>90%).

NAVIGATING THE LANDSCAPE OF PSMA TESTING AND TREATMENT: AN OVERVIEW FOR PATIENTS AND PROVIDERS



Amit Singnurkar
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Dr. Singnurkar is a nuclear medicine and molecular imaging specialist at Sunnybrook Health Sciences Center in Toronto. He formerly served as head of nuclear medicine at Hamilton Health Sciences/St. Joseph's Healthcare Hamilton, as well as the program lead for nuclear cardiology and the cardiac PET service. He is currently an advisor to Cancer Care Ontario (Ontario Health) for funding indications related to positron emission tomography (PET) and infrastructure planning for PET capacity for the province. His main interest is in policy development to ensure the provision of appropriate and high quality imaging tied to improved health outcomes. His other interests include translational research of novel radiotracers and imaging techniques primarily in the fields of oncology, cardiology and neurology. Dr. Singnurkar's qualifications including fellowship training at Memorial Sloan Kettering Cancer Center in PET and Nuclear Oncology, a Masters in public health obtained at the TH Chan Harvard School of Public Health and the Global Executive MBA program in Health and Life Sciences at the Rotman School of Management at the University of Toronto.

"PSMA is a protein found in abundance on the surface of prostate cancer cells, making it an ideal target for both diagnostic purposes and treatment. The PSMA test, which leverages this protein, is a game-changer in detecting and staging prostate cancer."

In the dynamic world of medical advancements, PSMA (Prostate-Specific Membrane Antigen) testing and treatment stand out as beacons of hope for patients being treated for prostate cancer. Known more generally as Theranostics or RLT (RadioLigand Therapy), this is a precision medicine approach where a molecule labeled with radiation is used to perform a low radiation dose diagnostic scan. If the scan is able to show the cancer, this is then followed by a treatment with the same molecule that can deliver a high radiation dose that can kill cancer cells. In other words, if the cancer lights up, then the patients stands to benefit from the treatment while sparing those who would not benefit. This innovative approach is not only reshaping the diagnostic landscape but also offering new avenues for targeted treatment.

In this article, we'll explore the key aspects of PSMA, shedding light on its implications for diagnostics, the patients who stand to benefit from its treatments, the radioactive markers used, its availability in Canada, and the cutting-edge technology that makes it all possible.

The Role of PSMA in Diagnostics

PSMA is a protein found in abundance on the surface of prostate cancer cells, making it an ideal target for both diagnostic purposes and treatment. The PSMA test, which leverages this protein, is a game-changer in detecting and staging prostate cancer. It's particularly useful for identifying the spread of cancer to other parts of the body, a critical step in planning effective treatment strategies. One of the breakthrough treatment strategies is RLT where seeing the cancer on the diagnostic scan is a prerequisite for treatment.

Who Benefits from PSMA Treatments?

The beauty of PSMA-targeted treatment lies in its specificity. It is currently most beneficial for patients with advanced prostate cancer, especially those who have exhausted other treatment options. The treatment is tailored for individuals whose cancers express the PSMA protein, enabling a more focused attack on cancer cells while sparing healthy tissues. Lutetium-177 PSMA treatments (LuPSMA) are Health Canada approved (Pluvicto) but provincial funding is not available to date. Pivotal studies have shown LuPSMA to be beneficial to patients who are castrate resistant and have already been treated with drugs such as taxanes and ARPIs. More recent studies are starting to show benefits to patients who are earlier on in their cancer journey including those that still have hormone sensitive prostate cancer.

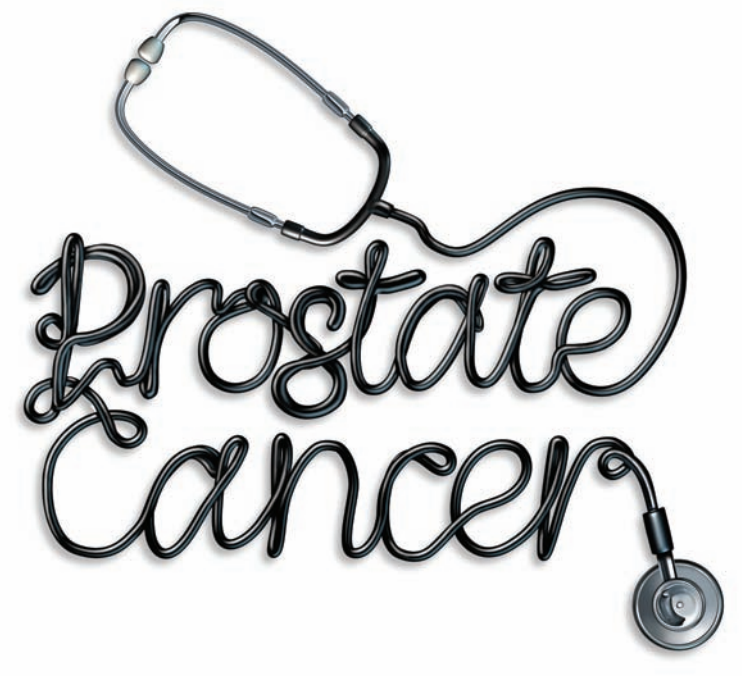
Radioactive Markers: The Guiding Lights

In the realm of PSMA treatments, radioactive markers play a pivotal role. These markers, such as Fluorine-18 (^{18}F) and Gallium-68 (^{68}Ga), are attached to molecules that specifically target and bind to PSMA on cancer cells. Once bound, they emit low amounts of radiation and light up the cancer cells that, while invisible to the naked eye, can be imaged with highly sensitive cameras known as Positron Emission Tomography (PET) scanners that are available at several centers across Canada. There are currently two Health Canada approved agents (Illucix and Locametz) which are approved for PSMA diagnostics, in addition to other agents that are still considered investigational.

PSMA PET Scans in Canada: Availability and Access

For Canadians, the landscape of PSMA testing and

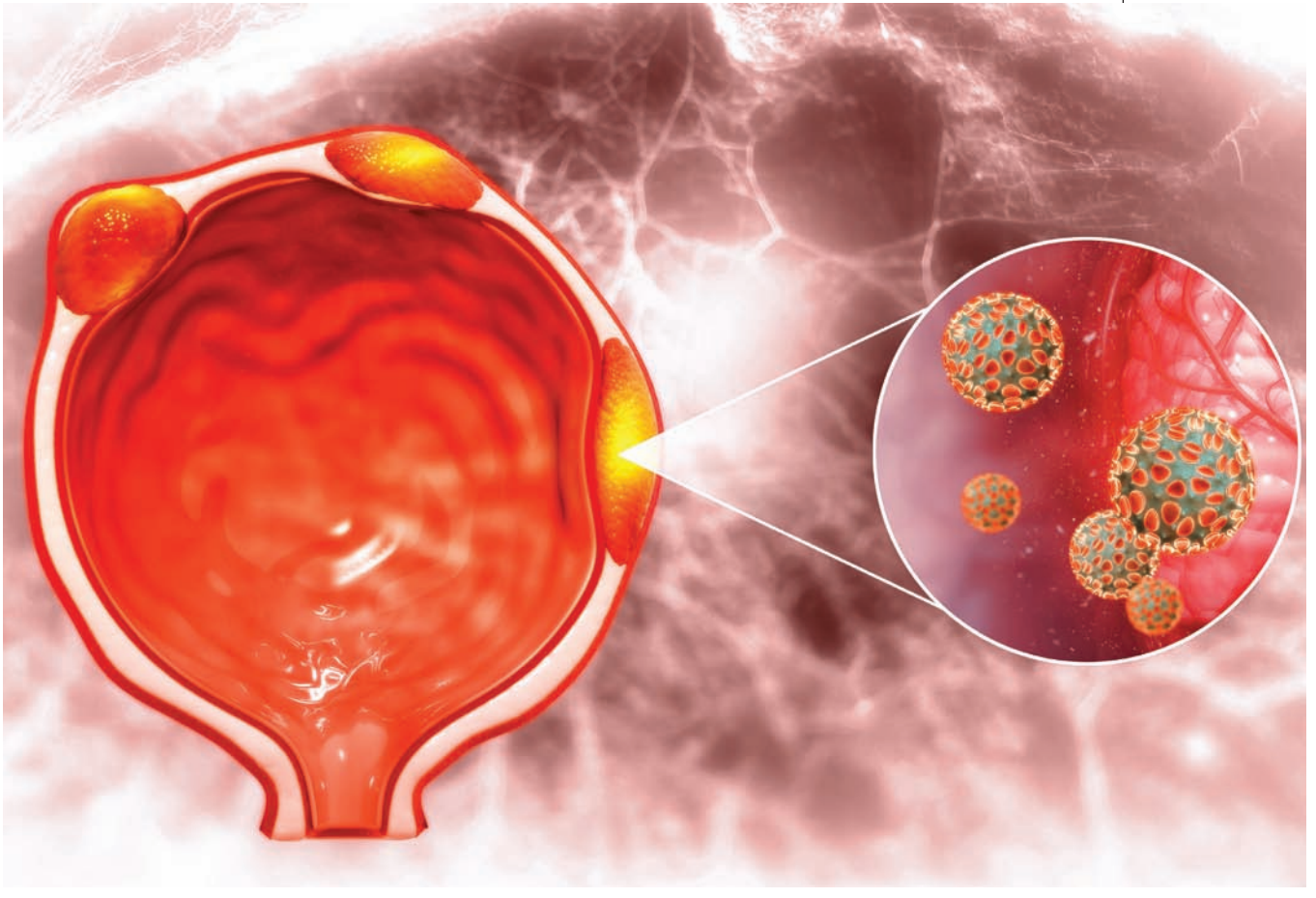
treatment is evolving. Available previously as part of research studies only, clinical access to PSMA PET scans is improving. Where available, access to PSMA diagnostics and treatments requires a referral from a healthcare professional. PSMA PET imaging is available in Ontario through provincial registries at both public hospitals and private clinics for several prostate cancer indications including staging of high risk cancers and evaluation for recurrent disease. Private centers in Quebec and British Columbia also provide access to PSMA PET scans. Patients interested in exploring this option should consult with their doctors, who can provide guidance on the suitability of PSMA-based approaches based on individual medical histories and the specifics of their cancer.



The Technological Backbone: Nuclear Medicine Innovations

At the heart of PSMA testing and treatments is the advanced technology of nuclear medicine. The process begins with a PET scan, a sophisticated imaging technique that uses radioactive tracers to visualize the body's internal processes. For PSMA tests, the tracer specifically targets the PSMA protein, lighting up cancer cells on PET scans and providing detailed images that guide diagnosis and treatment planning. The PSMA test is a seamless fusion of biology and technology. Patients receive an injection of the radioactive tracer, which then circulates through the body and binds to PSMA-expressing cancer cells. The PET scan follows, capturing detailed images of these tracers in action.

In conclusion, the advent of PSMA testing and treatment represents a significant leap forward in the battle against prostate cancer. Its precision in diagnostics and treatment promises a new era of improved cancer care. ■



PSMA PET – A NEW TOOL IN THE ERA OF PRECISION MEDICINE

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"PSMA PET is an example of molecular imaging, a technique that targets specific components of cells or biochemical pathways in order to identify disease."

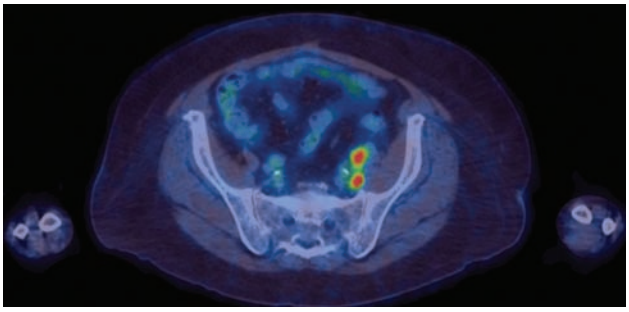
Modern medicine is evolving faster than ever and constantly turning out new tools for diagnosis. One of these is Prostate Specific Membrane Antigen (PSMA) positron emission tomography (PET) which physicians are now using to shine a light on prostate cancer.

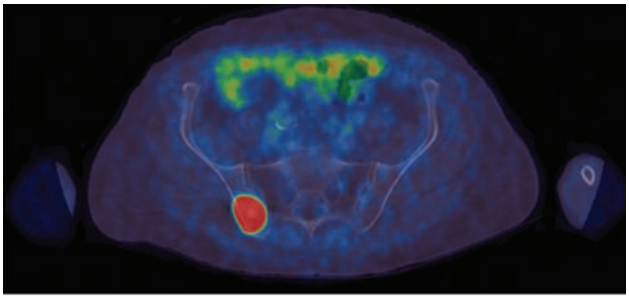
The Power of PSMA PET

Traditional imaging techniques, like MRI or CT scans, often lack the precision needed to detect cancer at its earliest stages or to accurately assess its spread. However, this is precisely where PSMA PET excels. PSMA PET is an example of molecular imaging, a technique that targets specific components of cells or biochemical pathways in order to identify disease. Prostate cancer cells express a protein – prostate specific membrane antigen – in high levels and it is this protein in which the radiotracers used in PSMA PET bind to, allowing physicians to identify small collections of prostate cancer cells anywhere they may be hiding in the body. These collections of cells light up on PET scans providing exquisitely detailed images of the location and distribution of disease in patients with prostate cancer. These images provide physicians with enormously more information than that see in conventional imaging and it is this information which is helping drive recent advances in prostate cancer treatment.

Guiding Therapy - Personalized Treatment Approaches

While PSMA PET has been shown to be invaluable for diagnosing cancer, its true potential lies in its ability to guide therapy decisions. This imaging modality allows oncologists to personalize treatment cancer treatment, accounting for specific characteristics of each patient's disease which can be seen for the time using PSMA PET. By identifying the extent of the cancer with unprecendented accuracry, to predicting its aggressiveness and biological behaviour, and assessing response to treatment, PSMA PET provides physicians with a wealth of information that can impact therapeutic decisions at every step of a patient's cancer journey.





Impacting Surgical Intervention

Surgery is often the primary treatment for patients with recently diagnosed localized prostate cancer. However, in order to be effective, accurately identifying the extent of the cancer and ensuring complete removal of the tumor while preserving surrounding healthy tissue is essential. PSMA PET can play a crucial role in this process by providing surgeons with high-quality images that accurately delineate the boundaries of the tumor and detect spread beyond the prostate gland. This information can then be used by surgeons to help plan the optimal approach for tumor removal, reducing the risk of leaving malignancy behind, and helping improve patient outcomes.

Enhancing Radiation Therapy

Like surgery, radiation therapy serves as another cornerstone of prostate cancer therapy. In order to be effective, radiation therapy must accurately target cancer cells while trying to spare nearby healthy tissue. PSMA PET has been shown to help radiation oncologists by revealing areas of cancer recurrence or metastasis that may be invisible on conventional imaging. By incorporating PSMA PET into treatment planning, radiation therapy planning can be improved by helping to target these areas more effectively, which can maximize the chances of tumor control while also minimizing side effects.

Monitoring Treatment Response

Not all cancer therapies work equally well for every patient. Monitoring the response of tumours to therapy is essential both for identifying when changes in therapy are indicated and for improving patient outcomes. PSMA PET allows physicians to track changes in tumor size and activity over time in a non-invasive way, which allows for assessment of treatment effectiveness, and which is more accurate than that provided by conventional imaging. Changes in PSMA expression levels can provide oncologists with an early indication of treatment response and could help physicians refine and optimize treatment plans, leading to improvements in patient outcomes.

Detecting Recurrence

In some patients with early disease, prostate cancer can recur despite appropriate treatment. This often takes the form of small tumor deposits or as metastases which may be difficult or impossible to

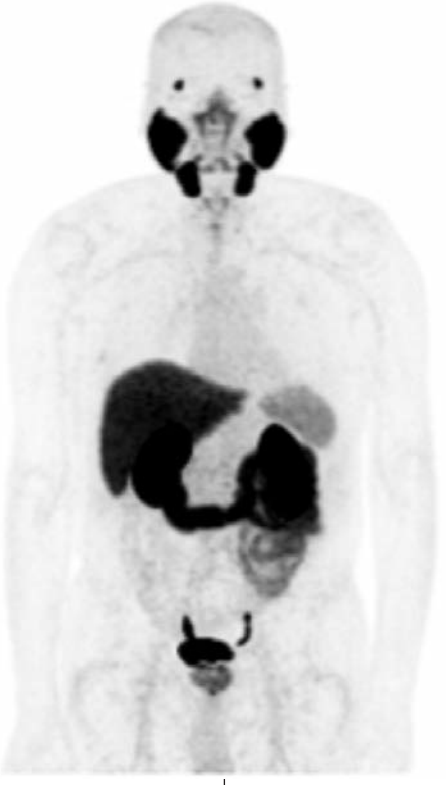
detect on conventional imaging. PSMA PET's ability to detect small lesions makes it the optimal imaging tool for detecting recurrent cancer early, when treatment options are most effective. By identifying recurrent disease sooner than was possible before the advent of PSMA PET, clinicians can intervene promptly with salvage therapies, potentially improving outcomes and prolonging patient survival.

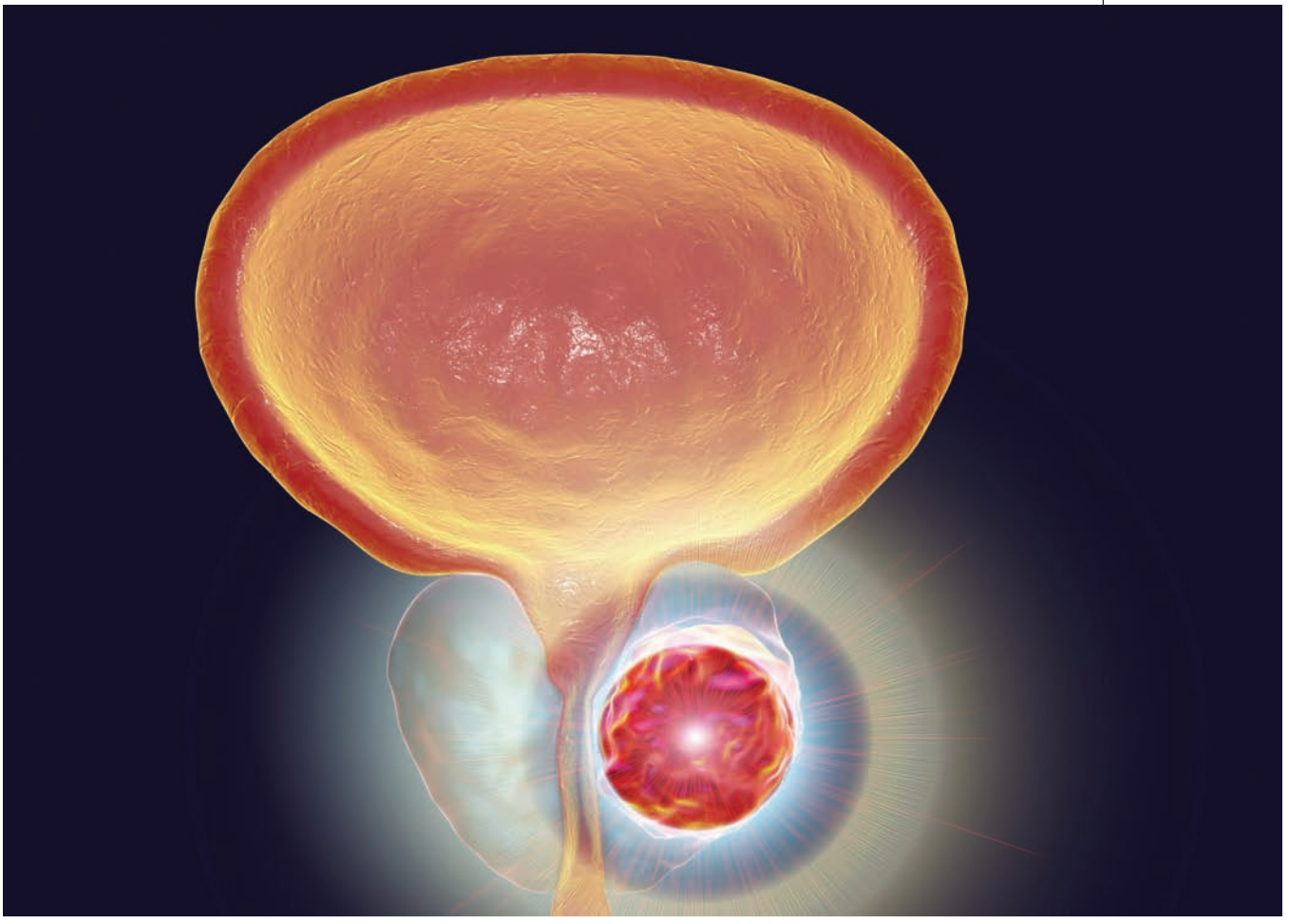
The Emergence of Theranostics

PSMA PET imaging is playing a key role in the theranostics – a new approach to cancer treatment. Theranostics combines molecular imaging techniques, such as PSMA PET, with targeted radiotherapy, providing a personalized approach to cancer treatment. Using PSMA-targeted radiopharmaceuticals -agents that deliver targeted radiation therapy at the cellular level - along with PSMA PET imaging, clinicians are now able to visualize previously unseen cancer deposits and can also deliver treatments directly to them. Theranostics helps minimizes damage to healthy tissue while also reducing the risk of side effects, and can offer better outcomes to patients with advanced or treatment-resistant disease.

Looking Ahead

PSMA PET has enormous potential to radically transform the landscape of prostate cancer diagnosis and therapy. With the ability to provide accurate and early diagnosis of prostate cancer, to its ability to help guide therapy and provide individualized treatment options, PSMA PET has inexorably altered our current approach to prostate cancer; however, the successes to-date of PSMA PET have spurred enormous research efforts aimed at exploring new radiotracers, improved imaging techniques, and has helped expand the utility of PSMA PET beyond prostate cancer, with potential for it to be used across a wide range of cancer types. Looking ahead, PSMA PET and other molecular imaging techniques will continue to push the boundaries of what's possible in cancer care.





PSMA-TARGETED MOLECULAR IMAGING AND RADIOLIGAND THERAPY FOR PROSTATE CANCER: FOR WHOM AND HOW?

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Manuscript

Prostate cancer is the fourth most common cancer in men. One in nine men will be diagnosed with prostate cancer in their lifetime. Rarely diagnosed before the age of 50, the most common subtype is prostate adenocarcinoma. To prevent this cancer, a healthy balanced diet and regular physical activity are the most effective means of prevention. Early detection measures such as digital rectal examination and prostate-specific antigen (PSA) blood test are available for men with a family history of prostate cancer, or for most men aged 55 to 69 who need screening. The Canadian Agency for Drugs and Technologies in Health (CADTH) and its Quebec counterpart, the Institut National d'Excellence en Santé et Services Sociaux (INESSS), have published a comprehensive review on the matter with recommendations against systematic screening. Prostate cancer is confirmed by transrectal prostate biopsies. In the presence of an elevated PSA and a prostate biopsy result confirming unfavorable intermediate-risk prostate cancer or higher grades, further evaluations with bone scintigraphy and computed tomography (CT) of the thorax, abdomen and pelvis are necessary to rule out distant cancer, or metastases. In addition to these tests, multiparametric magnetic resonance imaging (mpMRI) of the prostate is increasingly available for more accurate diagnosis. Depending on the stage of the disease at diagnosis, prostate cancer treatment may include surgery, radiotherapy, hormonal therapy and chemotherapy.

In recent years, a next-generation imaging modality for the diagnosis of this cancer and a new treatment for metastatic prostate cancer have emerged in theranostics. Health Canada approval of the second prostate-specific membrane antigen (PSMA) imaging radiopharmaceutical was confirmed in October 2022. When bound to a radioactive element, or radioisotope, it can be used to diagnose and stage prostate cancer using positron emission tomography/computed tomography (PET/CT), a diagnostic test performed in nuclear medicine. The first PSMA imaging radiopharmaceutical approved in Canada in 2002, ^{111}In-capromab pendetide, had lower sensitivity, specificity and accuracy, and is no longer used for these reasons. Moreover, since August 2022 in Canada, PSMA-targeted radioligand therapy (PSMA-RLT) has been used to treat metastatic prostate cancer. The principle of PSMA-RLT is that PSMA bound to a different radioisotope emits internal radiation, making it possible to treat prostate cancer.

What is PSMA?

PSMA is a prostate-specific transmembrane protein that is expressed 100- to 1,000-fold higher in prostate adenocarcinoma than in normal prostate. This molecular phenomenon in prostate cancer makes it possible to target PSMA receptors on the surface of individual cancer cells for diagnostic and therapeutic purposes (figure 1). 95% of prostate cancers have cells expressing PSMA receptors on their surface. PSMA is also found in other normal human cells, such as the lacrimal and salivary glands, liver, spleen, intestine and urinary tract. Several PSMA ligands have been developed to target PSMA receptors. The various PSMA ligands developed have similar biochemical and chemical properties, the most common being PSMA-11, PSMA-617, PSMA-1007 and DCFPyL. When a PSMA ligand is bound to a radioisotope, it is then possible to obtain PET/CT images or deliver internal radiation to metastases thanks to the radioactivity emitted by the radiopharmaceutical. The choice of radioisotopes used varies according to the intention. For imaging, radioisotopes with a short half-life are preferred. The longer half-life will find its use in therapy to treat metastases. In addition, radioisotopes that emit radioactivity in the form of γ-rays or ß+ emissions can be used for imaging, while radioisotopes emitting ß- or α particles are used for treatment.

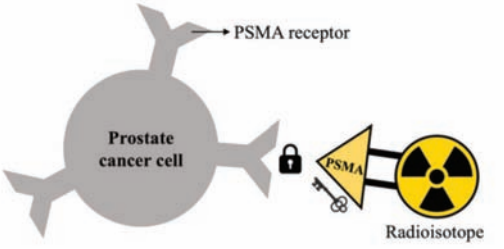


Figure 1: Binding of a single prostate cancer cell to the PSMA ligand. PSMA receptors, represented by the padlock, are present on the surface of prostate cancer cells. The radiopharmaceutical containing the PSMA ligand, represented by the key, is bound to the radioisotope chosen for imaging or treatment. When the key meets the padlock, the binding process is triggered, making it possible to image prostate cancer or treat metastases thanks to the radioactivity of the radioisotope.

PSMA-targeted molecular imaging

What is PSMA PET/CT?

It is possible to image PSMA receptors (padlock) expressed in prostate cancer using a PSMA ligand (key)

which is bound to a specific radioisotope (figure 1). The radioactivity emitted by this radioisotope is captured by PET/CT (figure 2). The integrated CT is used for anatomical imaging and localization. Then, PET captures photons emitted by the decay of fluorine-18 (^{18}F) or gallium-68 (^{68}Ga), the two main radioisotopes bound to the PSMA ligand for prostate cancer imaging (^{18}F-PSMA or ^{68}Ga-PSMA). The anatomical images obtained with CT help the nuclear medicine physician to precisely localize prostate cancer metastases, which are very intense on PET imaging (figure 3).

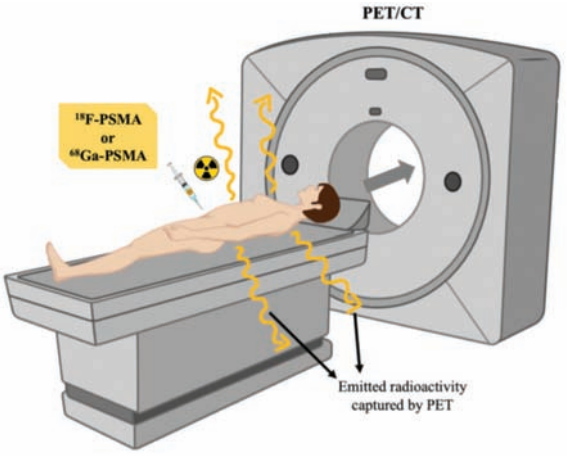


Figure 2: PET/CT imaging. The radioactivity emitted by the radioisotopes 18F or 68Ga bound to PSMA ligand is captured by PET/CT, enabling images to be obtained. 18F-PSMA or 68Ga-PSMA is injected approximately 60 minutes before PET/CT imaging. The patient lies under the camera for less than 20 minutes.

^{18}F and ^{68}Ga are two radioisotopes with a short half-life, ideal for examinations lasting less than two hours, such as PSMA PET/CT. This means that the patient has almost no radioactivity left in his body when the PSMA PET/CT is completed and he leaves the clinic. These radioisotopes are injected intravenously in liquid form prior to the PET/CT imaging. It is important to know that ^{18}F-PSMA and ^{68}Ga-PSMA are not iodinated contrast media (ICM). Patients known to be allergic to ICM can therefore have this test without any concern, but some centers may indeed use intravenous ICM to enhance contrast in the vascular compartment on anatomical images of the CT component. If known for ICM allergies, PET/CT will be performed without an intravenous ICM and is therefore not a contraindication to the test. In addition, although ^{18}F-PSMA and ^{68}Ga-PSMA are eliminated by the kidneys, renal impairment of any grade is also not a contraindication to PSMA PET/CT. As can be seen in figure 3, prostate cancer metastases that contain many PSMA receptors are very intense. This correlates with the presence of high levels of PSMA ligand-bound radioactivity (^{18}F or ^{68}Ga) in prostate cancer metastases. As previously mentioned, it is normal to see radioactivity in other organs of the body, as some have low levels of PSMA receptors. ^{18}F-PSMA and ^{68}Ga-PSMA are mainly eliminated in the urine. Drinking water after the test helps to quickly eliminate radioactivity from the body.

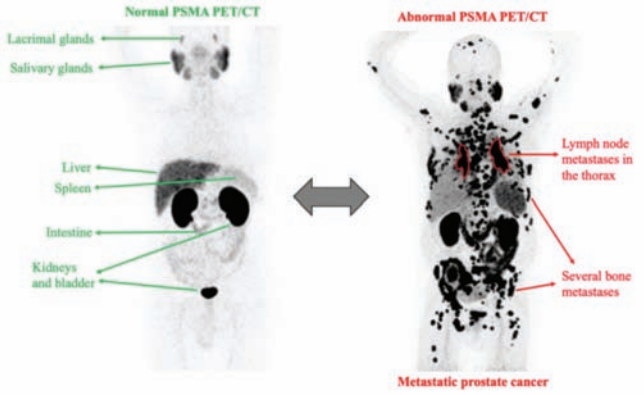


Figure 3: Normal and abnormal PSMA PET/CT in the presence of metastatic prostate cancer. The image on the left shows a normal PSMA PET/CT. It is usual to see an accumulation of the ^{18}F-PSMA or ^{68}Ga-PSMA in the lacrimal and salivary glands, liver, spleen, intestine and urinary tract. The image on the right shows a very intense accumulation of the ^{68}Ga-PSMA in the lymph node and bone metastases of a patient with metastatic prostate cancer. The black accumulation indicates that there are many PSMA receptors in the prostate cancer cells imaged.

How is PSMA PET/CT performed from the patients' perspective?
PSMA PET/CT is an outpatient procedure. Expect to spend a total of around three hours at the clinic. Patients do not need to undergo any specific preparation for PSMA PET/CT. The examination begins with an intravenous injection of ^{18}F-PSMA or ^{68}Ga-PSMA, followed by an uptake period of approximately 60 minutes, allowing the blood pool to clear. Furosemide, a drug to induce urination, may be administered intravenously about fifteen minutes following the injection of ^{18}F-PSMA or ^{68}Ga-PSMA. The purpose of the latter is to allow better visualization of the pelvic lymph nodes located near the urinary tract. As both ^{18}F-PSMA and ^{68}Ga-PSMA are eliminated via the urinary tract, furosemide helps to increase imaging sensitivity. Once the waiting period is over, the patient lies still for about 20 minutes. For claustrophobic patients, it is preferable to be accompanied for the examination, as anxiety-reducing drugs can be administered orally.

Who is eligible for a PSMA PET/CT?
Table 1 explains the most recent clinical indications for PSMA PET/CT in prostate cancer diagnosis. PSMA PET/CT is not recommended for patients with a new diagnosis of very low-risk, low-risk or favorable intermediate-risk prostate cancer. PSMA PET/CT is also not indicated for patients with suspected prostate cancer localized only within the prostate.

"In recent years, a next-generation imaging modality for the diagnosis of this cancer and a new treatment for metastatic prostate cancer have emerged in theranostics. Health Canada approval of the second prostate-specific membrane antigen (PSMA) imaging radiopharmaceutical was confirmed in October 2022."

Table 1: Indications for PSMA PET/CT

Routine clinical use	Future clinical applications
Initial staging of newly diagnosed prostate cancer • Unfavorable intermediate risk • High risk • Very high risk	Guidance of prostate biopsy
Location of recurrent or persistent prostate cancerfollowing curative therapy (e.g.: prostatectomy, definitive radiotherapy)	Monitoring of systemic therapy of prostate cancer
Location of prostate cancer with negative or equivocal metastatic disease on conventional imaging (CT and bone scintigraphy) • Nonmetastatic castration-resistant prostate cancer (CRPC = PSA progression following hormonal therapy)	
Staging of metastatic prostate cancer before PSMA-RLT	
Imaging of metastatic prostate cancer • Post-treatment PSA progression in CRPC	

"In prostate cancer, it is known that in the presence of more aggressive disease, cancer cells lose their PSMA receptors"

PSMA-targeted radioligand therapy

What is PSMA-RLT?

PSMA-RLT is an intravenous therapy in nuclear medicine for the treatment of prostate cancer metastases that strongly express PSMA receptors, previously imaged by PSMA PET/CT. One of the major differences between PSMA PET/CT and PSMA-RLT is that the PSMA ligand is bound to a long-half-life radioisotope, lutetium-177 (^{177}Lu), enabling radioactivity to be delivered to metastases over a longer period. Compared with ^{68}Ga or ^{18}F, which have respectively a half-life of 68 and 110 minutes, ^{177}Lu has a half-life of 6,5 days. The mechanism binding the radioisotope to cancer cells for ^{177}Lu-PSMA and ^{68}Ga-PSMA are exactly the same (figure 1). By giving several cycles of PSMA-RLT spaced at a given time interval, it is possible to achieve the expected response and disease control in prostate cancer metastases. As radioactivity is distributed locally to metastases, side effects are few and treatment is generally well tolerated.

The most frequent side effects are dry mouth, nausea and fatigue. Dry mouth is caused by uptake of the salivary glands, which naturally expresses PSMA receptors (figure 3), and occurs during treatment because of the cumulative effect of radioactivity after a few cycles of PSMA-RLT. Nausea and fatigue occur within the first 24 hours and are due to acute radiation syndrome; they disappear after a week or two. When the human body receives a therapeutic dose of radiation, as in radiotherapy, the body's cells react, causing these two symptoms. These symptoms are temporary and decrease rapidly after one cycle.

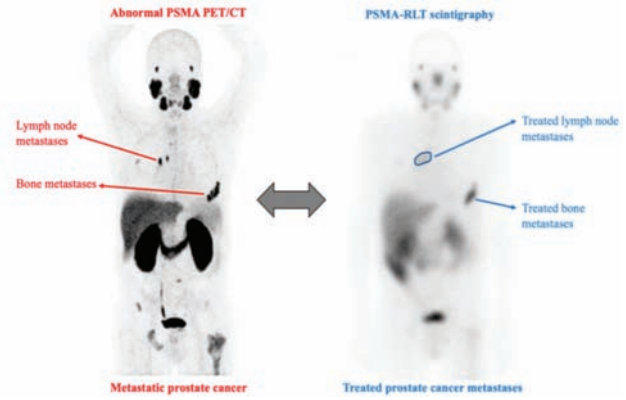


Figure 4: Abnormal PSMA PET/CT and PSMA-RLT-treated metastases imaged by scintigraphy. Before considering PSMA-RLT, patients should have a PSMA PET/CT to ensure that the prostate cancer has plenty of PSMA receptors. The image on the left shows lymph node and bone metastases of prostate cancer that are rich in PSMA receptors (red arrows). This patient received one cycle of PSMA-RLT as he was eligible. The radioisotope chosen for PSMA-RLT, ^{177}Lu, emits -rays that can be imaged using a -camera. The image on the right shows the radioactivity of ^{177}Lu-PSMA, which treats the patient's lymph node and bone metastases and is captured by nuclear medicine scintigraphy (blue arrows). Post-treatment scintigraphy can be performed from a few hours to a few days after the treatment cycle.

The ^{177}Lu is a radioisotope of interest, because in addition to treating prostate cancer metastases with its ß- emission, it also emits γ-rays. This γ-ray emission enables ^{177}Lu-PSMA to be imaged with a γ-camera and the location of the treatment in the body to be visualized (figure 4). Post-treatment scintigraphy with ^{177}Lu-PSMA can be performed from a few hours to a few days after receiving a treatment cycle. Post-treatment scintigraphy is used to monitor treatment response. This examination has two advantages for the patient: he can easily understand how his prostate cancer is progressing, and he does not need to receive any additional radiopharmaceutical to perform the scintigraphy. This examination is almost free!

Who is eligible for a PSMA-RLT?

PSMA-RLT is reserved for metastatic prostate cancers that have progressed despite several lines of treatment. Table 2 shows the eligibility criteria for PSMA-RLT. In the case of prostate cancer localized to the prostate without distant metastases, the best treatments are curative, including prostatectomy or curative radiotherapy. For these patients, PSMA-RLT is not the therapy of choice, as the aim of PSMA-RLT

is to control the disease, i.e., prevent it from progressing. PSMA-RLT is a palliative treatment, and prostate cancer will not be cured. That is why we prefer curative treatments whenever possible.

How does PSMA-RLT work for the patient?
In some countries, patients have to be hospitalized to receive PSMA-RLT. In Canada, PSMA-RLT is administered as an outpatient therapy. The patient presents to nuclear medicine to meet the nuclear medicine physician and receive the ^{177}Lu-PSMA. As soon as the treatment has been administered, the patient returns home. The intravenous injection time for ^{177}Lu-PSMA takes between 1 and 30 minutes.

However, as radiation acts over a longer period of time, the patient must follow a few additional precautions for 48 hours to limit the radiation exposure of those around him in accordance with federal regulations. For example, as ^{177}Lu-PSMA is eliminated mainly in the urine, sitting urination and flushing the toilet twice are recommended to contain radioactivity for the first 48 hours. Patients should also keep a distance of one meter from people for two days, and one week from pregnant women and younger children. As radioactivity disappears on its own over time, there is no question of disinfecting the house after a ^{177}Lu-PSMA treatment.

Typically, PSMA-RLT involves six cycles of ^{177}Lu-PSMA spaced every six weeks. The dose administered is a standard dose, 7,4 MBq of ^{177}Lu-PSMA, that is the same for each cycle. Although side effects are rare, blood samples are taken every 2-4 weeks to ensure the absence of significant bone marrow toxicity (anemia, reduced immune system, excessive bleeding). These side effects occur in less than 5% of cases. During blood tests, renal and hepatic functions are checked to ensure that there is no renal or hepatic insufficiency, which could impair the elimination of ^{177}Lu-PSMA. If any of these side effects occur, don't panic! Cycles can be spaced a few weeks apart to allow the bone marrow and kidneys to recover. Blood tests will be taken more regularly to monitor progress.

Table 2: PSMA-RLT eligibility criteria*

Clinical parameters	Blood test parameters
Age 18 or older	Acceptable red blood cell count ==> Preventing anemia • Hemoglobin ≥ 100 g/L
Metastatic castration-resistant prostate cancer (CRPC= PSA progression following hormonal therapy)	Acceptable white blood cell count ==> Maintaining a strong immune system • Leukocyte count ≥ 2,5 x 109/L
Metastatic prostate cancer expresses PSMA on PSMA PET/CT ==> Figure 3	Acceptable platelet count ==> Avoid coagulation disorders (excessive bleeding) • Platelet count ≥ 75 x 109/L
Received at least one secondary hormonal manipulation with abiraterone, enzalutamide or apalutamide	Acceptable renal function ==> No urinary obstruction (PSMA-RLT is eliminated in urine) • Glomerular filtration rate (GFR) ≥ 30 mL/min/1,73m2
Received at least one taxane-based chemotherapy or contraindications to chemotherapy	Acceptable liver function in the absence of liver metastases ==> PSMA-RLT is eliminated in small quantities by the liver • Alanine aminotransferase (ALT) and aspartate aminotransferase (AST) < five times normal value
Received radionuclide therapy with ^{223}Radium-dichloride for lymph node (less than 3 cm) and bone metastases in the absence of metastases in other organs	No minimum value for PSA
Clinical condition that allows standing for more than 50% of the day (ECOG ≤ 2)	

*To receive PSMA-RLT, all eligibility criteria must be met.

A few words about ^{18}F-FDG PET/CT
^{18}F-PSMA and ^{68}Ga-PSMA enable precise PET/CT imaging of prostate cancer cells. It should be noted that ^{18}F-PSMA and ^{68}Ga-PSMA are not the most frequently used radiopharmaceuticals for PET/CT imaging. Indeed, ^{18}F-FDG is the most widely used radiopharmaceutical in PET/CT, and can image several different types of cancer, as well as detecting infections and inflammatory processes. Fluorodeoxyglucose (FDG) acts as a cousin of glucose. Glucose is a substrate in which aggressive cancers and infections thrive, making these diseases appear very intense on ^{18}F-FDG PET/CT.

In prostate cancer, it is known that in the presence of more aggressive disease, cancer cells lose their PSMA receptors. In these particular cases, it is no longer possible to administer PSMA-RLT, as there are no longer any PSMA receptors to which ^{177}Lu-PSMA can bind (figure 5). ^{18}F-FDG PET/CT is therefore very useful to identify these aggressive prostate cancers, as it is more sensitive for cancer staging and confirms that PSMA-RLT is not useful for these patients. Prior to PSMA-RLT, the physician may ask ^{18}F-FDG PET/CT to ensure that the prostate cancer is not too aggressive, i.e., undifferentiated, especially when ^{68}Ga-PSMA accumulation on PET/CT is low.

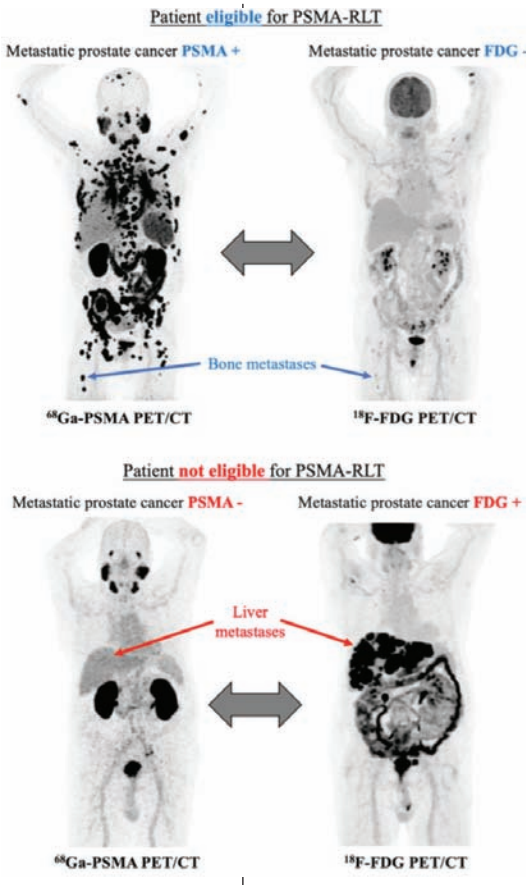


Figure 5: Difference between ^{68}Ga-PSMA and ^{18}F-FDG PET/CT enabling PSMA-RLT. The upper patient shows very intense ^{68}Ga-PSMA accumulation in bone metastases and very little ^{18}F-FDG accumulation, making him an ideal candidate for ^{177}Lu-PSMA treatment. This means that the disease is not yet too aggressive and expresses PSMA receptors. However, the patient on the bottom is not so lucky, and has a much more aggressive disease, as the liver metastases of prostate cancer have lost their PSMA receptors. ^{68}Ga-PSMA PET/CT shows no accumulation in the liver, unlike ^{18}F-FDG PET/CT, where a multitude of aggressive FDG-avid liver metastases are found. This patient is not eligible for PSMA-RLT, as there are no longer any PSMA receptors to which ^{68}Ga-PSMA and ^{177}Lu-PSMA can bind.

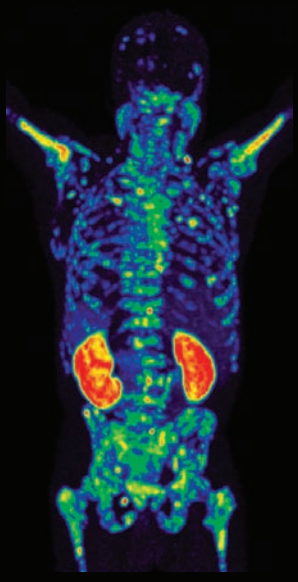
Where are PSMA PET/CT and PSMA-RLT available in Canada and around the world?

In recent years, both PSMA diagnostic and therapeutic agents spread rapidly around the world. PSMA PET/CT and PSMA-RLT are available in many countries of the world, including but not limited to Canada, the United States of America, Australia, South Africa, Europe such as France and Germany, Asia such as Japan, to name a few. The vast majority of hospitals with nuclear medicine departments and PET/CT may be able to offer PSMA PET/CT. The main factor limiting the possibility of performing PSMA PET/CT is the lack of PET/CT equipment. PSMA-RLT can be performed in any nuclear medicine department that is able to administer this treatment on an outpatient basis. Depending on the country and hospital, the availability of ^{18}F-PSMA, ^{68}Ga-PSMA and ^{177}Lu-PSMA may vary, as each local authority has its own funding and radiation protection regulations to comply with.

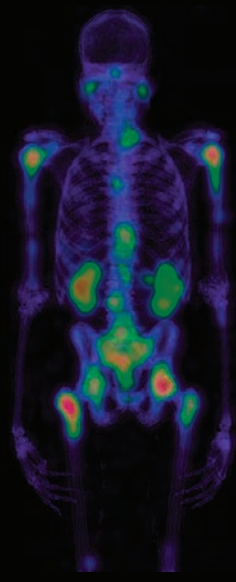
Finally, PSMA PET/CT and PSMA-RLT are two promising new diagnostic and therapeutic tools for metastatic prostate cancer. Several studies are currently underway to determine whether there are clinical indications other than prostate cancer that could benefit from PSMA PET/CT, such as cholangiocarcinoma and salivary gland cancers. Comparative studies are also underway to compare ^{177}Lu-PSMA with chemotherapy, to see whether it would be beneficial to receive PSMA-RLT earlier in the course of the disease. We are not done with PSMA discoveries yet! ■

"Finally, PSMA PET/CT and PSMA-RLT are two promising new diagnostic and therapeutic tools for metastatic prostate cancer."

Vous élargissez votre programme de théranostique?

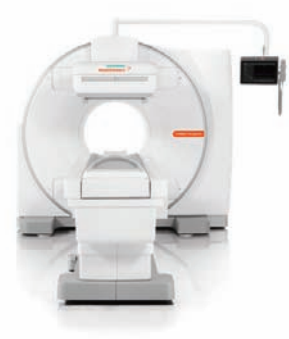


TEP



SPECT

Offrez à vos patients le niveau de soins de précision dont ils ont besoin et le traitement personnalisé qu'ils méritent grâce à des solutions théranostiques complètes de TEP/TDM et de SPECT/TDM de Siemens Healthineers.



Des solutions d'imagerie moléculaire éprouvées tout au long du continuum des soins théranostiques.

Haute résolution spatiale et temps de vol le plus rapide[1] en imagerie par TEP/TDM pour la détection de petites lésions.

Améliorez la planification thérapeutique et offrez une thérapie hautement ciblée à la bonne dose et au bon moment.

Quantification SPECT/TDM reproductible et précise à moins de 5 %[2] pour les isotopes de faible, de moyenne et de haute énergie.

Optimisez le suivi thérapeutique et personnalisez la planification thérapeutique future en fonction des besoins uniques de votre patient et de sa réponse au traitement.

Apprenez-en plus au siemens-healthineers.com/mi

[1] Selon la documentation concurrentielle accessible au moment de la publication. Données consignées.

[2] Précision de la quantification Bq/ml mesurée selon la norme NEMA NU1-2018 au moyen d'un fantôme cylindrique uniforme. Méthode d'étalonnage : source traçable au NIST.

SIEMENS Healthineers

HERMIA

THE ALL-IN-ONE MOLECULAR IMAGING SOFTWARE

About HERMIA

Hermia is a state-of-the-art software suite that supports all clinical scenarios in NM/MI on all cameras. Powerful tools enable clinicians to simplify their workflow, increase consistency and quality and keep pace with the fast development of scanners, tracers and procedures in nuclear medicine.

HERMES MEDICAL SOLUTIONS

Hermes Medical Solutions continuously innovates to enable faster and more personalized diagnosis and therapies in molecular imaging. We empower physicians and healthcare professionals with state-of-the-art software for all clinical scenarios into ONE vendor-neutral platform. The result is improved quality and outcomes for healthcare providers and their patients worldwide.

HERMIA

Osteology

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Joint pain
Infection/Inflammation

Whole Body SPECT/CT
Fused Volume Render
Whole Body Bone Scan
Dynamic 3-Phase
DEXA Results Review

Gastroenterology

Gastric Motility
Salivary Function
Bile Acid Malabsorption

Gastric Emptying
Colonic Transit
Oesophageal Reflux
Salivary Gland Analysis

Hepatology

Hepatobiliary Function
Surgical Planning
Gallbladder Functionality

HIDA Hepatic Uptake
Gallbladder Ejection Fraction
Remnant Liver Function
SeHCAT Analysis

Nephrology

Relative Function
Urinary Tract Obstruction
Renal Transplant

Rutland Patlak Method
Duplex Kidney
DMSA
Renogram
Advanced Renal Analysis

Endocrinology

Hyperthyroidism
Hyperparathyroidism
Thyroid Nodules

Thyroid Uptake
Parathyroid Subtraction
(Planar and SPECT)

Pneumology

Pulmonary Embolism
COPD
Surgical Planning

Lung V/Q SPECT(/CT)
Lung Lobe Quantification
AI Lung Lobe Segmentation
Planar Reprojection

Cardiology

Ischaemia
Myocardial Infarction
LVEF, CFR, Ca-Scoring

Invia 4DM
Cedars-Sinai QGS/QPS
FUGA/MUGA
Cardiac MPI Splash
AI Myocardium Detection
AI Motion Correction
First Pass Shunt

Neurology

Parkinsonism
Alzheimer's Disease
Epilepsy Focus

FDG vs Normal
DaTSCAN vs Normal
Ictal/Interictal
Amyloid SUVR (Amyvid™, Vizamyl™, Neuraceq™)

Oncology

Cancer Diagnosis
Tumor Staging
Treatment Response

AI Data Loading
Automatic Registration
AI Lesion Tracking
AI Foci Segmentation
PERCIST
WHO criteria

Dosimetry

Neuroendocrine Tumors
Thyroid Cancer
Metastatic Prostate Cancer

OLINDA/EXM v2
Organ-Based
Voxel-Based
Single Time Point
Quantitative SPECT

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- Simplified workflow and training
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- Fast and secure remote access
- Seamless connectivity and integration to your existing systems and workflows
- Local and dedicated support with NM experts
- 45+ years of leading innovation in NM

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GERO-THERANOSTICS

Jean-Luc Urbain, MD, PhD, FASNC, Past President CANM, Vice President Elect SNMMI

John Prior, MD, PhD, President SSMN

Andrew Ross, MD, Immediate Past President CANM

Francois Lamoureux, MD, President CANM

Nuclear Medicine & Theranostics

As the 21st century dawned, nuclear medicine faced a bleak outlook. The advent of clinical ultrasonography, computerized tomography, and magnetic resonance seemed to overshadow our field's relevance, while a dearth of investments in novel radiopharmaceuticals and relying on decades old Anger physics cast a shadow over its future.

Yet, through a series of remarkable developments intertwined with the human genome projects and the explosion of the omics knowledge and technologies, coupled with the relentless determination of pioneers, nuclear medicine has undergone a profound and fantastic resurgence. Today, it stands poised to play a pivotal role in patient management, particularly in oncology, marking a turning point marked by a shortage of nuclear professionals unprecedented in our history.

Central to this renaissance is the discovery and clinical application of a new class of radiopharmaceuticals known as Theranostics. Coined by John Funkhouser in 1998, Theranostics represents a revolutionary fusion of therapeutic and diagnostic modalities. Under Funkhouser's leadership as CEO of PharmaNetics, this vision crystallized into a paradigm-shifting approach that was intending to blend therapeutics and diagnostics seamlessly.

Nuclear Theranostics, epitomized by the use of a single target binding agent to both diagnose and treat specific diseases, has sparked immense enthusiasm within the nuclear medicine community. With approximately 90 companies currently engaged in developing precision medicine radiopharmaceuticals, market analyses indicate exponential financial growth for the specialty in the years ahead. Forecasts indicate a seismic shift from an imaging-centric specialty to a therapeutic focus, with nuclear medicine projected to transition from an 85 percent imaging specialty to a 60-70% therapeutic specialty.

While Nuclear Theranostics have already made significant inroads in managing neuroendocrine tumors, prostate cancers, and select thyroid cancers, their integration of diagnostic and therapeutic components represents just the beginning of the concept of Theranostics. Across diverse fields, from Nano Theranostics to Magnetic Theranostics and Immuno-Theranostics, researchers are harnessing the power of integrated platforms to tackle a spectrum of diseases, spanning from degenerative and systemic disorders to infectious diseases.

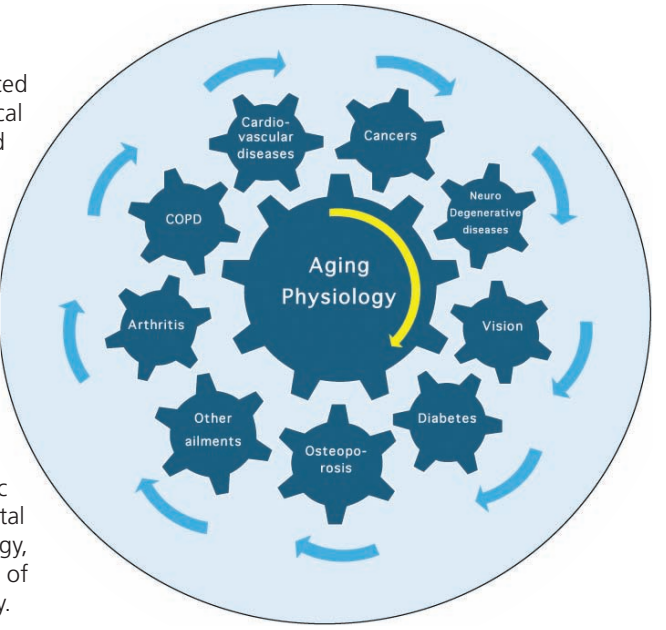


Figure 1. GeroScience: illustration of aging related conditions/diseases

In essence, the revitalization of nuclear medicine through Theranostics heralds not only a renaissance within our field but also a broader revolution in precision medicine and patients management fueled by relentless innovation and collaborative research.

GeroScience

The progress in socioeconomics, living standards, medicine, and public health has heralded a remarkable era of increased lifespan worldwide. Over centuries, life expectancy has nearly doubled from the early 19th century, a testament to humanity's strides in healthcare and societal development.

While aging itself isn't a disease, it significantly heightens the risk of various acute and chronic conditions, including cardiovascular disease, diabetes, cancer, arthritis, and degenerative disorders (Figure 1). Gerontology, coined by Ilya Ilyich Mechnikov in 1903, encompasses a broad spectrum of disciplines, addressing the societal, psychological, cognitive, and biological dimensions of aging's impact on older adults.

Recognizing the pivotal role of aging research, the National Institute on Aging (NIA), established by the U.S. Congress in 1974, has been at the forefront. In 2012, Drs. Felipe Sierra and Ronald Kohanski catalyzed the NIH-wide Geroscience initiative, consolidating efforts to understand the genetic,

molecular, and cellular biology processes that underpins aging.

GeroScience endeavors to unravel the intricate mechanism of aging, viewing it as a primary driver of age-related diseases. Geroscientists delve into the fundamental physiological, pathophysiological and biological processes associated with aging, aiming to develop interventions that mitigate age-related ailments and enhance overall well-being in older populations (Figure 2).

By probing the molecular and cellular intricacies of aging, GeroScience is poised to accelerate our understanding of aging and revolutionize approaches to age-related healthcare. This interdisciplinary pursuit unites researchers across diverse fields, forging pathways to address the multifaceted challenges posed by an aging worldwide population, with the ultimate aim to foster healthier and more fulfilling lives for older adults.

GeroScience, Nuclear Medicine and Theranostics

The intersection of GeroScience, nuclear medicine, and Theranostics represents a promising frontier in understanding and managing age-related conditions and diseases. As people worldwide are living longer, addressing age-related health challenges becomes increasingly urgent. GeroScience, as a field, seeks to unravel the underlying genetic, molecular, and cellular mechanisms driving aging and age-related diseases.

Nuclear medicine, with its ability to visualize and treat diseases at the molecular level, offers a unique toolset for GeroScientists to delve into the intricacies of aging processes. The development and utilization of nuclear diagnostic and therapeutic Theranostics further enhance this capability, enabling precise detection and targeted treatment of age-related conditions (Figure 3).

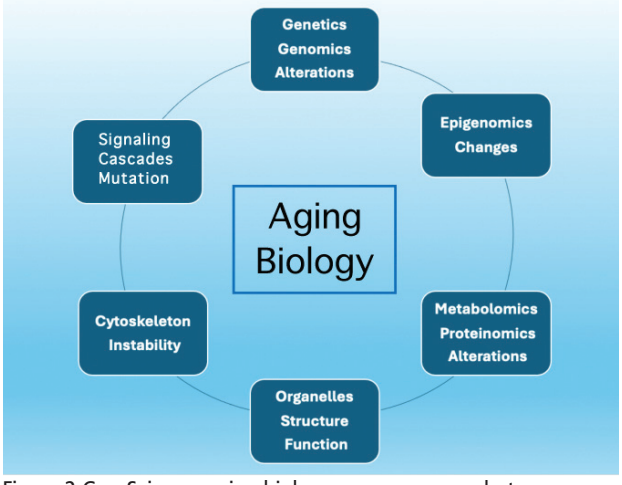


Figure 2.GeroScience: aging biology processes snapshot

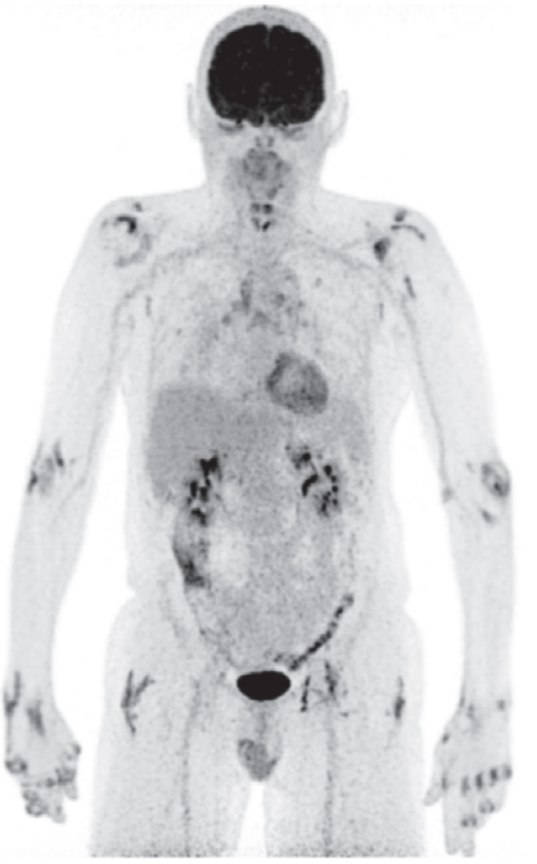


Figure 3. 18-FDG PET scintigraphy performed on a 62year old patient for suspicion of a pulmonary tumor showing in fact a diffuse joint inflammatory process related to a psoriatic arthritis

By leveraging radiopharmaceuticals and Theranostics, GeroScientists can gain insights into the molecular changes associated with aging, aiding in the identification of biomarkers and pathological pathways. This knowledge not only deepens our understanding of aging but also enables the development of interventions and therapies to mitigate in not curing age-related diseases.

Additionally, nuclear medicine techniques can assist Gerontologists in patient management by providing personalized diagnostic and therapeutic strategies tailored to individual molecular profiles. This targeted approach enhances treatment efficacy and patient outcomes, ultimately improving quality of life for older adults.

Conclusion

As the fields of GeroScience, Nuclear Medicine, and Theranostics continue to evolve, their integration holds great promise for advancing our understanding of aging and transforming the landscape of age-related healthcare. By synergizing these disciplines, researchers and clinicians can pave the way for innovative approaches to promote healthy aging and address the complex health challenges associated with growing older.

"GeroScience endeavors to unravel the intricate mechanism of aging, viewing it as a primary driver of age-related diseases. Geroscientists delve into the fundamental physiological, pathophysiological and biological processes associated with aging, aiming to develop interventions that mitigate age-related ailments and enhance overall well-being in older populations."

WORLD FEDERATION OF
NUCLEAR MEDICINE AND BIOLOGY

World Federation of Nuclear Medicine & Biology 2025-2026 President-Elect
Dr. Francois Lamoureux

- MD: University of Sherbrooke
  - Board Certified in Nuclear Medicine
- M.Sc: University of London, England
- Fellow Royal College of Canada
- Medalist of the city of Paris
- Professor at the University of Montreal
- Membership: EANM, SNMMI, SFNM, CANM
- Past President of the AMSMNQ, President of the CANM
- Several presentations/lectures in Europe, North & South America
- Editor in chief of the magazines Le Patient and ePatient
- Main interests: Precision Medicine, Theranostics, NM Education and Promotion

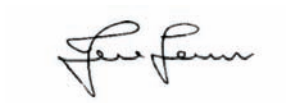
As President-Elect of the WFNMB, I will bridge connections with you worldwide.

I currently serve as the Treasurer of the World Federation of Nuclear Medicine and Biology (WFNMB) and as the President of the Canadian Association of Nuclear Medicine (CANM). For over 30 years, the CANM has worked closely with the WFNMB. I firmly believe that the WFNMB plays a vital role globally, fostering stronger partnerships among countries to ensure the enhancement of nuclear medicine.

With the development of new detectors, novel radiopharmaceuticals, and the rapid expansion of theranostics, the WFNMB is needed more than ever as a key interlocutor. I have strong relationships with the International Atomic Energy Agency (IAEA) and firmly believe that through this partnership, the WFNMB can significantly increase the availability of nuclear medicine for patients worldwide, especially in emerging countries.

The WFNMB is widely regarded as a well-respected organization, and I would be delighted to work closely with the executive board to enhance access to high-quality nuclear medicine across the globe.

As a professor of nuclear medicine, I have trained many residents, authored numerous publications and presentations, and genuinely believe that nuclear medicine has a promising future.



François Lamoureux M.D., M.Sc., FRCP(C).
President-Elect 2025-2026 Of the WFNMB
President CANM
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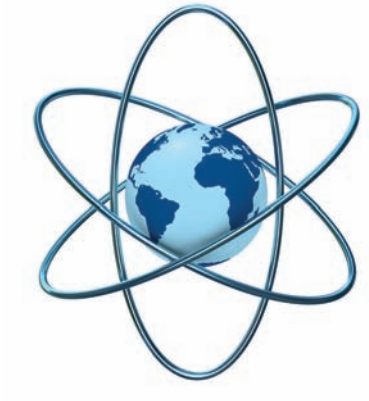

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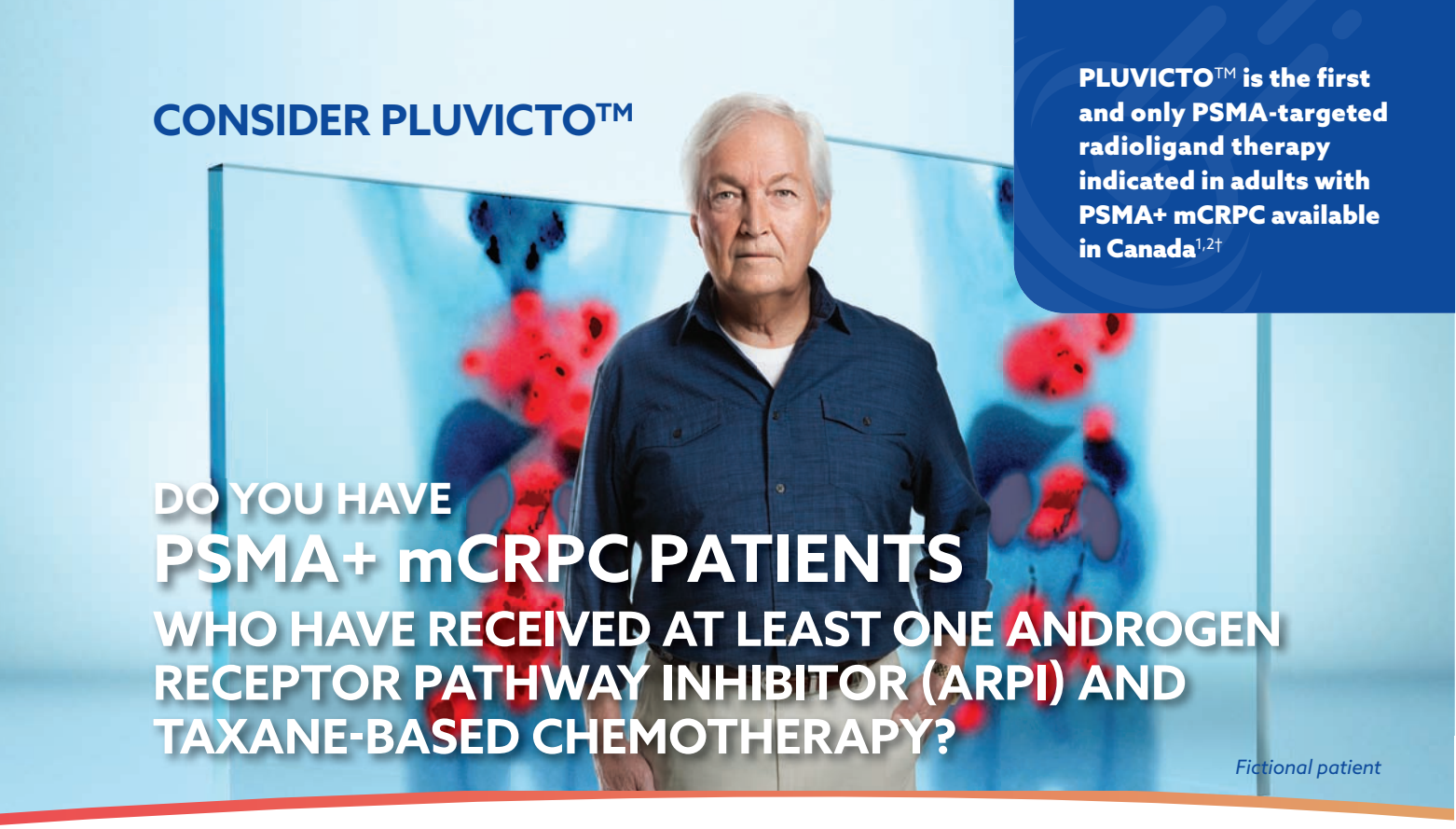
CONSIDER PLUVICTO™

PLUVICTO™ is the first and only PSMA-targeted radioligand therapy indicated in adults with PSMA+ mCRPC available in Canada[1,2†]



DO YOU HAVE PSMA+ mCRPC PATIENTS WHO HAVE RECEIVED AT LEAST ONE ANDROGEN RECEPTOR PATHWAY INHIBITOR (ARPI) AND TAXANE-BASED CHEMOTHERAPY?

Fictional patient

PLUVICTO™ (lutetium [^{177}Lu] vipivotide tetraxetan injection) is indicated for the treatment of adult patients with PSMA-positive mCRPC who have received at least one androgen receptor pathway inhibitor (ARPI) and taxane-based chemotherapy.

The VISION trial demonstrated a statistically significant improvement in both major efficacy outcome measures of OS and rPFS by BICR with PLUVICTO™ plus BSoC compared to treatment with BSoC alone, respectively.[1‡]

- OS: estimated 38% reduction in the risk of death based on the HR (HR=0.62; 95% CI: 0.52, 0.74; *P*<0.001); median OS 15.3 months vs. 11.3 months[1]
- rPFS: HR for progression or death, 0.40; 99.2% CI, 0.29 to 0.57; *P*<0.001 (significance level, 0.008); median rPFS 8.7 months vs. 3.4 months[3]

Interpretation of the magnitude of the rPFS effect was limited due to a high degree of censoring from early drop out in the control arm.[1]

Refer to the page in the bottom-right icon for additional safety information and for a web link to the product monograph discussing

- Most serious warnings and precautions regarding healthcare professional qualifications pertaining to use of radiopharmaceuticals; severe and life-threatening myelosuppression and renal toxicity including severe renal injury
- Other relevant warnings and precautions regarding location of use; compliance with regulations and good safety practices related to radiopharmaceuticals; contamination including special precautions such as bladder catheterization in incontinent patients; radiation exposure including long-term cumulative radiation exposure and increased risk for cancer; patient counselling on consumption of oral fluids and voiding to reduce bladder radiation; patient education regarding minimizing radiation exposure; hematology laboratory tests to assess myelosuppression; dose adjustments and discontinuation related to severity of myelosuppression; renal toxicity; kidney function laboratory tests; dose adjustments and discontinuation based on the severity of renal toxicity; male reproductive health; risk of temporary or permanent infertility; use effective contraception; no indication in pregnant women and risk of fetal harm in pregnant women
- Conditions of clinical use, adverse reactions, drug interactions, and dosing instructions.

In addition, the page contains the reference list and study parameters relating to this advertisement.

PSMA=prostate-specific membrane antigen; mCRPC=metastatic castration-resistant prostate cancer; BSoC=best standard of care; BICR= blinded independent central review; HR=hazard ratio; OS=overall survival; rPFS=radiographic progression-free survival

† Comparative clinical significance has not been established.

PLUVICTO™
lutetium (^{177}Lu) vipivotide tetraxetan injection

Indication and clinical use:

PLUVICTO™ (lutetium [^{177}Lu] vipivotide tetraxetan injection) is indicated for the treatment of adult patients with PSMA-positive mCRPC who have received at least one androgen receptor pathway inhibitor (ARPI) and taxane-based chemotherapy.

Pediatrics (<18 years of age): No data are available to Health Canada; therefore, Health Canada has not authorized an indication for pediatric use.

Geriatrics (≥65 years of age): No clinically relevant differences in efficacy were observed between patients ≥65 years and those younger than 65 years.

Most serious warnings and precautions:

Healthcare professional qualifications: Radiopharmaceuticals should be used only by those health professionals who are appropriately qualified in the use of radioactive prescribed substances in or on humans.

Myelosuppression can occur in patients treated with PLUVICTO™. PLUVICTO can cause severe and life threatening myelosupression including anemia, thrombocytopenia, leukopenia and neutropenia.

Renal toxicity can occur in patients treated with PLUVICTO™. Cases of severe renal injury have been reported.

Other relevant warnings and precautions:

- Location of use; compliance with regulations and good safety practices related to radiopharmaceuticals
- Contamination: the following measures should be taken for 2 days after receiving the radiopharmaceutical product:
  - Toilet should be used instead of urinal
  - Toilet should be flushed several times after use
  - Contamination: special precautions such as bladder catheterization should be taken following administration to incontinent patients to minimize the risk of radioactive contamination
- Radiation exposure including long-term cumulative radiation exposure is associated with an increased risk for cancer
- Radiation exposure to patients, medical personnel, and household contacts should be minimized during and after treatment
- Encourage patients to increase consumption of oral fluids and voiding to reduce bladder radiation
- Patient education regarding minimizing radiation exposure to patient and others including instruction about close contact, sexual activity and sleeping location
- Hematology laboratory tests before and during treatment to assess myelosuppression; PLUVICTO™ should be withheld, dose reduced, or permanently discontinued and patients should be clinically managed as deemed appropriate based on the severity of myelosuppression
- Renal toxicity; maintain hydration; frequent urination before and after administration; perform kidney function laboratory tests before and during treatment; withhold, reduce dose or permanently discontinue based on the severity of renal toxicity
- Male reproductive health; risk of temporary or permanent infertility; use effective contraception during treatment with PLUVICTO™ and for 14 weeks after the last dose
  PLUVICTO™ is not indicated in females; risk of fetal harm if used in pregnant women

For more information:

Consult the Product Monograph at **https://www.adacap.com/wp-content/uploads/pluvicto-pm-20220825-en.pdf** for adverse reactions, drug interactions and dosing information which have not been discussed in this piece. The Product Monograph is also available by calling 1-800-363-8883.

‡ VISION was an international, prospective, open-label, multicenter, randomized phase 3 clinical trial evaluating PLUVICTO™ in 831 adult patients with PSMA-positive mCRPC previously treated with at least 1 ARPI and 1 or 2 taxane regimens. Participants were randomized in a 2:1 ratio to receive PLUVICTO™ (7.4 GBq every 6 weeks for up to 6 cycles) + BSoC or BSoC alone.

References: 1. PLUVICTO™ Product Monograph. Advanced Accelerator Applications USA, Inc. August 25, 2022. **2.** Data on file. **3.** Sartor O et al. Lutetium-177–PSMA-617 for Metastatic Castration-Resistant Prostate Cancer. *NEJM* 2021;385:1091-103.

NOVARTIS

PLUVICTO™ is manufactured by Advanced Accelerator Applications USA, Inc. and is imported and distributed by Quality & Compliance Services Inc. for Advanced Accelerator Applications Canada, Inc., a Novartis Company.
Advanced Accelerator Applications Canada, Inc., a Novartis Company.

February/2024 – 378824E

REVIEWED BY PAAB

MEMBER OF INNOVATIVE MEDICINES CANADA

PLUVICTO™
lutetium (^{177}Lu) vipivotide tetraxetan injection

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Association canadienne de médecine nucléaire

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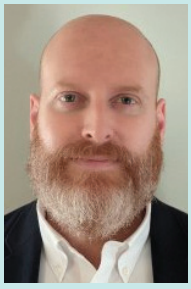

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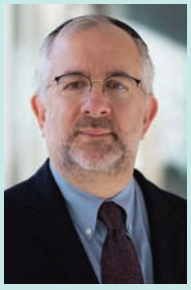

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✓ Its dedication to promote the **transfer of scientific bench discoveries** into molecular & personalized medical diagnostics and therapies.

✓ Its ability to **promote, develop and support** the use of medical isotopes **in the emerging countries**.

✓ Its proven commitment to educate and provide **high level training** to nuclear medicine professionnals from across the world, **particularly from emerging countries** in collaboration with the **Royal College of Canada**.

✓ **The Pangea** project.

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2024 INTERNATIONAL CONFERENCES

SNMMI	8-12 june 2024	Toronto
SSNM	20-22 june 2024	Genève
CANM-ACMN	19-21 september 2024	Montréal
EANM	19-23 october 2024	Hamburg
ALASBIMN	13-17 march 2025	Cancun
WFNMB	13-16 february 2026	Cartagena

The Canadian Association of Nuclear Medicine strives for excellence in the practice of diagnostic and therapeutic nuclear medicine by promoting the continued professional competence of nuclear medicine specialists, establishing guidelines of clinical practice, and encouraging biomedical research. We work with all professionals in nuclear medicine to ensure that Canadians have access to the highest quality nuclear medicine services.

SISTER ORGANIZATIONS

SNMMI Society of Nuclear Medicine and Molecular Imaging · EANM European Association of Nuclear Medicine · World Federation of Nuclear Medicine and Biology · APES · ARCCNM · ASNC · ARSNM Arab Society of Nuclear Medicine · AFNMB · IAEA International Atomic Energy Agency · alasbimn · South African Society of Nuclear Medicine · SFMN

THE ANNUAL SCIENTIFIC CONFERENCE CANM 2024 MONTREAL

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Facebook de l'AMSMNQ

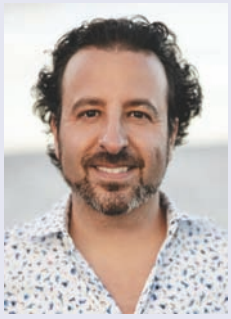
VENEZ CONSULTER : https://www.facebook.com/AMSMNQ/

Venez consultez la page Facebook de l'association des médecins spécialistes en médecine nucléaire du Québec. Vous y trouverez de multiples informations concernant principalement la médecine nucléaire québécoise.

Nous y partageons des événements à venir, des articles intéressants et toutes nouvelles susceptibles d'intéresser la communauté de médecine nucléaire d'ici et d'ailleurs. Nous sommes aussi très fier de présenter les réalisations exceptionnelles de certains de nos membres.

N'hésitez pas à nous contacter si vous souhaitez nous partager une bonne nouvelle, une information, ou un article d'intérêt.

Message du président de l'AMSMNQ



President AMSMNQ
Chief of the Department of Medical Imaging
Chu Québec

Un peu plus de six ans. C'est le temps que ça aura pris entre le moment où le Dr Norman Laurin m'appela afin que je me présente comme conseiller à l'Association des médecins spécialistes en médecine nucléaire du Québec (AMSMNQ) et le moment où il m'a passé le flambeau pour la présidence de l'Association.

Tout d'abord comme conseiller, puis comme trésorier, officier et délégué de l'Association aux assemblées de la Fédération des médecins spécialistes du Québec, j'ai eu l'occasion de parfaire mes aptitudes et habilités de gestion sur de nombreux dossiers. Le style de gestion instauré au sein du CA de l'Association sous la présidence de Dr Laurin est très ouvert, participatif, et surtout dans la transparence. Un style qui me rejoint; un style par lequel je compte entreprendre mon mandat en continuité avec le conseil d'administration qui a été reconduit, sans oublier l'arrivée de Dre Virginie Bruneau comme conseillère. Et je le dis sans aucune gêne, j'ai la chance d'être supporté par une équipe extraordinaire, et une directrice générale en or!

Ma voie jusqu'ici n'était certes pas tracée d'avance. Diverses opportunités et défis qui se sont présentés à moi m'ont permis d'en arriver là où j'en suis. C'est un peu par hasard que j'ai été dirigé vers l'une des plus belles spécialités médicales qu'est la médecine nucléaire au moment même où mon frère Christian était pris en charge par l'équipe de médecins spécialistes en médecine nucléaire du CHUM. Il a d'ailleurs su quelques semaines avant moi que j'étais accepté en cette spécialité!

J'entrevois la présidence de l'AMSMNQ comme un défi de taille, mais Norman me laisse les rênes d'une Association en bonne posture. La médecine nucléaire est florissante au Québec. Je suis fier de dire que la population bénéficie d'une médecine personnalisée de pointe digne des plus grands établissements de santé au monde. On a su pivoter à l'arrivée de la tomographie par émission de positrons (TEP). On vit le changement de paradigme avec l'émergence de la théranostique, alliant examen diagnostique fonctionnel, indispensable à une approche thérapeutique personnalisée.

Je souligne au passage que le CHU de Québec a été le premier établissement au Canada reconnu comme centre d'excellence en thérapie par radiopharmaceutiques décerné par la SNMMI. Le département de médecine nucléaire du CHUM a été le site désigné pour quelques premières mondiales dans le développement de paires théranostiques. Le CHUS travaille à l'accessibilité pour une médecine nucléaire de pointe à un autre ordre de grandeur. Collectivement, nous collaborons sur quelques dizaines de protocoles de recherche permettant aux malades un accès rapide à des traitements émergents. Par parrainage, l'éventail de développement professionnel continu se trouve bonifiée. Et tout ça ne serait pas possible sans la contribution de toutes et tous. Les patients nécessitant des soins en médecine nucléaire sont entre bonnes mains au Québec!

C'est donc avec un profond sens de l'honneur, sous la confiance de mes collègues, que j'entame ma présidence à l'AMSMNQ. Engageons-nous ensemble à joindre nos talents afin de tendre vers l'excellence, mettre à contribution l'innovation au service des patients.

AMSMNQ

ASSOCIATION DES MÉDECINS SPÉCIALISTES EN MÉDECINE NUCLÉAIRE DU QUÉBEC

L'IMAGERIE PERSONNALISÉE PAR LA MÉDECINE NUCLÉAIRE

« La mission du comité de développement professionnel continu (DPC) de l'Association des médecins spécialistes en médecine nucléaire du Québec (AMSNMQ) est de soutenir les médecins nucléistes à acquérir et à préserver leur expertise médicale, ainsi qu'à améliorer leurs compétences de collaboration et de communication dans le but de prioriser la qualité des soins aux patients. »

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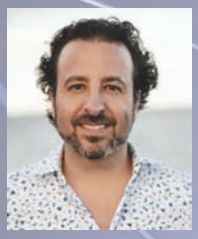
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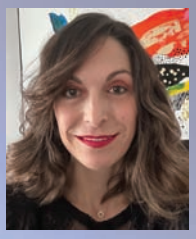
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Membre honoraire

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INTERVIEW WITH JOHN O. PRIOR

John O. PRIOR, PhD MD FEBNM
Professor and Head of Department
Department of Nuclear Medicine and Molecular Imaging
Lausanne University Hospital

Could you briefly present yourself to our readers?

I have been Professor and Head of Nuclear Medicine and Molecular Imaging at Lausanne University Hospital in Lausanne (Switzerland) since 2010. I underwent graduate studies in engineering at Swiss Federal Institute of Technology in Zurich (ETH Zurich) in Switzerland and earned a PhD in Biomedical Engineering from The University of Texas Southwestern Medical Center at Dallas (UTSW) in 1993 with a thesis on nuclear medicine instrumentation and image reconstruction. I returned to Switzerland to obtain my medical degree (MD) from the University of Lausanne and did nuclear medicine specialization training there. I was able to spend 2 years at the University of California at Los Angeles (UCLA) from 2002 to 2004. In 2018, I became President of the Swiss Society of Nuclear Medicine. Since 2019, I am the Liaison Officer between the World Health Organization (WHO) and the World Federation of Nuclear Medicine and Biology (WFNMB). In 2024, I also became President of the Section and Board of Nuclear Medicine of the European Union of Medical Specialists (UEMS), a more than 50-year-old political representative organisation of medical specialists in the European Union and associated countries aiming at obtaining comparable highest level of knowledge to allow free movement of specialists between member countries and guarantee high-quality CME programs of scientific and education excellence, free from healthcare industry influence.

As president of the Swiss Society of Nuclear Medicine could you give us an idea of the deployment of units of Nuclear Medicine in Switzerland?

Nuclear Medicine has a its origins in Switzerland with the first iron (^{59}F) and iodine studies (^{131}I) by Prof. A. Vannotti in Lausanne starting as early as 1945, followed with the first radionuclides therapies (intracavitary ^{198}Au and intravascular ^{63}Zn) by J. H. Müller in Zurich in 1948–50. The first radioimmunoscintigraphy was performed in Lausanne in 1975. Interestingly, a few first world premieres happened in Switzerland, as with the first clinical ^{90}Y-DOTATOC in Basel in 1996, the first clinical PET/CT installed in Zurich in 2001, and the first clinical use of PSMA radioligand therapy officially approved outside any clinical trial in 2019.

Our Swiss Society of Nuclear Medicine (https://nuklearmedizin.ch) has separated in 1997 from the common Society for Diagnostic Radiology, Nuclear Medicine, and Radiation Oncology, itself originating in 1979 from the Society for Radiology and Nuclear Medicine created in 1958. Since 2000, nuclear medicine exists as an independent specialty in Switzerland. Today, we count about 90 members in the 4 Swiss linguistic regions (German-, French-, Italian-, and Romansh-speaking).

We have witnessed a rapid adoption and expansion of PET/CT in Switzerland since its beginning two last two decades ago, with 38 centres in 2024 for about 9 million inhabitants with over 80,000 yearly examinations. There are over 100 PET/CT and SPECT/CT scanners in Switzerland with only 1 PET/MR used clinically. Radioligand therapies are also rapidly increasing, but with a total of only about 60 therapy beds in the whole Switzerland and a compulsory 48-hour minimal hospital stay per law, challenges are soon lying ahead, as the number of indications is increasing as well as the number of patients-to-treat, as we are moving toward earlier lines of treatment.

How do you see the contribution of the Artificial Intelligence for the patients in Nuclear Medicine?

Artificial Intelligence (AI) is certainly going to help our patients obtaining improved nuclear medicine quality in the future. As in radiology, AI in nuclear medicine has known a rapid progression, and it is starting to be used clinically outside research studies. It will change the way we practice nuclear medicine tomorrow offering improved diagnostic and prognostic precision using image features not-directly assessable by the human eye. It will also help the way therapeutic decision will be done using imaging information and integrating tumour heterogeneity, as well as making clinical dosimetry a clinical reality.

Also, languages models will help creating nuclear medicine reports, increasing automation, speed and reducing errors. However, we will keep on discussing with our patients like before, but AI will help tomorrow's physicians by reducing the work burden and offering more time and freedom for patient contact, taking over AI in matter of empathy. On the research side, AI will also speed up innovation progresses in radiopharmaceuticals and therapeutic regimen, as well as reducing side effects thanks to AI diagnostic and theranostic digital twins.

With the rapid development of theranostic, how will it impact the practice of Nuclear Medicine?

Although theragnostic has been practised in the last 80 years in nuclear medicine, its rapid expansion and recent frontline exposure has changed the face of not only nuclear medicine, but also medicine. We are witnessing a rapid explosion of indications and number of therapies worldwide outpacing often patient access to these novel and latest therapies in many countries. The numbers of indications will broaden, as will the number of diseases to be treated, as more clinical trials are performed, and research advances will be made. Amazingly, the theranostics sides effects are few and mild and most often predictable, allowing to adapt the administered activity accordingly. As mentioned above, this field will benefit from the progresses brought by AI to become even more efficient.

Finally, what is your greatest wish for the future of the speciality of Nuclear Medicine?

Wearing my hat as Liaison Officer between the World Health Organization (WHO) and the World Federation of Nuclear Medicine and Biology (WFNMB), my greatest wish for the future of our specialty would be to offer increased access to diagnostic and therapeutic nuclear medicine to the millions of people living in the Low- and Middle-Income Countries (LMICs) to improve health in patients with non-communicable disease including cancer, neurological diseases, and cardiovascular diseases. This goes not only through strengthening access to medical imaging equipment and radionuclides therapy, but also to training, supervision, quality management and qualified personnel. The concept of "frugal innovation" applies to low-cost technology designed specifically to LMICs addressing population needs considering the limited human resources and infrastructure from the design start (https://doi.org/10.1016/j.jacr.2024.04.003).

With this, every investment will decrease mortality from non-communicable diseases would ensure a durable return on investment saving downstream health care costs and patient's number and quality of years left. This goes through the creation of specific WHO resolutions and their adoption by member countries in line with the WHO conceptual framework called "the triple billion targets" to be reach by 2030 as compared to the 2018 baseline, in particular with Pillar 1 "One billion more people benefitting from universal health coverage" and Pillar 3 "One billion more people enjoying better health and well-being" (https://www.who.int/about/general-programme-of-work). We can be proud that nuclear medicine has also a role to play in health equity. ■

"Although theragnostic has been practised in the last 80 years in nuclear medicine, its rapid expansion and recent frontline exposure has changed the face of not only nuclear medicine, but also medicine. We are witnessing a rapid explosion of indications and number of therapies worldwide outpacing often patient access to these novel and latest therapies in many countries."

ENTREVUE AVEC MIKE HAMILTON

Mike Hamilton, président de GE Santé au Canada

« Stimulés par l'expansion de la médecine nucléaire et sa croissance exponentielle, nous développons de nouvelles technologies et de nouveaux équipements qui répondent aux besoins des systèmes de santé et bénéficient directement aux patients. »

Pouvez-vous vous présenter brièvement à nos lecteurs ?

Je me nomme Mike Hamilton, et je suis président de GE Santé au Canada. GE Santé est une société qui génère 19,6 milliards de dollars et emploie 51 000 collaborateurs dans le monde entier, travaillant à un même objectif : créer les soins de santé du futur. Des soins plus précis, personnalisés, préventifs, plus performants à un moindre coût, voire « sans limites ». J'ai rejoint l'entreprise en 2022 pour diriger nos activités au Canada, tandis que nous nous efforçons de faire progresser le système de santé canadien et la technologie utilisée ici, chez nous. L'un des développements les plus prometteurs de la médecine à l'heure actuelle est le domaine de la médecine nucléaire et le rôle prépondérant qu'elle joue dans la théranostique – la pratique consistant à combiner l'imagerie diagnostique et les traitements cibles dans un seul parcours de soins pour aider à traiter des cancers spécifiques et des excroissances tumorales.

La société GE Santé est bien connue pour sa contribution majeure à la médecine nucléaire, mais comment la société fait-elle face à l'expansion rapide de ce domaine ?

Stimulés par l'expansion de la médecine nucléaire et sa croissance exponentielle, nous développons de nouvelles technologies et de nouveaux équipements qui répondent aux besoins des systèmes de santé et bénéficient directement aux patients. La demande d'images de haute qualité, de flux de travail améliorés, de temps d'acquisition plus courts et de technologies évolutives va en s'accélérant. Nous nous attachons à mettre au point des technologies plus précises, plus efficaces et plus accessibles afin d'améliorer la pratique de soins.

GE Santé est le seul partenaire de l'industrie des soins de santé à disposer de solutions couvrant les cyclotrons, la synthèse chimique, les diagnostics pharmaceutiques, les systèmes TEP/TDM, TEP/IMR, TEMP/TDM, l'oncologie avancée et les solutions numériques pour répondre aux besoins de cette approche thérapeutique.

Nous collaborons également avec des systèmes de santé qui favorisent l'adoption clinique de la théranostique, tels que BAMF Health aux États-Unis et St. Joseph's Health Care London au Canada. À St Joe's, nous avons collaboré à la création d'un Centre d'excellence en théranostique qui soutiendra les activités de recherche, la collaboration clinique et les programmes d'éducation et de formation destinés à la pratique clinique de la théranostique en pleine évolution, afin de favoriser l'adoption de cette approche médicale par les systèmes de santé et d'améliorer les soins et la sensibilisation des patients.

Quels types d'équipements sont concernés ? Quels types de radiotraceurs ?

GE Santé est largement connue pour ses solutions d'imagerie diagnostique, et nos systèmes de couplage TEP/TDM, TEMP/TDM et TEP/IRM représentent une véritable innovation dans le domaine de l'équipement médical.

Notre système Omni Legend TEP/TDM possède une sensibilité plus de deux fois supérieure à celle des scanners[i] numériques précédents, ce qui permet de diminuer les temps d'acquisition[ii] et d'obtenir une détection précise des petites lésions.[iii] Notre système SIGNA TEP/IRM AIR associe l'un des détecteurs TEP à temps de vol (ToF) les plus sensibles de l'industrie à notre impressionnante technologie AIR pour aider les cliniciens à visualiser jusqu'aux plus infimes lésions, à rechercher de nouveaux radiotraceurs, et à planifier avec plus de précision les voies thérapeutiques de chaque patient. Notre système StarGuide TEMP/TDM permet aux cliniciens de suivre de près les traitements grâce à un détecteur 12 CZT conçu pour les explorations en 3D, plus riches en informations, et est également optimisé pour certaines procédures de théranostique, offrant aux cliniciens le haut degré de précision dont ils ont besoin pour déterminer la taille, la forme et la position des lésions.

Ces solutions matérielles sont comparables au moteur V12 d'un véhicule de haute performance !

Nous produisons également le « carburant », ou les traceurs TEP– en l'occurrence, notre plateforme PETtrace Solid Target, qui, en combinaison avec sa plateforme FASTlab 2 New Edition, peut produire 100 fois plus de gallium qu'un générateur afin d'augmenter les capacités de la théranostique et l'accès aux soins des patients atteints du cancer de la prostate.

Nous travaillons à améliorer nos capacités d'imagerie et apprenons à produire des traceurs TEP plus efficacement, avec des rendements plus élevés, afin de répondre à la demande. Il s'agit là d'un élément important pour l'ensemble de la pratique, car la capacité de production des traceurs TEP sur site signifie que les systèmes de santé peuvent améliorer l'expérience des patients, réduire les temps d'attente pour les acquisitions et, par conséquent, traiter plus de patients dans un délai plus court – tout cela, nous l'espérons, conduisant à de meilleurs résultats thérapeutiques pour les patients.

Bien entendu, nous possédons les solutions numériques associées qui permettent de franchir encore une nouvelle étape en matière de performance.
Dans un souci d'amélioration constante de ces solutions numériques, nous avons récemment acquis la société MIM Software, un fournisseur mondial de solutions d'analyse d'imagerie médicale et d'intelligence artificielle pour la pratique de la radio-oncologie, de la radiothérapie moléculaire, de l'imagerie diagnostique et de l'urologie. L'ajout du portefeuille de MIM Software aux solutions numériques existantes de GE Santé vise à améliorer la recherche médicale et les flux de travail cliniques de la théranostique afin d'aider les cliniciens à améliorer la stratification et la sélection des patients, la prédiction de la réponse, et soutenir le développement de nouveaux traitements – y compris l'alphathérapie.

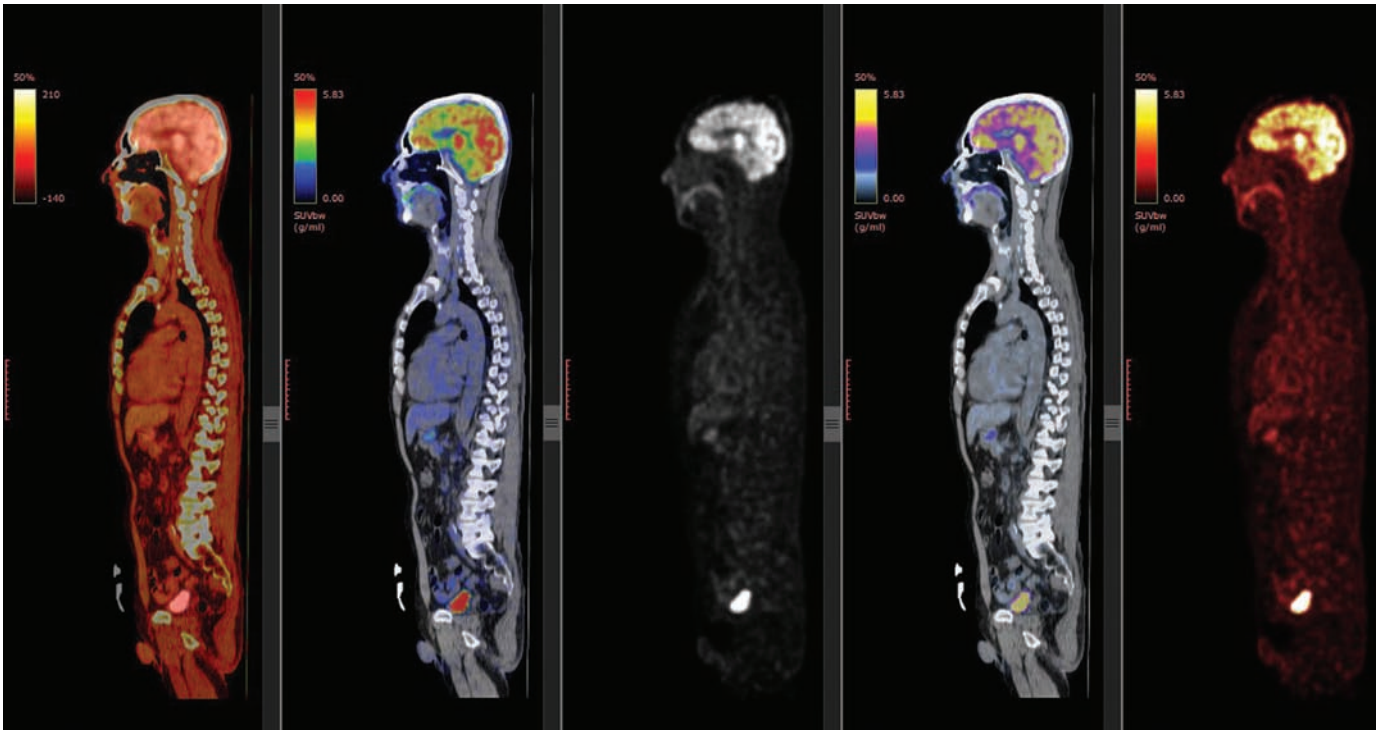
Comment voyez-vous GE Santé faire face à l'expansion rapide de l'utilisation de l'intelligence artificielle en médecine nucléaire ?

Vous avez entendu parler de nos équipements TEP/TDM, TEMP/TDM et TEP/IRM innovants, mais avec les solutions d'intelligence artificielle embarquées qui améliorent ces systèmes et les solutions numériques qui peuvent aider à normaliser les soins, les choses deviennent passionnantes.

Un bon exemple de solution d'intelligence artificielle embarquée est Effortless Workflow, qui peut s'interfacer avec les solutions de Molecular Imaging pour la plateforme Omni TEP/TDM et le système StarGuide TEMP/TDM. Cette solution utilise l'intelligence artificielle pour automatiser et accélérer les flux de travail existants – des examens préliminaires aux examens post-acquisition – à travers des fonctionnalités faisant économiser du temps en général, telles que le positionnement du patient automatique, la suggestion de protocoles, qui contribuent à transformer radicalement l'expérience de l'imagerie moléculaire et à maximiser l'efficacité, la précision, la clarté et la cohérence des parcours de soins.

D'autres solutions d'intelligence artificielle ou d'apprentissage profond embarquées comprennent

« GE Santé est le seul partenaire de l'industrie des soins de santé à disposer de solutions couvrant les cyclotrons, la synthèse chimique, les diagnostics pharmaceutiques, les systèmes TEP/TDM, TEP/IMR, TEMP/TDM, l'oncologie avancée et les solutions numériques pour répondre aux besoins de cette approche thérapeutique.»



« La contribution de l'intelligence artificielle s'étend également aux tâches administratives qui étayent le parcours de soins en oncologie. Tous ceux qui ont vécu l'expérience des soins oncologiques, eux-mêmes ou par l'intermédiaire d'un proche, savent combien de visites de contrôle ou cliniques, de séances de traitement, de rencontres avec des médecins ou des cliniciens, etc. sont nécessaires. »

« La médecine nucléaire et la théranostique marquent le début d'une nouvelle ère dans le domaine des soins de santé. Nous vivons une époque passionnante, et nous sommes confiants dans l'avenir. »

Precision DL pour la TEP/TDM et AIR Recon DL pour l'IRM et le couplage TEP/MR. Dans l'ensemble, ces avancées offertes par la technologie de l'intelligence artificielle peuvent aider nos équipements à produire des images précises et de haute qualité, accélérer les temps d'acquisition, accroître le confort des patients et aider les cliniciens dans leur processus de prise de décision.

Lorsqu'il s'agit de localiser des zones spécifiques du corps et pour y administrer des traitements ciblés, comme dans le cas de la théranostique, l'intelligence artificielle aide à trouver ces zones avec une plus grande précision et une plus grande certitude.

GE Santé s'est engagé à développer des dispositifs intelligents, alimentés par l'intelligence artificielle, pour permettre aux cliniciens de fournir des soins plus personnalisés aux patients souffrants de pathologies spécifiques. Nous pensons que l'intégration de MIM Software fera également progresser nos efforts en matière de connexion des données tout au long du parcours de soins.

La contribution de l'intelligence artificielle s'étend également aux tâches administratives qui étayent le parcours de soins en oncologie. Tous ceux qui ont vécu l'expérience des soins oncologiques, eux-mêmes ou par l'intermédiaire d'un proche, savent combien de visites de contrôle ou cliniques, de séances de traitement, de rencontres avec des médecins ou des cliniciens, etc. sont nécessaires. Tout cela représente un défi du point de vue de la gestion des données volumineuses – en particulier à grande échelle, à mesure que ces thérapies deviennent plus largement disponibles.

Les solutions d'intelligence artificielle de GE Santé peuvent également contribuer à optimiser l'efficacité et la continuité des programmes de soins, des doses et des diagnostics pour les cliniciens et les patients.

Comment voyez-vous l'avenir de la médecine nucléaire ?

À l'avenir, la médecine nucléaire, et en particulier de la théranostique pour le traitement des maladies, ouvre une perspective passionnante. Nous n'en sommes pas encore à promettre une solution universelle pour le cancer, mais la médecine nucléaire a le potentiel de nous rapprocher de cette vision.

À mesure que la technologie, l'accès et l'adoption de cette approche thérapeutique progressent, nous pourrions voir l'avènement de systèmes de santé disposant de capacités théranostiques complètes « sous un même toit » – en d'autres termes, un seul établissement pourrait être en mesure d'effectuer l'imagerie diagnostique, d'administrer le traitement, et de produire les traceurs TEP qui sont essentiels pour localiser les maladies dans l'organisme.

Actuellement, le processus du parcours de soins reste fragmenté et laborieux, car ses différentes composantes, qu'il s'agisse de fabrication, d'exécution ou d'administration, sont cloisonnées. En particulier, les médicaments radioactifs nécessaires à l'administration des traitements théranostiques soulèvent un problème : ils ne sont produits que dans certaines régions du monde, et leur demi-vie signifie qu'ils peuvent devenir inutilisables s'ils ne sont pas administrés et utilisés dans un certain délai. L'avenir pourrait enfin voir la réalisation de toutes les étapes du parcours de soins simultanément.

Enfin, quel est votre plus grand souhait pour les patients qui ont besoin des services de la médecine nucléaire ?

Mon vœu le plus cher est que les plans de traitement soient moins laborieux, que les patients passent moins de temps dans les cliniques, qu'ils souffrent moins, qu'ils soient moins inquiets en recevant leur diagnostic, qu'ils aient plus d'espoir et qu'ils obtiennent de meilleurs résultats thérapeutiques dans l'ensemble. Nous n'en sommes pas encore là, et il nous reste un long chemin à parcourir.

Mais il faut savoir que des personnes incroyablement intelligentes et motivées travaillent à la résolution de ces problèmes complexes, et que nous n'avons jamais été aussi près du but. Tout cela est à notre portée.

La médecine nucléaire et la théranostique marquent le début d'une nouvelle ère dans le domaine des soins de santé. Nous vivons une époque passionnante, et nous sommes confiants dans l'avenir. ■

[i] Le système Omni Legend 32 cm présente une augmentation de sensibilité de 2,2 par rapport au système Discovery MI 25 cm, avec des capacités de mesures conformes à la norme NEMA NU 2-2018.

[ii] Le système Omni Legend 32 cm offre jusqu'à 53 % de réduction du temps de TEP par rapport au système Discovery MI 25 cm, comme l'ont démontré des essais effectués sur fantôme.

[iii] Le système Omni Legend 32 cm offre jusqu'à 53 % de réduction du temps de TEP par rapport au système Discovery MI 25 cm, comme l'ont démontré des essais effectués sur fantôme.

INTERVIEW WITH MIKE HAMILTON

Mike Hamilton, President of GE HealthCare in Canada

Could you briefly present yourself to our readers?

I'm Mike Hamilton, President of GE HealthCare in Canada. GE HealthCare is a $19.6 billion business with 51,000 colleagues worldwide focused on delivering a future where care is more precise, personalized and preventive, with better outcomes at lower costs, to ultimately create a world where healthcare has no limits. I joined the company in 2022 to lead our Canadian business as we strive to advance the Canadian healthcare system and the technology utilized here at home. One of the most exciting developments in medicine right now is within the field of Nuclear Medicine and its ability to power Theranostics – the practice of combining diagnostic imaging and targeted therapies in one care pathway to help treat specific cancers and tumorous growths.

GE HealthCare is well known as a major contributor to Nuclear Medicine but how is it coping with the rapid expansion of Nuclear Medicine?

Driven by the exponential growth and expansion of Nuclear Medicine, we're developing new technologies and equipment to help meet the needs of health systems and ultimately benefit patients. Demand is accelerating for high-quality images, enhanced workflows, shorter scan times and scalable technologies. We are focused on building technology that is more precise, more efficient, and more accessible to help improve the practice.

GE HealthCare is the only healthcare industry partner with solutions spanning from cyclotrons, chemistry synthesis, pharmaceutical diagnostics, PET/CT, PET/MR, SPECT/CT, and advanced oncology and digital solutions to meet the needs of this treatment approach.

We're also collaborating with health systems that are driving clinical adoption of Theranostics, like BAMF Health in the U.S. and St. Joseph's London here in Canada. At St. Joe's, we have collaborated on a Theranostics Centre of Excellence that will support research activities, clinical collaboration, educational and training programs for the evolving clinical practice of Theranostics to help increase healthcare system adoption and improve patient care and awareness.

What kind of equipments? What kind of radiotracers?

GE HealthCare is known widely for its diagnostic imaging solutions, so when we talk about PET/CT, SPECT/CT, and PET/MR systems, we're talking about true innovation in medical equipment.

Our Omni Legend PET/CT boasts more than two times the sensitivity of prior digital scanners[i] , which can enable faster scan times,[ii] and precise small lesion detectability. [iii] Our SIGNA PET/MR AIR pairs one of the industry's most sensitive Time-of-Flight (ToF) PET detectors with the company's impressive AIR technology to help clinicians see some of the smallest lesions, research new tracers, and more accurately plan treatment paths for every patient. Our StarGuide SPECT/CT can help clinicians monitor therapies with a 12 CZT detector design that not only scans patients in 3D to provide more information to clinicians but is also optimized for certain Theranostics procedures, which in turn helps clinicians pinpoint the size, shape, and position of lesions with a high degree of accuracy.

Think of these hardware equipment solutions as the V12 engine that powers a high-performance car. But then we also produce the fuel or PET tracers – in this case we have our PETtrace Solid Target Platform, which – in combination with its FASTlab 2 New Edition platform – can produce 100x the amount of Gallium compared to a generator for increased Theranostics capabilities and access in prostate cancer patient care.

We're improving our imaging capabilities and learning how to produce PET tracers more efficiently with greater yields to meet demand. This is important to powering the whole practice because being able to produce PET tracers on-site means health systems can improve the patient experience, shrink the wait times for patient scans, and as a result treat more patients on a shortened timeline – which we hope will lead to better patient outcomes.

Then of course we have digital solutions that can take it all to another level.

We continue to enhance these digital solutions with our recent acquisition of MIM Software, a global provider of medical imaging analysis and artificial intelligence (AI) solutions for the practice of radiation oncology, molecular

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radiotherapy, diagnostic imaging, and urology. The addition of MIM Software's portfolio with GE HealthCare's existing digital solutions aims to enhance Theranostics medical research and clinical workflows to help clinicians improve patient stratification and selection, response prediction, and support the development of new treatments, including alpha therapies.

How do you see GE Healthcare coping with the rapid expansion of the use of Artificial Intelligence in Nuclear Medicine?

"GE HealthCare is committed to developing smart, AI-powered devices that cater to specific disease states, thereby enabling clinicians to deliver more personalized care. We expect the integration of MIM Software will also advance our efforts in connecting data across care pathways."

You've heard about our innovative PET/CT, SPECT/CT, and PET/MR equipment, but things get exciting when we talk about the on-device AI solutions that enhance those systems and digital solutions that can help to standardize care.

One on-device AI solution that comes to mind is Effortless Workflow – that can interface with Molecular Imaging solutions for the Omni PET/CT platform and StarGuide SPECT/CT. It utilizes AI to automate and help expedite existing workflows – pre-scan to post-scan – by automating patient positioning and suggesting protocols and enabling time savings to help transform the entire Molecular Imaging experience and help to maximize efficiency, accuracy, clarity, and consistency across care pathways.

Other on-device AI or deep learning solutions include Precision DL for PET/CT and AIR Recon DL for MR and PET/MR. In all, these advancements in AI technology can help to enable our hardware to produce high quality, precise images; enable faster scan times; increase patient comfort; and aid clinicians in their decision-making process.

"Nuclear Medicine and Theranostics are the markings of a new era in healthcare. We are living in exciting, hopeful times."

When we talk about pinpointing specific areas of the body and delivering targeted therapies to those acute areas as in Theranostics – AI is helping us to find those areas with greater accuracy and certainty.

GE HealthCare is committed to developing smart, AI-powered devices that cater to specific disease states, thereby enabling clinicians to deliver more personalized care. We expect the integration of MIM Software will also advance our efforts in connecting data across care pathways.

AI is also helping with the back-office duties that enable the oncology care pathway. Anyone who has experienced cancer care themselves or with a loved one knows how many check-ins, clinical visits, therapy sessions, doctors, clinicians, and so on are involved. That presents a challenge from a big data perspective – especially at scale as these therapies become more available.

GE HealthCare's AI solutions can also help to optimize the efficiency and seamlessness of those schedules, doses, and diagnostics for the clinicians and the patients.

How do you see the future of Nuclear Medicine?

The future of Nuclear Medicine and especially Theranostics as a solution for treating disease is exciting. We aren't to the point of promising a cure-all solution for cancer, but nuclear medicine has the potential to take us closer to that vision.

As technology, access, and adoption advance, we could see a future where health systems have full Theranostics capabilities under one roof, which is to say they might have the ability to perform diagnostic imaging, administer therapy, and produce the PET tracers that are essential to pinpointing diseases in the body in one place. Currently, there is a fragmented and laborious process where different moments in the care pathway are manufactured, performed, or administered separately. This is especially tough when talking about the radioactive medicines needed to deliver Theranostics therapies. These therapies are only produced in certain areas of the world, and their half-life means they can become unusable if they are not delivered and utilized within a certain timeline. The future might mean everything is possible at once.

Finally what is your greatest wish for the patients requiring the services of Nuclear Medicine?

My greatest wish is that patients experience less time in clinics, less pain and labor in treatment plans, less worry about their diagnoses, and experience more hope and better results overall. We are not there yet, and we have a long way to go.

But there are some amazingly smart and driven people working on solving these complex issues, and we're closer now than we've ever been. It's within our grasp.

Nuclear Medicine and Theranostics are the markings of a new era in healthcare. We are living in exciting, hopeful times. ■

[i] Omni Legend 32 cm has up to 2.2 increase in system sensitivity as compared to Discovery MI 25 cm. Measurement follows NEMA NU 2-2018.

[ii] Up to 53% reduction of PET scan time on Omni Legend 32 cm compared to Discovery MI 25 cm, as demonstrated in phantom testing.

[iii] Up to 53% reduction of PET scan time on Omni Legend 32 cm compared to Discovery MI 25 cm, as demonstrated in phantom testing.

GE HealthCare

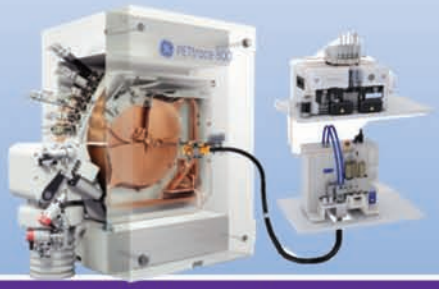
When it comes to Theranostics – the future is now.

Every step of the care you provide is an opportunity to make personalized decisions for your patients. That's why we're committed to providing total MI solutions for Theranostics.

Discovery

Increasing the availability of the radiotracers essential for diagnosis

PETtrace™ Solid Target Platform
Incredibly productive and reliable



Diagnosis

Helping increase diagnostic confidence with ultra-high sensitivity and resolution

Omni Legend
Answers at the speed of sight

Treatment

Designing innovative SPECT/CT systems and clinical applications to help you make precise decisions and accurately monitor treatment response.

StarGuide
Precision imaging at the speed of tomorrow

Xeleris™ V
AI processing and review

JB01116CA

INTERVIEW WITH ELIOT SIEGEL

Eliot Siegel

Dr. Eliot Siegel served as Lead Radiologist for the VISN 5 Diagnostic Service. He served as chief of diagnostic radiology and nuclear medicine at the VA Maryland Healthcare System since 1986. He also served as Professor and Vice Chair of research information systems at the University of Maryland School of Medicine and has adjunct appointments as Professor of Bioengineering at the University of Maryland College Park and as Professor of Computer Science at the University of Maryland Baltimore County.

Dr. Siegel created the NCI's National Cancer Image Archive and served as Workspace Lead of the National Cancer Institute's caBIG In Vivo Imaging Workspace.

He has been named as Radiology Researcher and Radiology Educator of the year by his peers as well as one of the Top Ten radiologists.

Under his leadership, the VA Maryland Healthcare System became the first filmless healthcare enterprise in the world. He has written over 300 articles and book chapters about PACS (Picture Archiving and Communication Systems) and digital imaging, and has edited six books on the topic, including Filmless Radiology and Security Issues in the Digital Medical Enterprise. He has made more than 1,000 presentations throughout the world on a broad range of topics involving computer applications in imaging and medicine.

Dr. Siegel served as symposium chairman for the Society of Photo-optical and Industrial Engineers (SPIE) Medical Imaging Meeting for three years and served on the board of directors of the Society of Computer Applications in Radiology (SIIM) where he was recently awarded the Society's Gold Medal in 2023.

He has for the past several years served as co-chair of the annual conference on Machine Intelligence in Medical Imaging and helped to create the current University of Maryland Medical Intelligent Imaging Center. He is a fellow of the American College of Radiology and a fellow of the Society of Imaging Informatics in Medicine.

"The emerging subspecialty of Theranostics may represent both the future of cancer treatment as well as the future of Nuclear Medicine."

Dear Doctor Eliot Siegel could you briefly presents yourself to our readers?

Absolutely. I recently retired from positions at the University of Maryland where I was Vice Chair of Research Information Systems in the department of Diagnostic Radiology and served clinically in the Department of Nuclear Medicine. I also recently retired from the Department of Veterans Affairs where I was responsible for Radiology and Nuclear Medicine for the VA hospitals in the Washington DC, Maryland and West Virginia region. During my career I had the opportunity to develop and pioneer the world's first "filmless", digital radiology department at the VA, to develop the National Cancer Center's Imaging Archive, to introduce enterprise advanced visualization, serve on the IBM Jeopardy! Watson team, serve as chair of the SPIE Medical Imaging Conference and co-chair the annual Conference on Machine Intelligence in Medical Imaging which concentrates on AI applications in healthcare. Most recently I have worked with two former residents, Drs. Michael Morris and Babak Saboury as a founder of the company, **United Theranostics**.

What is and what is the aim of +the organization, United Theranostics?

United Theranostics was created with some very ambitious goals including to substantially expand patient access to radiopharmaceutical therapy, provide outpatient centers for Theranostics care throughout the United States, enhance the specialty of Nuclear Medicine as practiced in the United States by encouraging the best and brightest medical students and residents to enter into this exciting and pioneering emerging specialty and to establish the largest repository of patient data and data science to advance the field. We aim to serve as patient advocates and to provide concierge patient care and to collaborate closely with our colleagues in medical oncology and radiation oncology.

What will be the major developments of United Theranostics in the next few months?

In order to provide better access to outpatient Theranostics in the United States, we plan to open centers in the major metropolitan areas initially and then in more rural areas of the country to allow us to meet our goal to provide universal access for patients in this rapidly emerging field. We plan to continue to hire the best and brightest nuclear medicine physicians and radiologists, technologists, physicists, data scientists and experts in imaging equipment and pharma for our clinical practice, clinical trials and data analysis.

Where is United Theranostics actually offering services for the patients and how they can reach you?

Patients and providers and researchers can contact us via our website which is unitedtheranostics.com. Our initial Theranostics Center is in the Baltimore area and our second center with Dr. Munir Ghesani, recent President of the Society of Nuclear Medicine and Molecular Imaging has an opening date of June 1, 2024. We plan to open several additional outpatient centers within the next several months and then to expand across the United States.

What will be the next major developments in Theranostics?

The emerging subspecialty of Theranostics may represent both the future of cancer treatment as well as the future of Nuclear Medicine. Novel radiopharmaceuticals are being funded and developed at a tremendous pace with tens of billions of dollars of investment. These include expanded indications for radiopharmaceuticals for treatment of prostate cancer and neuroendocrine tumors as well as dozens of additional molecules for treatment of lymphomas, pancreatic adenocarcinomas, melanoma, breast cancers, lung cancers, and many other neoplasms. There will be more of an emphasis in the future on personalization of patient treatment with a special emphasis on dosimetry which calculates personalized patient doses and allows us to measure actual patient radiation exposures to optimize patient safety and treatment efficacy.

What is your greatest wish for the patients in need of these new treatments?

Our greatest wishes are for improved patient access in comparison to the current situation in which patients often have to travel hundreds of miles for Theranostics care and for medical oncologists to understand the important and increasing role of Theranostics in patient treatment. Only about 5% of patients currently eligible for Theranostics prostate cancer therapy are currently receiving it and there are major educational opportunities for providers. I wish that we could work with multi-disciplinary teams on an outpatient basis to optimize combination therapies for these patients with other treatments that are currently being used. ■

"United Theranostics was created with some very ambitious goals including to substantially expand patient access to radiopharmaceutical therapy, provide outpatient centers for Theranostics care throughout the United States, enhance the specialty of Nuclear Medicine as practiced in the United States by encouraging the best and brightest medical students and residents to enter into this exciting and pioneering emerging specialty and to establish the largest repository of patient data and data science to advance the field."

INTERVIEW WITH KALEVI KAIREMO

Kalevi Kairemo, MD, PhD, MSc(Eng),
Professor Consultant in Nuclear Medicine, Clinical Chemistry, Pharmaceutical Medicine & Health Care Administration
President 2024-5, World Association of Radiopharmaceutical and Molecular Therapy WARMTH

"From the beginning of this year I became President of the World Association of Radiopharmaceutical and Molecular Therapy (WARMTH), which I consider a great honor."

Dear Dr.Kalevi Kairemo 'You just have been elected President of Warthm Could you briefly present yourself to our readers?

I am now retired from the positions of chief physician/professor, in the field of molecular radiotherapy and nuclear medicine, at the Docrates Cancer Center (Helsinki, Finland) and, since 2015, I have been acting as a visiting professor in nuclear medicine at the University of Texas M.D. Anderson Cancer Center (Houston).

I graduated with an MSc (Eng) degree from the Helsinki University of Technology (Finland) in 1980 before completing my medical (1986) and doctorate (1993) degrees at the University of Helsinki. From 1989 to 1993, I had a postdoctoral research fellowship at the Memorial Sloan Kettering Cancer Center (MSKCC; New York, NY). I got medical specialist training in clinical chemistry (1994), nuclear medicine (1996), health care administration (2002), and pharmaceutical medicine (2006) at the University of Helsinki and University Central Hospital. I have had faculty leadership positions at the Norwegian University of Science and Technology (Trondheim), Uppsala University Hospital (Sweden), and the Docrates Cancer Center in Helsinki. I have been active in transitioning new agents and techniques through the developmental pipeline and authored more than 250 peer-reviewed publications.

From the beginning of this year I became President of the World Association of Radiopharmaceutical and Molecular Therapy (WARMTH), which I consider a great honor.

I am licensed physician in Sweden, Norway and Estonia besides Finland. I have also been working pharmaceutical industry; CTT Cancer Targeting Technologies, Imanext and Advanced Accelerator Applications. Additionally, I have been involved with therapy tourism to Finland (patients traveled to Helsinki to get radionuclide treatments) and I have been active in setting up targeted therapies in neighbouring (e.g. Estonia) and European countries (e.g. Greece, Ireland) and some African countries.

What is WARMTH and how it is implicated in the investgation and the treatment of patients in Nuclear Medicine?

The World Association of Radiopharmaceutical and Molecular Therapy (WARMTH) has been established in 2009 after initiatives from its predecessor World Radiotherapy Council in 1999 at the SNMMI meeting. In the beginning it had very strong connection with IAEA and its member states in promoting the medical use of radionuclides globally. It is the only worldwide organization founded to promote the use of radionuclide molecular therapy, and the relatively novel paradigm of 'Thera(g)nostics.' was in use from the very beginning. WARMTH is a voluntary non-profit organization of individuals specifically associated for the purposes, and for using the means, to

achieve the following research and educational objectives: Advance science and education of therapeutic nuclear medicine and radiopharmaceutical therapy including dosimetry, treatment evaluation, radiation physics, radiation biology and radiation protection for the benefit of public health and humanity; Work towards worldwide access to radionuclide therapy by harmonizing good practice; Educating nuclear medicine professionals in the use of radionuclide therapies and to facilitate research in this area.

WARMTH has conducted three major global trials which were published in high-ranked journals. There were two retrospective trials using Lu-177-PSMA-617 (the same compound as Pluvicto®), both published in the European Journal of Nuclear Medicine and Molecular Imaging. In these studies, there were more than 400 patients treated and factors predicting outcome and excellent results could be confirmed before official registration trials, using real-world evidence data. The third WARMTH trial was published this year in Lancet Oncology, describing targeted alpha therapy using Ac-225-PSMA-617. In this retrospective study with 488 patients from four continents the excellent outcome, more than half of the advanced stage patients responded and limited adverse effects were observed, and multiple factors affecting response could be identified. Additionally, Lancet Oncology asked for a commentary from me.

What do you think will be in the next future the great developments in Nuclear Medicine?

My own research has been based on multiomics, making discoveries at the nexus of genomics, transcriptomics, proteomics, metabolomics, microbiomics, epigenomics, imaging, and precision medicine. And my research has focused on theragnostics from the very beginning.

The prime examples of great developments are NET and especially prostate cancer theragnostics. Additionally, there are multiple new specific tracers for oncology; the best example is prostate cancer, 20 years ago there was nothing available, now there are more than 10 tracers. Similarly, the diagnostics in neurology, for example in movement disorders and dementias, has improved substantially. Actually, the diagnostics in many aspects in this field is ahead treatments. But more precise diagnostics will help the discovery of new medication. I will have great expectations in this field eventhough functional MRI is very potent, but unfortunately not that sensitive as nuclear medicine methods. The newest developments in oncology, speak very much for targeted treatment. Therefore, there will be new findings in the field of theragnostics. Mutation-driven cancers can sometimes be treated with specific "blockers"; theragnostics may offer an ideal diagnosis/ therapy treatment combination possibility. Very often these treatments are based on the use of radiopharmaceuticals.

With this incredible expansion of Nuclear Medicine either in the diagnostic or in the therapeutic fields whow will Nuclear Medicine will be able to cope with the shortages of medical nuclear medicine specialists and technologists?

The shortage of labor is a problem in almost all sectors within medicine. We have to make nuclear medicine attractive; the discipline speaks for itself, but we have to increase awareness to the target populations. This nuclear medicine is such a fascinating field: a person has to understand cell and atomic nuclear behavior and make a clear difference between nuclear physics and cell biology. The radioactive atoms decay in a way which is known very precisely, but how they behave in organisms is not that easy to understand, but they can be tracked in a quantitative and dynamic manner. With nuclear medicine methods we can follow online physiology.

Finally what is your greatest wish for wish for the patients needing Nuclear Medicine ?

I have been a patient, too. Some of my minor health issues have been diagnosed with nuclear medicine techniques. From my own experience, I know that there is no need for an irrational fear of nuclear medicine imaging or therapy studies, because of radiation. In the world there has always been radiation (e.g. soil, cosmic) and a human body has multiple mechanisms to repair radiation damage. Radionuclide therapies are designed to overcome this resistance and these treatments can be planned with a targeted accuracy. These therapies can therefore be powerful, even in resistant conditions. Diagnostic radionuclide methods are very sensitive, therefore they are here to stay, especially becuse of depth resolution (imaging) and reasonable acquisition times.

Because of their sensitivity, specificity, time factors, and depth resolution in imaging, radionuclide methods cannot be replaced. Relevant therapy products can be designed for targeting and optimal kinetic constants. I have believed in this method for more than 30 years, and now we have products such as Pluvicto that have changed the treatment paradigm. Theranostics are here to stay. ■

"The World Association of Radiopharmaceutical and Molecular Therapy (WARMTH) has been established in 2009 after initiatives from its predecessor World Radiotherapy Council in 1999 at the SNMMI meeting. In the beginning it had very strong connection with IAEA and its member states in promoting the medical use of radionuclides globally."

"Because of their sensitivity, specificity, time factors, and depth resolution in imaging, radionuclide methods cannot be replaced. Relevant therapy products can be designed for targeting and optimal kinetic constants."

INTERVIEW WITH RENÉ REBEAUD

René, could you briefly present yourself to our readers?

With pleasure! My name is René Rebeaud and I currently head the North American and Latin American business for Hermes Medical Solutions. I have been with the company now for over 20 years and in the field of Nuclear Medicine and Medical Imaging for nearly 30 years. My educational background is in nuclear physics. Although my career started in clinical institutions like the CHUM, I soon took on roles like Sr. Development QA Engineer and Application Physicist on the industry side. The diversity of roles I have undertaken, spanning both clinical and corporate environments, has significantly enriched my career and bolstered my capacity to steer Hermes Medical Solutions' ventures in NA and LATAM effectively.

What is Hermes Medical Solutions?

Hermes Medical Solutions (HMS) is the leader in molecular and nuclear medicine imaging software for nearly 50 years. As an industry leader, we were the first company to develop and market SPECT reconstruction software and to introduce vendor-neutral medical image fusion software for combined viewing of images from different scanners.

"Hermes Medical Solutions (HMS) is the leader in molecular and nuclear medicine imaging software for nearly 50 years. "

Hermes Medical Solutions distinguishes itself as the only company committed to Molecular Imaging Software. This focused approach enables us to be more agile, responsive, and attuned to our customer needs. By incorporating customer feedback, we continuously innovate and refine our renowned Hermia Software Suite.

Today, our comprehensive HERMIA software suite provides a high-performance and highly intuitive toolkit for displaying, post-processing, and analyzing planar Nuclear Medicine imaging, PET/CT, SPECT/CT, and PET/MR, including support for RTDOSE and RTSTRUCT. HERMIA is the ONLY end-to-end vendor neutral solution to empower healthcare professionals with state-of-the-art software for all clinical scenarios into one software suite.

In which part of the World is Hermes Medical Solutions offering its services?

Hermes Medical Solutions is headquartered out of Stockholm, Sweden and has a significant international presence, in over 30 countries across North America, Europe, and Asia-Pacific.

The contribution of Hermes Medical Solutions in the treatment of data in the diagnostic field in Nuclear Medicine is well known but what is it implication in personal dosimetry in theranostics?

Hermes Medical Solutions stands at the forefront of personalized nuclear radiotherapy. We offer OLINDA, the premier software for organ dosimetry, utilized extensively in medical practice, by researchers devising new clinical methodologies, and importantly, by pharmaceutical companies creating groundbreaking tracers.

HMS has made personalized dosimetry more accessible by introducing single time point voxel dosimetry for various isotopes. This advancement enables dosimetry calculations from just one imaging time point, enhancing the patient experience and streamlining operational procedures.

How do you see the future of nuclear medicine in the area of Artificial Intelligence?

The future of Nuclear Medicine looks very promising, and I believe Artificial Intelligence can bring great contributions to automate the workflow of the processing of nuclear medicine examinations as well as facilitate tedious tasks like organ segmentation for example. As we move towards theranostic procedures, efficiency gains will be of great value to allow for clinicians to dedicate time on dosimetry planning and verification for each patient as well as to adapt and follow-up treatments.

What is your greatest wish for the patient requiring the services of Nuclear Medicine?

My wish is that we, as a community, are successful in providing patients with new ways to diagnose and treat conditions like cancer and neurodegenerative diseases such as Alzheimer and Parkinson's disease. Hermes Medical Solutions is deeply committed to advancing the treatment of prevalent diseases, particularly in the fields of oncology and neurology. I am truly honored to contribute to this mission. ■

René, pourriez-vous vous présenter brièvement à nos lecteurs?

Avec plaisir! Je m'appelle René Rebeaud et je dirige actuellement les activités nord-américaines et latino-américaines d'Hermes Solutions Médicales. Je travaille dans l'entreprise depuis maintenant plus de 20 ans et dans le domaine de la médecine nucléaire et de l'imagerie médicale depuis près de 30 ans. Ma formation est en physique nucléaire. Bien que ma carrière ait débuté dans des institutions cliniques comme le CHUM, j'ai rapidement assumé des rôles tels qu'en développement d'assurance qualité et physicien d'application du côté de l'industrie. La diversité des rôles que j'ai occupés, couvrant à la fois les environnements cliniques et d'entreprise, a considérablement enrichi ma carrière et renforcé ma capacité à diriger efficacement les projets d'Hermes Solutions Médicales en Amérique du Nord et en Amérique latine.

Que fait Hermes Solutions Médicales?

Hermes Solutions Médicales (HMS) est le leader en logiciel d'imagerie pour la médecine moléculaire et nucléaire depuis près de 50 ans. En tant que leader du secteur, nous avons été la première entreprise à développer et à commercialiser un logiciel de reconstruction SPECT et à introduire un logiciel de fusion et de visualisation combinée d'images médicales provenant de scanners et caméras de différents fournisseurs.

Hermes Solutions Médicales se distingue comme la seule entreprise engagée dans les logiciels d'imagerie moléculaire. Cette approche ciblée nous permet d'être plus agiles, réactifs et à l'écoute des besoins de nos clients. En intégrant les commentaires des clients, nous innovons et affinons continuellement notre célèbre suite logicielle Hermia.

Aujourd'hui, notre suite logicielle complète Hermia fournit une boîte à outils performante et hautement intuitive pour l'affichage, le post-traitement et l'analyse de l'imagerie planaire de médecine nucléaire, de la TEP/CT, de la SPECT/CT et de la TEP/MR, y compris la prise en charge de RTDOSE et RTSTRUCT. Hermia est la SEULE solution complète indépendante du fournisseur de caméra incluant la dosimétrie qui permet aux professionnels de la santé de disposer d'un logiciel de pointe pour tous les scénarios cliniques et ce dans une seule et même suite logicielle.

Dans quelle partie du monde Hermes Solutions Médicales propose-t-elle ses services ?

Hermes Solutions Médicales a son siège social à Stockholm, en Suède, et jouit d'une présence internationale significative dans plus de 30 pays en Amérique du Nord, en Europe et en Asie-Pacifique.

L'apport d'Hermes Solutions Médicales dans le traitement des données dans le domaine du diagnostique en Médecine Nucléaire est bien connu mais quelle est son implication en dosimétrie personnelle en théranostique ?

Hermes Solutions Médicales est à la pointe de la radiothérapie nucléaire personnalisée. Nous proposons Olinda, le premier logiciel de dosimétrie d'organes, largement utilisé dans la pratique médicale, par les chercheurs concevant de nouvelles méthodologies cliniques et, surtout, par les sociétés pharmaceutiques créant des nouveaux traceurs innovants.

HMS a rendu la dosimétrie personnalisée plus accessible en introduisant la dosimétrie voxel basée sur un seul point temporel et ce pour divers isotopes. Cette avancée permet d'effectuer des calculs de dosimétrie à partir d'un seul examen d'imagerie, améliorant ainsi l'expérience du patient et rationalisant les procédures opérationnelles.

Comment voyez-vous l'avenir de la médecine nucléaire dans le domaine de l'intelligence artificielle ?

L'avenir de la médecine nucléaire s'annonce très prometteur et je pense que l'intelligence artificielle peut apporter de grandes contributions pour automatiser le flux de travail des examens de médecine nucléaire ainsi que pour faciliter les tâches fastidieuses comme la segmentation des organes par exemple. À mesure que nous nous dirigeons vers les procédures théranostiques, les gains d'efficacité seront d'une grande valeur pour permettre aux cliniciens de consacrer du temps à la planification et à la vérification de la dosimétrie pour chaque patient ainsi qu'à l'adaptation et au suivi des traitements.

Quel est votre plus grand souhait pour le patient nécessitant les services de médecine nucléaire ?

Mon souhait est que, en tant que communauté, nous parvenions à offrir aux patients de nouvelles façons de diagnostiquer et de traiter des maladies comme le cancer et les maladies neurodégénératives comme la maladie d'Alzheimer et la maladie de Parkinson. Hermes Solutions Médicales est profondément engagé dans l'avancement du traitement dans les domaines de l'oncologie et de la neurologie. Je suis vraiment honoré de contribuer à cette mission. ■

« Hermes Solutions Médicales (HMS) est le leader en logiciel d'imagerie pour la médecine moléculaire et nucléaire depuis près de 50 ans. En tant que leader du secteur, nous avons été la première entreprise à développer et à commercialiser un logiciel de reconstruction SPECT et à introduire un logiciel de fusion et de visualisation combinée d'images médicales provenant de scanners et caméras de différents fournisseurs. »

INTERVIEW WITH RENÉ REBEAUD

Hermes Medical Solutions (HMS) es el líder en software de imágenes de medicina molecular y medicina nuclear desde casi 50 años. Como líder de esta industria, fuimos la primera empresa en desarrollar y comercializar el software de reconstrucción de imágenes de SPECT y en lanzar el software de fusión de imágenes médicas, combinando así, imágenes generadas en diferentes escaners o cámaras, independientes de la marca o el proveedor.

René, Podrías presentarte brevemente a nuestros lectores?

Con mucho gusto! Mi nombre es René Rebeaud y actualmente dirijo el negocio de Norte América y Latino América para Hermes Medical Solutions. Llevo más de 20 años en la empresa y casi 30 años en el campo de la medicina nuclear y de imágenes médicas. Mi formación académica es en física nuclear. Aunque mi carrera comenzó en instituciones clínicas como el CHUM, pronto asumí funciones, como Ingeniero líder para Desarrollo de Control de Calidad y físico de aplicaciones, en empresas de la industria. La diversidad de roles que he asumido, ambos clínicos y corporativos, ha enriquecido significativamente mi carrera y ha reforzado mi capacidad para dirigir las iniciativas de Hermes Medical Solutions en NA y LATAM de manera efectiva.

Qué es Hermes Medical Solutions?

Hermes Medical Solutions (HMS) es el líder en software de imágenes de medicina molecular y medicina nuclear desde casi 50 años. Como líder de esta industria, fuimos la primera empresa en desarrollar y comercializar el software de reconstrucción de imágenes de SPECT y en lanzar el software de fusión de imágenes médicas, combinando así, imágenes generadas en diferentes escaners o cámaras, independientes de la marca o el proveedor.

Hermes Medical Solutions se distingue por ser la única empresa dedicada al desarrollo de software de imágenes moleculares. Este enfoque nos permite ser más ágiles, receptivos y compenetrados con las necesidades de nuestros clientes. Al incorporar las sugerencias de los usuarios, innovamos y refinamos continuamente nuestro producto más reconocido: Hermia Software Suite.

Hoy, nuestro extenso programa Hermia Software Suite provee un detallado conjunto de herramientas de alto rendimiento e intuitivo para la visualización, el procesamiento y el análisis de imágenes de medicina nuclear, PET/CT, SPECT/CT y PET/MR, incluyendo RTDOSE y RTSTRUCT. HERMIA es la ÚNICA solución independiente para profesionales clínicos que provee los desarrollos y aplicaciones más recientes para el análisis de imágenes clínicas en una sola plataforma.

Dónde ofrece sus servicios Hermes Medical Solutions?

Hermes Medical Solutions tiene su sede en Estocolmo, Suecia, y tiene una importante presencia internacional en más de 30 países de América del Norte, Europa y Asia-Pacífico.

Es bien conocida la contribución de Hermes Medical Solutions en el tratamiento de data en el campo diagnóstico de Medicina Nuclear, pero ¿qué implicaciones tiene en la dosimetría personal en teranóstica?

Hermes Medical Solutions está a la vanguardia de la radioterapia nuclear personalizada. Ofrecemos OLINDA, el principal software para la dosimetría de órganos, utilizado ampliamente en la práctica médica, por investigadores que diseñan nuevas metodologías clínicas y, lo que es más importante, por empresas farmacéuticas que crean radio-trazadores innovadores.

HMS ha hecho que la dosimetría personalizada sea más accesible mediante la introducción de la dosimetría de vóxel usando un solo estudio o scan de SPECT (STP), para varios radiofármacos. Este avance permite realizar cálculos dosimétricos desde un solo tiempo de obtención de imágenes. Mejorando así la experiencia del paciente y agilizando los procesos operativos.

Cómo ves el futuro de medicina nuclear en el área de la Inteligencia Artificial?

El futuro de la Medicina Nuclear parece muy prometedor, y creo que la Inteligencia Artificial puede contribuir a automatizar el procesamiento de los exámenes de medicina nuclear, así como facilitar la segmentación de órganos, por ejemplo. A medida que avanzamos hacia los procedimientos teranósticos, el aumento en eficiencia permitirá a los médicos dedicar tiempo a la planificación y verificación de la dosis de cada paciente y a adaptar y hacer un seguimiento de los tratamientos.

Cuál es su mayor deseo para el paciente que requiere los servicios de Medicina Nuclear?

Mi deseo es que nosotros, como comunidad, tengamos éxito en proporcionar a los pacientes nuevas formas de diagnosticar y tratar afecciones como el cáncer y enfermedades neurodegenerativas como el Alzheimer y la enfermedad de Parkinson. Hermes Medical Solutions está profundamente comprometida con el avance del tratamiento de enfermedades prevalentes, particularmente en los campos de la oncología y la neurología. Me siento verdaderamente honrado de contribuir a esta misión.

Outils de lecture

Pneumologie

Intelligence Artificielle

Cardiologie

Théranostiques et thérapies

Dosimétrie

Oncologie

Neurologie

Gastro-entérologie

Hépatologie

Endocrinologie

Ostéologie

Néphrologie

HERMIA

Logiciel d'Imagerie Moléculaire Tout-en-un

Une plateforme logicielle robuste et universelle permet aux professionnels de la santé de simplifier leur flux de travail, d'augmenter la productivité et la qualité tout en intégrant le développement rapide des appareils d'imagerie, des théranostiques ainsi que des examens de médecine nucléaire.

Voici HERMIA – La solution unique répondant aux multiples facettes du monde de l'imagerie moléculaire. Notre suite logicielle de pointe offre de nombreuses fonctionnalités novatrices pour la lecture et l'analyse de toutes les études TEP/TEMP/TDM/IRM.

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HERMES MEDICAL SOLUTIONS

INTERVIEW WITH JAMES WILLIAMS

Dear James Williams could briefly present yourself to our readers?

I am the worldwide head of Molecular Imaging for Siemens Healthineers and based in Knoxville, Tennessee. Molecular Imaging (MI) for us includes the PET & SPECT imaging modalities as well as the PETNET radiopharmaceutical business. I originally trained as a scientist and started with Siemens in their research labs in Princeton, focusing on work in medical imaging with a specialty in image guidance for interventional radiology. After that I spent most of a decade in Germany working on angiography systems before returning to the US in 2013 as CEO of Molecular imaging

Siemens Healthineers has been, and is still, an indispensable partner to make sure that Molecular Imaging will be at its highest level to help the nuclear medicine physicians to investigate and treat their patients. What do you see are the 3 most important challenges for the next 3 years?

The last decade has been a real renaissance for nuclear medicine, driven largely by clinical theranostic adoption. The success of specific tracers and therapies for neuroendocrine and prostate cancer has brought deserved recognition, excitement, and investment to the area.

Looking at the challenges for the next 3 years is quite short-term, but several come immediately to mind:

First, and perhaps most difficult: understanding response and non-response in radionuclide therapy. There are multiple targets in development as well as multiple radionuclides for energy delivery. I think better understanding of in-vivo effects will be enlightening. Dosimetry alone is probably not sufficient to generate this understanding. I see opportunity in looking at cellular level response mechanisms to radiation damage. We are in a much better position today with radionuclide therapy to be able to look at these responses in-vivo, there are three reasons for this. 1. The radiation exposure from RNT is titrated over a reactively long time period, giving a more flexible imaging window. 2. There is already a reasonably well-developed toolbox of PET tracers for potentially interesting processes which is continually expanding. 3. Although the signal may be more attenuated due to the extended duration of RNT radiation delivery, we have much more sensitive PET scanners that should be able to adequately image and quantify what tracer there is.

The second challenge is one that I think most NM departments face today, people. Growth in procedure demand has in some areas outpaced the training of new techs, physicists, and physicians. We can compensate this in the short term with increased productivity, supported with technology to help automate some of the processes. However, in the mid to long term, we just need to bring more people into the field.

As for a third challenge, I would again look at RNT. Specifically, what might happen when RNT moves into earlier treatment stages and how can it be effectively combined with the existing therapeutic toolbox. This puts biology and physiology back in the center of focus just as in the case for understanding treatment response in later stage disease.

How Siemens Healthineers see the contribution of Artificial Intelligence in the world of Molecular Imaging?

We have been extensively using trained networks in conjunction with conventional analytic algorithms to help with a number of automation problems for some time and there are broad areas where they are proving very effective.

First of those is in the automation of some repetitive data-driven tasks. A simple example is assisting of scan planning based on either a topogram or a live camera image. Providing assistance to the tech for these kinds of repetitive tasks can save a lot of time and allow more time to focus on patient care.

In the scanning and reconstruction phase, there are opportunities to automate and to accelerate the process which we do leverage. However here we are cautious to not cross the line and alter the presented image in any way that is not quantitatively in agreement with the fundamental physics. We have a responsibility to the reader not to create something for which there is no direct physical evidence, nor suppress potentially meaningful data in pursuit of a more pleasing impression. AI can produce some beautiful pictures, but one cannot cheat on the physics.

Post processing, analysis and reporting have tremendous potential for the application of AI and we see already how voice recognition and intelligent assisted population of reports can save time and yield more consistent results. This has much of the same benefit for physicians as scan automation has for the techs, giving more time to focus where they need to.

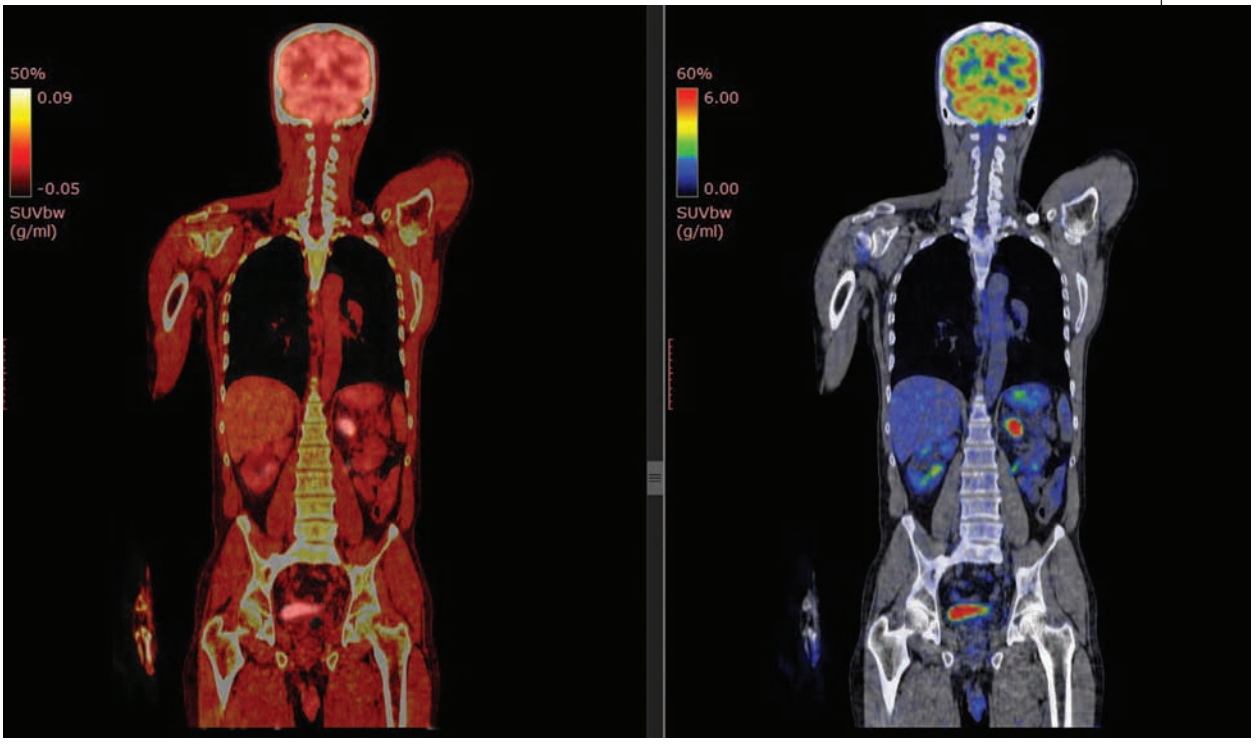
How Siemens Healthineers is involved in the incredible expansion of Theranostics?

When I discussed the three challenges earlier, it was probably obvious that we take this seriously since two of the three involve Theranostics. In addition to the basics, provision of imaging systems and diagnostic PET radiopharmaceuticals, we are actively sponsoring research and co-development with numerous academic partners to help answer these questions and improve our products to support future needs. These range from preclinical investigations of new imaging techniques for radiation-induced cellular processes to the development of high speed, high accuracy dosimetry scanning protocols for a full spectrum of isotopes.

What is your greatest wish for the patients in need of these new developments in the world of Molecular Imaging?

My single and most basic wish is that our work helps improve patient outcomes, both individually and collectively. How to get there involves not only investing in innovation on the cutting edge, but also ensuring that those innovations become broadly available worldwide and that there is access to care for those who need it. Theranostics really holds the potential to be both an effective medically advanced therapy and to be affordable. I think it is up to all of us in the field to keep both those goals always in mind.

"The last decade has been a real renaissance for nuclear medicine, driven largely by clinical theranostic adoption. The success of specific tracers and therapies for neuroendocrine and prostate cancer has brought deserved recognition, excitement, and investment to the area."



Mr. Pierre-Marie Lemer
President, Lemer Pax SAS

Mrs. Valérie Chevreul
Chief Executive Officer, Lemer Pax SAS

Mr. François Hébert,
Chief Revenue Officer,
Lemer Pax America

Mr. Pierre-Marie Lemer, can you briefly introduce yourself to our readers?

Descendant of the founder of the family lead foundry created in 1872, I joined the LEMER group in Nantes, France in 1982 and took over, in 1995, the General Management of Lemer Pax spin-off company created in 1970 and dedicated to radiation protection. I became President in 2005.

After a university education in the United States, I owe most of my professional culture to a complete immersion in the company group, especially in the management of the design/engineering office. Aware from the start, of the French market relatively small size, I chose to expand our business internationally to accelerate the development of the company while ensuring the quality and innovation of "Made In France" products on the global stage by relying on an excellent network of local partners.

In 2018, I co-founded, with the CEO of Lemer Pax **Valérie Chevreul** and partners from Nuclear Medicine, **Global Morpho Pharma**, a company aiming at the development and distribution of radionuclides and radiopharmaceuticals in compliance with Good Manufacturing Practices for the benefit of cancer patients and the promising field of targeted therapy. More recently, in 2023, we created Lemer Pax America in Montreal, Canada, in order to meet the rising demand of the North American nuclear medicine market.

Tell us about Lemer Pax and its contribution to Nuclear Medicine?

Today, Lemer Pax, recognized as a strategic company by the French government, **is the historical leader in the French Nuclear Medicine market and still stands out. It is in our DNA, our ability to innovate in the radiation protection market.** Lemer Pax covers, for example, the entire GMP equipment requirements for radiopharmaceuticals and industrial laboratories. A solid industrial and technological business, employing 125 people, Lemer Pax designs and manufactures innovative high-tech protection solutions (more than 100 international patents), individual and collective, in the fields of Nuclear Medicine, radiopharmacy, interventional medicine in cardiology, neurovascular and peripheral vascular, as well as in the civil nuclear industry and research.

In addition, Lemer Pax was **the first company in the world** to have standardized shielded cells for PET (Positron Emission Tomography) and later designed and developed a mobile unit for the preparation and patient injection of high-energy radiopharmaceuticals, the Posijet®.

With the rapid development of theranostics, how does Lemer Pax bring its added value in the treatment of patients in Nuclear Medicine?

Nuclear Medicine is rapidly evolving towards targeted therapy, this is a fact and very good news for patients. It uses radioactive drugs from diagnostic applications in imaging to therapeutic applications in oncology. This year we have launched the Theranojet® ^{ARA} on the European and North American market, a new secure infusion pump shield dedicated to theranostic products and co-developed with the AP-HP (Assistance Publique-Hôpitaux de Paris). The Theranojet®^{ARA} is an innovative, patented device in the form of an injection pump shield designed for the radiation protected intravenous administration of radiopharmaceutical drugs for RadioPharmaceutical Therapy (RPT) most commonly using 177Lu. These therapies induce an increased risk of radiation exposure and external contamination of medical personnel. The utilization of this needleless device has been shown to drastically reduce the exposure of medical personnel to ionizing radiation at every stage from the handling of radiopharmaceuticals to preparation, administration, disconnection and waste management. A result that is fully in line with our **"Protecting Life" signature.**

Also, within the framework of this new medical approach aimed at accelerating the simultaneous development of diagnostic and therapeutic aspects in Nuclear Medicine, Lemer Pax has invested in Research and Development of our Posijet®, a shielded injector of radiopharmaceuticals, to add the therapy indication, thus opening up parallel access to PET diagnostic injections and RPT injections with the same level of safety. With the launch on the market of new molecules like ^{177}Lu-DOTATATE for the treatment of neuroendocrine tumors, as well as ^{177}Lu-PSMA for specific prostate indications, the Lemer Pax team wanted to support these developments by offering healthcare professionals the opportunity to improve the effectiveness and safety of their administration methods for these new radiopharmaceutical drugs.

INTERVIEW WITH PIERRE-MARIE LEMER

How do you see the future of nuclear medicine?

Nuclear medicine is a rapidly evolving specialty. It offers incomparable diagnostic and treatment solutions, personalized for the remission and cure of serious pathologies. **For me, the future of Nuclear Medicine is the deployment of therapy.**

We are clearly experiencing a **therapeutic revolution** for the benefit of the patients, mainly through the use of new technologies. Advances in PET and SPECT scanners allow for more accurate visualization of tissues and biological processes, improving the diagnosis and monitoring of diseases. There is also a **revolution** in the tremendous potential of developing new isotopes associated with new molecules capable of targeting several types of cancer. Nuclear Medicine offers possibilities for targeted therapies, where radioisotopes are used to selectively destroy cancer cells while preserving healthy tissue. These new therapies detect the surface characteristics of cancer cells, before attaching the radioactive molecule that will make them visible, irradiate them and finally destroy them. A major step forward!

What is your greatest wish for patients in need of Nuclear Medicine services?

For patients requiring nuclear medicine services, the future is brighter today than it was yesterday. Advances in technology allow for accurate and early diagnoses leading to better patient care with better results regarding their health. Targeted therapies, which are personalized and less invasive than other treatment proposals, significantly reduce side effects and as such greatly improve patients quality of life.

Nuclear medicine also offers valuable tools for monitoring and managing chronic diseases such as cardiac, neurological, and oncological diseases, allowing physicians to monitor the evolution of the disease and adjust treatments accordingly. My absolute wish is to see the Nuclear Medicine services expand to make them accessible and available to as many patients as possible so that they can benefit from the latest radiopharmaceutical drugs, as they become standard of care, which carry great hopes of recovery.

"Nuclear Medicine is rapidly evolving towards targeted therapy, this is a fact and very good news for patients. It uses radioactive drugs from diagnostic applications in imaging to therapeutic applications in oncology."

INTERVIEW WITH MINA BECHAI

Mina Bechai
FOUNDER /CEO Initio

"INITIO Medical Group, a renowned private nuclear medicine facility headquartered in Burnaby, British Columbia, is rapidly expanding its presence across Canada."

Dear Mina could you briefly present yourself to our readers?

Mina is a seasoned entrepreneur with a proven track record of building and scaling successful businesses across both medical and non-medical sectors. His unwavering vision is to improve accessibility and enhance the quality of cancer treatment within Canada's public healthcare framework. With a keen focus on driving innovation and sustainable growth, Mina has been instrumental in crafting and executing strategic initiatives that foster public-private partnerships and develop key relationships with provincial health authorities.

Mina's leadership extends beyond the boardroom as he is deeply committed to supporting organizations aimed at creating a positive impact on patients' well-being. He actively invests in improving awareness and education in Canadian healthcare by initiating scholarships with BCIT to increase the number of graduate students to meet the increasing demand in the workforce and forming partnerships with organizations such as the Canadian Nuclear Machine Association and the Ontario Brain Injury Association to publish guidelines.

Mina's efforts are not just about business success; they reflect a genuine dedication to advancing healthcare, driving innovation, and creating a tangible difference in the lives of individuals across Canada.

What is Initio medical?

INITIO Medical Group, a renowned private nuclear medicine facility headquartered in Burnaby, British Columbia, is rapidly expanding its presence across Canada. With an unwavering commitment to advancing patient care and healthcare innovation, INITIO proudly stands as english Canada's sole private pet/ct and theronastics facility. With over 20 years of experience, the facility ensures rapid access to diagnostics and treatment, effectively addressing critical medical needs.

Recognizing the pivotal role it plays in meeting the growing demand in healthcare and increasing both capacity and awareness, INITIO Medical Group continues to foster public-private partnerships. This proactive approach entails persistent collaboration with public entities, industry stakeholders, and research institutions, enhancing the facility's capabilities and significantly contributing to the overall improvement of healthcare services in the region.

What kind of services are they offering to the patients?

We provide full range pet ct diagnostic imaging and theranostics for both routine clinical practice and clinical trials.

In which part of Canada are those services available?

Currently in Vancouver bc with expansion plans in every Canadian province starting with Ontario , Saskatchewan and Alberta

What is Initio medical goal and mission statement?

At Initio Medical, our goal and mission revolve around closing the disparity present in the Canadian healthcare infrastructure. We aim to empower physicians to deliver healthcare based on the best practices in medicine rather than being limited to what the system offers. Our primary objective is to enhance accessibility through efficient and sustainable means, prioritizing community well-being over financial gains.

To achieve this, we plan to collaborate with public health entities to leverage private sector resources for expanding the healthcare infrastructure. Through this synergy, we aspire to deliver high-quality, affordable healthcare services that are accessible to all, with costs covered by public funding.

What is your greatest wish for the patients requiring the services of Nuclear Medicine?

My wish is to provide hope for every patient by increasing awareness and accessibility to all.

DR. GISELA ESTRADA-SÁNCHEZ

The Latin American Association of Societies of Biology and Nuclear Medicine (ALASBIMN) is a Scientific Society founded in 1964, whose permanent secretariat is located in Montevideo, Uruguay. It includes the Biology and Nuclear Medicine Societies of Latin America: Argentina, Bolivia, Brasil, Chile, Colombia, Ecuador, Guatemala, México, Paraguay, Perú, Uruguay and Venezuela.

The main purpose of ALASBIMN is to promote the development of Nuclear Medicine in the region, generating spaces for exchange and learning.

Nuclear medicine is a medical specialty that uses very small amounts of radioactive tracers (radio-pharmaceuticals) to diagnose and treat disease. Specially designed cameras allow doctors to track the path of these radioactive tracers. Single Photon Emission Computed Tomography or SPECT and Positron Emission Tomography or PET scans are the two most common imaging modalities in nuclear medicine.

Nuclear Medicine provides unique information that often cannot be obtained using other imaging procedures to help diagnose. Nuclear imaging shows organ and tissue structure as well as function.

SPECT scans are primarily used to diagnose and track the progression of heart disease, such as blocked coronary arteries. There are also radiotracers to detect disorders in the brain, thyroid, kidneys, parathyroids, bone, breast, lungs, gall bladder and intestinal bleeding.

The major purpose of PET/CT scans is to detect cancer and monitor its progression, response to treatment, and to detect metastases using different radiotracers, the most common is glucose.

Nuclear medicine is used to treat various pathologies. These include hyperthyroidism, thyroid cancer, lymphomas, prostate cancer, neuroendocrine cancer and bone pain due to metastasis.

Dr. Gisela Estrada-Sánchez, MD, PhD.

Nuclear Medicine Physician
18 years of experience in PET/CT. High resolution breast PET
Treatments with I-131, Ra-223, Lu-177.
She is the chief of the PET/CT department at
Imagen Tomográfica y Molecular in Cancun, Mexico.
Dr. Estrada authored numerous peer-reviewed research articles, reviews, committee publications and editorials. She co-edited The book PET and PET/CT in Oncology. Ed. Panamericana, 2013.
President Mexican Board Nuclear Medicine 2018-2021.
President Mexican Federation of Nuclear Medicine 2021-2023.

President of ALASBIMN 2023-2025.

Nuclear medicine physicians are strongly committed to keeping radiation exposure to patients as low as possible, giving the least amount of radiotracer needed to provide a diagnostically useful examination.

ALASBIMN has a Journal that publishes different topics in general nuclear medicine and PET/CT http://www.alasbimnjournal.net/, also organizes a meeting every two years, the next one will be in Cancún, México in April 2025.

All the updated information will be at Federación Mexicana de Medicina Nuclear e Imagen Molecular 2021 and in the ALASBIMN page https://alasbimn.net/acerca-de-alasbimn/

INTERVIEW WITH HEATHER HUGHES

Heather Hughes (she/her), RTNM, CBDT
Instructor, SoHS Nuclear Medicine

Are you seeking a career with excellent hours, benefits, and opportunities for advancement? Do you wish to work in a growing field that integrates cutting-edge technology with patient care? If so, consider the rewarding path of a nuclear medicine technologist! Hi, I'm Heather, a registered nuclear medicine technologist and an instructor of nuclear medicine at BCIT. I often joke that nuclear medicine is "the best job you've never heard of," so allow me to shed some light on who we are and what we do.

Nuclear medicine technologists play a crucial role in the healthcare system, conducting specialized diagnostic imaging and administering targeted cancer therapies. Trained to safely handle radiation and operate highly specialized technology, we prioritize patient care alongside technical expertise. BCIT is the only school in British Columbia and one of only five in Canada offering nuclear medicine technologist training. Graduates of our program predominantly work in hospitals or clinics, performing diagnostic imaging and some therapeutic treatments for patients.

"Nuclear medicine technologists play a crucial role in the healthcare system, conducting specialized diagnostic imaging and administering targeted cancer therapies. Trained to safely handle radiation and operate highly specialized technology, we prioritize patient care alongside technical expertise."

While nuclear medicine has quietly existed in Canada since the late 1960s, it's now poised for significant growth, especially with the emergence of "Theranostics," a term coined to combine therapeutic and diagnostic imaging. This field holds immense promise for effectively diagnosing and treating cancer and other diseases. With billions of dollars presently being allocated for researching new radiopharmaceuticals, the career outlook in nuclear medicine is promising. There will be tremendous growth in the field, leading to an unprecedented demand for technologists!

At BCIT, our Nuclear Medicine Diploma Program is streamlined for efficiency and competency-based training. In just 24 months, graduates are job-ready and eligible to write certification exams required for entry-to-practice in Canada or the US. Prospective students can expect a rigorous two-year curriculum that combines coursework with extensive clinical practicum experience. During the first year, from September to May, students delve into foundational nuclear medicine sciences, radiation safety, and patient care. Then, from June to August, they embark on their first practicum, applying classroom knowledge to real-world clinical cases. In second year, students alternate between classroom instruction and clinical practicums, further refining their skills. Placements in various clinical settings ensure students graduate with ample practical experience, and ready for work. The practicum locations include general nuclear medicine departments within hospitals as well as specialty clinical placements at BC Children's Hospital, BC Cancer Agency for PET imaging, and 4 weeks in dedicated CT departments.

BCIT proudly boasts a nearly 100% employment rate for our nuclear medicine graduates, who are highly sought after both nationally and internationally. In response to this demand, many job postings now offer relocation allowances and signing bonuses to attract and retain talented technologists. There are also several career advancement opportunities for nuclear medicine technologists, including roles in research, hospital administration and management, radiation safety and quality assurance, informatics, and teaching. Research roles, particularly in radiochemistry, are presently burgeoning in Canada with the goal to develop novel radiotracers for targeted cancer therapy.

New funding opportunities are currently available for students. The British Columbia provincial government recently allocated $15 million in bursaries for students attending priority programs, with nuclear medicine being one of them. Our students currently receive automatic bursary grants of $2000 per year! Furthermore, BCIT recently built a state-of-the-art Health Sciences Center, featuring redesigned learning spaces and new cutting-edge equipment, including a Siemens Intevo Bold SPECT/CT gamma camera, Hermes processing software, and a fully operational radiopharmacy lab. Students benefit from hands-on experience with this real-world technology before entering their clinical practicums. Our curriculum continually evolves to incorporate advancements in PET, CT, and Theranostics, supplemented by simulation-based learning experiences. Several instructors in the program are graduate technologists themselves with ample clinical expertise to share, and all instructors are committed to nurturing the next generation of nuclear medicine professionals.

With only 16 students accepted into each September cohort, strong bonds are forged among students, fostering lifelong connections within the nuclear medicine community. Despite its relative smallness, this community fosters a deep sense of camaraderie and collaboration that is evident in recurring professional development at conferences hosted by the CAMRT and the SNMMI associations. For a fulfilling career in a dynamic field where you can truly impact patients' lives, consider becoming a nuclear medicine technologist. The future awaits your expertise!

For more information on entrance requirements, visit our website: https://www.bcit.ca/programs/nuclear-medicine-diploma-full-time-6700diplt/. You can also follow us on Instagram **@BCIT_NuclearMedicine** to see what our students are up to.

INTERVIEW WITH CATHY SUE CUTLER

Cathy Sue Cutler, PhD, FSNMMI

Could you briefly present yourself to our readers?

I chair the Isotope Research and Production Department at Brookhaven National Laboratory. which is part of the U.S. Department of Energy (DOE) Isotope Program. We utilize our unique facilities to provide isotopes that are not commercially available, to perform novel research and development and to develop the work force. We support one of the nuclear chemistry summer schools, which is nearly 40 years old, and open our facilities for faculty and students to perform research that can't be done at their home institutions. I was trained as a chemist and drawn into nuclear medicine based on the impact it has on patients and the cross-disciplinary nature of the field.

SNMMI plays an important role in nuclear medicine worldwide. As the new president, what will be your major areas of focus?

I was introduced to SNMMI early in my career. The networking opportunities it provides across different disciplines are critical to moving the field forward, and the Annual Meeting offers exceptional education opportunities. The SNMMI engages stakeholders to advocate for the field, ensuring that regulations do not impede patient access and that proper reimbursement is in place. These are critical areas that we will need to continue to address over the coming year. Another challenge we are facing is the shortfall in the number of appropriately trained professionals available to do the work in this rapidly expanding field.

What will be the impact of artificial intelligence in the practice of nuclear medicine?

We look forward to utilizing artificial intelligence to support our work by handling time-intensive tasks, freeing up time for professionals to devote to patients and to tasks that require unique and advanced expertise and creative problem-solving.

With the rapid expansion of theranostics, what are the major challenges that nuclear medicine specialists and technologists will have to overcome?

This field has expanded so quickly in recent decades that it is challenging to keep up. There are logistical and technical challenges, regula-tory considerations and requirements, and medical considerations related to training and development of the expert work force. In addition, we need to work through where theranostics fit into the treatment algorithm and how nuclear medicine physicians and technologists will collaborate with the care team.

Finally, as the new president of the SNMMI, what is your greatest wish for the patients?

I hope to use my time as president to raise awareness among patients and the public about nuclear medicine – what it is, how it works, and how it may enhance the quality of life of those dealing with cancer, heart issues and other types of disease. I will focus on ensuring that patients have access to nuclear medicine scans and therapies that could change the course of their treatment. In addition, I will work to maintain and increase patient access to nuclear medicine treatment and diagnosis by ensuring that the profession has appropriate support from our government.

"We look forward to utilizing artificial intelligence to support our work by handling time-intensive tasks, freeing up time for professionals to devote to patients and to tasks that require unique and advanced expertise and creative problem-solving."

THE ONCIDIUM FOUNDATION'S COMMITMENT TO GLOBAL RADIOLIGAND THERAPY ACCESS FOR CANCER PATIENTS

An Interview with Rebecca Lo Bue, CEO of the Oncidium Foundation, on the Foundation's Mission to Increase Global Access to Radioligand Therapy for people living with cancer.

"The Oncidium foundation is a non-profit organization dedicated to supporting and advancing global development of radio-theranostics for cancer care."

Dear Rebecca could you briefly present yourself to our readers?

Of course. My name is Rebecca Lo Bue, and I have been the CEO of the Oncidium foundation since the beginning of its operational activities in 2019. I've worked in the nuclear medicine field for over 20 years and have witnessed the increasing interest in and need for personalized therapies for people living with cancer.

Initially, I was responsible for setting up the foundation and launching our activities. I managed to do so by establishing a team at our headquarters in Belgium and by building a large and global network of radiotheranostics enthusiasts and experts, at present composed of 75 Ambassadors, allowing us to work across borders.

Today, my role includes overseeing the organization's strategic direction while keeping patients at the center of all we do. At Oncidium foundation, we work towards broader and more equitable awareness of and access to radiotheranostics for cancer care.

It brings me great satisfaction to work for such a meaningful cause. Leading this foundation is a great honor, and I am humbled to be given the opportunity, alongside my colleagues, to help people living with cancer get access to this life-saving option.

What is the Oncidium foundation and what is its objective?

The Oncidium foundation is a non-profit organization dedicated to supporting and advancing global development of radio-theranostics for cancer care, founded in 2011 by Dr. Richard Zimmermann who foresaw that radiotheranostics were going to gain momentum. His next major concern was: "How are we going to make this technology available to the largest number of patients?" And this is how the Oncidium project flourished.

The foundation envisions a world where radioligand therapy (RLT) is within reach for every individual affected by cancer. To achieve that, we work around three key pillars:

Access: We endeavor to consolidate the RLT ecosystem and create cohesion between interlocutors. This includes, surrounding ourselves by expert Ambassadors, helping patients find nearby treatment facilities; offering information on clinical trials; offering a worldwide map for practitioners to register their therapy centers to help patient assess if they are RLT candidates and highlighting advancements in precision medicine and its applications for experts in the field and healthcare professionals in general.

Education: Patients and non-nuclear practitioners are generally unaware of the existence of RLT. We tackle these awareness gaps by providing educational resources tailored to patients, oncologists, and the nuclear medicine community. This ensures that everyone has the knowledge they need to understand and access these treatments.

Hope: We are driven by the long-term vision of improving lives globally by financing treatment for patients that are not able to afford the therapy costs or by actively supporting groundbreaking research and projects to expand accessibility to innovative treatments, building hope for patients, when other options have failed.

How does the Oncidium foundation interact with different Nuclear Medicine organisations in the World?

We engage with various nuclear medicine organizations globally notably through a well-established network of Ambassadors, which currently includes over 75 individuals across 20 countries.

The most important aspect of this interaction is that it is patient-centric. Everything we do has the collective goal of centering patients at the heart of our work. Our Ambassadors help us to stay grounded in this principle by bringing insights from their regions and by actively seeking ways to improve patient access to radiotheranostics. We maintain a global perspective while focusing on local initiatives, allowing us to make meaningful connections that benefit patients worldwide.

Through our Ambassadors, we are also able to connect with local nuclear medicine communities, attend nuclear medicine and oncology conferences, and work closely with other organizations to further our mission of expanding the reach of radiotheranostics.

Our Ambassadors play an essential role in maintaining these connections. They have volunteered to be our representatives on the ground, working within their regions to understand the local challenges, opportunities, and needs. Through their participation in events and their ongoing communication with other nuclear medicine professionals, we ensure that we are building strong relationships and identifying opportunities for collaboration.

Become our next ambassador: www.oncidiumfoundation.org/volunteer/#ambassador.

"We engage with various nuclear medicine organizations globally notably through a well-established network of Ambassadors, which currently includes over 75 individuals across 20 countries."

"Our primary focus is on supporting patients through every step of their radioligand therapy journey. This begins by enhancing patient access to treatment."

"My greatest wish is also to make radiotheranostics treatment for cancer care so widely known that patients around the world ask their doctors about this therapy to see if it's a suitable option for them. The earlier a patient can access this treatment, the higher their chances of success."

How does the Oncidium foundation provide support to the patients and where in the World?

Our primary focus is on supporting patients through every step of their radioligand therapy journey. This begins by enhancing patient access to treatment. Recognizing the disparities in access to RLT based on location and financial resources, we've launched the RLT-Connect Platform. This initiative connects healthcare practitioners with leading medical radioisotope companies to facilitate the donation of treatment doses for patients who cannot afford the therapy costs. It focuses on regions with existing RLT facilities but where treatment isn't readily available or reimbursed, mainly in low- and middle-income countries.

target 365 lives WITH RLT-CONNECT

The endpoint is simple math: we envision helping 365 lives over the next five years, which is equivalent to 2000 doses. Key radioisotopes suppliers, radiopharmacies and healthcare professionals are already on board by donating doses, lab time or delivering doses to patients. We are also happy to count on the collective support of individuals and companies that believe and trust us in this great cause. We are also currently discussing with other key stakeholders that are interested to join our initiative, to bring us one step closer to a future where accessible cancer care knows no bounds.

In parallel, we put many efforts into raising awareness about RLT and its potential to enhance patient quality of life. We achieve this through educational content that explains the technique in simple terms and demystifies concerns about radioactivity. Our commitment to patient support knows no borders. Through our network of Ambassadors in various countries, we ensure that our reach extends far and wide to ensure that everyone has access to the information and resources they need.

We also understand that the most powerful insights often come from those who have experienced RLT firsthand. That's why we actively engage with patients who have undergone treatment, encouraging them to share their stories, challenges, and lives post-therapy. These testimonials not only provide valuable support to others facing similar situations but also help us refine our approach to patient care.

As Chief Executive Officer what is your greatest wish for your foundation and the patients that you are helping?

It's evident that I aspire for everyone to have access to this treatment, regardless of their background, financial situation, or where they live. Cancer care should have no boundaries or limitations.

My greatest wish is also to make radiotheranostics treatment for cancer care so widely known that patients around the world ask their doctors about this therapy to see if it's a suitable option for them. The earlier a patient can access this treatment, the higher their chances of success.

I'm grateful for the opportunity to share how we, at the Oncidium Foundation, are passionately working to advance this mission. Our goal is to ensure that everyone, everywhere, can access the best possible cancer care.

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James McBrayer
Managing Director and CEO of Cyclopharm/ Cyclomedica

A NEW ERA IN NUCLEAR PULMONOLOGY: EVOLUTION, IMPACT, AND FUTURE PROSPECTS

Summary:

This article reviews the history of diagnostic lung imaging and explores the pivotal shift towards the burgeoning field of nuclear pulmonology.

The nuclear medicine landscape of lung imaging has undergone a remarkable evolution, from the early days of planar imaging to contemporary techniques of SPECT (Single-Photon Emission Computed Tomography) and SPECT CT (Computed Tomography) with quantification.

In recent years, the ventilation imaging challenges specific to COVID-19 have only served to accelerate the progression and utility of nuclear medicine in lung imaging. This progression has hastened in an exciting new era of novel diagnostic and therapeutic avenues well beyond pulmonary diseases - and with it the prospect of improved patient outcomes.

"The nuclear medicine landscape of lung imaging has undergone a remarkable evolution, from the early days of planar imaging to contemporary techniques of SPECT (Single-Photon Emission Computed Tomography) and SPECT CT (Computed Tomography) with quantification."

Introduction: The Evolution of Lung Imaging

The history of diagnostic lung imaging in nuclear medicine is a testament to the pursuit of precision medicine. Planar imaging, though a cornerstone in early lung diagnostics, lacks the depth and detail offered by the modern techniques using SPECT and SPECT CT. At the next level of progression, evolving nuclear pulmonology techniques, supported by a growing body of peer reviewed clinical evidence, is revolutionizing our understanding of pulmonary physiology and pathology.

Nuclear medicine lung imaging is historically best known for diagnosing acute pulmonary embolism (PE). Drawing insights from the seminal works of Roach, Bailey, Leblanc, Bajc, Le Roux, King, Gibson and others, this article briefly discusses the expanding role of nuclear medicine in diagnosing and managing pulmonary diseases Beyond PE, such as chronic thromboembolic pulmonary hypertension (CTEPH), asthma, COPD, lung cancer, lung transplant evaluations, and interventions in respiratory medicine.

A crucial aspect of this progression is the rapid advances in nuclear medicine compared to imaging with computed tomographic pulmonary angiography (CTPA). While CTPA remains the frontline modality for diagnosing acute PE, nuclear medicine techniques offer unique advantages, especially in scenarios where CTPA may be inconclusive, contraindicated or where concerns exist about the high radiation dose in patient populations including paediatrics[19] and young women. CTPA, for example, delivers up to 20 times higher radiation to the breast dose than a nuclear medicine ventilation perfusion (V/Q) study.[23, 40]

Despite the widespread use of CTPA for determining acute PE, present-day nuclear medicine methods are delivering improved sensitivity, specificity, negative predictive values, positive predictive values and accuracy at a fraction of CTPA's radiation dose[40]. The following diagram provides a comparison of the expected clinical outcomes between CTPA versus the various ventilation perfusion (V/Q) techniques available via nuclear medicine.[1,2,3]

In the case of a ventilation perfusion SPECT CT study, where a low dose of non-contrast CT is also performed with the nuclear medicine study, the ability of nuclear imaging to provide metabolic insights, complemented by anatomical referencing from CT and automated analytical tools[13, 27], is paving the way for a potential subspecialty in nuclear medicine.

Introduction: The Evolution of Radiopharmaceuticals in Lung Imaging

Essential to any nuclear medicine study is a radiopharmaceutical or tracer that has an affinity for a disease state, a metabolic process or organ system. By combining ventilation and perfusion images, clinicians can evaluate lung function, identify areas of ventilation-perfusion mismatch (which can indicate conditions like pulmonary embolism or other lung diseases), and make other diagnostic and treatment decisions.

Perfusion imaging is achieved with Technetium-99m labelled macroaggregated albumin (Tc-99m MAA). These particles are injected into a vein and become trapped in the small blood vessels of the lung, allowing imaging of blood flow distribution.

Radiopharmaceuticals used in ventilation imaging have evolved over time and are being leveraged to drive some of the advancements in this field. There are four tracers used in nuclear medicine ventilation studies. They are; inert gases, Krypton-81m and Xenon-133; Tc99m based agents, to include 99mTc-

diethylenetriaminepentaacetic acid aerosol (Tc99m-DTPA) and the ultrafine 99mTc-carbon dispersion of Technegas. Kr-81m's use is limited by availability, cost, and its short half-life, and is less practical for SPECT imaging. Xenon-133, due to its low energy, long administration time and inability to be utilized with SPECT, has progressively been displaced globally in favour of the Tc99m based agents. [3, 4, 5, 36, 37, 38]

99mTc-DTPA has aerosolized droplets with varying sizes (0.5–2 µm), with distribution dependent on the aerodynamics of gas flow. As a result, 99mTc-DTPA aerosol ventilation studies can be confounded by deposition in large airways, and this issue is exacerbated in patients with respiratory symptoms. The ultrafine Tc99m-Technegas particles with greater than 80% that are less than .92 µm, by contrast, have a gas-like distribution, particle-like retention, and the attractive properties of 99mTc to allow high-quality imaging, including SPECT. Internationally, Technegas is considered the best alternative for the ventilation portion of the V/Q scan. [3, 4, 22, 36, 37, 38]

Furthermore, according to the recently published Canadian Guidelines for ventilation/perfusion (V/P SPECT) in pulmonary embolism state, "For ventilation, 99mTc-Technegas is the best radio-aerosol, particularly in patients with COPD. Liquid aerosols produced in nebulizers such as 99mTc-DTPA are inferior for SPECT and should not be used unless Technegas is not available." [3]

Technegas was approved by the United States Food and Drug Administration on 29 September 2023, making the USA the 65th country in which Technegas is available. [39]

Impact of COVID-19 on Lung Imaging

The COVID-19 pandemic brought unprecedented challenges to the realm of diagnostic imaging, particularly in nuclear medicine ventilation imaging. At the onset of the pandemic, the lack of personal protection equipment saw a reduction in procedures across all modalities. However, due to the perceived contamination risk associated with long administration times of Xenon-133 and Tc99m-DTPA, a return to previous levels of procedures has been slower in countries where the choice of agents was limited to Xenon-133 and Tc99m-DTPA.

In markets where Technegas was available during the pandemic, citing the limited risk associated specifically with the product and the clinical importance of the ventilation procedure, lung ventilation imaging was either maintained during the pandemic or has fully recovered to pre-pandemic levels. The importance of continuing ventilation imaging during the pandemic was highlighted in a multicentre study conducted 2021 in France in a population of COVID-19 patients assessed with lung scintigraphy. Based on the results of the study PE could confidently be excluded without the ventilation imaging in only 57% of patients. Importantly, ventilation imaging was required to confidently rule out PE in 31% of patients.[33]

It was this concern about false positives leading to unnecessary anticoagulation, which in turn places those patients at risk of severe associated adverse effects, that led the French Society of Nuclear Medicine to recommend that the routine performance of ventilation studies be maintained despite the pandemic on the basis that the clinical importance of the

"The history of diagnostic lung imaging in nuclear medicine is a testament to the pursuit of precision medicine. "

"Essential to any nuclear medicine study is a radiopharmaceutical or tracer that has an affinity for a disease state, a metabolic process or organ system."

Diagnosing Pulmonary Embolism: VQ Planar vs V/Q SPECT +/- CT vs CTPA

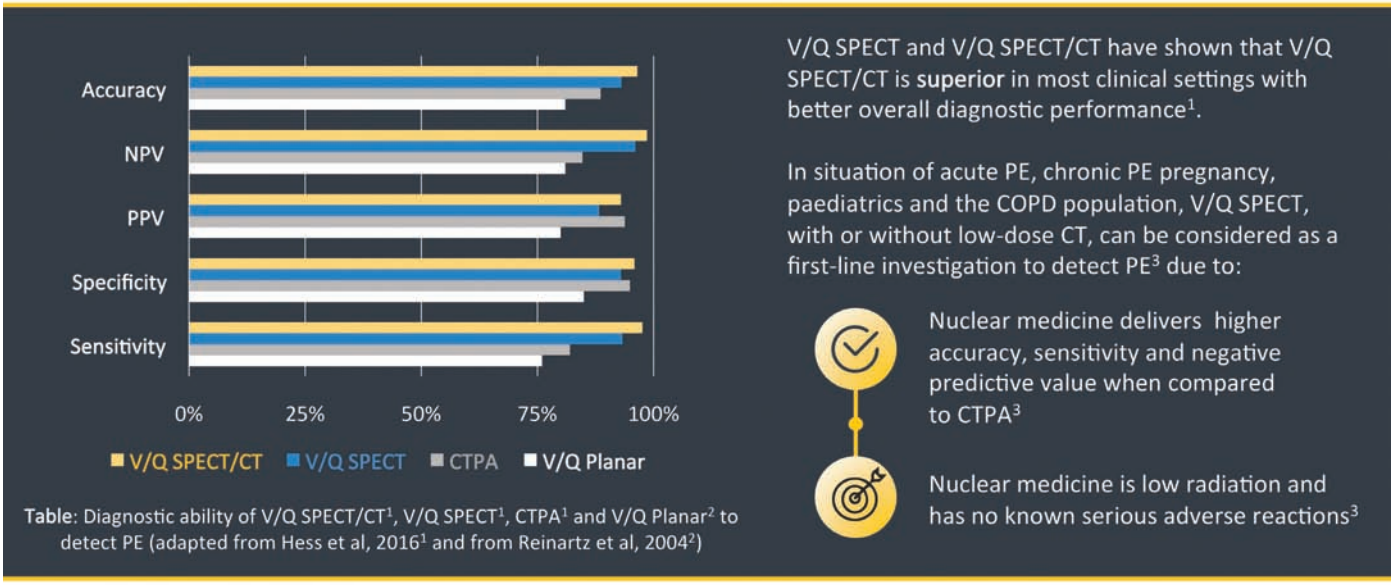

Table: Diagnostic ability of V/Q SPECT/CT[1], V/Q SPECT[1], CTPA[1] and V/Q Planar[2] to detect PE (adapted from Hess et al, 2016[1] and from Reinartz et al, 2004[2])

1. Hess S, et al. Semin Thromb Hemost 2016; 42(8): 833-845
2. Reinartz P, et al. J Nucl Med 2004; 45: 1501-1508
3. Leblanc M, et al. CANM guidelines; Nov 2018: www.canm-acmn.ca/guidelines

ventilation study far outweighs the concern of viral contamination, particularly when risks can be mitigated by appropriate personal protective equipment.[33]

Expanding Horizons: Nuclear Pulmonology Beyond PE

"The COVID-19 pandemic brought unprecedented challenges to the realm of diagnostic imaging, particularly in nuclear medicine ventilation imaging."

Historically, lung ventilation imaging in nuclear medicine played a crucial role almost exclusively in the diagnosis of acute pulmonary embolism. Technological strides have, however, expanded the procedure's horizons to encompass a broader spectrum of pulmonary diseases. Multimodality imaging, coupled with artificial intelligence (AI), has unlocked new frontiers in nuclear pulmonology including, but not limited to:

- CTEPH and Congestive Heart Failure: Nuclear imaging plays a pivotal role in identifying perfusion defects characteristic of chronic thromboembolic pulmonary hypertension and congestive heart failure, aiding in early diagnosis and management. [25, 40]
- Asthma and COPD: Functional imaging techniques provide valuable insights into airflow dynamics, inflammation, and ventilation-perfusion matching, aiding in personalized treatment strategies. [7, 9, 14, 16, 18, 20, 26, 28, 29]
- Lung Transplantation: Pre-transplant evaluations and post-transplant monitoring benefit from nuclear imaging's ability to assess graft function, perfusion, and potential complications. [8, 32]
- Interventional Respiratory Medicine: Nuclear imaging guides interventions such as lung volume reduction, offering a quantitative assessment of treatment efficacy and patient response.[10, 11, 12, 13, 30, 31]
- Occupational Hazard Screening: Risks associated with particulates to include silicosis, mining and other work related toxic exposures.[21, 42]

"Historically, lung ventilation imaging in nuclear medicine played a crucial role almost exclusively in the diagnosis of acute pulmonary embolism. Technological strides have, however, expanded the procedure's horizons to encompass a broader spectrum of pulmonary diseases."

Indeed, the translational work that is being driven by the collaboration between nuclear medicine and respiratory medicine is growing rapidly. An example of this alliance is the recently published study by Radadia N, et al entitled Comparison of ventilation defects quantified by Technegas SPECT and hyperpolarized 129Xe MRI where, "observations indicate that, despite substantial differences between the imaging modalities, assessment of ventilation defects using established quantification practices for Technegas SPECT and 129Xe MRI are comparable" thus opening a pathway from research initiatives using 129Xe MRI, with its limited availability and high cost, to clinical practice through nuclear medicine.[8]

Towards Precision Medicine: The Era of Treatable Traits

The paradigm shift towards precision medicine in pulmonary care is epitomized by the concept of "treatable traits."[35] By leveraging advanced imaging modalities, clinicians can identify and target specific pathophysiological traits in individual patients, tailoring therapies for optimal outcomes. Here, lung imaging transcends mere diagnosis to become a predictive tool, guiding therapeutic decisions and enhancing patient-centric care.

One recent example is the publication by Gibson, P, et al. entitled Ventilation Heterogeneity is a Treatable Trait in Severe Asthma, The Journal of Allergy and Clinical Immunology: In Practice. The study concludes that in a population of severe asthmatics that Ventilation Heterogeneity, as diagnosed using Ventilation SPECT with Technegas, is "clinically significant, measurable, and treatable, which establishes Ventilation Heterogeneity as a treatable trait in severe asthma". [35]

Conclusion: A Vision for the Future

The fusion of nuclear medicine with pulmonology heralds a new era characterized by precision, innovation, and personalized care. In tandem with the continuing evolution of technology, the role of nuclear pulmonology will undoubtedly expand, encompassing novel diagnostic and therapeutic avenues. The pathway from imaging to patient management is no longer linear but holistic, reflecting the transformative impact that nuclear medicine is already having on shaping the future of respiratory medicine. [13, 24]

The author, James McBrayer, is a Nuclear Pharmacist and CEO of Cyclopharm/Cyclomedica the manufacturer of Technegas®. For more information about Technegas please direct inquires to info@technegas.com.

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"The paradigm shift towards precision medicine in pulmonary care is epitomized by the concept of "treatable traits."[35] By leveraging advanced imaging modalities, clinicians can identify and target specific pathophysiological traits in individual patients, tailoring therapies for optimal outcomes."

"The fusion of nuclear medicine with pulmonology heralds a new era characterized by precision, innovation, and personalized care. In tandem with the continuing evolution of technology, the role of nuclear pulmonology will undoubtedly expand, encompassing novel diagnostic and therapeutic avenues. "

MATHIEU DALLAIRE

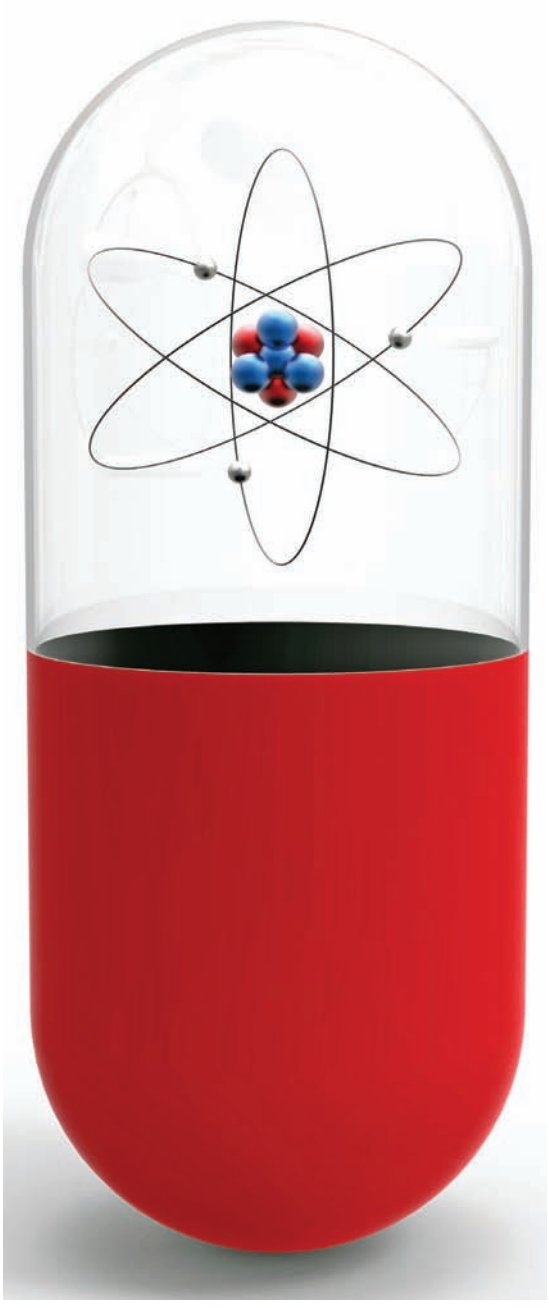
Mathieu Dallaire t.i.m
Enseignant et responsable de la coordination en technologie de médecine nucléaire au collège Ahuntsic

CollègeAhuntsic
Département de médecine nucléaire

L'enseignement technique au collégial au Québec a depuis des années été un sujet de discussions, de polémiques et de développements pédagogi-ques et humains. La fameuse « Commission Parent » au début des années 60 qui redonnait à l'état les pleins pouvoirs en éducation (au détriment du clergé) a été un moment de réflexion collective sur la diplomation en enseignement supérieur au Québec. Cette réflexion a mené au développement d'une éducation sociale et professionnelle ouverte à tous et toutes. En se voulant un tremplin vers l'enseignement universitaire ou vers une vie professionnelle ancrée dans les défis de la modernité et des changements perpétuels et rapides auxquels la société doit faire face. Ces changements se sont poursuivis au fil des décennies et sont devenus de plus en plus rapides, complexes et stimulants. Cette stimulation technologique s'est même insérée dans nos quotidiens sans que l'on cherche à s'y opposer puisqu'elle répondait à différents besoins de socialisation et de développement inhérents à la condition humaine. Par sa situation dans le système d'éducation au Québec, les cégeps ont su remplir leur rôle de zone tampon entre la formation professionnelle et le savoir universitaire. La Technologie de médecine nucléaire a été aux premières loges pour observer cette évolution de la société. Depuis le début de la formation en 1965 , offerte à l'Institut de Technologie de Laval, et qui deviendra en 1968 la technique de 3 ans en médecine nucléaire offerte au tout nouveau cégep Ahuntsic, bien de l'eau a coulé sous le pont des savoirs. À l'intérieur de ce texte, je désirais démontrer la grande capacité d'adaptation des technologues en médecine nucléaire et le rôle que joue l'éducation dans celle-ci.

« Le cégep Ahuntsic est un chef de file par rapport à la qualité de son équipement mis à la disposition des étudiants et étudiantes. Celui-ci a fait l'achat de 4 caméras à scintigraphies hybrides (TEMP-TDM) de dernière génération. »

Prenons par exemple le développement des molécules de radiopharmaceutiques. Que ce soit la recherche et le développement associé aux différents radionucléides (prenons simplement comme exemple l'administration de l'antimatière chez l'humain) ou les différentes méthodes de marquage développées au fil des ans, cette recherche se base sur l'expérience du milieu que possèdent les technologues. La recherche pure permet l'atteinte des objectifs théoriques, mais l'application de ceux-ci en contexte clinique se fait toujours par l'intervention d'un ou d'une technologue. Leur implication dans la recherche fondamentale associée aux radiopharmaceutiques permet donc l'implantation de protocoles pratiques adaptés à la réalité du milieu



de la santé au Québec. Un exemple de cette implication touche la technique de prélèvement en milieu stérile. Le besoin de changement n'est pas venu de l'extérieur ou d'un changement législatif, mais bien des technologues eux-mêmes qui jugeaient qu'une adaptation des pratiques aux normes de pharmacie était essentielle. La formation technique doit aussi permettre de développer chez les futurs technologues une curiosité et une approche scientifique face au développement perpétuel auquel ils devront faire face au cours de leur carrière. La capacité d'adaptation devient donc une valeur essentielle au travail des technologues. Nous sommes convaincus que l'apport des cours de psychologie dans la formation aide à développer ce sens de l'adaptation. Mais deux cours ne peuvent bien entendu pas éveiller à eux seuls la fibre naturelle de l'adaptation chez les étudiants et les étudiantes. Celle-ci est plutôt tissée par l'intervention du milieu et les besoins énoncés par celui-ci.

Comment décider des radiopharmaceutiques essentiels? Comment choisir parmi une offre qui ne cesse de se renouveler avec des molécules de plus en plus complexes? La solution en éducation ne peut passer par l'enseignement de l'ensemble des connaissances. Le temps imparti à la formation étant limité, il est impossible d'enseigner tous les radiopharmaceutiques existants. Il devient donc impératif de les aider à développer leur esprit critique et de stimuler leur soif de connaissance. L'offre de formation doit devenir un outil au développement et non pas la « machine » ou le « tordeur » modulant précisément ce développement. Puisque l'apprentissage n'est pas figé dans le temps, ce qui devient important d'apprendre est l'adaptation aux apprentissages et non pas le « par cœur » associé à des techniques spécifiques.

Un autre exemple de la grande adaptation dont doivent faire preuve les technologues touche le développement perpétuel de l'appareillage et des systèmes de traitement de l'image. La médecine nucléaire était aux premières loges de la formation des images numériques. Cette numérisation a entraîné l'application de techniques de traitement de l'image permettant non seulement de mieux visualiser certains phénomènes, mais aussi de les quantifier. Ainsi, nous avons pu observer l'émergence du développement de l'informatique, de la réseautique et même de la robotique. Les premières caméras étaient plutôt simplistes, jusque dans les années 90, il n'était pas rare de voir des systèmes qui demandaient un déplacement manuel de la tête détectrice. La robotisation des appareils a permis de simplifier et d'accélérer certaines tâches, mais elle est aussi devenue un nouveau facteur de risque associé aux déplacements des caméras de plus en en plus massives et rapides. De plus, comment ne pas percevoir l'importance de la TEP et du développement de la correction d'atténuation à l'aide de sources externes, puis ultimement, la correction et la fusion des images de MN aux images TDM et IRM. Toutes ces technologies démontrent à elles seules les défis associés à leur enseignement.

Le cégep Ahuntsic est un chef de file par rapport à la qualité de son équipement mis à la disposition des étudiants et étudiantes. Celui-ci a fait l'achat de 4 caméras à scintigraphies hybrides (TEMP-TDM) de dernière génération. Les investissements associés à ces appareils permettent aux étudiants et aux étudiantes d'expérimenter concrètement les divers principes théoriques associés à leur utilisation, sans devoir nuire au fonctionnement clinique d'un hôpital. Nous croyons que cette chance permet un meilleur approfondissement de leurs aptitudes cliniques, sans devoir gérer la productivité du travail en milieu hospitalier. L'arrivée massive des semi-conducteurs ces dernières années tant en TEP qu'en médecine nucléaire conventionnelle démontre aussi le besoin d'actualisation perpétuel des connaissances nécessaires à la profession.

En conclusion, plusieurs défis continuent de faire valser le grand navire de la médecine nucléaire. La pénurie de technologues en est un. Il s'agit d'un enjeu de formation, mais principalement de profession. Au Québec le salaire des technologues reste un enjeu social auquel l'ensemble de la population devra faire face un jour ou l'autre. Comme maison d'enseignement, Ahuntsic tente de répondre à ce besoin en délocalisant de façon temporaire la technique dans la ville de Québec. Ce projet se veut une réponse à la pénurie de technologues de cette région tout en garantissant un niveau de formation optimale basé sur une expérience pédagogique de plus de 50 ans et sur une application novatrice en centre clinique. Par cet exemple, le collège tente à nouveau de démontrer qu'être Technologue en médecine nucléaire permet de se développer comme être humain, mais permet aussi l'entrée dans une profession où tout peut encore être inventé! ■

« En conclusion, plusieurs défis continuent de faire valser le grand navire de la médecine nucléaire. La pénurie de technologues en est un. Il s'agit d'un enjeu de formation, mais principalement de profession. Au Québec le salaire des technologues reste un enjeu social auquel l'ensemble de la population devra faire face un jour ou l'autre. »

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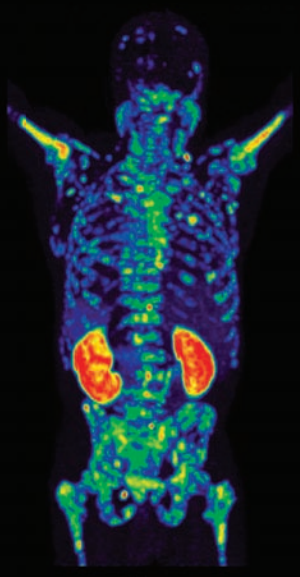

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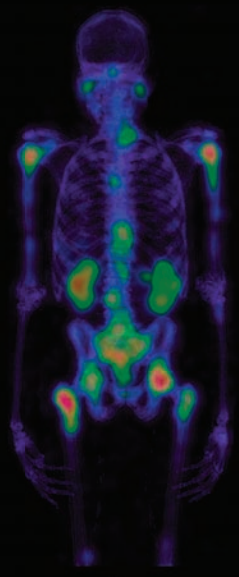

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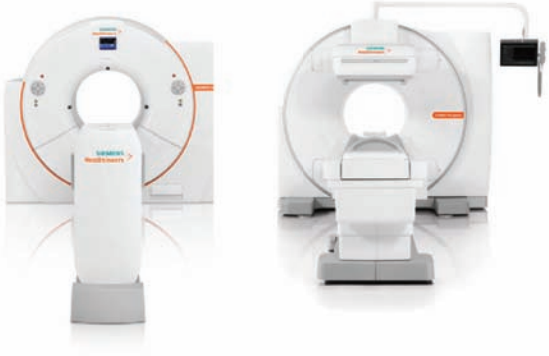

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INTERVIEW WITH TIFFANY PIZIOLI

Tiffany, can you briefly presents yourself to our readers?

I am Tiffany Pizioli, the Chief Executive Officer (CEO) of the Canadian Urological Association (CUA). I have been privileged to serve this member-based association, starting first as the Director in the Office of Education in 2008, and then as CEO in 2011.

I have a master's degree in business administration (MBA) and over time, having developed and executed numerous educational initiatives, I have gained extensive experience in the treatment and management of urologic conditions. I am extremely passionate about education, both for healthcare practitioners and ultimately for patients.

Can you give us an outline of the mission of the Canadian Urological Association (CUA)?

The Canadian Urological Association (CUA) is comprised of more than 90% of all urologists in Canada. With about 65% of our members in the community setting, education of our members is at the forefront of what we do. Educating urologists ultimately leads to better patient care.

The CUA is driven by its dedicated and dynamic Board of Directors, who serve on a volunteer basis. This past January, the Board of Directors met in Montreal with the various committee chairs and corporate office team to revise our strategic plan and set the roadmap for the next five years. With a comprehensive environmental scan and input from key stakeholders, we revised our mission and vision.

CUA's Vision:
• The best urologic health for all Canadians.

CUA' Mission:
• The Canadian Urological Association (CUA) is a national organization advancing urologic care through education, research, and advocacy.

What are the three major projects of the CUA over the next three years?

Our strategic plan identified four major goals over the next five years: membership growth and engagement; increased educational resources for professionals and patients; advocacy on behalf of professionals to improve patient care; and support of innovative urological research in Canada.

MEMBERSHIP: Urologists are the first point of contact for the treatment of urologic conditions,

including urologic cancers such as bladder, kidney, and prostate cancers. With advances in treatment options for genitourinary cancers, a multidisciplinary approach must include surgical, medical, and radiation oncologists; thus, for our multidisciplinary educational tools, it is essential that the CUA engages these associate members. The CUA also has partnerships with urology nurses, nurses in oncology, and soon, pharmacists.

EDUCATION: As the diagnosis and treatment options in urology and urologic oncology continue to change rapidly, the CUA is leading the way for real-time updates of our multidisciplinary resources, including tool cards based on treatment algorithms, decision support calculator based on CUA guidelines, and drug access listings by province. With clinical trials paving the way for potential life-saving opportunities, the CUA also regularly updates it national clinical trials database. All our educational tools are open access and available through our online repository — UROpedia Canada (at cua.org).

ADVOCACY: The CUA collaborates closely with patient advocacy groups to ensure our educational

materials are disseminated to patients. While these resources are primarily intended for healthcare professionals, our advocacy partners ensure the options outlined on our tool cards and treatment decision support tools are at a more appropriate reading level for patients. And at the very least, patients can bring these support tools to their appointments and discuss options with their healthcare teams.

With the rapid development of theranostics, how does the CUA intend to work more closely with different specialities like nuclear medicine, oncology, or radiology?

The exciting developments in theranostics have been communicated to our general membership over the past few years via educational webinars and publications in our journal, the Canadian Urological Association Journal (CUAJ); however, this past year, the CUA has expanded the scope of its membership to include nuclear medicine and radiology. We are working closely with the Canadian Association of Nuclear Medicine (CANM) through its educational programs, including the endorsement of a much-needed provincial heatmap with respect to PSMA PET scans. With a robust Office of Education and accreditor status, the CUA is looking to develop more multidisciplinary programs and tools to assist with the diagnosis and treatment of prostate cancer.

Finally, as the CEO of CUA what is your greatest wish?

My greatest wish is that CUA becomes the "go-to" educational resource for all healthcare professionals when treating GU cancers. I would like to play a part in standardizing the care of GU cancer patients in Canada, be it in an academic or community setting, by creating easy-to-use resources for all healthcare professionals. At the same time, I would like to be able to get all the tools we create into the hands of patients so that they are able to discuss treatment options with their multidisciplinary team and demand the same standard of care across the country. And finally, if the other speciality societies can create synergies in their respective fields with their multidisciplinary treaters, we could create economies of scale and optimize patient outcomes. ■

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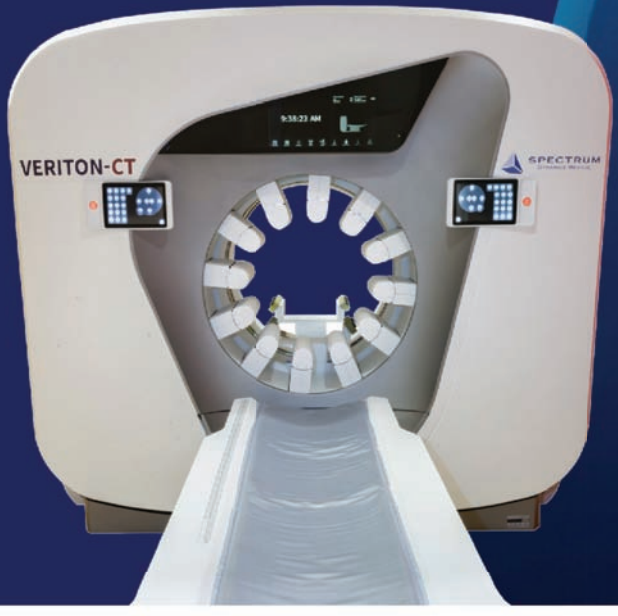

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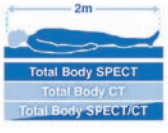

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