Research—The Key to Nuclear Medicine's Past and Future

Alan B. Packard, PhD, 2020–2021 SNMMI President

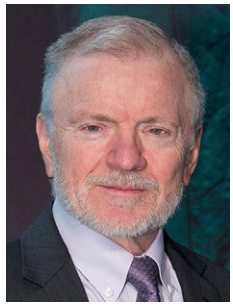
I often speak about the energy at SNM annual meetings in the 1980s and 1990s, when at every meeting there was a great deal of anticipation about what new radiopharmaceuticals or camera developments would be introduced that year. I am very excited to see that energy reappearing at recent SNMMI meetings. The energy has reappeared because we are on the leading edge of a new wave of exciting developments in nuclear medicine, with several new diagnostic and therapeutic radiopharmaceuticals expected to be approved within the next year or so and continued advances in camera technology—a truly amazing surge of innovation.

These innovations grow out of a strong tradition of research that has been the backbone of nuclear medicine since the first use of ^{128}I to study the thyroid in 1938. In the 1950s and 1960s, several breakthroughs fundamentally changed the field, starting with the development of the ^{99}Mo/^{99m}Tc generator by Tucker, Green, and Richards at Brookhaven National Laboratory (BNL) and the development of the gamma camera by Hal Anger in the late 1950s. The introduction of the ^{99}Mo/^{99m}Tc generator was soon followed by the first use of ^{99m}Tc in a patient by Harper and Lathrop. In the early 1970s, the invention of the ^{99m}Tc "instant kit" by Eckelman and Richards at BNL led to the development of large number of new ^{99m}Tc agents, many of which are still in use today. It was not until the 1980s, however, that the first chemically well-defined ^{99m}Tc compounds were developed.

In the PET arena, critical developments include the invention of the PET camera by Phelps, Hoffman, and Ter-Pogossian at Washington University in 1973; the synthesis of ^{18}F-FDG at BNL and its first use in humans at the University of Pennsylvania in 1976; the development of synthesis modules (aka "black boxes") that facilitate the automated synthesis of ^{18}F-, ^{15}O-, ^{13}N-, and ^{11}C-labeled compounds under cGMP conditions so that they can be more widely used; and the more recent introduction of "non-standard" PET radionuclides, such as ^{64}Cu, ^{68}Ga, and ^{89}Sr.

In the area of physics and instrumentation, the introduction of PET/CT, SPECT/CT, and PET/MR has changed how images are interpreted, and the whole-body PET camera, digital PET, and digital SPECT have dramatically improved image quality and the way in which PET images are acquired.

Therapy has been central to nuclear medicine since its beginning, from the first use of radioiodine to treat hyperthyroidism in 1941. It is now seeing a rebirth with the current excitement about ^{68}Ga and ^{177}Lu as theranostic pairs to diagnose and treat neuroendocrine tumors and prostate cancer, as well as possible future uses of ^{68}Ga or ^{18}F diagnostics paired with α-emitting therapeutics.



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All of which is a backdrop to remind us that one of SNMMI's most important roles is to help encourage, accelerate, and promote research. The society is uniquely able to accomplish this goal because it brings together a broad spectrum of professionals—physicians, radiochemists, physicists, pharmacists, and technologists—who, together, make our society the world leader in innovation and excellence in nuclear medicine. This does not, however, happen in a vacuum. For innovation to continue, it must be supported and valued. This must happen on multiple levels, beginning with graduate students and postdoctoral fellows but also including medical students and clinical fellows who, optimally, will have an opportunity during their training to participate in a research project, perhaps spurring interest in nuclear medicine to such an extent that they become clinician-scientists.

SNMMI's Value Initiative includes multiple programs to provide this support. New initiatives are underway aimed at building a strong pipeline of new researchers and clinicians to grow the field in the future, at helping to ensure continued support for research and demonstrating the exciting future of nuclear medicine to medical students and undergraduates, and at helping ensure continued research support from federal agencies, such as the National Institutes of Health, the Department of Energy, and the Department of Defense.

We must also ensure that this exciting research has impact by sharing the results with our colleagues and with the broader medical community. It is essential that SNMMI continue to promote high-visibility venues for that purpose, such as *The Journal of Nuclear Medicine*, which continues to excel as the leading journal in nuclear medicine, and the SNMMI Annual Meeting, where younger scientists often have first opportunities to present their work to an audience of their peers.

All of these pieces must work together to ensure that nuclear medicine continues to be as exciting and innovative today and tomorrow as it has been in the past. SNMMI's role, as in the past, is to focus and amplify this energy, ensuring that the future of nuclear medicine is brighter than ever.