Radiopharmaceuticals and COVID-19

In an article in the December 21 issue of *Pharmaceutics*, Neumaier et al. from the Institute of Neuroscience (Jülich), University Hospital Cologne/University of Cologne, and the Max Planck Institute for Metabolism Research (Cologne; all in Germany) outlined potential current and future uses of nuclear medicine techniques and radiopharmaceuticals in the context of the novel coronavirus SARS-CoV-2 and the global COVID-19 pandemic. They highlighted associated techniques that can be explored in functional imaging of pathophysiologic processes at the cellular or molecular level and for treatment approaches based on targeted delivery of therapeutic radionuclides. Among the topics discussed were PET-based imaging of host molecules and host responses to SARS-CoV-2 infection, PET- and SPECT-based antiviral drug development, and SARS-CoV-2–specific nuclear imaging. The authors also pointed to the potential for low-dose radiotherapy and/or radionuclide therapy targeting infected cells. They concluded that, given continuing threats from emerging coronaviruses and other pathogens, it seems likely that "improved approaches for preclinical imaging of animals infected with contagious pathogens will become available in the near future, so that nuclear medicine techniques could also contribute to a better understanding of disease transmission, progression, and eradication."

Pharmaceutics

Hanson Named NRC Chair

On January 20, Christopher T. Hanson was designated by U.S. President Joseph Biden as Chair of the Nuclear Regulatory Commission (NRC). Hanson replaced Kristine L. Svinicki, who had served as chair since 2017 and was the longest serving member of the commission in the agency's history. "I am honored to have been selected by President Biden to serve as the next NRC Chairman and to lead the talented women and men who oversee the licensing and regulation of our nation's civilian use of radioactive materials," said Hanson. "I look forward to building on Chairman Svinicki's many accomplishments as the commission takes on new challenges and faces new opportunities as nuclear energy technologies continue to evolve and uses of nuclear materials expand in the future." Hanson has served as an NRC commission member since June 8, 2020. He has more than 2 decades of government and private sector experience in nuclear energy. Prior to joining the NRC, he served as a staff member on the Senate Appropriations Committee, where he oversaw civilian and national security nuclear programs. He has also served as a senior advisor in the Department of Energy (DOE) Office of Nuclear Energy and the DOE Office of the Chief Financial Officer, where he oversaw nuclear and environmental cleanup programs and managed the department's relationship with Congressional appropriations committees.

U.S. Nuclear Regulatory Commission

LBNL and PET for α-Particle Therapy

In a December news release, the U.S. Department of Energy (DOE) Lawrence Berkeley National Laboratory (LBNL; CA) highlighted ongoing research at the facility on innovative ways to image and monitor targeted α-particle therapy (TAT). In a collaboration supported by the DOE Isotope Program at LBNL and Los Alamos National Laboratory (NM), researchers have developed new methods for large-scale production, purification, and use of ^{134}Ce, which could serve as a tuneable PET imaging surrogate for several α-emitting therapeutic isotopes. Findings reported in the December 14 issue of *Nature Chemistry* described studies that could lead to the use of a single molecular system for imaging and TAT in a range of cancers. "Our study demonstrates the power of designing small molecules that will control the chemistry of metallic elements for different applications in nuclear medicine," said senior author Rebecca Abergel, PhD, from LBNL. "But what's even more exciting is that the newly demonstrated large-scale production of new α-compatible PET imaging isotopes through the DOE Isotope Program may also serve as a roadmap for making targeted α-emitting therapies more widely available." The article, outlining the history and development of the project, the complex methodologies used to isolate ^{134}Ce from irradiated lanthanum, and potential applications is available at: https://www.nature.com/articles/s41557-020-00598-7. By "tuning" the oxidation state of ^{134}Ce to the favored states of ^{225}Ac or ^{227}Th, the researchers performed preliminary biokinetic studies in mice, using chelated ^{134}Ce. They plan next to investigate methods for attaching cell-targeting antibodies to the chelated ^{134}Ce and to demonstrate the targeting of cancer cells in animal models for diagnostic and therapeutic applications.

U.S. Department of Energy

NorthStar Announces FDA Approval for ^{99}Mo Production Capacity

NorthStar Medical Radioisotopes, LLC (Beloit, WI), a producer and distributor of radiopharmaceuticals, announced on January 6 that the U.S. Food and Drug Administration (FDA) had approved its application for producing ^{99}Mo from concentrated ^{98}Mo, as well as related software updates for the RadioGenix ^{99m}Tc generator system. Processing of concentrated ^{98}Mo targets increases production capacity for ^{99}Mo up to 4 times that of the company's current technology and enables the supply of higher activity source vessels to support enhanced radiopharmacy efficiencies. The process uses natural

molybdenum, which is ~24% ^{98}Mo, that has been concentrated to be up to 98% ^{98}Mo, to produce ^{99}Mo using neutron capture technology. FDA approval was granted through a Prior Approval Supplement to NorthStar's original RadioGenix System New Drug Application, which was approved in 2018. The company indicated it would begin shipments of larger capacity, multisized source vessels to customers "in the coming days" after the announcement.

"NorthStar and its partners at the University of Missouri Research Reactor (MURR) are proudly leading the way as the only commercialized producer of ^{99}Mo in the United States," said Stephen Merrick, President and Chief Executive Officer of NorthStar. "This approval of production utilizing concentrated ^{98}Mo and the related RadioGenix System software updates is a transformational event for NorthStar Medical Radioisotopes and a key milestone in significantly increasing domestic production and capacity of nonuranium-based ^{99}Mo for the United States. . . . The ability to provide our customers with a range of higher activity source vessels (7.5, 12, 15, and 19 Ci) will help drive efficiencies in radiopharmacy operations and patient access to ^{99m}Tc, which informs more than 40,000 U.S. health care decisions daily. . . . In conjunction with this approval, we also wish to recognize the important support that our partners at MURR, with whom we jointly produce ^{99}Mo in Columbia, MO, have had in helping to progress concentrated ^{98}Mo development."

NorthStar Medical Radioisotopes, LLC

TRIUMF Partners to Expand Access to ^{225}Ac

TRIUMF, Canada's national particle accelerator center (Vancouver), announced on December 16 a new research partnership with Fusion Pharmaceuticals (Hamilton, Canada) to expand production and availability of ^{225}Ac. The partnership is intended to increase availability of cyclotron-produced ^{225}Ac, bolster the development pipeline from basic sciences to clinical applications, and strengthen Canada's role in isotope production and research. The agreement will provide TRIUMF with funding to make the upgrades needed to scale up production of ^{225}Ac; in return, Fusion will receive increased research and development access to this promising isotope.

"Today's announcement marks an important step in positioning Canada to play a leading role in the development and deployment of next-generation radiotherapies, and in ensuring that researchers and patients around the world have a stable supply of life-saving medical isotopes," said Jonathan Bagger, PhD, Director of TRIUMF. "Enabled by decades of public investment in TRIUMF's infrastructure and research programs, this collaboration recognizes the laboratory's capacity to drive innovation, moving this promising treatment closer to market."

"TRIUMF and the wider nuclear medicine research community are working hard to usher in this new generation of radiotherapies for fighting cancer and other diseases," said Paul Schaffer, PhD, TRIUMF Associate Laboratory Director of Life Sciences. "Targeted α therapies, including those that employ ^{225}Ac, show some of the most promising results due to their ability to effectively deliver therapeutic doses of disease-killing radioactive payloads while leaving healthy parts of the body generally unaffected."

Despite the documented promise of ^{225}Ac in therapy, supplies are limited because the radioisotope does not occur naturally. In 2015, Schaffer noted that significant amounts of ^{225}Ac were present in TRIUMF's spent research targets as a result of spallation. Using particle accelerators at TRIUMF to produce ^{225}Ac has numerous advantages over the various legacy methods that rely on reactors or weapons, notably the ability to create consistent, scalable quantities of the isotope on demand.

With both its existing infrastructure as well as the new capacity that will be added through its new Institute for Advanced Medical Isotopes, TRIUMF is positioned to support partners such as Fusion Pharmaceuticals in accelerating the development of next-generation therapeutics.

TRIUMF

ARTMS ^{68}Ga-PSMA-11 Collaborations

ARTMS Inc. (Vancouver, BC) announced 2 international collaborations in January targeting improvement of ^{68}Ga-prostate-specific membrane antigen (PSMA)-11 production for PET imaging in prostate cancer. On January 12 the company announced that, working with Telix Pharmaceuticals Limited (Indianapolis, IN), they had successfully produced Telix's prostate cancer imaging product, TLX591-CDx (Kit for preparation of ^{68}Ga-PSMA-11), using multicurie quantities of cyclotron-produced ^{68}Ga via the ARTMS proprietary Quantum Irradiation System (QIS) solid target system. The testing demonstrated a 6-hour stability for TLX591-CDx. Testing exceeded relevant quality control standards for both low- (50 and 100 mCi) and mid-level output (>2,500 mCi) ^{68}Ga production runs. The "cold kit" format of TLX591-CDx enables rapid radiolabeling at room temperature with high radiochemical purity and production consistency. One week later, ARTMS announced with Isotopia Molecular Imaging (Petach Tikva, Israel) the successful radiolabeling of Isotopia's prostate cancer imaging kit product, PSMA-11, with >2 Ci of cyclotron-produced ^{68}Ga using the ARTMS QIS solid target system. Testing again exceeded targeted quality expectations.

ARTMS Inc.

FTC to Study Physician Group and Health Care Mergers

The Federal Trade Commission (FTC) on January 14 announced the issuance of orders to 6 health insurance companies to provide information that will allow the agency to study the effects of physician group and health care facility consolidation that occurred from 2015 through 2020. The study is part of a broader initiative announced in September 2020 by the FTC Bureau of Economics to revamp its merger retrospective program, with a goal to encourage economists both inside

and outside the agency to carry out more retrospective studies to test analytic tools and strengthen enforcement efforts.

The 6 companies receiving orders from the FTC were: Aetna Inc., Anthem, Inc.; Florida Blue; Cigna Corporation; Health Care Service Corporation; and United Healthcare. These orders seek patient-level commercial claims data for inpatient, outpatient, and physician services, including imaging data, in 15 U.S. states from 2015 through 2020. These data will help the FTC assess the impact of physician consolidation during this period, including physician practice mergers and hospital acquisitions of physician practices. It should also allow the FTC to assess the impact of health care facility consolidation during this period.

In a press release, the FTC noted that study results should aid the FTC enforcement mission by providing much more detailed information than is currently available about how physician practice mergers and health care facility mergers affect competition. The study results will also aid policy makers by providing evidence documenting how mergers and acquisitions of physician groups and health care facilities affect health care markets.

U.S. Federal Trade Commission

Sleep, Attention, and Experience in Image Reading

In an article e-published on January 19 ahead of print in the *Journal of the American College of Radiology,* Alshabibi et al., from the University of Sydney Cumberland Campus (Lidcombe, Australia), the College of Applied Medical Sciences of King Saud University (Riyadh, Saudi Arabia), and the Australian Council on Healthcare Standards (Ultimo), reported on a study intended to examine whether radiologists' mammogram reading performance varied relative to the number of hours they had been awake and/or the number of hours slept the night before. Participants were categorized as more and less experienced (reading $\geq$2,000 or $<$2,000 studies/year, respectively). The authors found that hours awake significantly influenced lesion sensitivity for less experienced participants. Those awake for $<$2 h had significantly lower sensitivity than those awake for 8–10 hours. In addition, less experienced radiologists with $\leq$6 h of sleep had significantly lower accuracy than those with $>$6 h of sleep. No statistically significant findings were correlated with sleep/awake time in the more experienced groups. "More experienced radiologists, despite the added responsibilities and pressure to read more images in less time, develop coping mechanisms to withstand the pressure and manage their fatigue," Alshabibi told *Radiology Business.* "A lack of this skill exacerbates the effects of fatigue in less experienced individuals. Moreover, novices tend to be less aware of their own limitations than experts, thus failing to employ fatigue-relieving mechanisms."

Journal of the American College of Radiology
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