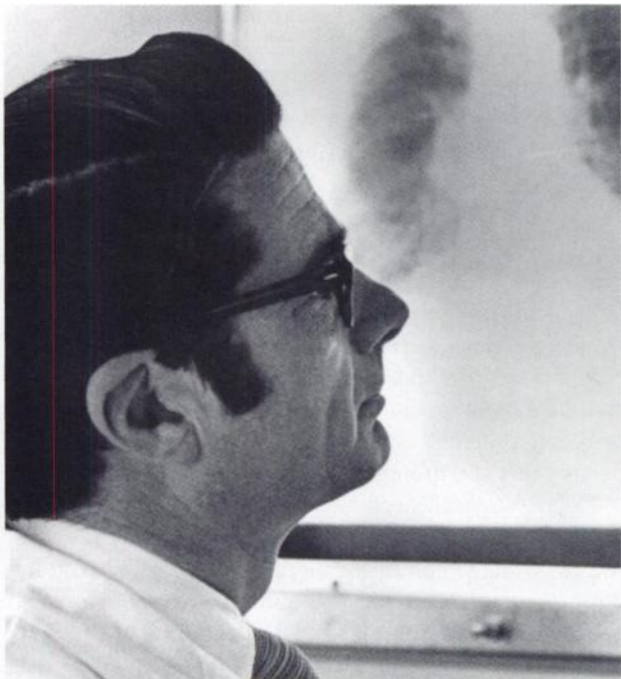


Nuclear Medicine Pioneer: John G. McAfee, MD



John G. McAfee, MD, former professor and chairman of the Department of Radiology at SUNY Upstate Medical Center, and discoverer of a wide range of clinical applications in nuclear medicine, attributes his many scientific successes to a lifetime of “wild ideas.” His colleagues’ opinions, however, are tempered with admiration: “John is the complete atoms-to-molecule person,” said one. “He’s the perfect example of how to successfully apply basic science to clinical practice.”

Others see McAfee’s “wild ideas” as inspired vision. “John has had real impact clinically and crossed several organ systems, so that he is a true generalist in developing new radiopharmaceuticals for solving clinical problems that have had widespread and lasting value,” said Dr. Ronald Neumann, of the National Institutes of Health. McAfee’s research achievements, and their applications to clinical nuclear medicine, and, not least, his integrity and early academic leadership, have earned him a place as one of the specialty’s most respected pioneers.

“The Only Thing That Matters is Good Health”

In his last year of high school in 1943, 17-year-old McAfee was rushed to the hospital for a burst appendix. The boy who had entertained dreams of becoming a pilot came to take a different perspective on his life. “I spent three days close to death. I came to realize that the only thing that matters in life is good health,” McAfee recalled in a recent interview. He put in a last-minute application and was accepted

to the University of Toronto Medical School. After graduation in 1948 (the pressures of wartime had “condensed” the usual eight-year medical school program into five years), McAfee took up an internship and an assistant residency at Victoria and Westminster hospitals, which he held until 1951. He recalls that hospital clinicians held radiology in low esteem, chuckling over radiologists’ “shoddy” reports, and remembers thinking that “if radiology deserved its own department, there must be more to it.”

In Toronto McAfee learned of Russell Morgan, MD, who had studied medicine there and gone on to become a successful radiologist at Johns Hopkins University. Morgan hailed from a family of engineers and had applied his talents to the development of radiology equipment. McAfee wrote to Morgan, who agreed to put him on trial as assistant resident at Johns Hopkins.

“We Had Lots of Wild Ideas”

From Morgan McAfee heard about radioisotope technology, a new branch of radiology, and in 1958 Morgan suggested McAfee take a year’s leave of absence from Johns Hopkins to investigate the incipient field.

Meanwhile, Henry Wagner, MD, was also “discovering” nuclear medicine at Hammersmith Hospital in England. Wagner and McAfee returned to Johns Hopkins simultaneously—Wagner to assume the position of chief resident, McAfee to become an associate professor of radiology. Together they founded the first nuclear medicine facility at Johns Hopkins in 1958. Their team also included James Mosley, PhD, an engineer who built their machinery by hand, and Howard Stern, PhD, a chemist who made simple radioactive compounds. Their first facility measured 9 by 11 feet, and they worked with a homemade rectilinear scanner.

McAfee and Wagner were sure that nuclear medicine bridged a gap between internal medicine and radiology, but the two men were among the few active supporters of the fledgling discipline. They were given backing by Johns Hopkins, McAfee recalled, through their two departments, radiology and internal medicine. According to McAfee, this gave them greater freedom to conduct research that fell outside the medical mainstream. Wagner recently recalled that “we had to prove that nuclear medicine techniques added something to regular x-rays.” McAfee and Wagner superimposed nuclear scan results on chest or brain x-rays, a common technique today but one which they practiced from the start to make the reports more accessible to their peers.

Within a year their facility was well established and could take advantage of the favorable post-war environment. With no FDA in place at the time and the supportive climate stimulated by the Atoms for Peace program,

said McAfee, they were free to experiment without restrictions. "We both had lots of wild ideas," he said, "but only about 1% of them actually worked."

McAfee said their research advanced as he "conned chemical people into synthesizing strange things." Strange they may have been, but these led to some of nuclear medicine's seminal discoveries. According to Neumann, "John probably individually contributed the most to nuclear medicine practice of the last 20 years in terms of developing radiopharmaceuticals that actually achieved widespread clinical use."

Edward Silberstein, MD, of the University of Cincinnati, agreed. "His work is behind a great deal of what we do on a daily basis, not some esoteric discovery but major, fundamental procedures."

As one of their first accomplishments, McAfee and the Johns Hopkins group discovered radioactive mercury for kidney scanning in the 1950s, using mercurio-203 chlormerodrin, and conducted brain scanning using ^{99m}Tc in 1963. In 1964 they put together a chemical kit for liver imaging, produced an improved brain scanning agent, and became the first to use a large 8 in scanning crystal. Not all of their discoveries met with such success. McAfee remembers that just as they succeeded in producing a "beautiful image of the placenta, ultrasound put us out of business."

The Syracuse Years

In 1965, after 13 years at Johns Hopkins, McAfee moved to SUNY Upstate Medical Center as professor and chairman of the Department of Radiology. Gobul Subramanian, MD, whom McAfee had known as a promising undergraduate chemistry major at Johns Hopkins, followed him to Syracuse.

Together this new team came up with methaline diphosphonate, now the first-choice agent for bone imaging, and discovered a safer method of making technetium sulfur colloid. Subramanian also developed quick and easy methods to produce technetium micro- and macroaggregated albumen for lung imaging. Other achievements included the development of improved kidney imaging using glucoheptonate in combination with other agents, basic research and data collection on the distribution of technetium chelate, and fundamental contributions to bone marrow scans.

One discovery was made in England in 1972, when McAfee was on sabbatical at Hammersmith Hospital. He and Mathew Thakur, MD, had been searching for an agent to irreversibly label blood cells, and had already tried

many chelates with no luck. One rainy day their scheduled experiment fell through, and Thakur and McAfee were bored. They retried one of the agents that had failed in earlier tests, this time with surprising success. That chelate, indium oxine, has been the most widely used method for imaging infections and inflammations ever since.

After 25 years at Syracuse, McAfee moved to Washington, DC, to be closer to his three children and their families. Beginning in 1990 he taught in the Division of Nuclear Medicine of the Department of Radiology at George Washington University Medical Center. From 1992 to 1995 he also worked as chief of the NIH's Radiopharmaceutical Research Section and consulted in the Clinical Center until recently. He is now retired from clinical work but is still a part-time consultant for the NIH.

In fact, McAfee is still going strong. "He continues to think in advanced clinical terms; his mind is still as fertile as ever," remarked Silberstein. McAfee is currently writing a book on fatal diseases of famous historical figures, and remains a source of knowledge and inspiration to his peers and protégés.

"John is an excellent physician, an outstanding scientist, and above all, a warm person. These qualities of John's have always led me to talk to him frequently, and seek his advice on scientific matters. John is always abreast of the literature and full of novel ideas," says Thakur.

McAfee's extraordinary career has long been recognized by his colleagues. He has authored hundreds of scholarly articles and belongs to several medical societies. He has earned a number of awards, including the Paul C. Aebersold Award and the George Charles de Hevesy Nuclear Medicine Pioneer Award from the Society of Nuclear Medicine; the Johns Hopkins Alumni Award in Nuclear Medicine; the Hermann L. Blumbart Award from the New England Chapter of the Society of Nuclear Medicine; and the Albion O. Bernstein, MD, Award from the Medical Society of New York. He is the honorary president of the International Society of Radiolabeled Blood Elements.

McAfee's contribution to the field of nuclear medicine is unquestionably considerable. His vision, creativity, and decades of hard work have helped to solidify nuclear medicine as a powerful clinical tool. He has provided practitioners with fundamental radiopharmaceuticals and clinical techniques, as well as the inspiration to make their own contributions to the field.

— Katherine M. Bailey