

Fact Sheet: Molecular Imaging and Therapy *Revolutionizing the future of medicine and improving patient care today.*

What Is Molecular Imaging? “Viewing” the Body’s Biological Processes

Molecular imaging is the use of imaging technologies to assess biological activity in the body. It provides a way to see, define and determine the biology of diseases (such as cancer and Alzheimer’s disease) and improve patient care. Molecular imaging shows what cells are doing and how they are functioning over a period of time, as opposed to conventional diagnostic imaging procedures—such as X-rays or CT scans—which offer anatomical pictures of the body’s organs and tissues. Molecular imaging is an invaluable way to obtain medical information that would otherwise require exploratory surgery, more expensive diagnostic tests or simply be unavailable. Molecular imaging will result in early detection and earlier and better treatment. By helping understand the basis of disease, not just the end result, molecular imaging also holds the promise of preventing disease.

Why Is Molecular Imaging Important? It is Personalizing Medicine Non-invasively

Increased capabilities to image the human body—coupled with advances that reveal more about our molecular makeup—are deepening our understanding of disease and allowing researchers to explore new ways to manage and treat illnesses. Since the presence of disease can now be determined based on changes observed at the cellular and molecular level, molecular imaging delivers on the promise of personalized medicine—allowing doctors to tailor the treatment of a disease to each individual patient—before and during treatment. Molecular imaging is advancing the understanding, diagnosis, treatment and management of disease—to improve the lives of people worldwide.

What Are the Benefits of Molecular Imaging? The Promise of a New World of Health

Detection: With molecular imaging, abnormalities can be detected very early in the progression of a disease, often before problems can be observed with other diagnostic tests or even before symptoms occur. Molecular imaging minimizes the need for biopsies. Early detection improves the probability of a successful outcome.

Treatment: The drugs of the future will be designed based on a disease or patient specific “molecular signature”. This precise level of detail provides critical information not only for diagnosis but also to help determine what therapy will be most effective for any given patient. In addition, molecular imaging will enable physicians to monitor treatment very early to determine exactly how well a therapy is working and if changes are needed. Furthermore, molecular imaging will lead to faster, cheaper and better drug development—providing better patient care and overall cost-savings. In addition, molecular therapy will target specific disease processes, avoiding unnecessary toxicity to normal tissues.

Prevention: Molecular imaging will, in the future, allow screening of at-risk populations, thereby optimizing a patient’s care and outcome.

What Does the Future Hold? Technological Advances

Imaging capabilities have evolved from those that provide anatomical pictures to those that capture functional information and, more recently, molecular information (nuclear medicine, PET, SPECT, PET/CT, SPECT/CT, MRS, contrast-enhanced ultrasound, fluorescence and bioluminescence imaging). Leading-edge hybrid imaging (combining multiple, complementary imaging technologies such as PET and CT) offer unique opportunities to “view” the molecular biology of disease, and the use of this equipment is on the rise. Patients with cancer, heart disease, stroke or debilitating neurological conditions are benefiting



from earlier, more accurate diagnoses and safer, more effective treatments because their medical care includes scanning technologies such as PET/CT or SPECT/CT.

Are Molecular Imaging Procedures Available Today? Yes!

There are many molecular imaging procedures that are currently available and essential in many medical specialties—providing safe, painless and cost-effective techniques to image disease at the cellular and molecular level and also to treat disease. Molecular imaging plays a pivotal role in guiding the management of cancer: detection and diagnosis, staging (extent and location), assessing therapeutic targets, monitoring therapy and evaluating response. Patients undergo molecular imaging procedures to diagnose liver and gall bladder abnormalities, and to diagnose and treat hyperthyroidism and thyroid cancer. Molecular imaging is playing an increasingly significant role in conditions such as brain tumors, dementias (such as Alzheimer’s disease), and movement, seizure, and psychiatric disorders. Molecular imaging is also allowing a more personalized approach to the evaluation and management of cardiovascular disease. There are also many molecular imaging techniques now under development that will become available in the clinic in the near future. New and innovative treatments that target molecular processes within the body are revolutionizing our understanding of—and approach to—a range of diseases. As the fields of molecular biology, genomics and nanotechnology continue to advance, molecular imaging will also evolve, applying these advances to improve patient care.

SNM is an international scientific and professional organization of more than 16,000 members dedicated to promoting the science, technology and practical applications of molecular and nuclear imaging to diagnose, manage and treat diseases in women, men and children. SNM’s Molecular Imaging Center of Excellence is an organizational component within SNM that is dedicated to fostering and accelerating the acceptance, application, and appropriate use of molecular imaging and therapy in research and clinical practice. For more information, please visit www.snm.org/MI