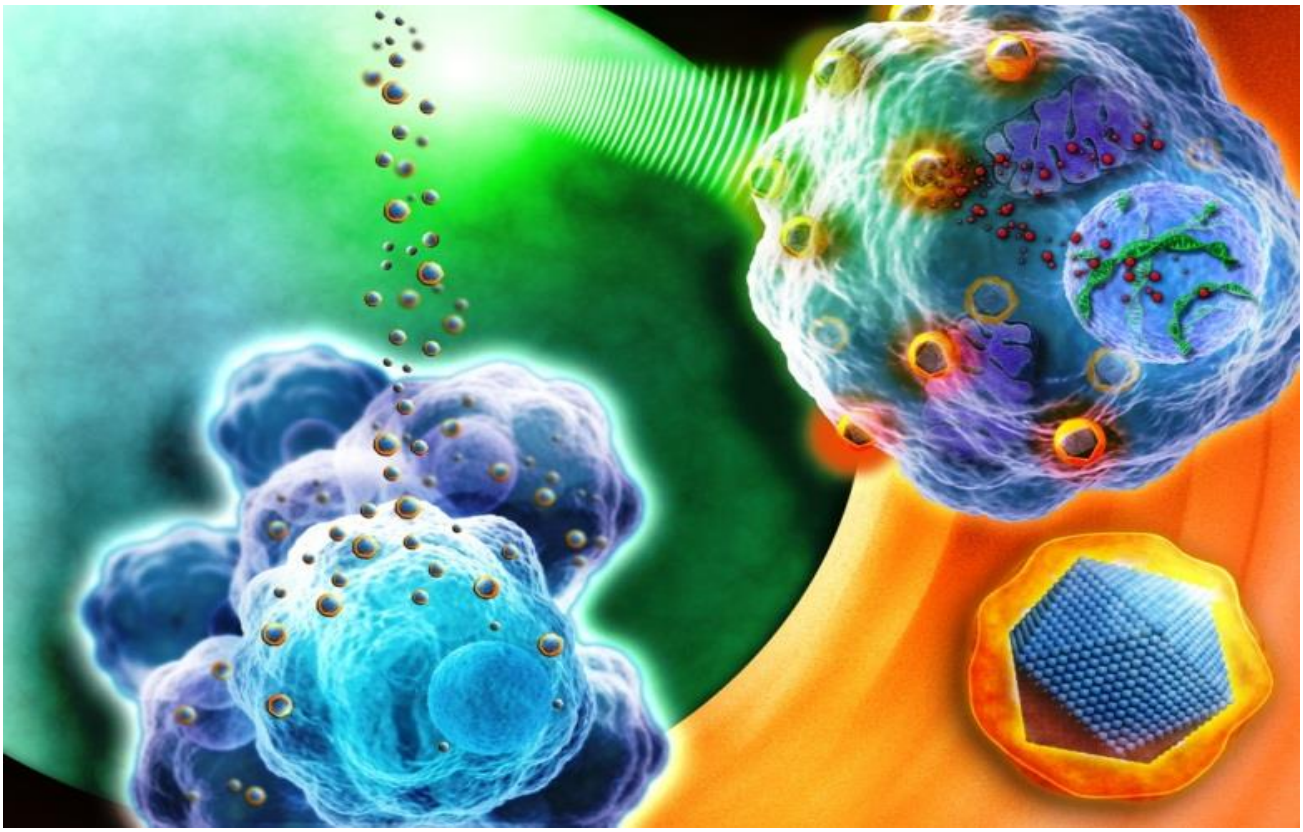
Summer 2015

NANOMEDICINE



Despite many advances in targeted therapeutics and diagnostics, there is still a need for specific, effective therapies without side effects and mechanisms for early detection that ensure therapies have the best opportunity to be timely and effective. Having witnessed substantial technological advances in the field of nanotechnology, scientists at the Imaging Research Center have been inspired to tackle these clinical problems with a nanomedicine approach. This involves research and technology development at the atomic, molecular, or macromolecular levels for the creation and use of functionalized structures, devices, and systems that exist at the nanoscale, which is about 1-100 nanometers. The nanoscale cannot be seen with the naked eye and requires the use of powerful microscopes. For example, a virus is about 30-50 nanometers.

The clinical potential for nanotechnology is immense. For example, nanoparticles targeting tumor cells or atherosclerotic plaques will enable clinicians to deliver therapy specifically to the tumor or plaque while reducing unwanted side effects. In addition, an increased capacity to image tumor cells or arterial plaque will aid in earlier diagnoses, allow for increased effectiveness, and enhance the monitoring of disease. Furthermore, cancer and cardiovascular therapeutics that have been abandoned due to toxic side effects have the potential to be viable options again with nanotechnology delivery systems.

NANOMEDICINE LABORATORY

This laboratory has two modules:

- The synthetic lab
- The analytical/biochemistry/biology lab

We are able to synthesize established imaging reagents for supply and distribution. In the synthetic lab, there are two large synthetic chemistry hoods that can accommodate four synthetic chemists working simultaneously. Each scientist has individual bench space for work-up and for storing samples, reagents, buffers, etc.

The analytical/biochemistry/biology lab has two smaller hoods for doing wet chemistry work. Both facilities have been equipped with state-of-the-art instruments to support the work.

The synthetic lab is well equipped for investigators to perform small-scale syntheses of organic, inorganic, and organometallic compounds for use in a multitude of imaging modalities as well as drug delivery nanoparticles. In addition, we are also capable of labeling peptides and antibodies with commercially available optical dyes, CT, or MR contrast agents.

Mulder Lab

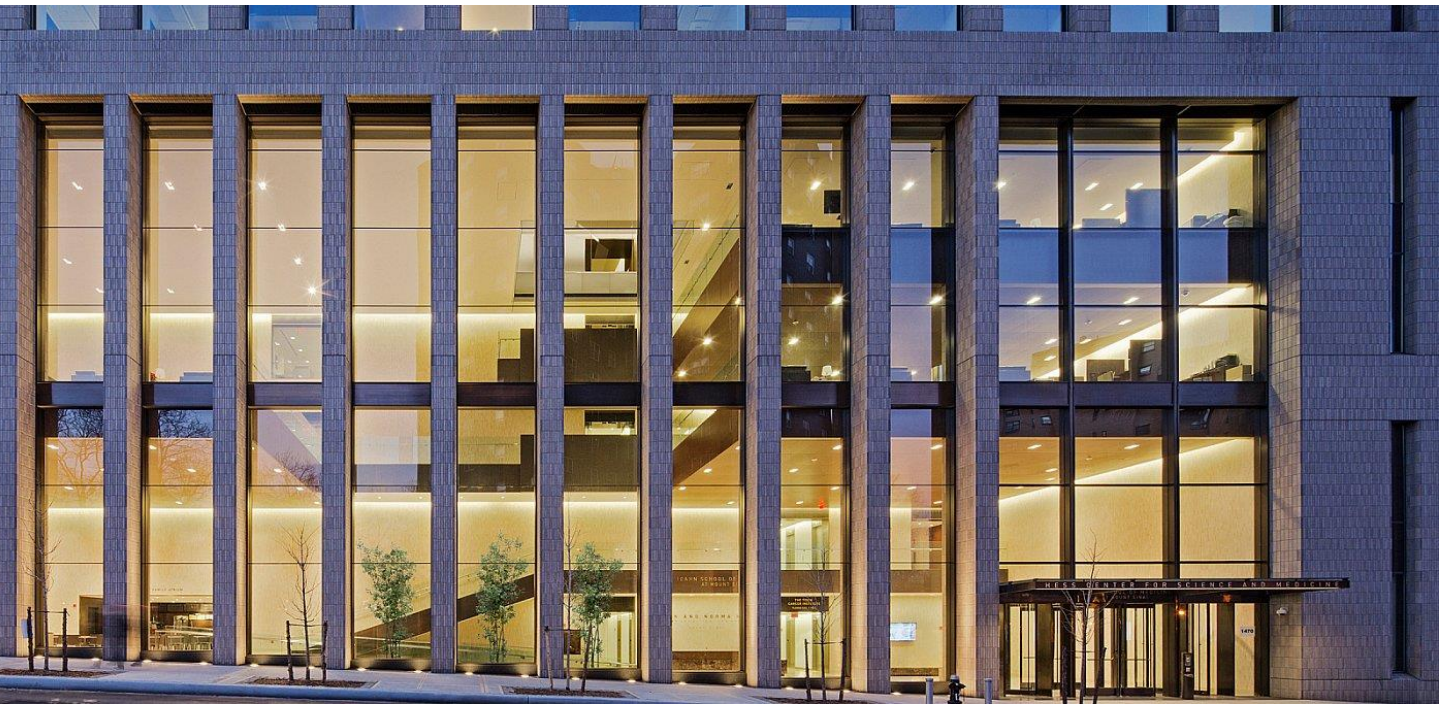
Willem J.M. Mulder, PhD
Associate Professor of Radiology
Director, Nanomedicine

The Nanomedicine Laboratory's mission is to develop and advance nanomedicinal approaches to allow a better understanding, identification and treatment of the most detrimental pathologies today: cardiovascular disease and cancer. The research projects range from fundamental, including nanotechnologies to better understand lipoprotein biology, to translational, with one of the developed nanotherapies being in clinical trials.

Carlos Perez-Medina, PhD
Mulder Lab

Dr. Perez-Medina's work revolves around the development of radiolabeling strategies for nanoparticles with a view to evaluate their in vivo behavior and non-invasively visualize their bio distribution by positron emission tomography (PET) imaging. Thus far we have been able to successfully radiolabel liposomal and high-density lipoprotein (HDL) nanoparticles with the long-lived, PET-active isotope zirconium-89. We have tested both nanoparticles in different animal models of cancer and cardiovascular disease with outstanding results that warrant further investigation. We are currently working on PET imaging tools to evaluate nanotherapy in a non-invasive manner as well as novel ways to assess vascular inflammation in the context of cardiovascular disease.

LEADERSHIP



Dr. Zahi Fayad is Director of the Imaging Research Center and the Translational and Molecular Imaging Institute, Director and Founder of the Eva Morris Feld Imaging Science Laboratories, and Director of Cardiovascular Molecular Imaging Research at the Icahn School of Medicine at Mount Sinai. He is a world leader in the development and use of multimodality cardiovascular imaging including: cardiovascular magnetic resonance (CMR), computed tomography (CT), positron emission tomography (PET). He holds twelve U.S. and worldwide patents and/or patent applications.

Dr. Fayad is the recipient of multiple prestigious awards and was recently honored with the John Paul II Medal from the City of Krakow, Poland, in recognition of the potential positive impact of his work on humankind and he holds the title of Honorary Professor in Nanomedicine at Aarhus University in Denmark.

In 2013, he was elected Fellow of the International Society of Magnetic Resonance In Medicine, Magnetic Resonance Imaging, received a Distinguished Reviewer from Magnetic Resonance in Medicine, and was selected as an Academy of Radiology Research, Distinguished Investigator. In 2014 his alma mater, Bradley University, awarded him its highest honor, the Centurion Society Award, for bringing national and international credit to his university.

Dr. Fayad has authored more than 300 peer-reviewed publications, 50 book chapters, and more than 400 meeting presentations. He is currently the principal investigator of four federal grants/contracts funded by the National Institutes of Health's National Heart, Lung and Blood Institute and the National Institute of Biomedical Imaging and Bioengineering, with a recent large award from NHLBI to support the Program of Excellence in Nanotechnology. In addition, he serves as principal investigator of the Imaging Core of the Mount Sinai National Institute of Health (NIH)/Clinical and Translational Science Awards (CTSA).

Icahn School of Medicine at Mount Sinai

If you wish to make a donation to support the Translational & Molecular Imaging Institute, please contact:
Victoria Medford, Office of Development
646.605.8742 or victoria.medford@mountsinai.org