Institute for Molecular Imaging and Theranostics(iMIT)

Director
Prof. **Jung-Joon Min,** M.D., Ph.D.

Major Research Goals

iMIT's primary mission is to achieve imaging-based precision medicine through the convergence of molecular imaging and therapy in major diseases such as cancers, cardiovascular, neurological, infectious and inflammatory diseases. Although human lifespan has been extended by the development of diagnostic or therapeutic technologies, many patients spend significant cost for therapies with uncertain efficacy. One of the main reasons is the selection of ineffective therapeutics without precise considering of the patient's own characteristics. Our research team has been developing technologies to visualize disease status and therapeutic mechanisms through combining imaging probes and specific molecules or microorganism to target and alter diseases in a lesion-specific manner. We believe our next generation core technology will have an important role in realization of precision medicine through image-guided selection of optimized therapeutic methods and, finally, simultaneous convergence of diagnosis and therapy.

Major Research Topics

1. Establishment of bacteria-based cancer theranostics platforms, emcompassing cancer-targeting *Salmonellae* and *E. coli*, smart bacterial engineering, tumor microenvironmental alteration, and enhanced targeting and immunotherapy strategies.
2. Identification of the image biomarkers to assess therapeutic response and predict therapeutic outcome of cancer.
3. Development of radio-acoustic imaging technology for non-invasive quantification of radiation dose and enhancement of effectiveness of radiotherapy.
4. Development of advanced PET, optical and photoacoustic imaging techniques for imaging infection, inflammation and pain focus.
5. Establishment of next-generation imaging probes for cardiovascular and neurological diseases.
6. Establishment of high-throughput screening and production system for target-specific peptides and protein binders.

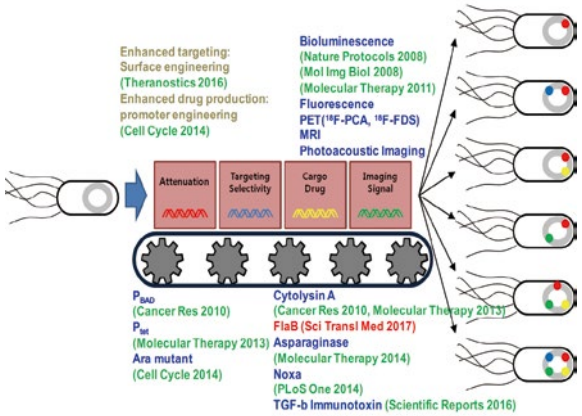
Major Achievements

1. Cancer theranostic *Salmonella typhimurium* has been engineered for targeted delivery of payload, generation of imaging signal, and tumor-selective production of cargo drugs(Science Translational Medicine 2017, Theranostics 2016, 2015, Molecular Therapy 2013(cover story), 2012, 2010, Cancer Research(2010), Nature Protocols 2008, etc.).
2. Mitochondrial voltage sensors has been developed for ^{18}F-labeled agent-based PET myocardial imaging(J Nucl Med 2012, 2015, etc.).
3. A novel protein binder, repebody, has been established for targeted imaging and therapy of EGFR-expressing cancers(Angew Chem Int Edit 2015).

Representative Figures

Scheme of iMIT

Engineering of smart bacteria for cancer theranostics



Major Relevant Publications

1. Zheng JH, et al. Two-step enhanced cancer immunotherapy with engineered Salmonella typhimurium secreting heterologous flagellin. Sci transl Med 2017 Accepted.
2. Park SH, et al. RGD Peptide cell-surface display enhances the targeting and therapeutic efficacy of attenuated Salmonella-mediated cancer therapy. Theranostics. 2016;6(10):1672-82.
3. Lee JJ, et al. Enzymatic prenylation and oxime ligation for the synthesis of stable and homogeneous protein-drug conjugates for targeted therapy. Angew Chem Int Ed Engl. 2015;54(41):12020-4.
4. Kim JE, et al. *Salmonella typhimurium* suppresses tumor growth via the pro-inflammatory cytokine Interleukin-1β. Theranostics 2015; 5(12): 1328-1342.
5. Nguyen VH, et al. Genetically engineered Salmonella typhimurium as an imageable therapeutic probe for cancer. Cancer Res. 2010;70(1):18-23.

Research Networks