

Real-time IntraVital Microscopy (IVM): In Vivo Cellular-level Imaging of Internal Organs in a Live Animal

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Intravital microscopy is a unique imaging technique to visualize various *in vivo* cellular-level dynamics such as cell trafficking, cell-to-cell or cell-to-microenvironment interactions in a live animal. Intravital imaging of cellular dynamics in a natural physiological microenvironment can provide unprecedented insights in the dynamic pathophysiology of human diseases those were impossible to obtain through conventional histological observation of *ex vivo* sample or *in vitro* culture system. During the last decade, the intravital microscopy has become a highly valuable, indispensable technique in wide areas of biomedical sciences such as immunology, neuroscience, developmental and tumor biology. Notably, *in vivo* visualizations of gene expression, protein activity, cell trafficking, cell-cell / cell-microenvironment interactions and various physiological responses to external stimuli have been successfully achieved. Additionally, it's a unique tool for the development of new therapeutics and diagnostics by providing improved accuracy and reliability in *in vivo* target validation with delivery monitoring and efficacy assessment. It has been used to directly analyze the delivery and efficacy of new biopharmaceuticals such as antibodies, cell therapy, gene therapy, nucleic acids and exosome in an *in vivo* microenvironment.

In this talk, IVIM Technology's All-in-One real-time intravital two-photon and confocal microscopy system will be introduced. The imaging system has been extensively optimized for *in vivo* cellular-level imaging of internal organs in live animal model for various human diseases. It can acquire a real-time multi-color sub-micron resolution microscopic images in a live animal model with automatic motion compensation, enabling direct imaging analysis of complex cancer immune-microenvironment consisted of various immune cells, stromal cells, vascular cells and extracellular matrix. Intravital imaging of various organs including skin, liver, spleen, pancreas, kidney, small intestine, colon, retina, lung, heart, lymph node, brain, and bone marrow will be briefly introduced. Subsequently, recent studies utilizing the real-time intravital imaging technique to investigate dynamic cellular-level pathophysiology of various human diseases and develop new therapeutics will be introduced.

Keyword: Intravital microscopy, Two-photon microscopy, Confocal microscopy, In vivo imaging, Pathophysiology