MAJOR RESEARCH INTERESTS

My laboratory is involved in studying 2 basic cell biology research problems; and 3 translational research problems in liver tissue engineering for therapeutics and drug development. The 2 basic cell biology research problems centre on studying the endoplasmic reticulum (ER) dynamics in liver fibrosis and resolution, jointly with MIT, Duke University and Columbia University. We have discovered that liver fibrosis/cirrhosis can be resolved via stem cell transplantation. With in vitro cell co-culture model, we hypothesize that TGF-β1 homeostasis is critical in the fibrosis resolution; and are elucidating the molecular mechanisms of homeostasis that involves two protease pathways: one regulating the normal liver and the other fibrotic liver. We also discovered that a membrane protein, kinectin on the ER, is important to maintain ER morphology, membrane trafficking, protein synthesis, cell attachment and migration. We are studying whether and how these cellular processes can play a role in activation/inactivation of hepatic stellate cells in liver fibrosis/resolution. We are also testing whether ER plays a key role in global and local protein synthesis. The 3 liver tissue engineering problems are: 1) developing a re-usable bio-artificial liver-assisted device for patients with liver failure; 2) establishing a pharmacokinetics model with human cells-on-chip to facilitate drug development; and 3) engineering and imaging large tissue constructs with intra-tissue perfusion system for in vitro and in vivo applications. A multi-disciplinary team of biologists, chemists, engineers, medical doctors, and physicists has been assembled to tackle these problems.

RECENT REPRESENTATIVE PUBLICATIONS

