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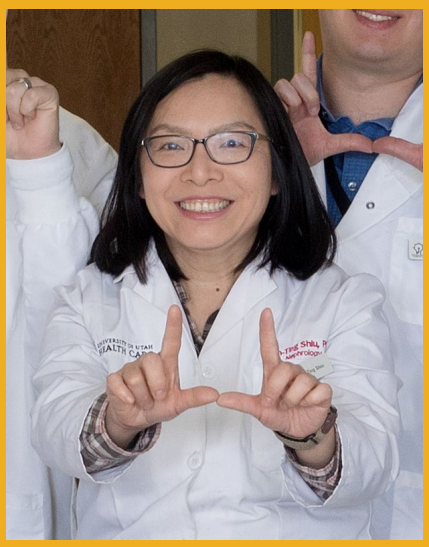
School of Biological and Health Systems Engineering

Translational Research in Hemodialysis Vascular Access



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Friday, April 25, 2025
9:00 a.m. - 9:50 a.m., SCOB 228
Faculty Host: Mark Wang

Abstract Hemodialysis requires functional vascular access, which serves as the conduit for blood flow between the patient and the hemodialysis machine. The arteriovenous fistula (AVF), created by surgically connecting an artery to a nearby vein in the upper extremity, is the preferred form of vascular access for maintenance hemodialysis. Newly created AVFs must undergo a maturation process, during which the fistula vein enlarges and develops sufficient lumen size and blood flow to be used effectively for dialysis. However, since the invention of AVFs 60 years ago, rates of AVF maturation failure have remained high. Currently, no proven therapies exist to promote maturation or prevent maturation failure. My presentation examines the current understanding of the cellular and molecular mechanisms underlying AVF maturation failure, with particular focus on the impact of the aberrant hemodynamic environment on the vascular system. I will also discuss current therapies and investigational approaches to promote AVF maturation.

Biosketch I obtained my BS degree from National Taiwan University (1994) and PhD degree from Rice University (1999), both in chemical engineering. During 1999-2001, I did my postdoc training at UCSD Dept. of Bioengineering under Dr. Shu Chien's mentorship. I came to University of Utah in 2002, spending the first few years in the Dept. of Biomedical Engineering where classroom teaching and committee services took up most of my time. I transferred to Dept. of Internal Medicine in 2010 to focus on research. I am now a tenured full professor of internal medicine and Dialysis Research Foundation Endowed Chair of Internal Medicine. I am a biomedical engineer by training, with a focus on the vasculature's mechanobiology and biomechanics. Since 2010, my research has sharply focused on hemodialysis vascular access (HVA) dysfunction. As a PI, I've obtained 5 NIH R01's, 3 VA Merit Awards, and several foundation awards and industry contracts, all for supporting my research on HVA dysfunction. HVA has extremely aberrant blood flow. After 15 years of working with collaborators, my lab has a unique and the world's largest HVA blood flow database including HVA in patients and animal models (pig, rat, mouse). We use this information to investigate druggable targets. My lab is a leader in the field of translational research of HVA dysfunction. I also conduct clinical research and am an investigator in the NIDDK-funded HFM Consortium and CRIC Study. In recent year, I've started to expand my research program to investigating vascular dysfunctions and the progression of cardiovascular disease in patients with chronic kidney disease, given that cardiovascular disease is the leading cause of death in this population.