BioNanofluidics for Drug Screening, Disease Diagnosis, Medical Device Design, and Personalized Medicine

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Professor

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Brief Bio of Yaling Liu

- **AIMBE Fellow, ASME Fellow,**
- **Associate editor of Journal of Medical Device**
- **Associate editor of Frontiers in Bioengineering and Biotechnology**

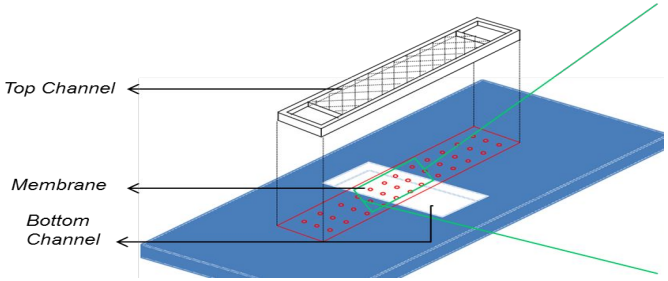
- **Education**
  Northwestern University, Department of Mechanical Engineering, PhD 2006

- **key publications**

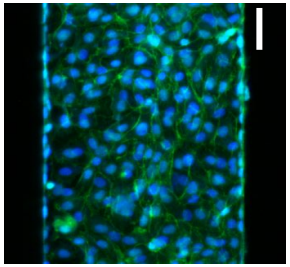
1. R. Paul, Y. Zhao, D. Coster, Y. Liu, “Rapid Prototyping of High-resolution Large Format Microfluidic Device through Maskless In-situ Image Guided Photopolymerization”, Nature Communications, 14: 4520, 2023
2. A. Wu, Y. Zhao, Y. Zhou, Y. Liu, “Microfluidic Droplet-assisted Fabrication of Vessel-supported Tumors for Preclinical Drug Discovery”, ACS Applied Materials and Interfaces, 15, 12, 15152–15161, 2023
3. Y. Zhou, A. Wu, Y. Liu, “Hierarchical Vessel Network Supported Tumor Model-on-a-Chip by Induced Spontaneous Anastomosis”, ACS Applied Materials and Interface, 15, 5, 6431–6441, 2023
4. A. Wu, Y. Zhou, Y. Liu, “An Adaptable Vessel-on-a-Chip platform for Investigating Metastatic Transport in Bloodstream”, Analytical Chemistry, 94, 35, 12159–12166, 2022

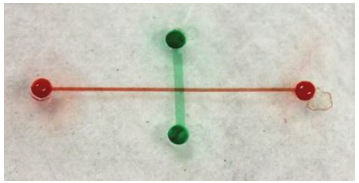
- **Keywords for research**
  Precision Medicine, Biotransport, Microfluidics, Organ-on-Chip, Cell Mechanics, MEMS, NEMS

Biomimetic Drug Evaluation Platform

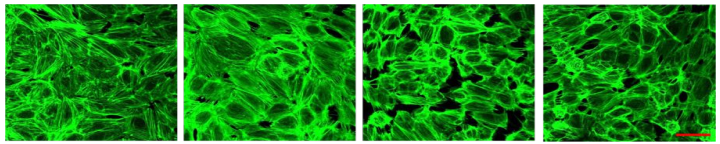


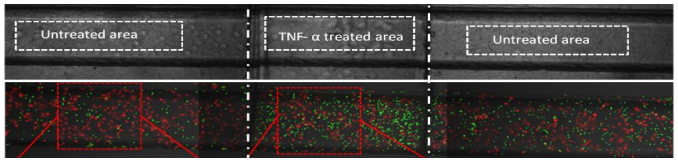
Nanoparticle binding on biomimetic blood vessel



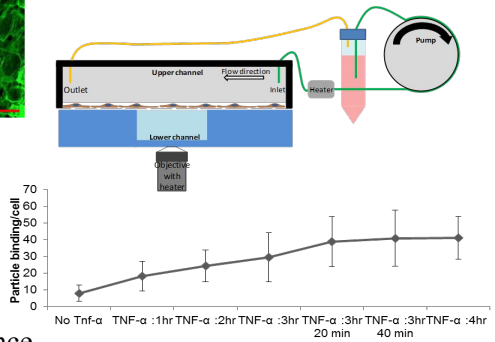


endothelium coated to mimic blood vessel

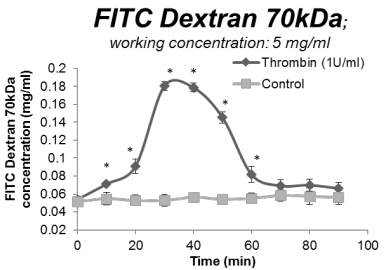




Binding distribution of ICAM-1 coated 210nm fluorescence nanoparticle on anti-ICAM-1 coated microfluidic channels



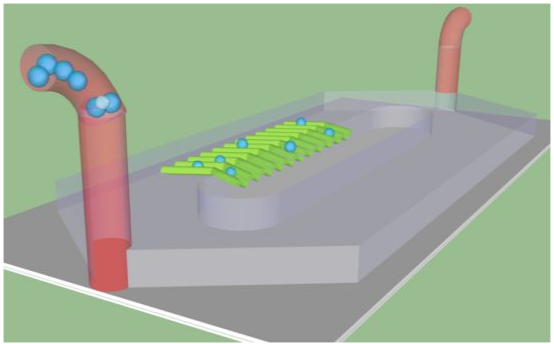
Real-time particle binding study under flow



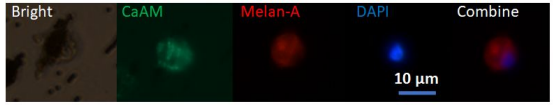
Vascular Permeability dynamics

We developed cell-seeded microfluidic chips for evaluation of various nanoparticles drug carriers

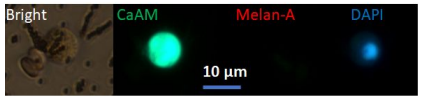
Cancer Diagnosis and Personalized Medicine



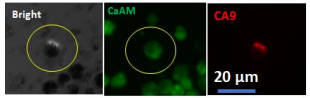
A CTC from MM-05



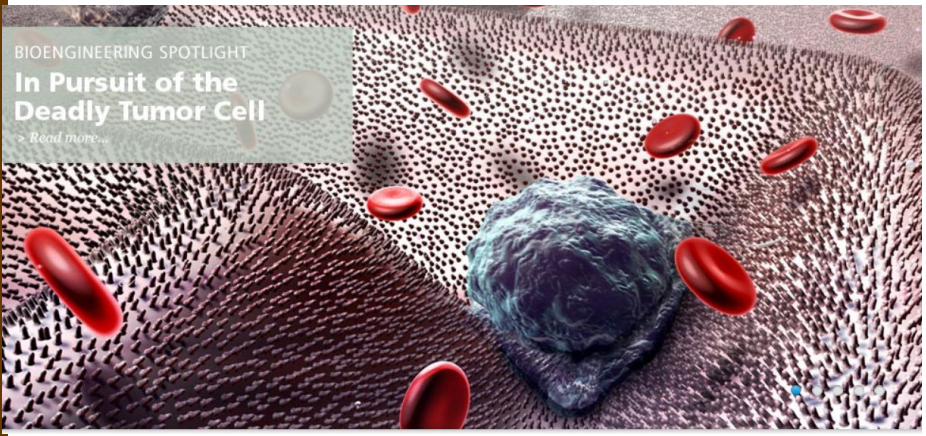
A WBC from MM-05



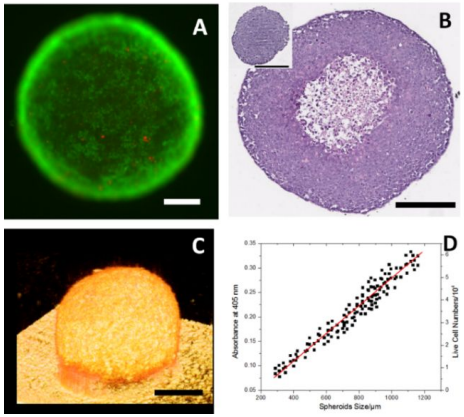
A CTC from RCC-06



Lab on Chip Capture of Circulating Tumor Cell from Patient Blood Sample



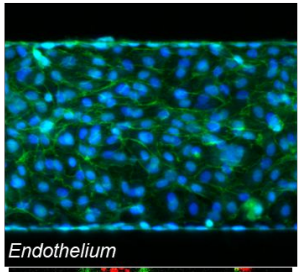
In collaboration with Lehigh Valley Hospital, we are using liquid biopsy (circulating tumor cell and circulating tumor DNA) for cancer diagnosis, monitoring, and personalized drug screening

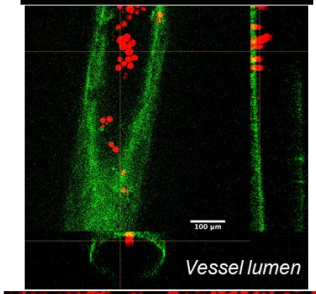


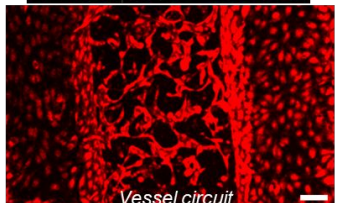
3D culturing of tumor spheroid for personalized drug testing

Organ on Chip

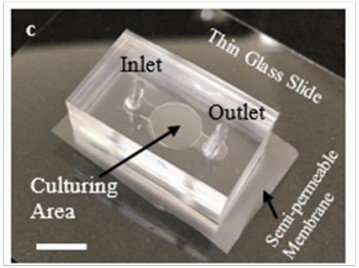
Blood Vessel Chip

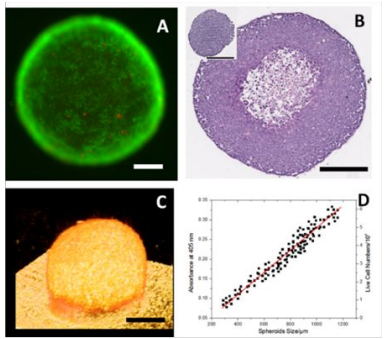






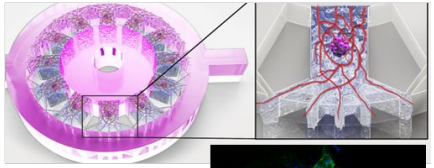
Tumor Chip



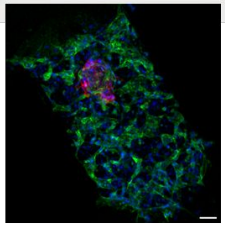


3D culturing of tumor spheroid

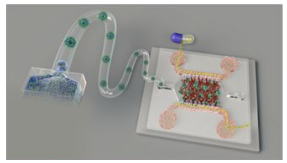
Vascularized Tumor Chip

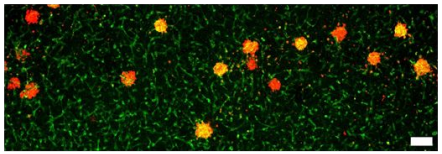


Precise

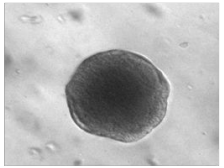


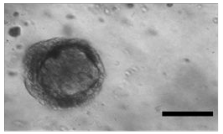
High-throughput

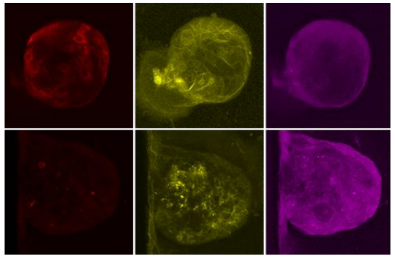




Patient Derived Organoid

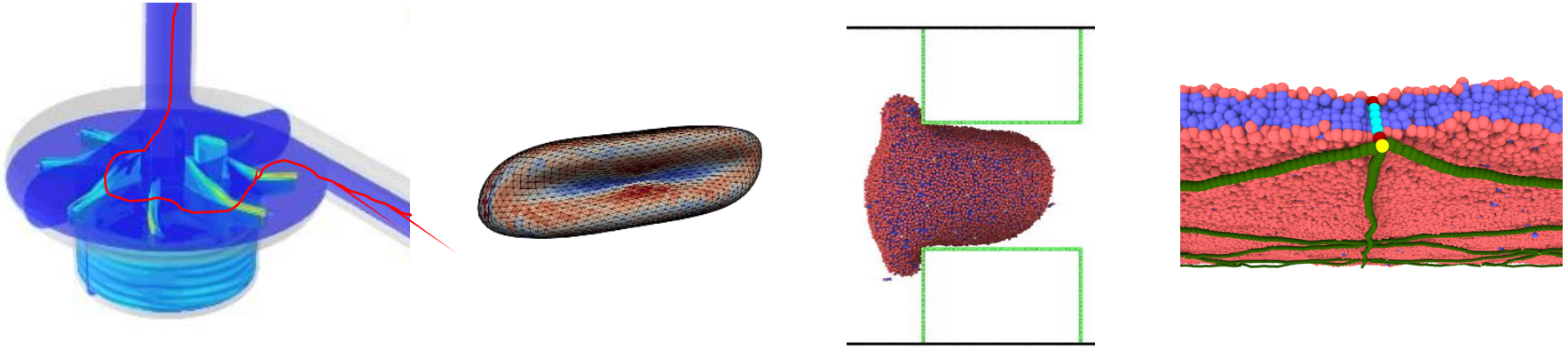






Hemolysis Prediction in Medical Devices

Multiscale modeling of blood cell damage in medical device



Hemolysis evaluation is an important step for FDA approval of any blood-wetting device. In collaboration with University of Maryland Medical School, we aim to develop a cellular model that can predict hemolysis in any device.

Contact

- Looking for PhD student and Post Doc
- Our research is supported by
  - National Institute of Health (NIH)
  - National Science Foundation (NSF)

- Contact: yal310@lehigh.edu