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

Yaling Liu
Professor
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Department of Bioengineering
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
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

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

Department of Bioengineering
Biomimetic Drug Evaluation Platform

Nanoparticle binding on biomimetic blood vessel

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

Real-time particle binding study under flow

Vascular Permeability dynamics

Binding distribution of ICAM-1 coated 210nm fluorescence nanoparticle on anti-ICAM-1 coated microfluidic channels
Cancer Diagnosis and Personalized Medicine

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**

- Endothelium
- Vessel lumen

**Tumor Chip**

- Inlet
- Outlet
- Culturing Area
- 3D culturing of tumor spheroid

**Vascularized Tumor Chip**

- Precise
- High-throughput

**Patient Derived Organoid**

- CK7
- EpCAM
- PD-L1

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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.
Looking for PhD student and Post Doc

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- National Institute of Health (NIH)
- National Science Foundation (NSF)

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