



Paul Hsieh-Fu Tsai

Curriculum Vitae

Education

- 2006–2010 **Bachelor of Science**, *Clinical Laboratory Sciences and Medical Biotechnology*, National Taiwan University, Taiwan.
The effect of farnesol on lipase and protease activity of clinically isolated Staphylococcus aureus and Staphylogoccus epidermidis
- 2010–2012 **Master of Science**, *Institute of Biophotonics*, National Yang-Ming University, Taiwan.
Electrotaxis of lung adenocarcinoma cells and its signaling pathways
- 2014–2020 **Doctor of Philosophy**, *Micro/Bio/Nanofluidics Unit*, Okinawa Institute of Science and Technology Graduate University, Japan.
Glioma-on-chip: cell guidance and responses of glioma cells in a microfluidic-controlled microenvironment

Publications

- [1] **Hsieh-Fu Tsai**, Camilo IJspeert, and Amy Q. Shen. Voltage-gated ion channels mediate the electrotaxis of glioblastoma cells in a hybrid pmma/pdms microdevice. *bioRxiv*, 2020. doi: 10.1101/2020.02.14.948638.
- [2] **Hsieh-Fu Tsai***, Kazumi Toda-Peters, and Amy Q. Shen*. Glioblastoma adhesion in a quick-fit hybrid microdevice. *Biomedical Microdevices*, 21(2):30, Mar 2019. ISSN 1572-8781. doi: 10.1007/s10544-019-0382-0.
- [3] **Hsieh-Fu Tsai***, Joanna Gajda, Tyler F.W. Sloan, Andrei Rares, and Amy Q. Shen*. Usiigaci: Instance-aware cell tracking in stain-free phase contrast microscopy enabled by machine learning. *SoftwareX*, 9:230–237, 2019. doi: 10.1016/j.softx.2019.02.007.
- [4] **Hsieh-Fu Tsai**, Alen Trubelja, Amy Q Shen*, and Gang Bao*. Tumour-on-a-chip: microfluidic models of tumour morphology, growth and microenvironment. *Journal of The Royal Society Interface*, 14(131):20170137, 2017. doi: 10.1098/rsif.2017.0137.
- [5] Toshiaki Mochizuki, Yi-Jyun Luo, **Hsieh-Fu Tsai**, Akane Hagiwara, and Ichiro Masai*.

Cell division and cadherin-mediated adhesion regulate lens epithelial cell movement in zebrafish. *Development*, 144(4):708–719, 2017. doi: 10.1242/dev.138909.

- [6] Joshua J Cardiel, Daisuke Takagi, **Hsieh-Fu Tsai**, and Amy Q Shen*. Formation and flow behavior of micellar membranes in a t-shaped microchannel. *Soft matter*, 12(39): 8226–8234, 2016. doi: 10.1039/C6SM01093H.
- [7] **Hsieh-Fu Tsai**, Ji-Yen Cheng, Hui-Fang Chang, Tadashi Yamamoto, and Amy Q Shen*. Uniform electric field generation in circular multi-well culture plates using polymeric inserts. *Scientific reports*, 6:26222, 2016. doi: 10.1038/srep26222.
- [8] **Hsieh-Fu Tsai**, Yi-Ching Tsai, Sharon Yagur-Kroll, Noa Palevsky, Shimshon Belkin, and Ji-Yen Cheng*. Water pollutant monitoring by a whole cell array through lens-free detection on ccd. *Lab on a Chip*, 15(6):1472–1480, 2015. doi: 10.1039/C4LC01189A.
- [9] Hsien-San Hou, **Hsieh-Fu Tsai**, Hsien-Tai Chiu, and Ji-Yen Cheng*. Simultaneous chemical and electrical stimulation on lung cancer cells using a multichannel-dual-electric-field chip. *Biomicrofluidics*, 8(5):052007, 2014. doi: 10.1063/1.4896296.
- [10] Kai-Yin Lo, Yun Zhu, **Hsieh-Fu Tsai**, and Yung-Shin Sun. Effects of shear stresses and antioxidant concentrations on the production of reactive oxygen species in lung cancer cells. *Biomicrofluidics*, 7(6):064108, 2013. doi: 10.1063/1.4836675.
- [11] **Hsieh-Fu Tsai**, Ching-Wen Huang, Hui-Fang Chang, Jeremy JW Chen, Chau-Hwang Lee, and Ji-Yen Cheng*. Evaluation of egfr and rtk signaling in the electrotaxis of lung adenocarcinoma cells under direct-current electric field stimulation. *PLoS One*, 8(8): e73418, 2013. doi: 10.1371/journal.pone.0073418.
- [12] **Hsieh-Fu Tsai**. Electric field directed lung adenocarcinoma cell migration in a micro-controlled environment. Master's thesis, Institute of Biophotonics, 2012. URL <https://etd.lib.nctu.edu.tw/cgi-bin/gs32/ymsgweb.cgi?o=dymcdr&s=id=%22GYS122622024%22.&searchmode=basic>.
- [13] **Hsieh-Fu Tsai**, Shih-Wei Peng, Chun-Ying Wu, Hui-Fang Chang, and Ji-Yen Cheng*. Electrotaxis of oral squamous cell carcinoma cells in a multiple-electric-field chip with uniform flow field. *Biomicrofluidics*, 6(3):034116, 2012. doi: 10.1063/1.4749826.
- [14] Ji-Yen Cheng, Mansoureh Z Mousavi, Chun-Ying Wu, and **Hsieh-Fu Tsai**. Blue light emission from a glass/liquid interface for real-time monitoring of a laser-induced etching process. *Journal of Micromechanics and Microengineering*, 21(7):075019, 2011. doi: 10.1088/0960-1317/21/7/075019.

Patents

EP3350310B1 3D POLYMERIC INSERT TO APPLY UNIFORM ELECTRIC FIELD IN CIRCULAR CULTUREWARE

☎ (81) 80 6481 5004 • ✉ hsiehfutsai@gmail.com
🌐 hftsai.radiagnostics.com • 🏠 github.com/hftsai

US Appl. 62/968,768 A DETACHABLE MICROFLUIDIC SYSTEM AND METHOD FOR ROBUST SPARSE CELL SEEDING WITHOUT BUBBLES

Professional activity

Referee

Nature Communication
Biomedical microdevices

Award

- 2008 National Taiwan University Theodore Memorial Scholarship
- 2009 Research Creativity Award from National Science Council of Taiwan [Acceptance rate 4.5%]
- 2012 National Yang-Ming University Annual Thesis Competition Excellence Award

Fellowship & Grant

- 2008–2009 Undergraduate Student Thematic Grant, NSC97-2815-C-002-072B, National Science Council, Taiwan [Acceptance rate 41.9%]
- 2017–2020 Research Fellows of Japan Society for the Promotion of Science (DC1 & PD) & Grants-in-Aid for Scientific Research (KAKENHI), JP1700362, Japan Society for the Promotion of Science, Japan [Acceptance rate 20.7%]

Certificate

- 2011 Board Certified Medical Technologist (Taiwan)
- 2014 Emergency Medical Technician-1 (Taiwan)

Conference presentation

- 2011 [Oral]International Photonics Conference
- 2012 [Poster]The 20th Symposium on Recent Advances in Cellular and Molecular Biology
- 2012 [Poster]The 17th Biophysics Conference
- 2012 [Poster]The 4th International Symposium on Microchemistry and Microsystems
- 2012 [Poster]The 16th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS)
- 2014 [Poster]Advances in Microfluidics and Nanofluidics

- 2016 [Oral]NanoEngineering for Medicine and Biology
2017 [Poster]Lab-on-chip World Congress

Experience

Research

2007–2010 **Undergraduate Thematic Research**, *Teng's Group*, Department of Clinical Laboratory Sciences and Medical Biotechnology, National Taiwan University.

Explored the effect of farnesol, a sesquiterpene isolated from essential oils, on the enzyme activity of lipase and protease of clinical isolates of *Staphylococcus aureus* and *Staphylococcus epidermidis*. Identified that different strains have different extracellular enzyme activities but all the lipase activity of *S. aureus* and part of the protease activity of *S. aureus* and *S. epidermidis*, supposedly serine proteases, can be inhibited by farnesol. A new bacteriostatic strategy that could limit the rise of antibiotic resistance may be considered as the extracellular enzymatic and toxin activity of these pathogenic bacteria could be inhibited instead of killing the bacteria.

Detailed projects:

- 2008–2009 National Science Council Undergraduate Thematic Research Grant
– The Effect of Farnesol on the Lipase and Protease Activity of *Staphylococcus aureus* and *Staphylococcus epidermidis*
- 2009–2010 Molecular typing of pathogenicity island and fusidic resistance in Methicillin-resistant *Staphylococcus aureus*

2010–2012 **Master Research**, *BioMicrofluidic Applications Laboratory (BioMAps)*, Research Center for Applied Sciences, Academia Sinica.

Development of polymeric microfluidic chips for investigation of directional migration of lung adenocarcinoma cell in a direct current electric field. A novel multiple-electric-field microfluidic chip with uniform flow field was first developed for increasing the experimental throughput of electrotaxis. Bioreactor chips with large cell culture area for uniform electric field stimulation were also developed to collect large amount of sample for investigation of the cellular signaling of electrotaxis using phosphoproteomics and glycomics.

Detailed projects:

- 2010–2011, Multiple-electric-field microfluidic chip with uniform flow field (MFCII). Published in *Biomicrofluidics*(2012)
- 2011–2012, Extra-large electric field chip (XLEFC) for electric field stimulation sample collection. Published in *PLoS ONE*(2013)

2014–2015 **Rotation Research**, *Okinawa Institute of Science and Technology*, Japan.

- Cadherin-mediated adhesion regulate lens epithelial cell movement in zebrafish (Masai Unit) (*Development*, 2017)
- Fabrication of copper nanowire for gas sensing (Sowwan Unit)
- Isotachopheresis microfluidic chip for DNA purification and concentration (Shen Unit)

2015–2020 **Graduate Research**, *Micro/Bio/Nanofluidics Unit*, Okinawa Institute of Science and Technology, Japan.

My PhD work focused on developing heterogenous hybrid microdevices and open-source hardware as well as software to study the migration of glioblastoma cells under microenvironment created through microfluidics technology.

Detailed projects:

1. Uniform electric field generation in circular cultureware using 3D CAD polymeric inserts (*Scientific Report*, 2016)
2. Open-source temperature controller for lab-on-chip applications (*in prep*)
3. Usiigaci: Instance-aware cell tracking under stain-free phase contrast microscopy enabled by deep learning (*SoftwareX*, 2019)
4. Study of glioma cell adhesion on electric field and shear flow conditioned endothelium using a quick-fit microdevice (*Biomedical Microdevices*, 2019)
5. Automated microfluidic cell culture platform for studying cell migration (*in prep*)
6. Characterization of native protein biophysical properties in high ionic-strength buffers.
7. Electrotaxis of glioma cells under multiplex gradients in the microenvironment
8. Voltage-gated ion channels in glioblastoma cell electrotaxis (submitted, 2020)

Vocational

2010–2010 **Internship**, *National Taiwan University Hospital*, Taiwan.

Clinical rotation in a university hospital.

2013–2014 **Substitute Military Service**, *Ministry of Health and Welfare*, Taiwan.

Administrative evaluation of foreign medical staff visit to Taiwan.

2013–2014 **Research Assistant**, *Research Center for Applied Sciences*, Academia Sinica, Taiwan.

Development of microfluidic whole cell sensing platform for environmental sensing (In collaboration with Prof. Belkin's Group at The Hebrew University of Jerusalem, Israel. Results published on *Lab on Chip* (2015))

Teaching

2010–2010 **Teaching assistant**, *Clinical bacteriology*, CLSMB, National Taiwan University, Taiwan.

Editing of teaching materials for clinical bacteriology

2016–2016 **Teaching assistant**, *Microfluidics*, OIST, Japan.

Teaching assistant for microfluidics lab on microfabrication

2017–2017 **Guest lecturer**, *Skill Pills on 3D Printing*, OIST, Japan.

Teaching assistant for introduction of 3D printing technologies and its application.

Skills

Clinical science

Basic Clinical data quality control, *in vitro* diagnostics

Intermediate Clinical laboratory diagnostics

📞 (81) 80 6481 5004 • ✉ hsiehfutsai@gmail.com
🌐 hftsai.radiagnostics.com • 🌐 github.com/hftsai

Biomedical science

- Basic Transmission electron microscopy, bioinformatics
- Intermediate scanning electron microscopy, quantitative phase microscopy, molecular cloning, protein biochemistry, biostatistics, flow cytometry
- Advanced cell culture, bacteriology, confocal microscopy

Engineering

- Basic open-electronics, CNC machining, wire-EDM
- Intermediate 3D printing, micromilling
- Advanced lithography, laser micromachining

Computer skills

- Basic MATLAB, LABVIEW, Adobe Illustrator, Adobe Photoshop, PyTorch, TensorFlow
- Intermediate PYTHON, L^AT_EX, Linux, Microsoft Windows, ImageJ, Imaris, Computer Hardware and Support

Numerical simulation

- FEM COMSOL Multiphysics
- FVM CFD-ACE+, Fluent

Languages

- Taiwanese **Native speaker**
- Mandarin
- Taiwanese **Native speaker**
- English **Full professional proficiency**
- Japanese **Basic working proficiency**

Reference

1. **Professor Amy Q. Shen**, *Micro/Bio/Nanofluidics Unit*, Okinawa Institute of Science and Technology Graduate University, Japan.
amy.shen@oist.jp
2. **Professor Ji-Yen Cheng**, *Research Center for Applied Sciences*, Academia Sinica, Taiwan.
jycheng@gate.sinica.edu.tw
3. **Professor Lee-Jene Teng**, *Department of Clinical Laboratory Sciences and Medical Biotechnology*, National Taiwan University, Taiwan.
ljteng@ntu.edu.tw