



# 腦原位磁共振成像和超音波治療奈米複合平台

*An Advanced In Situ Magnetic Resonance Imaging and Ultrasonic Theranostics Nanocomposite Platform: Crossing the Blood-Brain Barrier and Improving the Suppression of Glioblastoma Using Iron-Platinum Nanoparticles in Nanobubbles*



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(詹明賢)

**Department of Biomedical  
Imaging and Radiological  
Sciences**

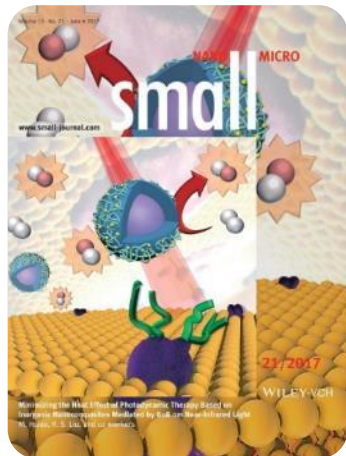
**National Yung Ming Chiao Tung  
University**



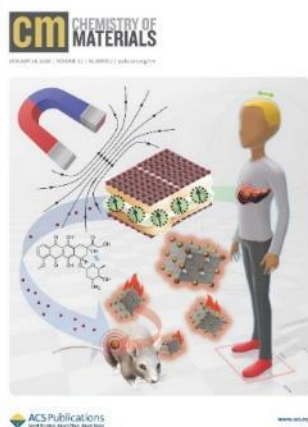
# Curriculum Vitae



▲ 第二十六屆肝病防治基金會優秀論文獎



Small 2017, 13, 1700038.



Chem. Mater. 2020, 32, 2, 697–708.

➤ **Residence:** Taipei City



➤ **Bachelor Degree:** Department of Bioscience and Biotechnology, National Taiwan Ocean University (2008-2012)



➤ **Master Degree:** Department of Bioscience and Biotechnology, National Taiwan Ocean University (2012-2014)



➤ **Doctor Degree:** Department of Chemistry, National Taiwan University (2014-2018)



➤ **Postdoctoral Fellow:** Genomics Research Center, Academia Sinica (2018-2023)



➤ **Assistant Professor:** Department of Biomedical Imaging and Radiological Sciences, National Yung Ming Chiao Tung University (2023-now)



## ◆ Introductions

- Suitable nanocarriers
- Drug delivery systems

## ◆ Current research topic

- An Advanced *In Situ* Magnetic Resonance Imaging and Ultrasonic Theranostics Nanocomposite Platform

## ◆ Cooperation and further research topics

- Taipei Veterans General Hospital
- Academia Sinica

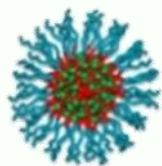




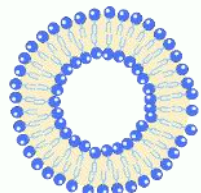
## Why we choose nanomaterials for bioapplications?

- **High surface area**
- **Size smaller than cells (animal cell size about 10-100  $\mu\text{m}$ )**
- **Enhanced permeability and retention effect (EPR)**

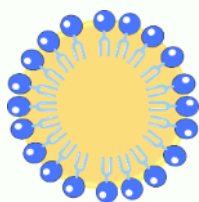
### Organic materials



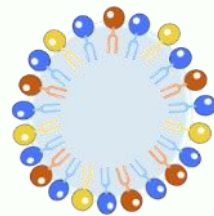
Micelle



Liposome



Solid-lipid nanoparticles

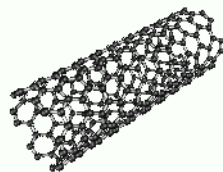


Nanobubble

### Inorganic materials



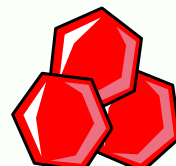
Mesoporous silica



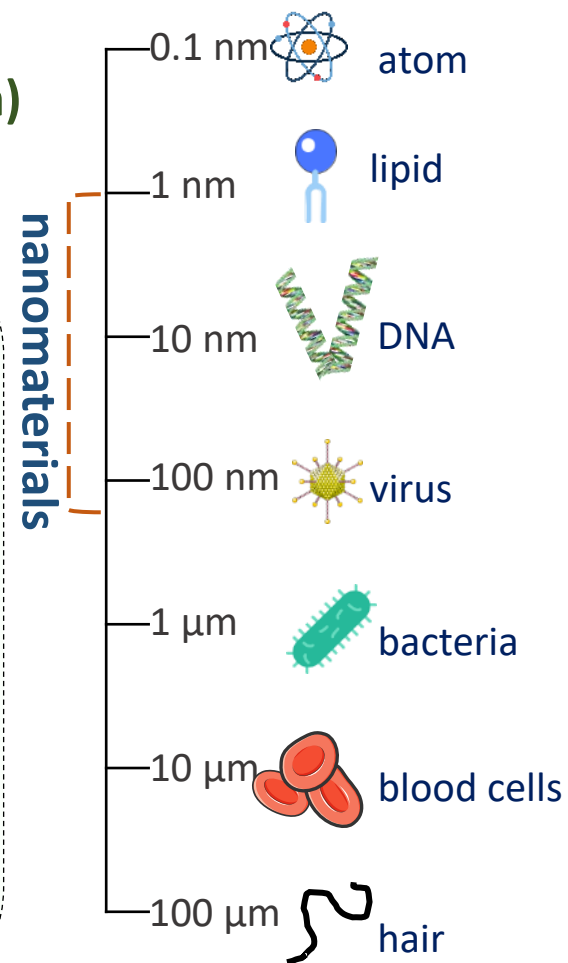
Nanotube



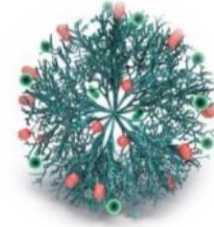
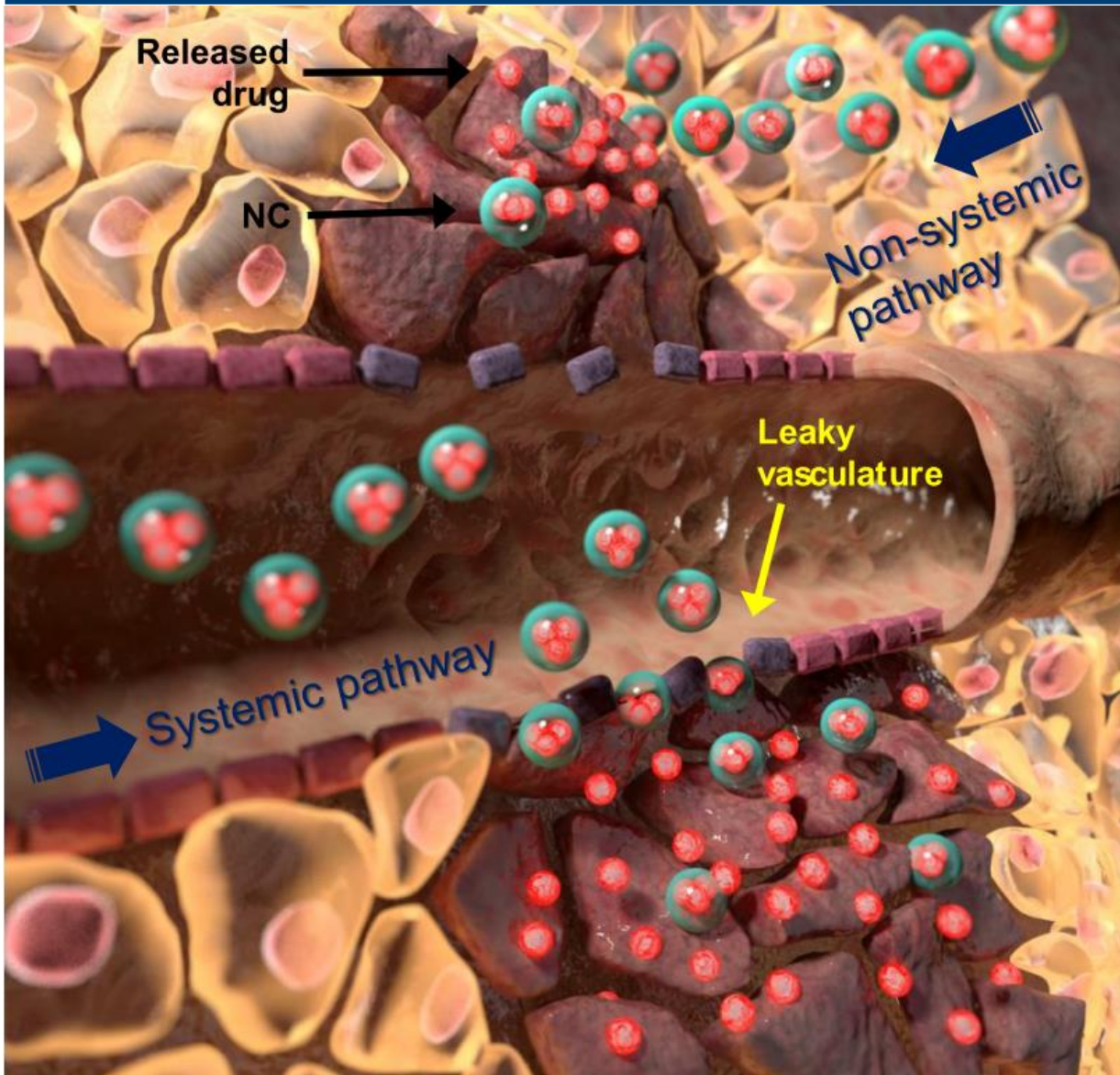
Nano gold



Quantum dots



# Drug delivery systems

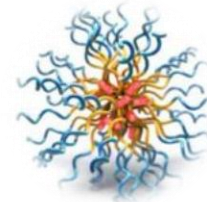


Dendrimer



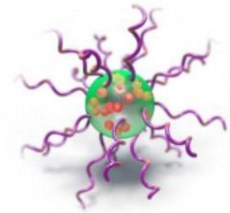
Liposome

Nanobubble

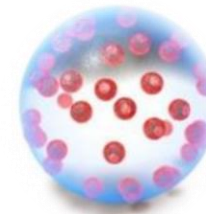


Polymer

Nanoparticle



Polymer Micelle

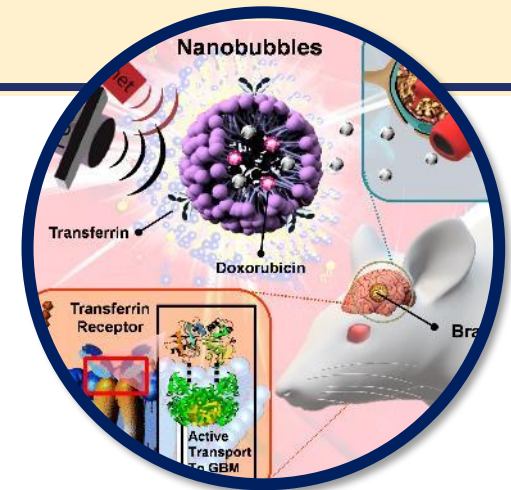


Inorganic  
Nanomaterial

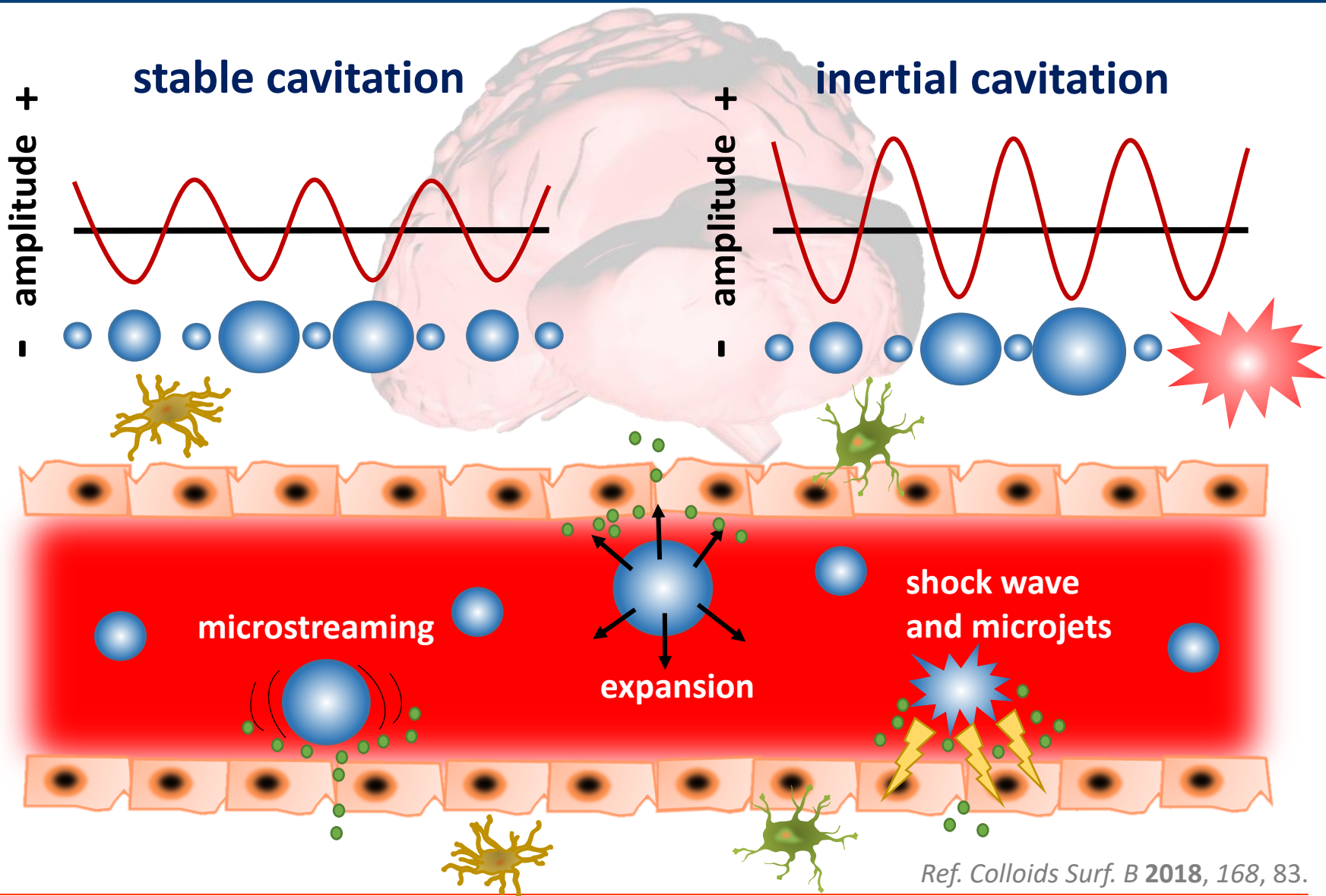
Ref. *Nanoscale* 2013, 5, 8925.



## An Advanced *In Situ* Magnetic Resonance Imaging and Ultrasonic Theranostics Nanocomposite Platform: Crossing the Blood–Brain Barrier and Improving the Suppression of Glioblastoma Using Iron-Platinum Nanoparticles in Nanobubbles

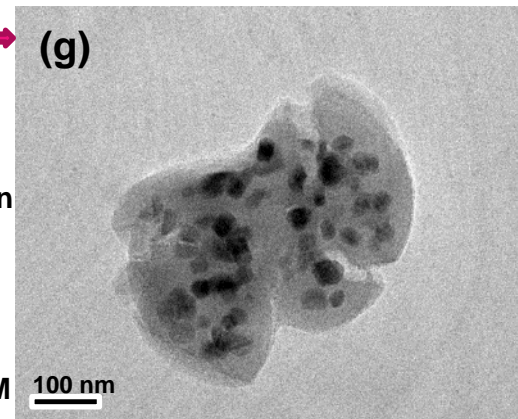
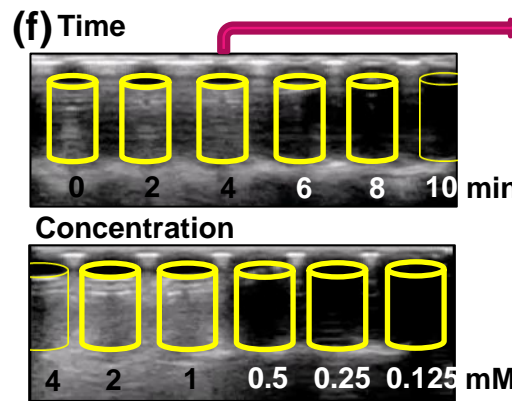
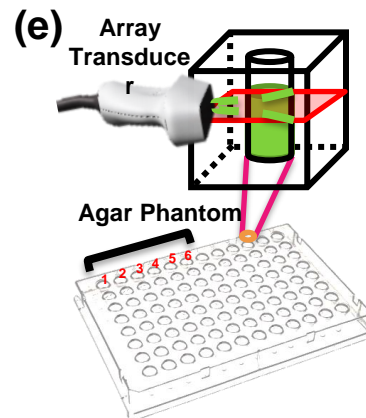
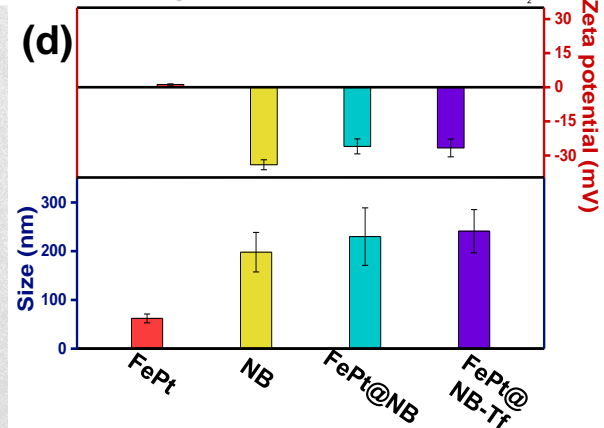
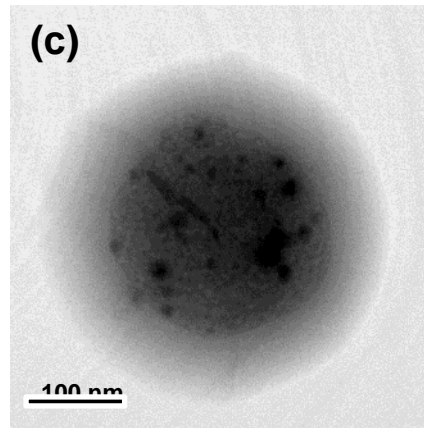
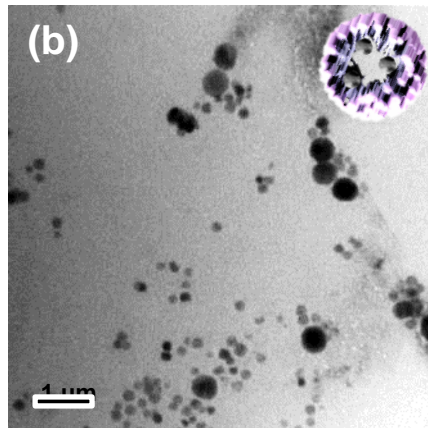
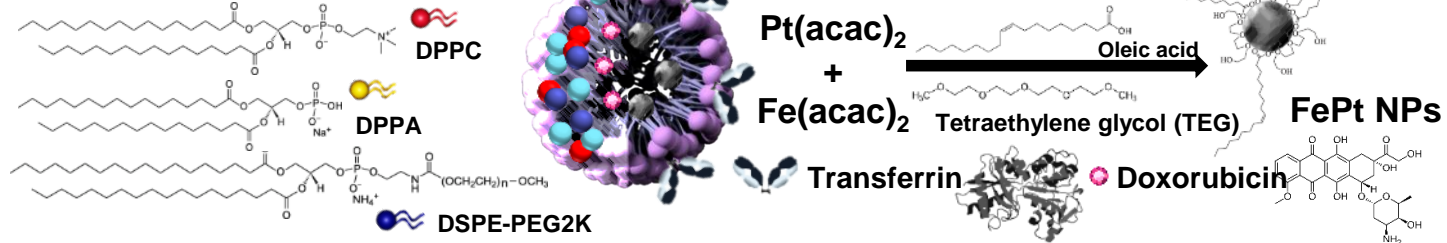






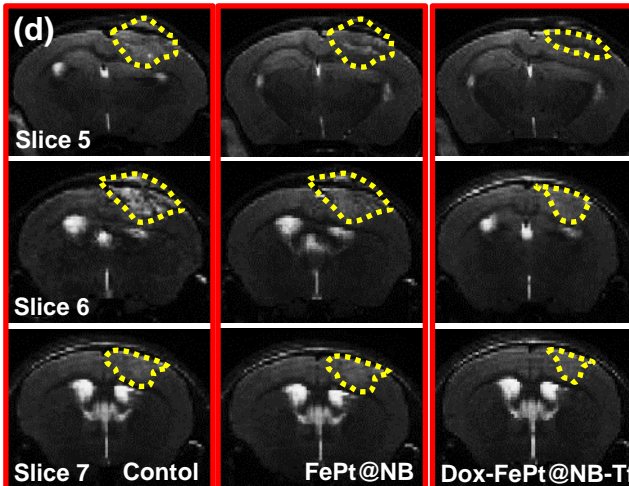
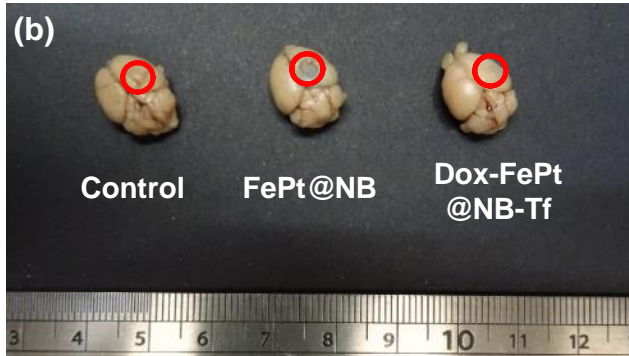
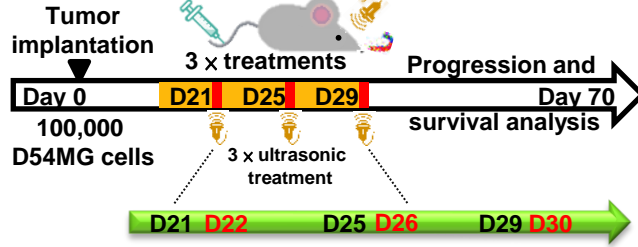
Ref. *Colloids Surf. B* 2018, 168, 83.

## (a) Dox-FePt@NB-Tf

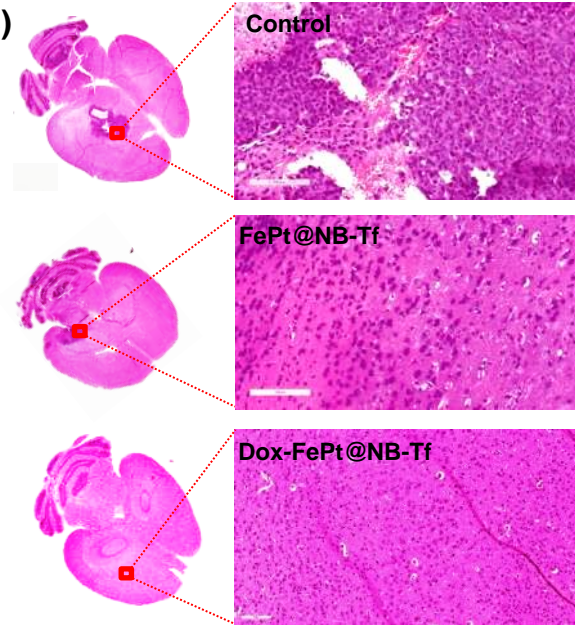




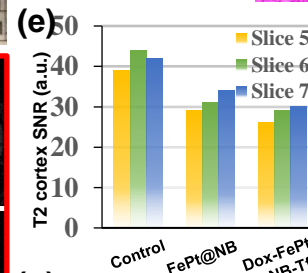
## (a) Experimental design



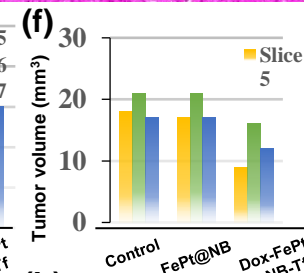
## (c)



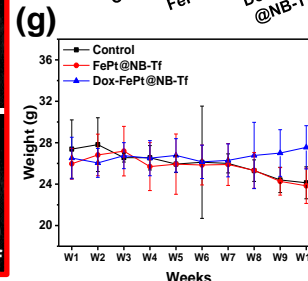
## (e)



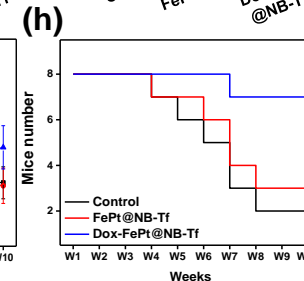
## (f)



## (g)



## (h)



## Problems

- Brain-blood barrier block
- Short-term tracking
- *In situ* animal model

## Approaches

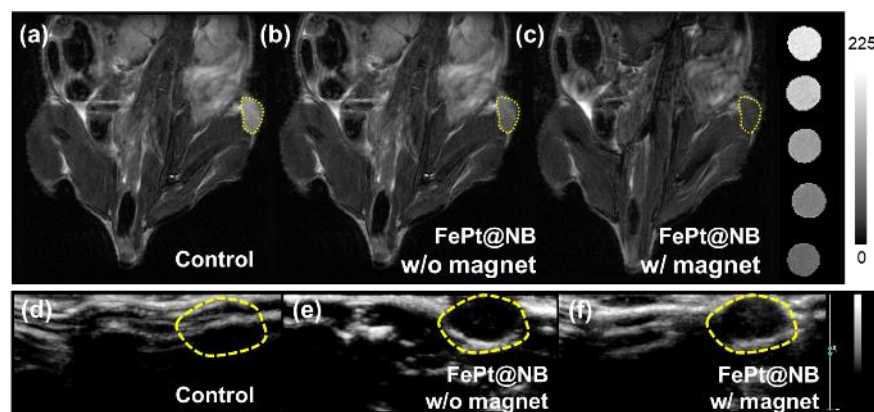
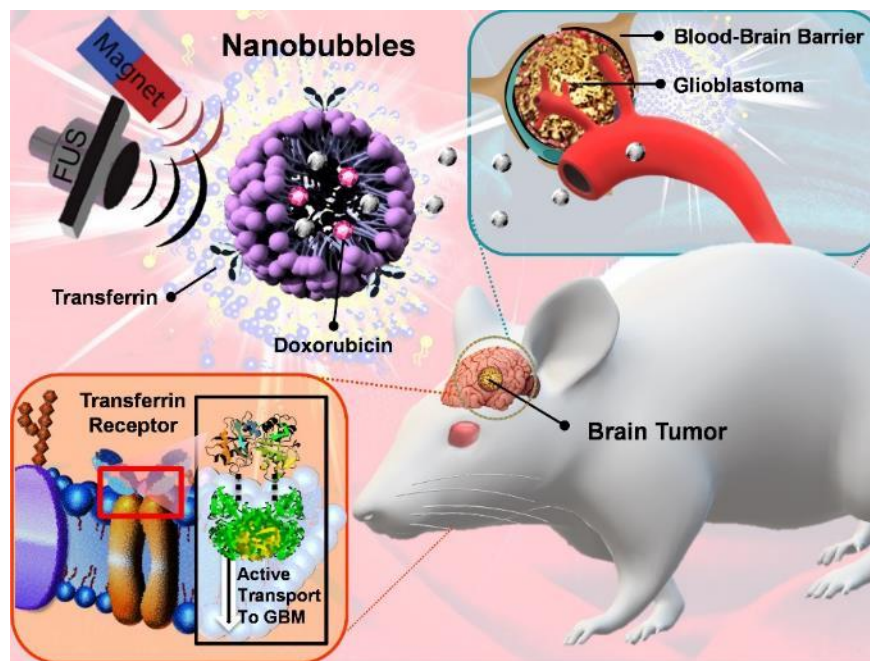
- Nanobubbles Cavitations
- *in-situ* MRI tracking
- Orthotopic animal GBM model

## Novelties

- Next-generation multifunctional nanoparticles

- My related published papers:

- *Adv. Sci.* 2020, 7, 1903741.
- *Theranostics* 2020, 10, 2, 782–796.... about 10 papers.

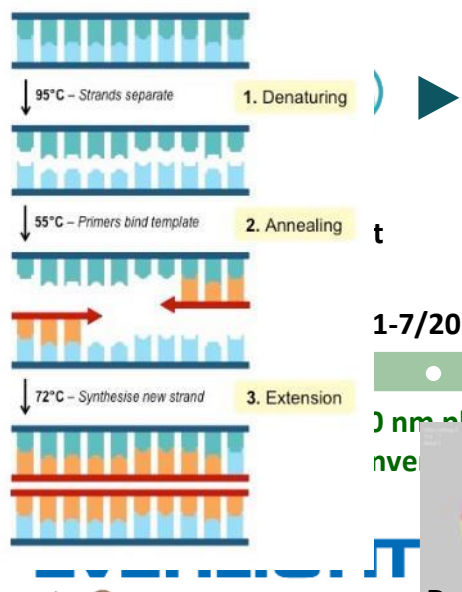


**Publication: ACS Appl. Mater. Interfaces 2021, 13, 26759–26769.**

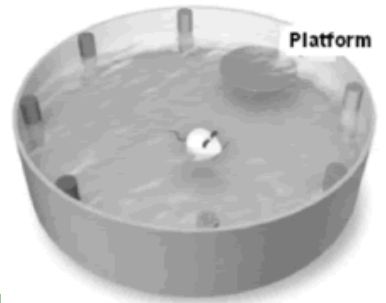


# Potential Cooperation

With Prof. Bi-Chang Chen

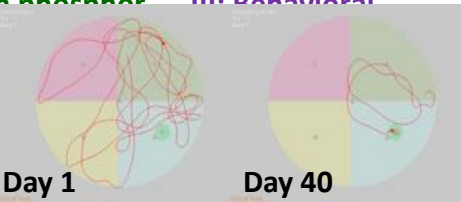


## Morris Maze Test



1-7/20

810 nm: AD with NIR LED



APPS1 transgenic mice

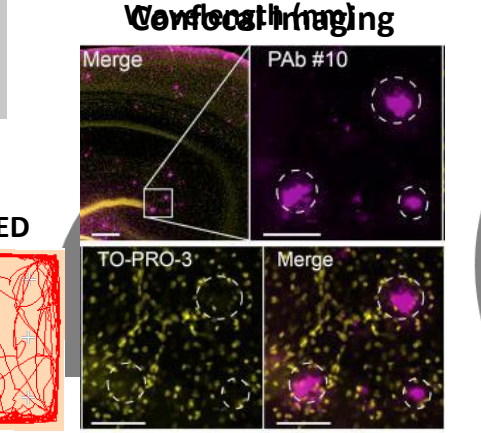
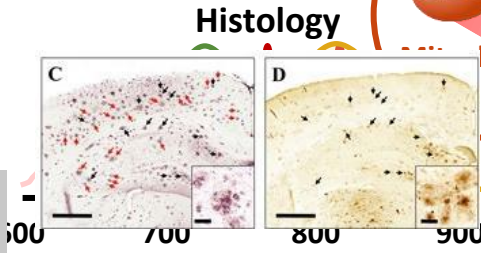
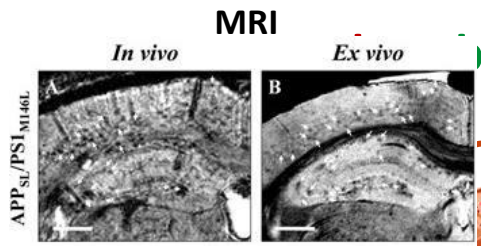
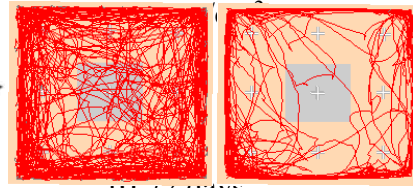
照射時間

治療天數

總輻射通量

實驗數值	文獻
770 / 810 nm	627, 670, 808, 1072 nm
	810 nm: AD with NIR LED
20 days	10-12 days
120 J/cm <sup>2</sup>	80-700 J/cm <sup>2</sup>

## Open-Field Test

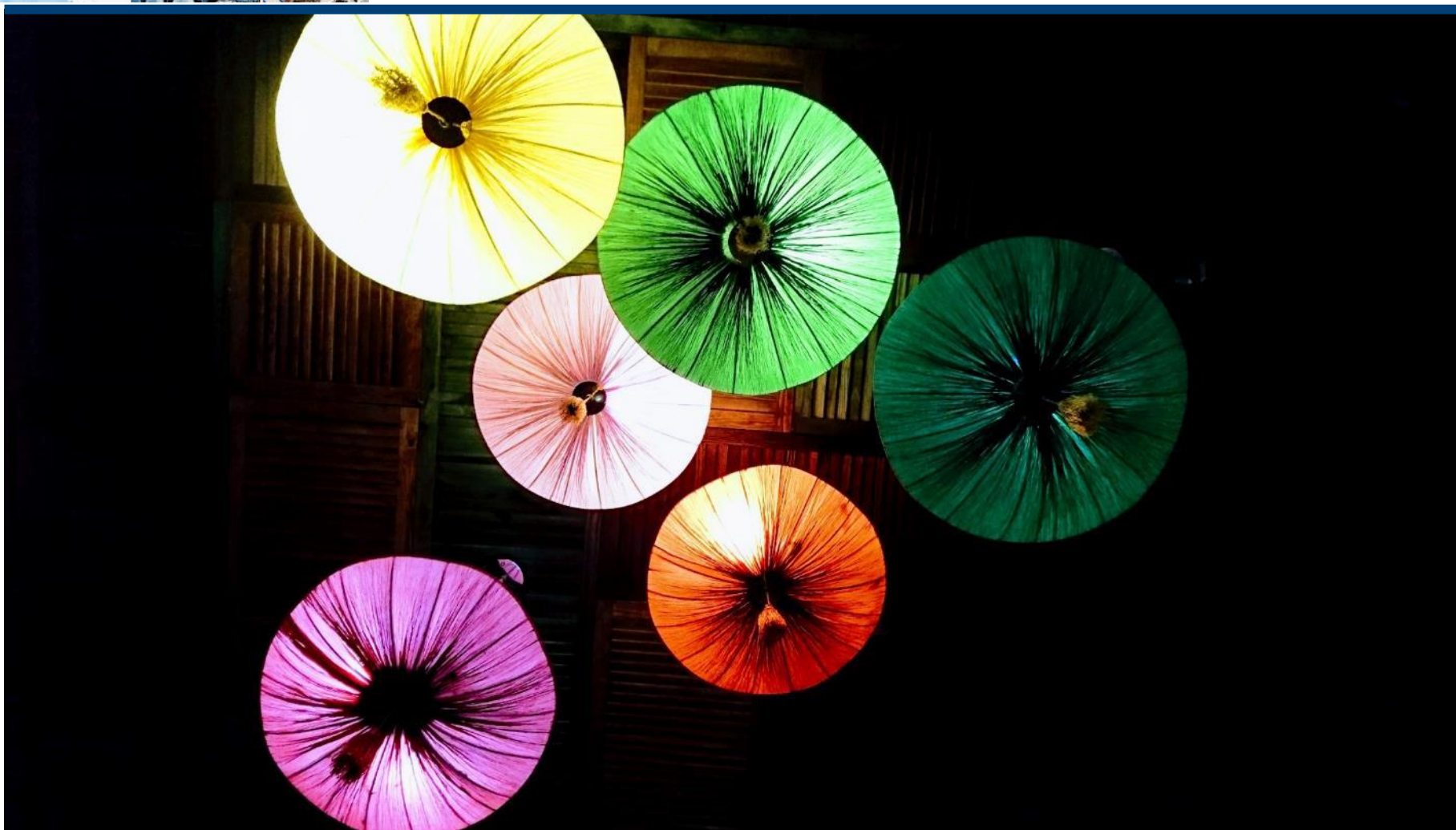


## 3D imaging Biomodulation (PBM)



Genomics Research Center + National Biotechnology Research Park + RCAS





***Welcome to join our laboratory!***