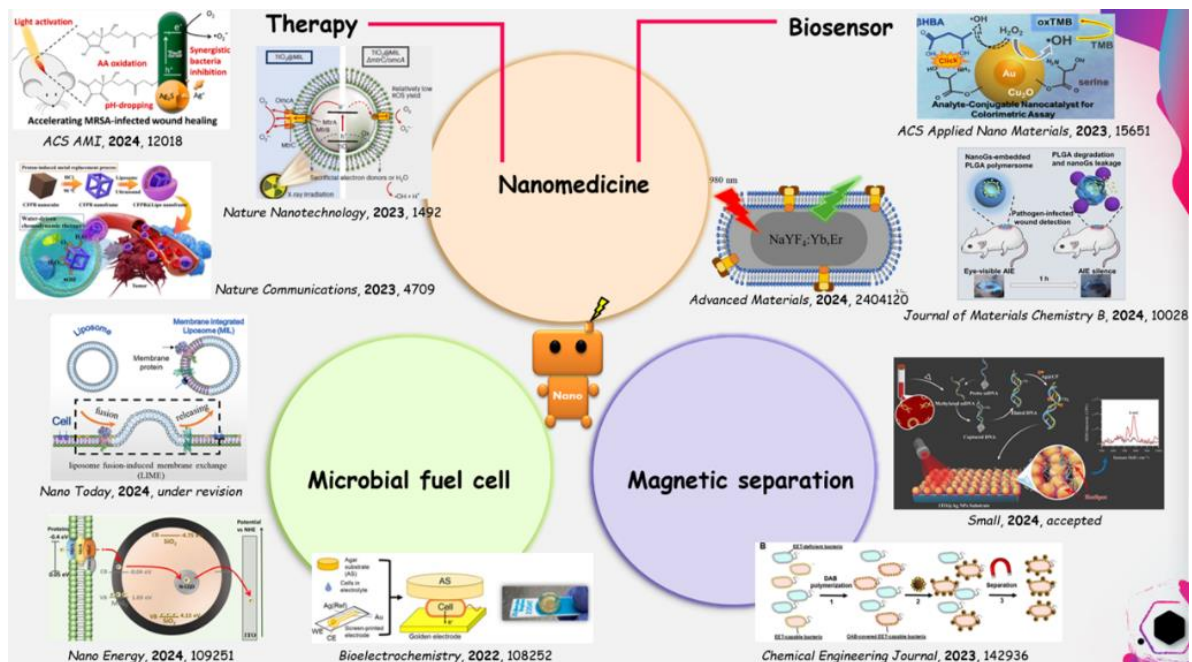




李偉鵬 副教授

生命科學院/醫藥暨應用化學系

- ▶ 高醫 2023 年研究績優教師-優秀論文獎
- ▶ 高醫 2023 年研究績優教師-研究成果績優獎年輕教師組



我於 2020 年建立創新奈米生醫實驗室，大膽結合尖端奈米技術與微生物電化學展開全新的研究方向，期望開發新穎性技術應用於解決當代醫學難題。我們成功開發奈米尺度電子載體應用於增強微生物燃料電池(*Nano Energy* 2024)。也採用催化性奈米材料開發酮酸代謝物的比色檢測技術(*ACS Appl. Nano Mater.* 2023)。除此之外，我們也積極擴大與其他專家學者的合作，我與成大王德華醫生合作完成光動力治療的題目(*ACS Appl. Mater. Interfaces* 2024)，與系上陳嘉祥老師合作開發聚集增強螢光猝滅的細菌檢測技術(*J. Mater. Chem. B* 2024)，與逢甲簡儀欣老師合作完成銀奈米簇促進表面增強拉曼散射用於基因甲基化偵測的技術(*Small* 2024)。此外，我也扮演關鍵角色串聯成大葉晨聖老師與日本岡本老師，成功進行三方合作來開發電活性膜包覆奈米粒子用於增強腫瘤動力治療(*Nat. Nanotechnol.* 2023)，該研究採用我們獨家之微脂體誘導膜交



換技術來提取電活性囊泡，我們也持續合作開發更多電活性膜增強奈米粒子特性的研究 (*Nat. Common.* **2023**; *Adv. Mater.* **2024**)。值得一提的是，我們與國衛院洪文俊老師合作開發應用於皮膚轉移性乳癌之光治療奈米藥物，成果顯示所開發的金奈米棒結合微脂體誘導膜交換技術產生的乳癌標靶囊泡後展現出色的腫瘤標靶性，我們將以此為一個全新的起點開發更多種類之腫瘤標靶性囊泡用於增強現今標靶治療的療效。

【具體成果】

代表性論文：

1. *Chemical Engineering Journal*, **2023**, 466, 142936.
2. *Nature Nanotechnology*, **2023**, 18, 1492-1501.
3. *Nature Communications*, **2023**, 14, 4709.
4. *ACS Applied Nano Materials*, **2023**, 6, 15651-15662.
5. *Nano Energy*, **2024**, 121, 109251.
6. *ACS Applied Materials & Interfaces*, **2024**, 16, 12018-12032.
7. *Advanced Healthcare Materials*, **2024**, 2400746.
8. *Advanced Materials*, **2024**, 2404120.
9. *Journal of Materials Chemistry B*, **2024**, 12, 10028-10040.
10. *Small*, **2024**, accepted.

國際合作：

1. 與 Akihiro Okamoto 教授(National Institute for Materials Science, Japan)的國際合作計畫申請案。
2. 與 Bodhisatwa Das 教授(IIT Ropar, India)的國際合作計畫申請案。
3. 與 Oh Seok Kwon 教授(Sungkyunkwan University, Korea)的國際合作計畫申請案。

產學專利申請：

1. 微脂體融合誘導腫瘤標靶性囊泡的生產與其應用。
2. 奈米石墨烯嵌入聚合物體進行聚集誘導螢光減弱介導的病原體檢測應用。



3. 透過奈米銀加合物促進表面增強拉曼散射精確檢測磁分離腫瘤抑制基因的甲基化程度。

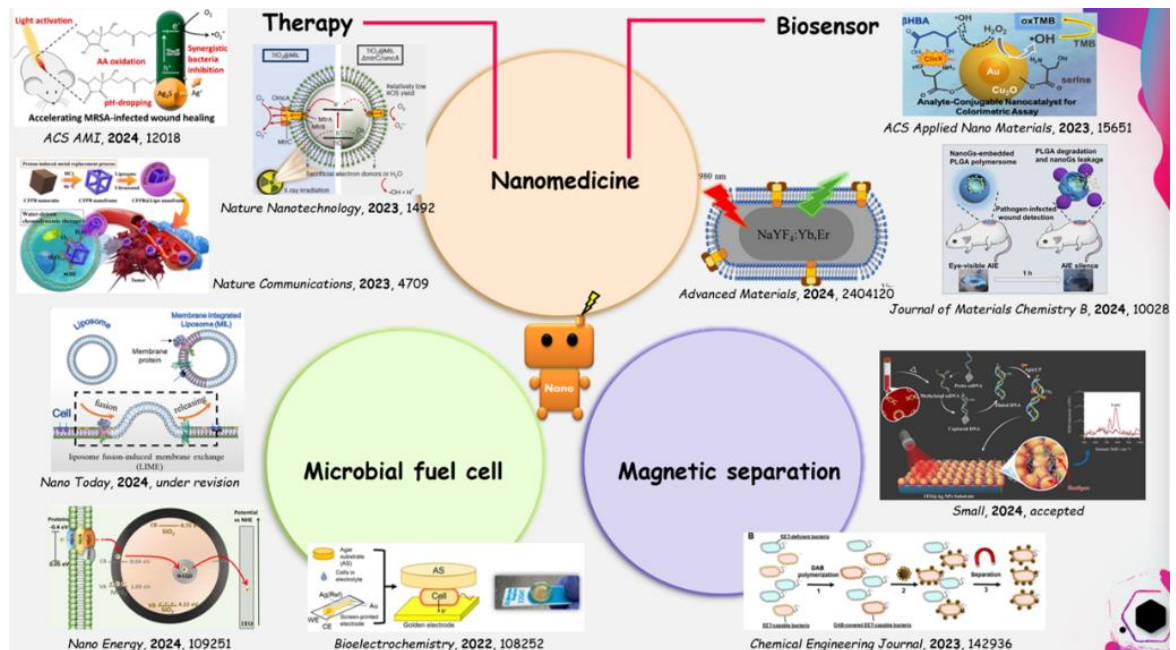
【研究團隊】

團隊成員：李偉鵬、王文君、Shubham Singh、Pooja Aich、郭喬和、楊俐婷、王沛瑜、鄭家宜、徐枋宜、陳佳歆

(<https://mao22913521.wixsite.com/kmuc-nano-lab>)

團隊簡介：創新奈米生醫研究團隊始於 2020 年，本團隊致力於結合奈米科技與微生物電化學技術來開發新穎性醫學方法，用於解決當代具挑戰性的醫學難題，目前的發展方向包含各類疾病的治療、個人化生醫檢測與微生物電池系統等。

研究聯繫 Email：wpli@kmu.edu.tw



In 2020, I established the Innovative Nanomedicine Laboratory, boldly combining cutting-edge nanotechnology with microbial electrochemistry to explore new research directions. Our goal is to develop novel technologies aimed at addressing contemporary medical challenges. We successfully developed nanoscale electron carriers to enhance microbial fuel cells (*Nano Energy* 2024). Additionally, we used catalytic nanomaterials to develop a colorimetric technique for ketoacid metabolite detection (*ACS Appl. Nano Mater.* 2023). Moreover, we actively expanded collaborations with other



experts. I worked with Dr. Tak-Wah Wong from National Cheng Kung University (NCKU) to complete a project on photodynamic therapy (*ACS Appl. Mater. Interfaces* **2024**) and collaborated with Prof. Chia-Hsiang Chen from our department to develop a bacteria detection technology based on aggregation-induced fluorescence silence (*J. Mater. Chem. B* **2024**). We also worked with Prof. Yi-Hsin Chien from Feng Chia University to complete a project on silver nanocluster-enhanced surface-enhanced Raman scattering for gene methylation detection (*Small* **2024**). Furthermore, I played a crucial role in facilitating a tripartite collaboration between Prof. Chen-Sheng Yeh from NCKU and Prof. Akihiro Okamoto from Japan. We successfully developed electroactive membrane-coated nanoparticles for enhanced radiodynamic therapy (*Nat. Nanotechnol.* **2023**). This study utilized our proprietary liposome fusion-induced membrane exchange (LIME) technique to extract electroactive vesicles, and we continued our collaboration to further develop more electroactive membrane-enhanced nanoparticles with enhanced properties (*Nat. Commun.* **2023**; *Adv. Mater.* **2024**). Notably, we collaborated with Dr. Wen-Chun Hung from the National Health Research Institutes to develop nanomedicines for phototherapy targeting skin-metastatic breast cancer. The results demonstrated that the gold nanorods combined with the LIME-based breast cancer-targeted vesicles had excellent tumor specificity. We are using this as a new starting point to develop a wider variety of tumor-targeting vesicles aimed at enhancing the efficacy of current target cancer therapies.

【Concrete Results】

Awards:

1. Outstanding Research Faculty - Excellence in Paper Award, Kaohsiung Medical University, 2023.
2. Outstanding Research Faculty - Excellence in Research Achievement Award (Young Faculty Group), Kaohsiung Medical University, 2023.

Representative Publications:

1. Chemical Engineering Journal, **2023**, 466, 142936.
2. Nature Nanotechnology, **2023**, 18, 1492-1501.
3. Nature Communications, **2023**, 14, 4709.



4. ACS Applied Nano Materials, **2023**, 6, 15651-15662.
5. Nano Energy, **2024**, 121, 109251.
6. ACS Applied Materials & Interfaces, **2024**, 16, 12018-12032.
7. Advanced Healthcare Materials, **2024**, 2400746.
8. Advanced Materials, **2024**, 2404120.
9. Journal of Materials Chemistry B, **2024**, 12, 10028-10040.
10. Small, **2024**, accepted.

International Collaborations:

1. International collaboration with Prof. Akihiro Okamoto (National Institute for Materials Science, Japan).
2. International collaboration with Prof. Bodhisatwa Das (IIT Ropar, India).
3. International collaboration with Prof. Oh Seok Kwon (Sungkyunkwan University, Korea).

Patents:

1. Liposome Fusion-Induced Tumor-Targeting Vesicles Production and Its Applications
2. Aggregation-Induced Emission Silence-Mediated Pathogen Detection Using a Rapidly Degradable Nanographenes-Embedded Polymersome
3. Precise Methylation Detection of Magnetically Isolated Tumor Suppressor Genes by Nano Silver Adduct - Promoted Surface-Enhanced Raman Scattering

【Research Team】

Team Members: Wei-Peng Li、Wen-Jyun Wang、Shubham Singh、Pooja Aich、Yi-Ho Kuo、Li-Ting Yang、Pei-Yu Wang、Chia-Yi Cheng、Fang-Yi Hsu、Jia-Sin Chen

(<https://mao22913521.wixsite.com/kmuc-nano-lab>)

Research Team Introduction: The Innovative Nanomedicine Laboratory, established in 2020, integrates nanotechnologies with microbial



electrochemistry to develop novel medical solutions for contemporary challenges. Our current focus includes the development of advanced treatments for various diseases, personalized biosensors, and microbial battery systems.

Research Contacts Email: wpli@kmu.edu.tw