

Intelligent Biomaterials-Enabled Drug Delivery and Precision Cell Engineering for Disease Therapy

Wei Chen (陳緯), Ph.D.

Assistant Research Fellow (Assistant Professor) and Principal Investigator
Genomics Research Center, Academia Sinica, Taipei, Taiwan

Email: wchen123@as.edu.tw Group Website: <https://www.weichenlab.com/>

Abstract

Intelligent biomaterials and nanomedicine have attracted much attention in recent decades for disease treatments. Notably, these advancements in cardiovascular disease, cancer, and inflammatory disease treatments hold significant promise for addressing unmet medical needs. The first section of the presentation will focus on the utilization of macrophage-modulating nano-biologics and siRNA/mRNA medicine for precision immune engineering and atherosclerotic cardiovascular disease immunotherapy. The second section of the presentation will highlight the biomedical applications of intelligent nanomaterials in innovative cancer immunotherapy as well as anti-aging technologies.

References

- [1] **Chen W**, Schilperoort M, Cao Y, Shi J*, Tabas I*, Tao W* "Macrophage-Targeted Nanomedicine for the Diagnosis and Treatment of Atherosclerosis." **Nature Reviews Cardiology** 2022, 19, 228–249.
- [2] He Z#, **Chen W*#**, Hu K#, Luo Y, Zeng W, He X, Li T, Ouyang J, Li Y, Xie L, Zhang Y, Xu Q, Yang S, Guo M, Zou W, Li Y, Huang L, Chen L, Zhang X, Saiding Q, Wang R, Zhang MR, Kong N, Xie T, Song X,* Tao W*. "Resolvin D1 delivery to lesional macrophages using antioxidative black phosphorus nanosheets for atherosclerosis treatment." **Nature Nanotechnology** 2024, 19, 1386-1398
- [3] Chen S, Li Y, Zhou Z, Saiding Q, Zhang Y, An S, Khan MM, Ji X, Qiao R, Tao W*, Kong N*, **Chen W***, Xie T*. "Macrophage hitchhiking nanomedicine for enhanced β -elemene delivery and tumor therapy." **Science Advances** 2025, 11, adw7191.
- [4] Zhou Z, **Chen W***, Cao Y, Abdi R, Tao W*. "Nanomedicine-based Strategies for the Treatment of Vein Graft Disease." **Nature Reviews Cardiology** 2025, 22, 255–272.
- [5] He Z, Luo Y, Duan Z, Su B, Zeng W, Guo Y, Li Y, He X, Shi H, Zhou Z, Jiang C, Qin D, Zhang J, Kang Y*, **Chen W***, Song X* "IRF5 siRNA Nano-Immunotherapy: Restoring Macrophage Efferocytosis in Atherosclerosis." **Circulation** 2025, 152, 1564–1581.
- [6] Li Y#, **Chen W#**, Kang Y, Zhen X, Zhou Z, Liu C, Chen S, Huang X, Liu H, Koo S, Kong N, Ji X, Xie T, Tao W*. "Nanosensitizer-mediated augmentation of sonodynamic therapy efficacy and antitumor immunity." **Nature Communications** 2023, 14, 6973.
- [7] Zhang Y, Zhou Z, Hao T, Chen S, Lou W, Khan MM, Shi Y, You X, Saiding Q, Zhen X, Tao W*, Tian Xie*, **Chen W***, Kong N*. "Cancer-Treating-Cancer" Strategy: Entrapping Chemically Engineered Dying Cancer Cells in Immunotherapeutic Hydrogel Against Tumor Recurrence." **Cell Biomaterials** 2025, 100252.
- [8] He Z*, Luo Y, Yang S, Shi H, Huang Y-C, Zhou Z, Liu S, Zeng W, Liu W-C, Li Y, Chen Y, Qin D, Duan X, He X, **Chen W***, Song X*. "Reprogramming Lesional Macrophage Homeostasis via Interferon Regulatory Factor 5 Targeted siRNA Nanoimmunotherapy for Atherosclerosis." **ACS Nano** 2026, online