Weill Cornell Medicine

Peptide Nanofibers for Targeted Delivery of Anti-Cancer Therapeutic and Diagnostic Agents

Lead Inventor:

Benedict Law, Ph.D.

Associate Professor of Pharmacology in Radiology,
Radiology, Weill Cornell Medical College

Business Development Contact:

Donna J. Rounds
Associate Director, Business Development and Licensing

(646) 962-7044
djr296@cornell.edu

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Background & Unmet Need

- Nanocarriers are small particles that can carry and deliver other substance (e.g., proteins, antibodies)
- Nanocarriers have been used for the direct and selective delivery of drugs to cancerous cells, and to deliver imaging agents in surgical or radiation-based therapies
- However, available nanocarriers have significant drawbacks that impair drug or agent delivery, such as being easily inactivated by the body, an inability to penetrate tumors or the blood-brain barrier (BBB), and provoking negative immune responses
- **Unmet Need:** There is a need for more effective nanocarriers that offer better drug or agent delivery efficiency as well as improved tissue penetration and distribution

Technology Overview

- **The Technology:** Self-assembling peptide-based nanofiber (NFP) that provides a platform for targeted delivery of therapeutics and diagnostic agents
- The NFP can be functionalized with a variety of imaging and therapeutic agents for on-demand customization
- When functionalized with glutathione, GSH-NFP demonstrated enhanced tumoral uptake and tumor penetration, reduced clearance rate and off-target distribution at the infusion site, and a longer local retention time in mice bearing human breast cancer
- **PoC Data:** Compared to free aldoxorubicin (aldox), mice injected with aldox-loaded GSH-NFP had a smaller tumor size and a longer survival time (see Figure 2)
- Compared to free Emtansine (DM1), DM1-NFP dramatically slowed glioma growth and doubled the median survival in mice with diffuse intrinsic pontine glioma (see Figure 3)

Inventors:
Benedict Law
Vanessa Bellat
Ching-Hsuan Tung

Patents:
US Patent 10,449,259

Publications:
Bellat et al. *Neuro-Oncology*. 2020.
Bellat et al. *Advanced functional materials*. 2018.

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Cornell Reference:
D-7086, D-8823

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Technology Applications

- Demonstrated utility for delivering cancer therapeutic and diagnostic agents
- Platform may also be useful for delivery of sensitive agents in other contexts (e.g., gene therapy, biomaterial delivery for tissue repair)

Technology Advantages

- Facile synthesis
- Delivery platform minimizes the premature clearance of the loaded agent by the body
- Improved tumor uptake and tumor penetration
- Nontoxic and nonimmunogenic
- NFP may be customized to delivery cargo of varied type and size

Supporting Data / Figures

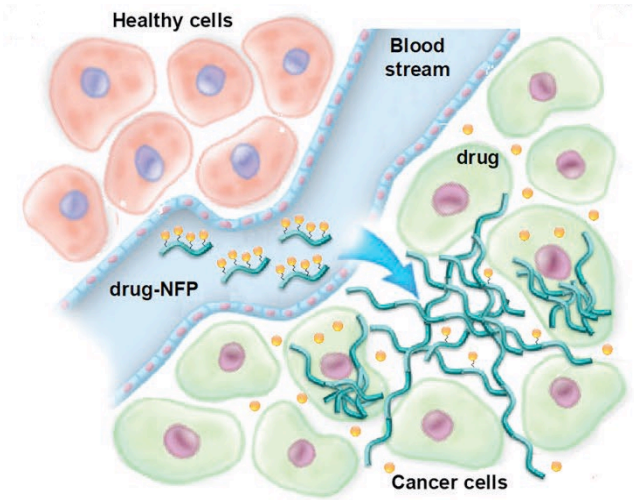

Figure 1: A Representative image demonstrating how NFP transports drugs to cancer cells.

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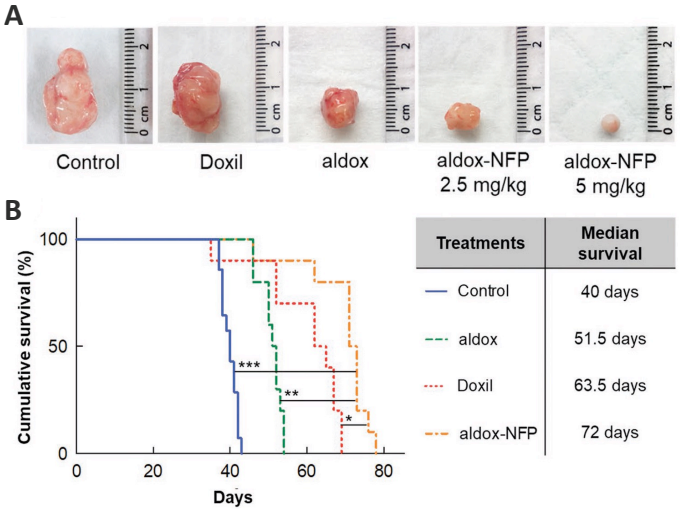

Figure 2: A: Treatment with aldox-NFP significantly reduced the size of breast cancer tumors. **B:** aldox-NFP improved survival in animals with breast cancer compared to unbound aldox.

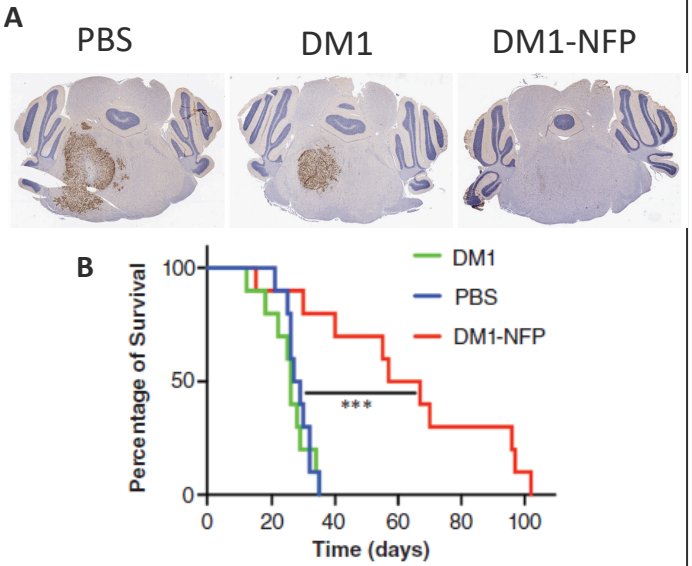

Figure 3: A: The size of brain tumor (shown in brown) was significantly reduced in the DM1-NFP treated animals. **B:** The animal's survival time was doubled in the DM1-NFP treated group compared to unbound DM1.

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