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Therapeutic Peptide Sequences and Gatekeepers Loaded with Mesoporous Silica Nanoparticles

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Introduction

• According to World Health Organization in 2018, nearly 9.6 million people worldwide are estimated to die from cancer.

•Although different kinds of cancer treatments exist, the research communities are continuously developing new ways of delivering anti-cancer treatments to ultimately decrease the side effects and increase the effectiveness of the anti-cancer drugs.

•In our lab, SA-K6L9-AS is enclosed in MSNs using peptide loaded MSN (P-MSNs) Synthesis.

•We then used a gatekeeper system to keep the cargo inside the MSNs and obtain the maximal loading capacity.

Objective

•Synthesize the self-assembling SA-K_6L_9-AS sequences

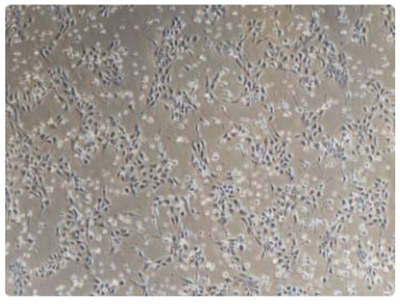
•Use MSN to "gift wrap" the peptide sequences

•Treat B16F10, GL26 and NSC cells with P-MSN, R-MSN, Tween P-MSN and Tween R-MSN

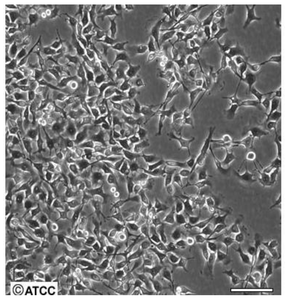
•Introduce a gate keeping system

Cell Lines

NSC



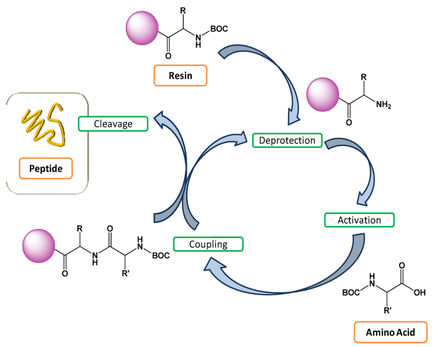
B16F10



B16F10 Murine melanoma
NSC Neutral Stem Cell

Methods

•Solid Phase Peptide Synthesis

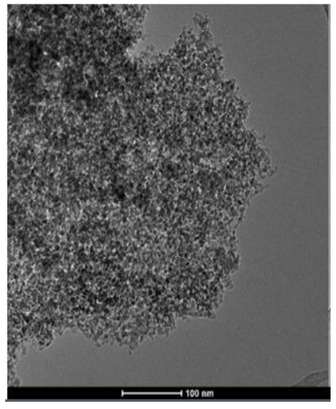


•MSN Synthesis

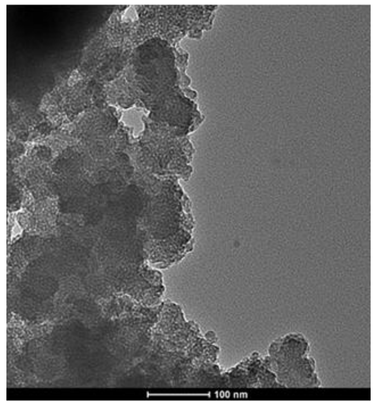
•Iron Oxide Nanoparticle Synthesis

•Lipid Bilayer Synthesis

TEM Images of P-MSNs and Tween P-MSNs

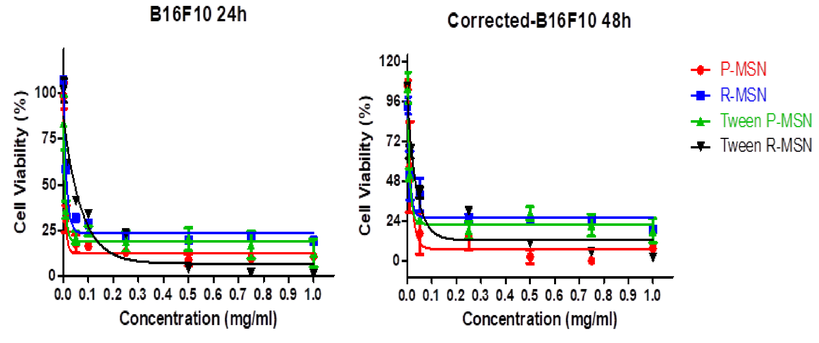


P-MSNs



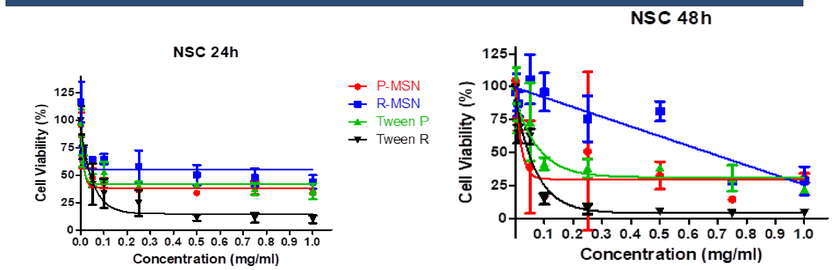
Tween P-MSNs

MTT Assay

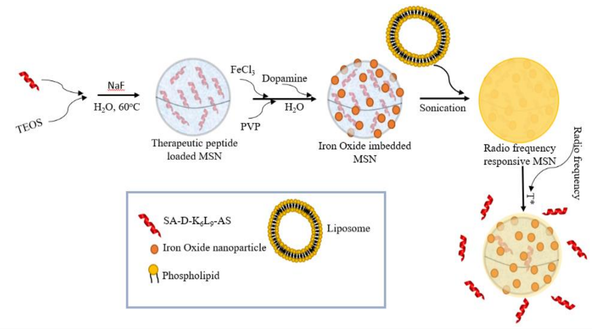


Data analyzed with Graphpad Prism 5. Non-linear fit, exponetial one phase decay/ *Linear fit

MTT Assay



Future Work



Conclusion

The center of this project is to increase the maximal loading efficacy of the therapeutic peptide using Tween-based MSN and a gatekeeper. This strategy will prevent the drug from leaking from the MSN before it has reached the targeted site (primary tumor or metastasis).

References

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5535255/
https://www.who.int/cancer/en/
Lauren Chlebanowski, PhD Thesis, Kansas State University, 2019

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