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A Multivalent Approach to Triggerable-Release Cancer Drug Delivery Systems

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Dennison, Jessica M.; Nasri, Sarah; Dennison, Emma Lauren; Meister, Daniel; and Trant, Dr. John F., "A Multivalent Approach to Triggerable-Release Cancer Drug Delivery Systems" (2022). *UWill Discover Conference*. 20.

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A Multivalent Approach to Triggerable-Release Cancer Drug Delivery Systems

Jessica Dennison, Sarah Nasri, Emma Dennison, Daniel Meister, Dr. John Trant





43% of Canadians are expected to be diagnosed with cancer in their lifetime.

Canada, P. H. A. of. Government of Canada. https://www.canada.ca/en/public-health/services/reports publications/health-promotion-chronicdisease-prevention-canada-research-policy-practice/vol-41-no-11-2021/canadian-cancer-statistics-2021.html (accessed Feb 3, 2022).





Mansoori, B.; Mohammadi, A.; Davudian, S.; Shirjang, S.; Baradaran, B. The Different Mechanisms of Cancer Drug Resistance: A Brief Review. *Advanced Pharmaceutical Bulletin* **2017**, *7*(3), 339–348.





Nanodiamonds

- Nanoscale diamond particles
- Popular in biomedical studies due to their:
 - Low toxicity
 - Biocompatibility
 - Decreased drug resistance
 - Easily functionalizable surface area
 - Increased drug efficacy







Meet the Pieces









Koosh Ball. https://en.wikipedia.org/wiki/Koosh_ball (accessed Mar 21, 2022).







Meet the Pieces









Why This Linker?

Increases selectivity by triggering the release of DOX at low pH



Swietach, P.; Vaughan-Jones, R. D.; Harris, A. L.; Hulikova, A. The Chemistry, Physiology and Pathology of Ph in Cancer. *Philosophical Transactions of the Royal Society B: Biological Sciences* **2014**, *369* (1638), 20130099.





Why This Linker?

Increases selectivity by triggering the release of DOX at low pH









Why This Linker?

• The multivalency provides a more potent delivery system







Making the Linker







Univ





Piecing Together the Drug-Delivery System













Piecing Together the Drug-Delivery







Adding PEG₂₀₅₀ to the Nanodiamond





Characterizing the System: A Work in Progress







Future Plans

Scale Up Reactions

Characterize and Confirm the Purity of the Product

> Send Out the Samples to Be Tested on Zebrafish



Thank you!



