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Triggered release of encapsulated Zno nanoparticles for drug delivery applications

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The targeted delivery and controlled release of drugs is the goal of many new drug delivery platforms as it offers the hope of increasing drug efficacy while reducing side effects. Lipid based carrier systems are biocompatible, can be functionalized to actively target specific tissues, and can achieve longer circulation times by avoiding immune system clearance. Inorganic nanoparticles have also been highly researched for potential therapeutic and diagnostic applications. Specifically, ZnO nanoparticles (nZnO) hold promise as a potential therapeutic agent as reports have demonstrated nZnO has a high selective toxicity to various cancer cell lines. In this work, we demonstrate that utilizing the inherent phsyical properties of nZnO, in combination with the benefits that lipid based delivery systems offer, can be used to create a new drug delivery platform that allows for the triggered release of nZnO and other cargo simotaneously. Using calcein as a hydrophillic drug model, we demonstrate that we can rapidly release the encapsulated contents via external stimuli. Additionally, to demonstrate the potential use of this system in cancer treatment options, we conducted experiments with two different cancer cell lines. We show that upon triggered release of the lipid encapsulated nZnO, we can achieve the desired in vitro therapeutic effect while minimizing the toxicity from the nanoparticles in the control group at concentrations up to 10 times the IC50. To further expand upon this, we co-encapsulated the hydrophobic drug, paclitaxel, and demonstrate decreased cancer cell viability when compared to the non-triggered release set.

Biography

Josh Eixenberger is a PhD candidate in the Biomolecular Sciences PhD Program at Boise State University and is expected to complete his PhD spring 2018. He received his Bachelor of Science in Physics and Applied Mathematics and an MS in Biomolecular Sciences. His work focuses on the synthesis, characterization and utilization of nanomaterials for various applications such as potential therapeutics, bio-imaging and in the semiconductor industry. He currently has eight published papers, three others in preparation and his graduate studies have led to the development of two different pending patents (USPTO).

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