

Biobased Calcium Carbonate (CaCO_3) nanoparticles for drug delivery applications

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Targeted delivery of a cytotoxic drug is beneficial to maximize the efficacy of the drug and to reduce the side effects. Recently, nanoparticle-based drug delivery systems are being developed to control the release of drugs in the body, to protect the drugs from enzymatic or chemical degradation, and to attain organ or tissue-targeted delivery. Studies have shown that calcium carbonate (CaCO_3) nanoparticles are highly porous, biocompatible, biodegradable, and have pH-sensitive properties. Such desirable properties make CaCO_3 nanoparticles one of the best candidates for biological drug delivery systems. In this project the CaCO_3 nanoparticles derived from egg shell was studied for their toxicity and as well as drug loading capacity. The effects of the nanoparticles on cell viability were studied using SW-480 (human colon cancer) and NIH/3T3 (mouse fibroblasts) and the 3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) Cell Proliferation Assay. The cells are propagated in tissue culture dishes and then seeded in 96-well plates before the experiments. A stock suspension of calcium carbonate nanoparticles was made as 100mg/ml in phosphate buffer saline (PBS) solution, from which serial dilutions were made to treat the cells. After initial rounds of testing, two fold serial dilutions of nanoparticle suspensions starting at 5mg/ml were prepared for the experiments. Cells were treated with the dilutions, and viabilities were assessed. Preliminary data suggest that high concentrations of the particles above 39.0625 μg physically overburden the cells, but concentrations at or below 9.765626 μg show insignificant cytotoxicity to the cells tested, and are well tolerated. The anticancer drugs 5-Fluorouracil (5-FU) and Indole-3-Carbinol (I3C) were loaded with as prepared CaCO_3 and release profiles were also studied.

Biography

Diane Render is from Douglasville, GA and she obtained her Bachelor of Arts in Mathematics from Albany State University in Albany, GA. Currently pursuing a PhD degree in Materials Science and Engineering at Tuskegee University on calcium carbonate nanoparticles for drug delivery applications.

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