GEMCITABINE-LOADED METAL-ORGANIC FRAMEWORKS FOR PANCREATIC CANCER

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Background: Gemcitabine is a chemotherapeutic utilized in the treatment of pancreatic cancer, however its use has become more limited due to issues with developing resistance. The aim of this work is to generate metal-organic framework (MOF) nanoparticles and load these with gemcitabine to determine any improvement in cytotoxicity in pancreatic cancer cell lines.

Methods: MOFs were synthesized and subsequently characterized by several techniques, including powder X-ray diffraction, scanning electron microscopy, and nuclear magnetic resonance. After completion of the drug loading protocol, HPLC analysis was used to determine the loading values, then these materials re-characterized using the same techniques used initially. Further, the cytotoxicity of free drug, MOF and drug-loaded MOF were determined in pancreatic cancer cell lines *in vitro*.

Results: The selected MOFs have been successfully synthesized (<200 nm) and loaded with the anticancer drug gemcitabine, with large drug loading efficiency values for each framework. Characterisation techniques, including powder X-ray diffraction, scanning electron microscopy, nuclear magnetic resonance, and gas adsorption have been used to determine that the structural integrity of the MOFs was not corrupted by the loading protocol, as well as to further evidence the presence of gemcitabine in the structures. Finally, *in vitro* testing has been completed to ascertain if there were any differences in the free gemcitabine versus the gemcitabine loaded MOFs.

Conclusions: Overall, the selected MOFs have been successfully synthesized and characterized by several techniques, with successful drug loading of gemcitabine. *In vitro* cytotoxicity experiments have been completed to ascertain the toxicity of the drug loaded MOF versus the free drug.