UiO-66 Metal Organic Frameworks (MOFs) Decorated with Cadmium Sulfide Quantum Dots: An Investigation of the Effectiveness of (MOFs) as a Drug Delivery System for Melanoma Treatment

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Metal organic frameworks (MOFs) have recently been introduced as a possible drug delivery system due to their porous, three-dimensional crystalline structure, created by repeated reaction of organic linkers and inorganic nodes. Because of their nanosized structure, MOFs have a large surface area, enabling for increased drug delivery. Cadmium sulfide quantum dots (CdS QDs) have recently been found to damage cells extensively, causing necrosis. The overall purpose of this project was to study the effectiveness of MOFs decorated with CdS QDs functioning as a drug delivery system on melanoma cells. It was hypothesized that nanosized MOF crystals decorated with CdS QDs would effectively reduce cancer cells by decreasing cell viability. To test this, UiO-66 MOFs decorated with CdS QDs on the surface were synthesized through two methods, resulting in micro and nano MOF sizes. In the first method, diethylformamide, formic acid, zirconium chloride, the inorganic node, and tetraphilic acid, the organic linker, created microsized MOFs. In the second method, dimethylformamide, acetic acid, zirconium chloride and Terephthalic acid created nanosized MOFs. X-ray powder diffraction results revealed 11 common peaks for the MOF crystals, indicating the stability of the particles. Following this, a metastatic melanoma cancer cell line was exposed to MOF crystals. A live/dead assay of the cancer cells revealed that a greater number of dead cells were observed in wells with nanosized CdS QDs MOFs as compared to the control. The results of this experiment strongly suggest the viability of nanosized MOFs with CdS QD for future cancer treatment studies.

Awards Won:
Third Award of $1,000