

Specific Reactive Oxygen Species (ROS) Generation of Bandgap Engineered Quantum Dots for Drug-Resistant Bacteria Killing

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Multi-drug resistant bacterial infection is a serious problem in many countries, afflicting millions of people annually. In this study, bandgap tunable indium phosphide (InP) quantum dots (QDs) were successfully synthesized to generate the specific reactive oxygen species (ROS), which was toxic to bacterial cells not to mammalian cells. The bandgap energy of InP QDs was tuned by the quantum confinement effect. InP QDs were treated to both bacterial cells (gram positive and negative) and mammalian cells, and the bacterial growth inhibition and mammalian cell viability were analyzed to confirm the QD induced superoxide cell death induction. The superoxide generation studies revealed that the ROS generation kinetics was good agreement with the Michaelis-Menten kinetics model. The InP QD-induced superoxide effectively attacked and growth inhibited the bacterial cells, but had no effect on the mammalian cells. InP QDs could be used for clinical phototherapy to care the bacterial infections.