Optosensor based on molecularly imprinted polymer coated quantum dots nanoparticles for the determination of ampicillin

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Abstract: A sensitive optosensor based on a molecularly imprinted polymer coated on CdTe quantum dots (MIP-CdTe QDs) was developed for the selective detection of trace ampicillin. The MIP-CdTe QDs fluorescence probe were synthesized via a sol-gel process using ampicillin as a template, 3-aminopropyltriethoxysilane (APTES) as a functional monomer and tetraethoxysilane (TEOS) as a cross-linker. After removal of the template molecule from the polymer layer, MIP-CdTe QDs containing cavities specific to ampicillin were obtained. The MIP-CdTe QDs showed a high sensitivity and good selectivity toward ampicillin. Fluorescence intensity of MIP-CdTe QDs was more strongly quenched by ampicillin compare to a non-imprinted polymer (NIP-CdTe QDs). Under the optimum condition, pH of MIP-CdTe QDs of 7.0, incubation time of 10 minutes, the fluorescence intensity of MIP-CdTe QDs was decreased in response to increase ampicillin concentration with good linearity in the range of 0.10-10.0 µg L⁻¹. The limit of detection and the limit of quantification were 0.04 µg L⁻¹ and 0.11 µg L⁻¹, respectively. The developed method showed good repeatability and reproducibility with the relative standard deviation lower than 10%. This simple, rapid and cost-effective method was applied for the determination of ampicillin in milk sample.

Keywords: Optosensor; Quantum dots; Molecularly imprinted polymer; Ampicillin