Simultaneous Detection of Multiple Mutations in Epidermal Growth Factor Receptor Based on Fluorescence Quenching of Quantum Dots

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Somatic mutations reported in the epidermal growth factor receptor (EGFR) of the advanced non-small cell lung cancer (NSCLC) patients. A deletion mutation in exon 19 and the point mutation L858R in exon 21 confer a greater response to gefitinib treatment. We have simultaneously detected mutations of exon 19 and exon 21 in the EGFR of non-small cell lung cancer patients using the fluorescence quenching of CdSe quantum dots. To farbricate this sensor, we synthesized the water-soluble CdSe quantum dots with two different sizes using surface-ligand exchange with mercaptoacetic acid. In case of perfectly matched DNA pairs (mutant DNA), one type of CdSe quantum dots was aggregated through hybridization of probe and target DNAs, which caused the fluorescence quenching phenomenon. However, it did not exhibit significant aggregation or fluorescence quenching phenomenon when there was a mismatch in DNA sequence (wild type DNA). The aggregation of CdSe quantum dots was monitored by photoluminescence spectroscopy (PL). Using this method, we were able to detect the deletion mutation in exon 19 or point mutation in exon 21 in a single experiment.