

Application of magnetic beads for specific detection of DNA based on quantum dots

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Here we present a sensitive DNA detection protocol using quantum dots (QDs) and magnetic beads (MBs) for large volume samples. In this study, QDs, conjugated with streptavidin, were used to produce fluorescent signals while magnetic beads (MBs) were used to isolate and concentrate the signals. The presence of target DNAs lead to the sandwich hybridization between the functionalized QDs, the target DNAs and the MBs. In fact, the QDs-MBs complex, which is bound using the target DNA, can be isolated and then concentrated. The binding of the QDs to the surface of the MBs was confirmed by confocal microscopy and Cd elemental analysis. It was found that the fluorescent intensity was proportional to concentration of the target DNA, while the presence of non-complementary DNA produced no significant fluorescent signal. In addition, the presence of low copies of target DNAs such as 0.5 pM in large volume samples up to 40 ml were successfully detected by using a magnet-assisted concentration protocol which consequently results in the enhancement of the sensitivity more than 100-fold.