

Surface plasmon resonance sensor based direct target DNA detection via gold nanoparticle signal enhancement without DNA amplification

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Molecular diagnostics are techniques used to analyze specific biological markers in deoxyribonucleic acid (DNA) sequence. Polymerase Chain Reaction (PCR) is a standard of molecular diagnostics but there are some limitations. First of all, whole processes including PCR and electrophoresis take long time, minimum 3 hours. Also, desktop sized thermal cyclers are needed to perform PCR process. Especially, if error is occurred at the initiatory step of PCR, the error is amplified. To solve these problems, in this study, we suggest surface Plasmon resonance (SPR) sensor based direct target DNA detection via gold nanoparticle (AuNP) signal enhancement without DNA amplification. SPR is very sensitive optical sensor suitable for detecting nano sized materials such as protein, DNA, chemicals, etc. However, direct DNA detection from low concentration sample such as patient's body fluid is impossible. We adopted AuNP for signal enhancement. AuNP DNAs consist of 2 parts, target binding part and receptor binding part, are immobilized on the surfaces of AuNPs. When the target binding part hybridizes with target DNA, Exonuclease III enzyme removes target binding part of AuNP DNA. In this process, target DNAs are not damaged, so other AuNPs with target binding part AuNP DNA can hybridize again and Exonuclease III works. This process makes 1st signal enhancement. The AuNPs have only receptor binding part and captured by receptor DNAs immobilized on sensor chip surface. The captured AuNP enhance the SPR effect, so the detection signal is amplified. Through this method, we successfully amplified SPR signal for direct detect target DNA.

Biography

Wonhwi Na is PhD student of Department of Micro/Nano system at Korea University. He received his BSc and MS in Department of Electrical and Computer Engineering from Sungkyunkwan University. His research efforts include control of microwave based non-contact heating, non-contact temperature measurement, Lab-On-a-Chip, nano material detection, DNA detection, and Surface Plasmon Resonance sensor.

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