Single-step Cell Trapping and In Situ Nucleic Acid Amplification Through Heat Generation with Plasmonic Absorption Effects

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ABSTRACT

We have previously demonstrated that plasmonic absorption induced localised heating can be used for manipulation and trapping of living cells [1] and optofluidics [2]. The forces that lead to the observed trapping effect are due to fluidic convection and a theromphoretic force field associated with the temperature distribution surrounding the optically heated spot. In this paper, we report a complete application of plasmonic localised heating in which one can perform trapping of a single cell in a micro-well and perform in situ screening of genetic markers. The targeted cell was first steered into a micro-well through varying the incident laser power. With the use of the same laser spot at higher incident power, the targeted cell was lysed to expose its nucleic acid contents and subsequently isothermal nucleic acid amplification through replacing the contents of the micro-well. The entire process, including the detection of nucleic acid amplification through fluorescence detection, was performed and monitored under an optical microscope. The reported method paves way for rapid screening of genetic markers at the single cell level within a 2-dimensional micro-cell array platform.

FIGURES AND REFERENCES

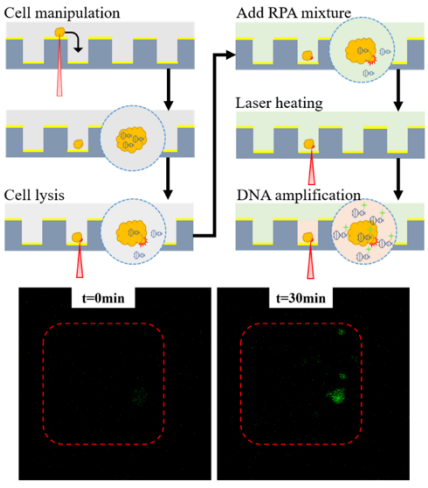

Figure 1.
Cell trapping with a focused laser 785nm spot and the subsequent steps for cell lysis; Recombinase Polymerase Amplification (RPR) of target nucleic acids, as indicated by an increase in fluorescence signal at 30 minutes after laser heating by the laser spot (Single cell: Leukemia cancer cell)

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