Single-cell detection of DMSO promoted HL-60 differentiation towards granulocyte based on DC-iDEP for medicine screening

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Abstract

Acute leukemia is the most common form of leukemia in adults. Drug differentiation control is critical for the treatment of acute leukemia. Unfortunately, current techniques detecting differentiation control experience long time and complex steps of verification hindering the steps of medicine discovery: flow cytometry and RT-PCR are highly accurate and efficient at a cost of inconvenient fluorescent labeling or a high risk of contamination; conventional staining leads to cell death unavailable for further pharmacological tests. Simple, fast and non-invasive techniques for medicine screening are in demand. DC-iDEP is an emerging label-free identification technique sorting cell populations taking advantage of the whole cell native biophysical property. Here, HL-60 cell line has been used as a model to study the differentiation process towards granulocytes and medicine efficacy. The results showed that DEP could detect the DMSO promoted differentiation degree by the weighted average characterization factor. This factor is related to the single cell biophysical property, which accumulate to generate differences in each population with distinct constitutions. Furthermore, chichoric acid was first found to promote DMSO-induced differentiation efficiently. The change induced by chichoric acid has been detected by DEP for primary medicine screening application. A rapid, label-free medicine screening method has been established monitoring HL-60 differentiation towards granulocyte for control and has great potential for medicine screening.

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