

THREE-DIMENSIONAL MICROFLUIDIC CHIP FOR EXTRACTION OF MITOCHONDRIAL DNA

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The current study reports an integrated microfluidic chip fabricated by micro-electro-mechanical-system (MEMS) technology for extraction of mitochondrial deoxyribonucleic acid (mtDNA) in an automatic format. Mitochondria is a key element associated with aging, degenerative diseases and cancers. An alteration in mtDNA may be induced by oxidative stress in tissues and cells and may be used as an indicator for aging diseases. Hence it is of great need to establish a quantitative and qualitative measurement method to evaluate mitochondria dysfunction. Traditional process for measurement of mtDNA alterations involves micro-cloning, direct sequencing, real-time polymerase chain reaction (PCR) process and microarray detection, which is a time-consuming and labor-intensive process. Especially, the extraction of mtDNA from cell samples requires delicate and lengthy process. The developed microfluidic chip integrates micropumps, a micromixer, and a micro temperature module in a three-dimensional structure to automate the entire process for extraction of the mtDNA. Compared with the conventional counterparts, this microchip has the advantages including less samples and reagents, higher extraction performance, shorter analysis time, and automation. The developed microsystem is promising for extraction of mtDNA and can be applied for further mitochondrial study.

Keywords :

Mitochondrial DNA, aging, MEMS, micromixer, microfluidics, micropump