

Title:

Metabolomics-on-a-chip: integrating microfluidic single cell culture with mass spectroscopy

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Abstract:

We are developing microfluidic systems to study the metabolome of a single cell or small cell groups in well-defined culture conditions. [1] Microfluidic systems, also called labs-on-a-chip, are constructed on the same scale as cells (features in the range of 1-100 μm) cell culture numbers with high spatial and temporal control of culture conditions. [2] Toward this end, we have adapted the use of microfluidic single cell traps capable of capturing and housing the culture of a single cell or small cell groups using polydimethylsiloxane (PDMS) based microfluidics. [3] Further, we have integrated microfluidic cell culture with novel monolithic PDMS electrospray ionisation (ESI) emitters. We have tested the fully integrated cell traps/ESI emitters using both test solutions and in trial runs on small yeast cell groups using an ion trap and fourier transform ion cyclotron resonance mass spectrometer. Initial results on the microfluidic cell traps, microfluidic-ESI characteristics, and performance of the integrated cell traps/ESI system will be presented along with an comparison of conventional nanospray-ESI with the integrate microfluidic system with emphasis placed on detection sensitivity and interference effects from PDMS.