

ARROWS

Advanced interfaced micro-systems Research for analysis of Real-wOrld clinical, food, environmental and Waste Samples

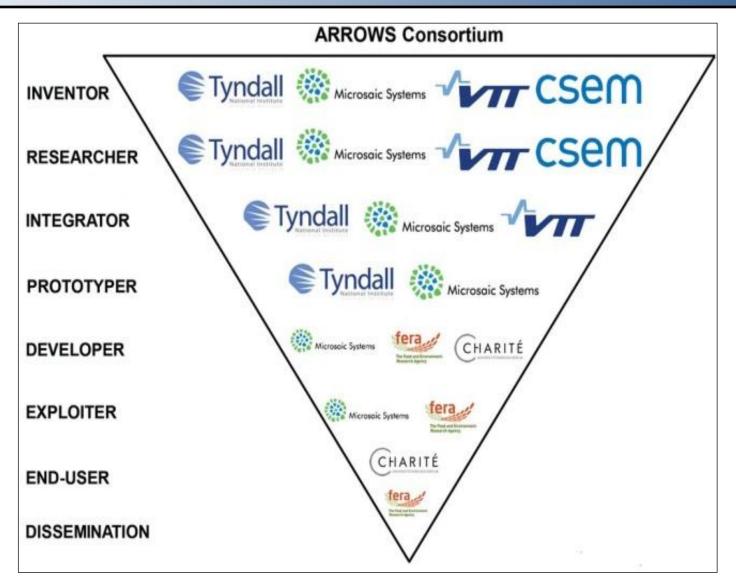
MNBS Concertation Event Athens, May 2012



The goal of ARROWS is to develop a microengineered platform for the analysis of 'real-world' samples from the food, drink and healthcare industries. The principle deliverable will be a chipscale capillary electrophoresis/liquid chromatography mass spectrometer (CE/LC-MS) that matches the performance of today's mainframe systems.



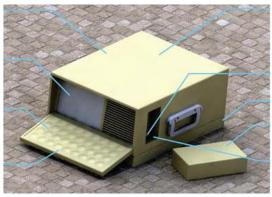














Functionality (FP7 goals) Global opportunity · Not a national niche market ·"More for less" Potential to grow €0.36B market by > 400% · Compact size Total market opportunity €0.75B to €1.5B · One fifth the price of SOTA Cost of ownership reduced by 100x **ARROWS** European competitiveness (Lisbon 2000) Massive competitive advantages over State of Art Micro-analytical · Build a value-chain offering revolutionary technology CE-LC-MS · Products could break market dominance of US corps. platform Quality of life (Lisbon 2000) Sustainability (Goteborg 2001) · 'Food quality, safety and traceability · Big drop in power consumption · Healthcare - rapid screening & diagnosis 100x drop in heat & Air-conditioning load · Environmental monitoring & water quality 1000x saving in solvent consumption · Social challenges - drug abuse, care 1000x reduction in solvent waste

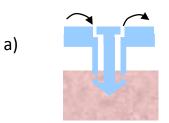


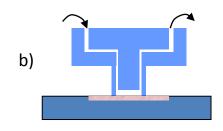
- A concept for the automated robotic handling procedure has been provided
- A microneedle has been designed
- An IDF has been filed for design of microinjector
- Ionchip wafers for the mass spectrometer delivered
- MS breadboard has been designed and assembled



Silicon Microneedles integrated on polymer microfluidic chip for sampling

- Two different microneedle designs have been made:
 - a) Sharp needle head for the biopsy samples
 - b) Blunt needle head for the tissue section samples

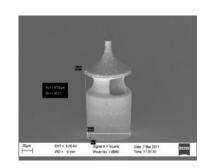


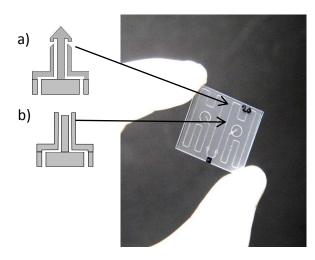


Sampling depth ~ 0.2-0.4 mm

Sampling volume 0.5-1 nL

- Microneedles which are integrated on polymer based microfluidic chip have two channels which can be operated separately. One channel is used for eluting the sample with the aid of the solvent and the other for the actual sampling
- The robotic system is used in aligning the microneedle over the tissue sample, in controlling the liquid flows through the microneedle channels during sampling, and in delivering the sample to the CE analysis.

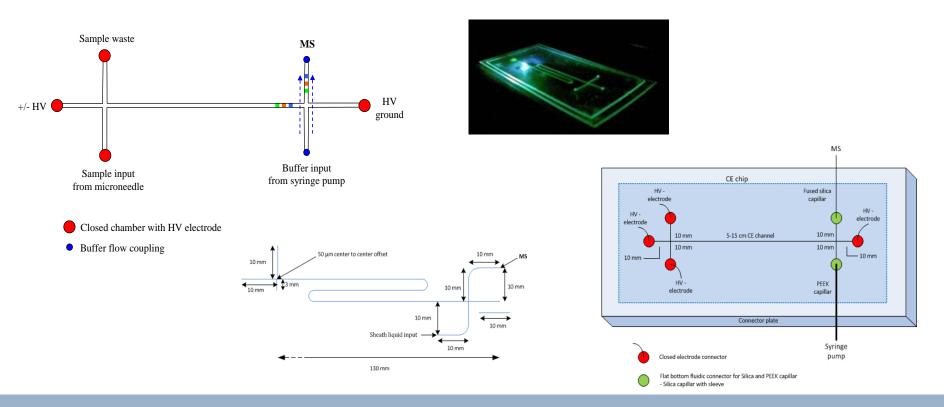






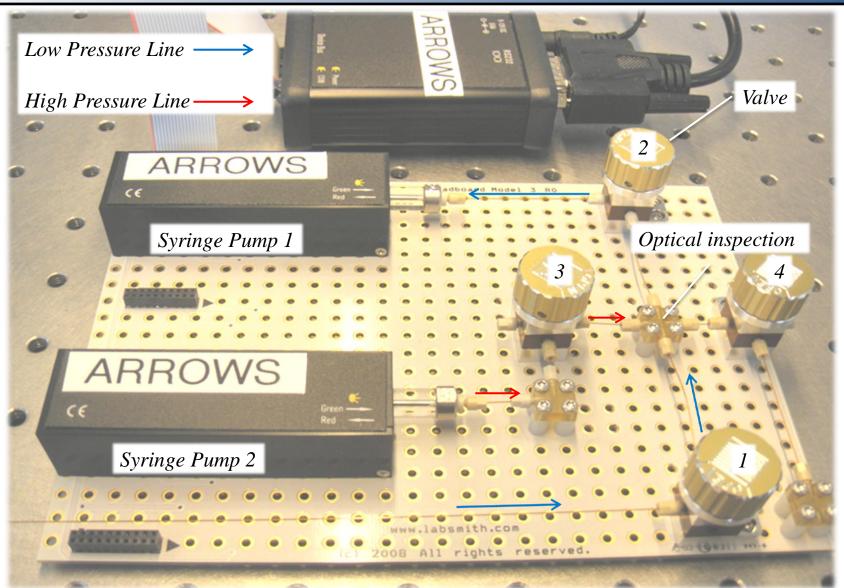
Polymeric CE Chip and MS coupling plan

- CE-chip: disposable polymeric platform (COC) fabricated by hot-embossing based printing technologies.
- Six lipid analytes which are overexpressed in breast cancer have been selected for the method development
- CE separated sample zones pumped to MS with a syringe pump



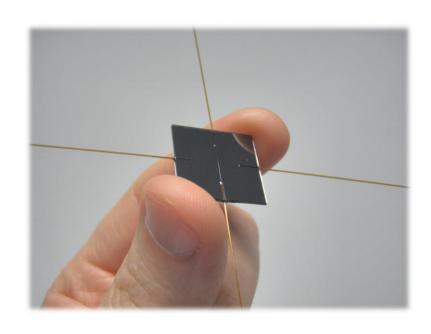


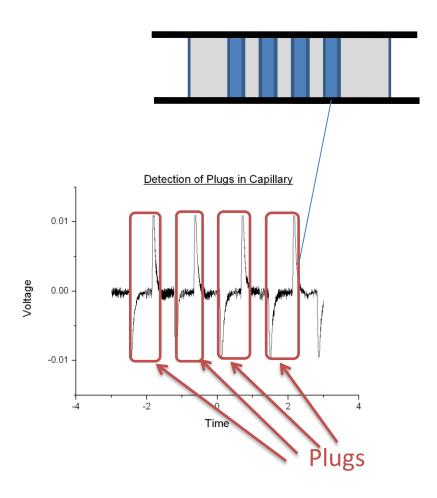
MicroHPLC Sample Injection





Micro HPLC Fabrication – Injection Chip



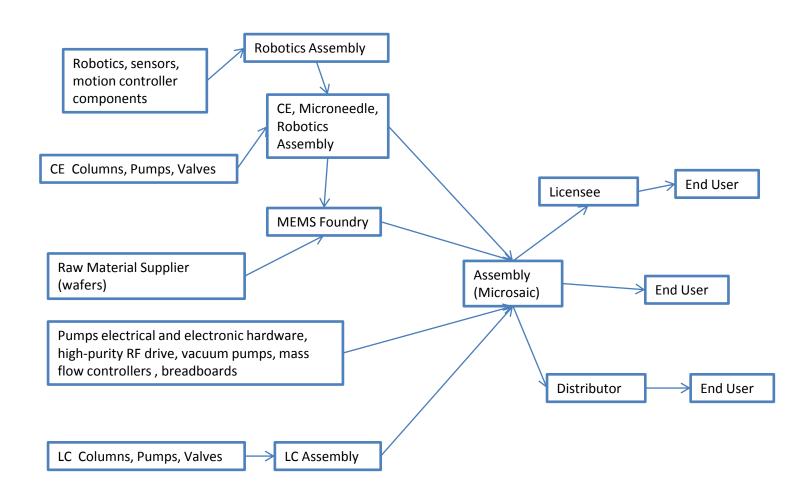




- Customer visit FERA
 - Visit to FERA laboratories, York
 - Understanding of applications, procedures, sample collection and preparation techniques, methods, analytical instrumentation used
 - Typical specifications shared with Microsaic team
 - Target specifications produced for discussion
- Customer visit Charité
 - Conference calls with Charité team
 - Correspondence with PIs to understand clinical application
 - Target specifications produced for discussion
- Market Research
 - New market research was purchased by Microsaic Systems from Strategic Directions International, Inc (SDI) on the market for mass spectrometers (MS), and liquid chromatography mass spectrometry (LC-MS)









- There is an opportunity for product differentiation by deployability, running costs and 'green' factors,
- These products would enjoy major advantages in the fast growing in the BRICs markets,
- A strategy may be to target the system developed by ARROWS at applications in the BRIC economies.



- Commission Strategic Directions International (SDI)
 - Leading market research firm for analytical instrumentation industry
 - 6 week market survey
- Up to 40 or 50 end-users of analytical instruments
 - CE and LC-MS
 - From pharmaceutical, clinical, environmental, food and drink
 - FERA is part of a global network of food analysis labs
- Identify best applications, market segments
 - Analysis of specifications produced with ARROWS partners
 - Receptiveness to product size, performance, price
 - Attractiveness of chip-based concept and ease of use