

# PROJECT PERIODIC REPORT

## Publishable Summary

**Grant Agreement number:** 257669

**Project acronym:** ARROWS

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

**Funding Scheme:** FP7-ICT-2009-5

**Date of latest version of Annex I against which the assessment will be made:**

2010-07-05

**Periodic report:** 1<sup>st</sup> ☒ 2<sup>nd</sup> ☐ 3<sup>rd</sup> ☐ 4<sup>th</sup> ☐

**Period covered:** from 1/07/10 to 30/06/11

**Name, title and organisation of the scientific representative of the project's coordinator<sup>1</sup>:**

Dr. Cian O'Murchu

Tyndall Institute

Prospect Row

Cork

**Tel:** +353 21 4904426

**Fax:**

**E-mail:** cian.omurchu@tyndall.ie

**Project website<sup>2</sup> address:** <http://www.arrows-online.eu>

---

<sup>1</sup> Usually the contact person of the coordinator as specified in Art. 8.1. of the Grant Agreement .

<sup>2</sup> The home page of the website should contain the generic European flag and the FP7 logo which are available in electronic format at the Europa website (logo of the European flag: [http://europa.eu/abc/symbols/emblem/index\\_en.htm](http://europa.eu/abc/symbols/emblem/index_en.htm) logo of the 7th FP: [http://ec.europa.eu/research/fp7/index\\_en.cfm?pg=logos](http://ec.europa.eu/research/fp7/index_en.cfm?pg=logos)). The area of activity of the project should also be mentioned.

## Contents

1	Project context and Objectives.....	3
1.1	Project context.....	3
1.2	Objectives .....	3
1.3	Action plan.....	3
2	Project results.....	3
3	Expected final results .....	4
3.1	Main expected result.....	4
3.2	User communities.....	4
3.3	International aspects .....	4
4	Contact Information .....	4
4.1	ARROWS website.....	4
4.2	Contact e-mail address.....	5
4.3	Logo.....	5
4.4	ARROWS Partners.....	5

# 1 Project context and Objectives

## 1.1 Project context

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 chip-scale capillary electrophoresis/liquid chromatography mass spectrometer (CE/LC-MS) that matches the performance of today’s mainframe systems.

## 1.2 Objectives

The ARROWS innovation is to integrate and interface multiple chip technologies into a platform capable of analysing messy, sticky biological matrices like tissue, food, blood and urine. Our vision is to offer users from the food, environmental and clinical sectors ‘more for less’ by delivering the functionality of a laboratory-scale, high-end CE/LC-MS system, which today is the size of a filing cabinet, in a mass-deployable tool the size of a desktop PC.

## 1.3 Action plan

Next-generation micro-analytical devices from Tyndall, Microsaic, VTT and CSEM will be combined into powerful, multi-sensing tools capable of identifying trace quantities of the chemical species of interest (e.g. pesticides, disease biomarkers) in complex biological matrices such as tissue, food and drinking water. Microsaic Systems will develop a MS based on patented ionchip technology. CE/LC/MS is a universal technique and analytical applications are unlimited. Initially, ARROWS will focus on two applications: (a) detection of cancer biomarkers in fractional spots found on tissue, and (b) screening of imported food for contamination. End-users Charité Universitätsmedizin Berlin and FERA will evaluate the platform. ARROWS utilizes the consortium’s ‘best-in-class’ capabilities to exploit the scaling laws associated with microfluidics, chip-based chromatography and electrophoresis and microengineered advanced mass spectrometry to minimise analysis time, sample volume and reduce manufacturing costs. These scaling laws address the cross-cutting issue of sustainability by reducing solvent consumption, waste and power consumption by orders of magnitude.

# 2 Project results

During the first year of the ARROWS project, results have been obtained in the following areas:

- 1) **Sample collection:** Sample collection microneedles have been designed and a robotics concept for sampling has been proposed
- 2) **Sample separation:** A liquid chromatography small volume sample injection chip has been designed and a capillary electrophoresis method for lipids separation has been developed
- 3) **Detection and identification:** Fabrication has commenced on chips for the miniaturised mass spectrometer

## 3 Expected final results

### 3.1 Main expected result

The objectives of ARROWS will be the development of prototype CE-MS and LC-MS systems that will be realised by addressing the following scientific and technical targets:

- 1) **Sample collection:** Development of an integrated sample collection microneedle
- 2) **Sample separation:** Development of a sample separation solution  
This will include both capillary electrophoresis and liquid chromatography
- 3) **Detection and identification:** Development of chip-scale mass spectrometer
- 4) **System integration:** Development of prototype System
  - a. Integration of breadboard prototype system
  - b. Testing against samples furnished by end-user (i.e. FERA, C-UB).

### 3.2 User communities

There is a requirement to identify trace quantities of certain chemicals in ‘messy’ samples such as food, drink and waste is driven:

- To protect the **needs of citizens**, food imports and animal feeds must be analysed for adulterants, toxic substances or for excessive residue of pesticides and veterinary medicines (e.g. herbicides, fungicides, hormones and antibiotics)
- In **healthcare and pharmaceuticals**, there is a responsibility to screen body fluids or tissue for drugs, poisons and disease biomarkers during toxicology, oncology and clinical trials, for example.
- In **clinical oncology** the cancer diagnosis is based on very small tissue biopsies, at the same time multiple biomarkers need to be analyzed in a systems biology approach. An integration of MS-based technologies into the routine analysis of tissue samples is urgently needed.

### 3.3 International aspects

The technology developed by ARROWS would address a global market opportunity, and not a national niche. At the right price, our market research reveals myriad new applications and new markets for such a powerful, deployable analytical tool that include diagnostics and point of care; sport; security, and of course quality assurance (QA) and quality control (QC) of food and drugs.

## 4 Contact Information

### 4.1 ARROWS website

<http://www.arrows-online.eu>

## 4.2 Contact e-mail address

[cian.omurchu@tyndall.ie](mailto:cian.omurchu@tyndall.ie)

## 4.3 Logo



## 4.4 ARROWS Partners

1	UNIVERSITY COLLEGE CORK, NATIONAL UNIVERSITY OF IRELAND, CORK	Tyndall-UCC	Ireland
2	VALTION TEKNIILLINEN TUTKIMUSKESKUS	VTT	Finland
3	Microsaic Systems	MS	UK
4	CSEM CENTRE SUISSE D'ELECTRONIQUE ET DE MICROTECHNIQUE SA – RECHERCHE ET DEVELOPPMENT	CSEM	Switzerland
5	THE SECRETARY OF STATE FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS	FERA	UK
6	CHARITÉ - UNIVERSITÄTSMEDIZIN BERLIN	C-UB	Germany