Project Number: 257401

A highly integrated and sensitive POrous SIlicon based lab on a chip for multiple quantitaTIVE monitoring of food allergies at point of care.

Specific Targeted Research Project

Information Society Technologies

Deliverable D11.14: Update and distribution of promotional material announcing the results of the Positive project by a newsletter.

Due date of deliverable: **February 28th 2014**

Actual submission date: **May 19th 2014**

Start date of project: 2010-09-01 Duration: 3 ½ Years

Organisation name of lead contractor for this deliverable: **UVEG**

Revision **[2.0]**

Project co-funded by the European Commission within the Seventh Framework Programme		
Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

1. About this deliverable

1.1. Introduction

This document contains a copy of the final newsletter sent to the Positive Interest Group.

1.2. Scope of the deliverable

The deliverable really just provides a copy of the newsletter.

1.3. Structure of this deliverable

The report is laid out according to the tasks defined in WP11 as follows:

T11.2: Creation and distribution of promotional material such as POSITIVE project leaflets/flyers/brochures, posters, videos, 2/3 slide presentation, newsletter, etc., available for broader distribution at key events and through a regularly updated database of contacts (including newcomers registering through the web-site). Months: 1-42. (D11.2, D11.7, D11.12, D11.14, D11.17) (All partners)

Contents

2. Description of work performed

2.1. T11.2: Creation and distribution of promotional material such as POSITIVE project leaflets/flyers/brochures, posters, videos, 2/3 slide presentation, newsletter, etc., available for broader distribution at key events and through a regularly updated database of contacts.

2.1.1. The Newsletter

POSITIVE NEWSLETTER 4: **MULTIPLE SPOT PHASE CHANGE MEASUREMENTS IN A FLOW THROUGH MEMBRANE – REAL TIME MULTIPLEXED BIOSENSING FOR THE FAST AND SAFE DETERMINATION OF SENSITIZATION TO MULTIPLE FOOD ALLERGENS**

Six European research centres and two industry partners have joined in a new European research consortium called POSITIVE. The goal of POSITIVE is to develop new rapid and multi-assay diagnostics for determining sensitization to food allergens. The European Union supports the consortium during a three-year period with 2.9 MEuro through its Seventh Framework Programme.

Food allergies can provoke clinical reactions whose most severe is anaphylaxis, with respiratory and/or cardiovascular problems that might result in death. They are common in 1-2% of adults and up to 8% of children, corresponding to a serious public health problem that affects over **15 million people in Europe** from infants to the elderly and its prevalence is increasing.

POSITIVE will develop a diagnostic platform that can quickly and safely identify the sensitization of a patient to multiple food allergens so as to be able to proscribe a suitable diet and lifestyle. Ideally it will be a rapid system with little hands-on time, so as to be used at point of care (PoC) in an intensive care unit by paramedics.

The consortium will develop a state-of-the-art diagnostics Lab-on-a-Chip platform via an integrated microfluidic sample preparation technique capable of serum preparation from whole blood of volumes, <100µl. The detection will be based on ultrasensitive photonic biosensors that are integrated into the lab-on-chip device. A final prototype consisting of a packaged biochip and reader will be used on clinical samples in order to determine sensitization to allergens such as that for hen's eggs, cow's milk, peanuts, wheat, tree nuts, fish, sesame, and shrimp ingestion.

More information about POSITIVE and its partners can be found in the attached project flyer or on the POSITIVE website http://www.fp7positive.eu ,

ABOUT THE POSITIVE CONSORTIUM:

Positive project manager and main contact person:

Dr. Daniel Hill, UVEG – Universitat de Valencia (http://www.uv.es/umdo)

Other partners:

Centre Suisse d'Electronique et de Microtechnique (http://www.csem.ch)

Farfield Group Ltd (www.farfield-group.com)

Charite Universitaetsmedizin Berlin (http://www.charite.de)

Phylogene SA (http://www.phylogene.com)

Università degli Studi Di Trento (http://science.unitn.it/~semicon/)

Consiglio Nazionale Delle Ricerche (http://www.icrm.cnr.it)

Royal Institute of Technology - Microsystem Technology Lab (http://www.ee.kth.se/mst)

Highlights of technology developed in Positive:

After switching to porous alumina membranes the project progressed rapidly and following a 6 month extension in its final 18 months we have been able to demonstrate:

- Real time measurements for concentrations of IgG down to 33.7ng/ml (225pM), with a noise floor of 3.7ng/ml (25pM) and a good reproducibility, bound to Anti β-LG which is attached to the β-lactoglobulin immobilized on the functionalized porous alumina membrane for a total assay time below one hour for sample volumes (Anti β-LG) < 100 µl. Capture efficiency was <70%.
- Serum flow through the mounted membranes with a very large binding response through physisoprtion and also flow through functionalized and β-LG spotted porous alumina chips for which a new mounting chip with a smaller spot size was developed.
- Chips can be multiply spotted with allergen and these multiple allergens are active on planar devices, both in array format as a fluorescent assay and in sequential experiments on a Refractive index sensitive device. One allergen has also been spotted and shown to be active on the porous POSITIVE device and used for a full concentration dependent assay.
- The multiplexed instrument showed very well its suitability for simultaneous multi-spot phase change measurements with linear response to different saline concentrations, so far down to a 4% solution or 10mrad.

Although resources have not permitted us develop an instrument that meets all of the required end-user specifications within the time frame of the project whilst endeavoring to do so several interesting technologies or technological applications have been developed and/or demonstrated including:

(1) Combination of OSTE(+)[1] with copolymer. The method aims at improving and simplifying the batch back-end processing of microarrays and create microfluidic cells. The Biosticker is aimed to be a plug-in for existing microarray platforms to enable faster protein assays and DNA hybridizations through mass transport optimization. (KTH, CNR)
(2) A micro-well platform enabling simultaneous flow through and optical inspection. This unique technology has applications in single cell studies, where the response of individual cells trapped in the micro-wells to stimulants supplied in the flow stream can be followed by microscopy in real-time. (KTH, CSEM, UVEG)
(3) A high performance sensor chip thermal control system that has already been implemented in optical instrumentation in over a dozen international University and industrial research laboratories. (Farfield)
(4) A module developed for blood filtering that enables several 100 µl of whole blood to be filtered and plasma to be generated for subsequent analysis. This will find uses in lab on chip applications which require alternatives for plasma extraction from whole blood samples which is currently done in dedicated laboratories by centrifugation. (CSEM)
(5) A module for sequential actuation of a set of fluids through a microfluidic cartridge, which also enables priming of the cartridge with CO_2 and avoids the introduction of air plugs between the different fluids[2] (CSEM).
(6) A fluorescence based milk and egg allergen microarray for detection of specific IgE and IgG with sensitivity and reproducibility comparable to the commercially available ImmunoCAP ISAC from Thermo Fisher. (C-UB, CNR)

[1] Mercene Labs AB is a spin-off Company from KTH commericializing OSTE, which was developed during FP7 InTopSens and FP7 Positive, for device fabrication by customers.

[2] CSEM is working on a demonstrator of a compact, stand-alone pressure driven fluid handling module anditt is intended to have this ready for SLAS 2015 in Washington DC to present to the lab automation and instrumentation community. CSEM is also implementing such a module in two currently running projects, one for food quality monitoring and one for 3D cell tissue generation for pharma research.

Partner feature:

CSEM SA, founded 1984, is a private applied research and development center specializing in micro- and nanotechnology, systems engineering, photovoltaics, microelectronics, and communications technologies. CSEM's mission is to develop applied technology platforms in these domains and transferring them to the industrial sector, thereby enhancing the competitiveness of industry. The development of such highly innovative platforms is supported by the Swiss Confederation and by several cantons including Neuchâtel, Basel Land, Graubünden and the cantons of central Switzerland Switzerland (Obwalden, Nidwalden, Luzern, Schwyz, Zug and Uri).

The emphasis of technology platforms in the field of life sciences is on (lab) automation & instrumentation, diagnostics, and quality & process control. CSEM is thus an ideal partner for the realization of integrated solutions for the field of life sciences instrumentation by enabling new approaches and more reliable process flows. The following technologies in this field are currently covered.

Miniaturization and automation for the preparation and handling of samples and reagents
Integration of miniaturized sensors and actuators for process monitoring or control, signal processing, (micro)fluidic systems (design, modelling, fabrication), automation, combining microfluidics & robotics
Links: Integration & Packaging, Automation,

Methods & tools for handling of cells, cell clusters, tissue samples or small model organisms
Development of methods and modules for picking, sorting, manipulating, dosing of cells, microtissues, small model organisms etc. using microfluidic systems, MEMS, robotics or a combination thereof
Links: Integration & Packaging, Biosurface Engineering

Biosensor development
Development of (label-free) optical biosensors, fluorescence-based biosensors, electrochemical sensors
Links: Nanosurface Engineering, Biosurface Engineering

In-vitro platform for monitoring (3D) cell cultures for assessing the effect of compounds or toxicological studies of compounds in the life sciences
Development of microsystems for the integration of cells or cell clusters, support membranes as artificial biological barriers, modified surfaces for controlled or structured growth of cells, chip-based 3D cell cultures, sensors for measuring metabolic products of cells

Links: Nanosurface Engineering, Biosurface Engineering

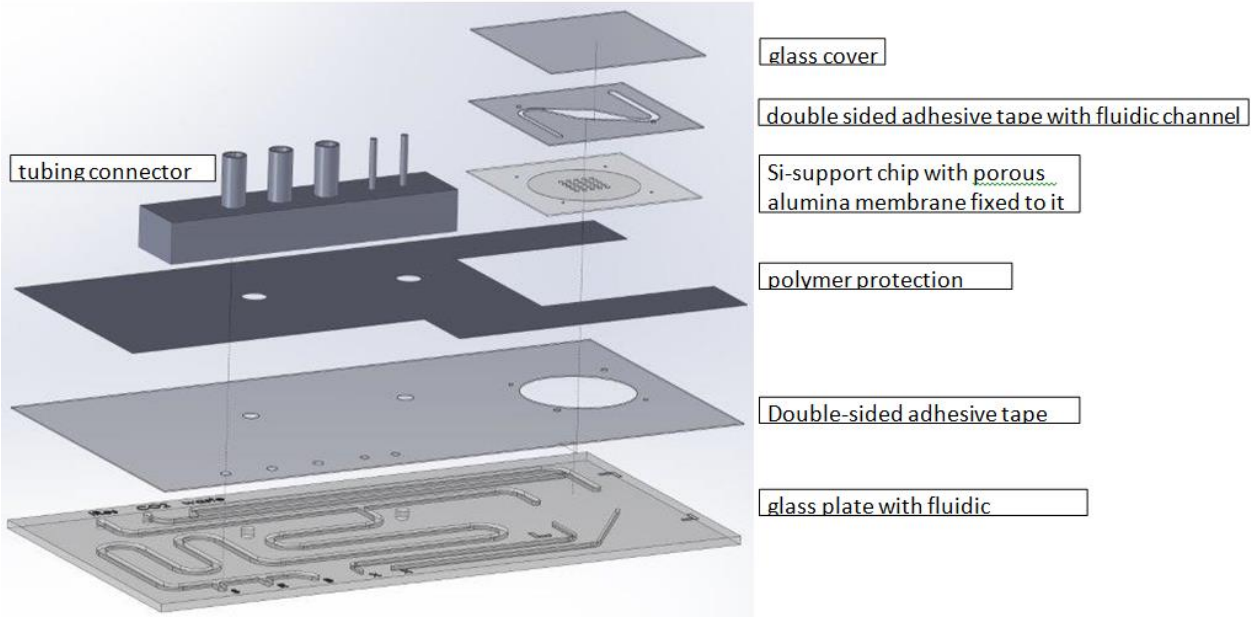
Contact: microfluidics@csem.ch

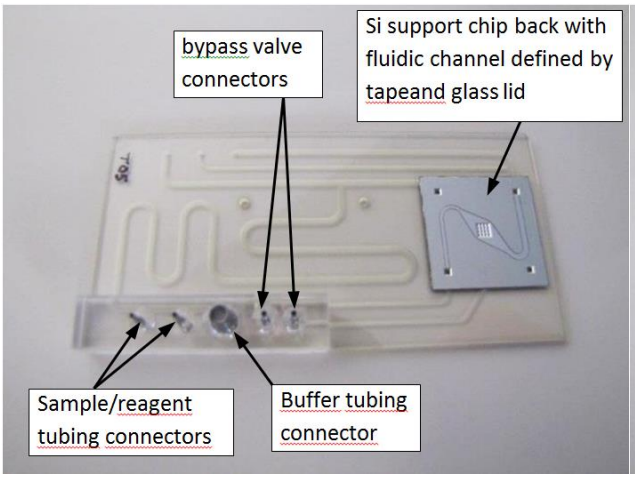
YouTube Channel: www.youtube.com/user/CSEMmicrofluidics

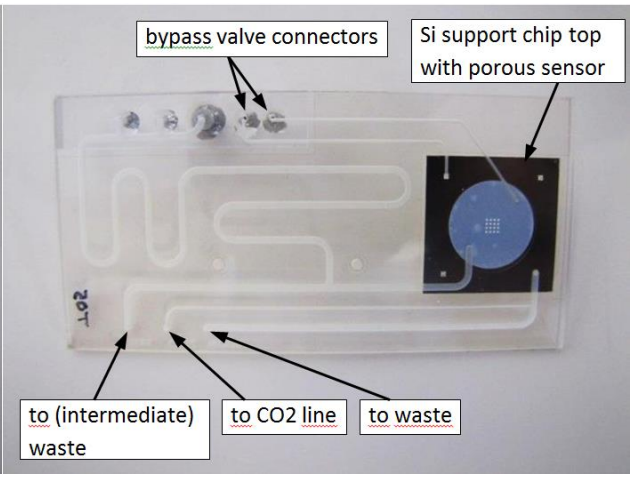
Activity within POSITIVE

Within POSITIVE the partner CSEM is responsible for the development of the measurement platform providing the fluidic actuation and optical readout for the multispot measurements. To this end, CSEM has developed a fluidic module for sequential actuation of three fluids, stored in tubing reservoirs, through a microfluidic cartridge. The fluidic module employs CO_2 priming of the microfluidic cartridge containing the nanoporous membrane. Only through this feature can a dry

nanoporous structure be filled with aqueous solutions at pressures in the few 100 mbar range. The optical module of the multispot measurement platform uses a diode laser modulated with a photo elastic modulator to illuminate a 16 spot sample. The transmitted light is then measured using a phasecam camera with lock-in functionality. The customized software enables to automatically locate the 16 light spots in the camera image and to measure changes in the retardance of each spot. Changes in retardance are caused by changes of the refractive index within the well aligned pores of the nanoporous membrane. CSEM is also responsible for the development of the microfluidic cartridge incorporating the nanoporous sensor membrane. The assembly of this cartridge and the two sides of an assembled cartridge are shown below.







ABOUT THIS NEWSLETTER - SUBSCRIBE/UNSUBSCRIBE

You received this email because you were identified by one of the Positive partners as a potential interessee in the technology we develop. This is the fourth and final newsletter.

3. Conclusions

Promotional material has been created for disseminating the project at its end, and within this deliverable the final Positive Interest Group newsletter has been included.