

The POSITIVE Consortium



Universitat de València is one of the oldest, largest and most important universities in Spain and participates as project coordinator through the Unit of Materials and Optoelectronic Devices (UMDO) from within the Institute of Materials Science (ICMUV).
Contact: Dr Daniel Hill, daniel.hill@uv.es, URL: www.uv.es/umdo



Centre Suisse d'Electronique et de Microtechnique is an applied R&D center specializing in micro- & nanotechnology, microelectronics, and system engineering. It leads the fluidic and optical measurement platform development and also contributes to the microfluidic sample handling and microsystem packaging.
Contact: Dr. Helmut Knapp, Helmut.KNAPP@csem.ch, URL: www.csem.ch



Farfield Group Ltd is a UK instrumentation company specializing in measurement of conformational changes in proteins for bioanalytical purposes. Farfield's technology measures sub atomic dimensional changes in proteins implicated in a host of disease processes and is used to study the disease mechanism and drug candidates to inhibit it.
Contact: Dr. Marcus Swann, mswann@farfield-group.com, URL: www.farfield-group.com



Charite Universitaetsmedizin Berlin is one of Europe's largest university hospitals, the department of pediatric pneumology and immunology focuses on the development of better diagnostic and therapeutic approaches for allergic diseases including food allergy.
Contact: Dr. Kirsten Beyer, Kirsten.Beyer@charite.de, URL: www.charite.de



Phylogene SA is a specialized R&D and service laboratory located in the south of France that has developed a range of tests to allow allergen tracking in food.
Contact: Dr. Gilbert Skorski, g.skorski@phylogene.com, URL: www.phylogene.com



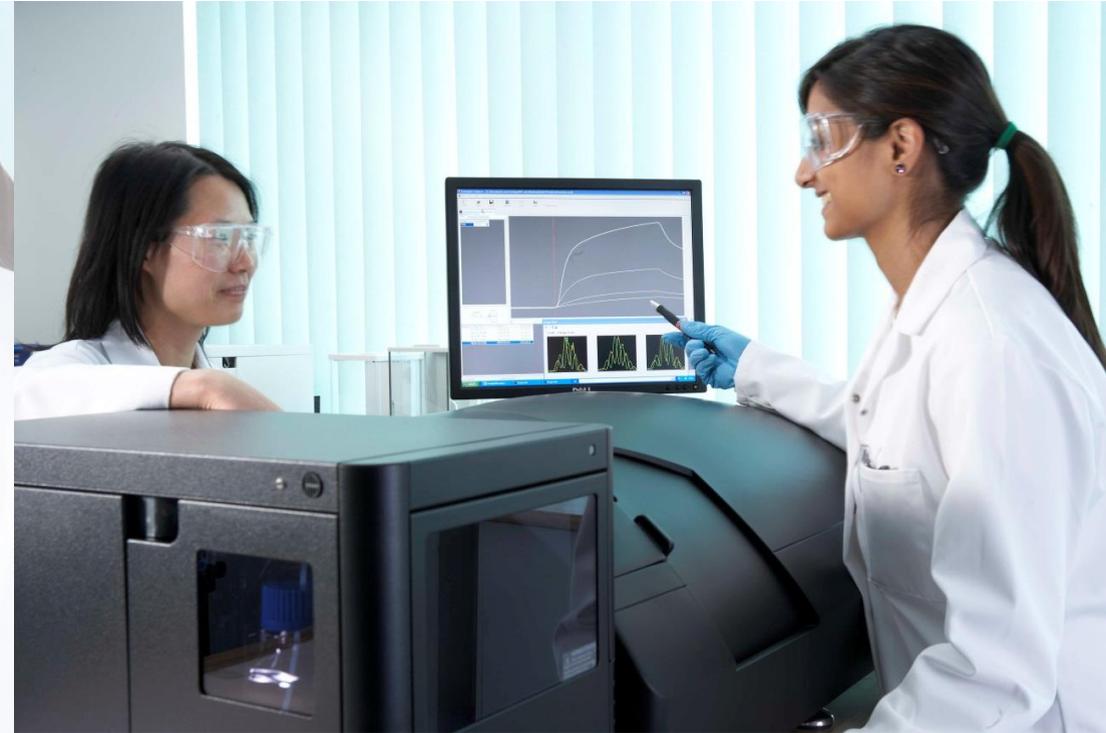
Università degli Studi Di Trento - The Nanoscience Laboratory is within the Physics Department of the University of Trento. The activities of the laboratory are along three main research lines: silicon photonics, nanophotonics and nano-biotechnologies.
Contact: Prof. Lorenzo Pavesi, pavesi@science.unitn.it, URL: science.unitn.it/~semicon/



Consiglio Nazionale delle Ricerche - The Institute of Molecular Recognition Chemistry (ICRM), based in Milan, is one of the several research institutes of Italian National Research Council (CNR).
Contact: Dr. Marcella Chiari, marcella.chiari@icrm.cnr.it, URL: www.icrm.cnr.it



KTH – the Royal Institute of Technology The **Microsystem Technology Lab** is a leading MEMS and microfluidics group. It leads the integration of the biochip.
Contact: Prof. Wouter van der Wijngaart, wouter@ee.kth.se, URL: www.ee.kth.se/mst



The POSITIVE consortium between 2010-2014 had aimed...

- ❑ to develop a label-free biosensor for the point of care evaluation of food allergy risks
- ❑ to create disposable lab-on-chip cartridges with integrated microfluidic sample preparation and ultrasensitive photonic transducers, as well as a bench-top readout system
- ❑ To focus on a rapid solution (<15 minutes) with little hands-on time, so as to be used at point of care in an intensive care unit by paramedics and General Practitioners
- ❑ Consisted of six research centres and two industry partners from seven European countries
- ❑ was supported during 2010-2013 with 2.9 Million Euro by the European Union through its Seventh Framework Programme

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www.fp7positive.eu

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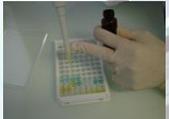
A highly integrated and sensitive POrous Silicon based lab on a chip for multiple quantitaTIVE monitoring of Food allergies at point of care

Food allergy as a condition and current diagnostic methods

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.



The skin prick test is the most commonly used test for allergy diagnostics. However, this test has its limitation in patients with severe allergic reactions (anaphylaxis), eczema, taking anti-histamines and young children, where the tests are difficult to administer. Unfortunately, food allergy is most frequently seen in young children with eczema and/or severe reaction in the past.



Therefore, blood based tests, mostly using the FEIA, RAST and ELISA techniques are often used. These tests are normally performed as a laboratory test using sent-in blood samples. On the other hand point-of-care (PoC) devices exist; however, they are currently able to assay only few allergens at a time. Other immunological blood tests, using enzymes, are now superseding the original methodology. Moreover, the existing market PoC products provide at best semi-quantitative determination of allergy sensitization.



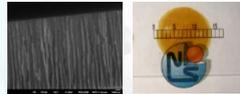
Lab-on-chip technology for rapid and low cost quantitative determination of hundreds of food allergies

POSITIVE aimed to 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. A final prototype was to consist of a packaged biochip and reader to 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.

Project Innovation from Start to End

The project has just come to completion after 42 months of significant advance towards our initial high risk-high gain target of developing a Lab-on-Chip diagnostic platform for multiple food allergies. On our way we faced very difficult challenges that led us to develop some very interesting individual component technologies or novel applications of existing technologies including the below:

- 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)
- 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)
- 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)
- 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)
- A module² for sequential actuation of a set of fluids through a microfluidic cartridge, which also enables priming of the cartridge with CO₂ and avoids the introduction of air plugs between the different fluids (CSEM).



(1) Mercene Labs AB is a spin-off Company from KTH commercializing 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 and it 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.