

New Sensor to Detect Lung Cancer from Exhaled Breath

ScienceDaily (Dec. 23, 2011) — Tecnalia, through the Interreg project Medisen, is contributing to develop biosensors capable of detecting the presence of tumour markers of lung cancer in exhaled breath. This is possible because of the changes produced within the organism of an ill person, changes reflected in the exhaled breath of the patient and which enable determining the presence of this type of marker during the initial stages of the disease.

Some illnesses such as lung and stomach cancer or liver diseases which, due to the difficulty of diagnosis, have symptoms that are often confused with routine disorders. Therefore, in most cases, the disease is only detected at an advanced stage. New methods for early detection are being investigated as an urgent need.

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Patients with lung cancer, treated in the Section of Medical Oncology of the Institute of Onco-Haemathology of the Donostia Hospital (IDOH) have collaborated in this phase of the project. For that, the Ethic Committee of the Clinical Research of Euskadi (CEIC) gave the authorization to the *Instituto Biodonostia* for the clinical trials

Human breath, whether from a healthy or ill person, is composed of a hundreds of organic compounds: acetone, methanol, butanol, hydrocarbons, amongst others. There is not a single specific component in the exhaled breath capable of acting as a marker for the diagnosis of lung cancer. A range of biomarkers and its combination should be selected. The compounds of interest are generally to be found at 1-20 parts per billion (ppb) in healthy human breath but can be increased 10-100-fold in the breath of sick patients. In order to be able to detect these changes the development of novel materials was required.



Tecnalia, through the Interreg project Medisen, is contributing to develop biosensors capable of detecting the presence of tumour markers of lung cancer in exhaled breath. (Credit: Image courtesy of Elhuyar Fundazioa)

During the first phase of the project, breath samples were collected by the hospital staff by a breath collecting device. A detailed analysis of the most representative compounds present in the breath samples has been carried out and the family or families of compounds required to act as markers for the presence of lung cancer selected. Organic compounds have been analysed using gas chromatograph/mass spectrometry analysis (GC/MS). Then, the GC/MS results of breath tests have been analysed by statistical and structural algorithms to discriminate and identify "healthy and "cancerous" patterns that really provide information for the design of the sensor.

In parallel, novel materials for the detection of the selected organic compounds have been developed by Tecnia in order to increase the sensitivity of the devices. Participating together with Tecnia in this project were the *Instituto de Tecnologías Químicas Emergentes de La Rioja* (Inter-Química) designing the sensor device and the University of Perpignan (France) testing the novel materials.

As a conclusion, the biosensors will facilitate the diagnosis of certain diseases; mainly those located in the lungs, at the initial stages of the illness, which could increase considerably the chances of survival.

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