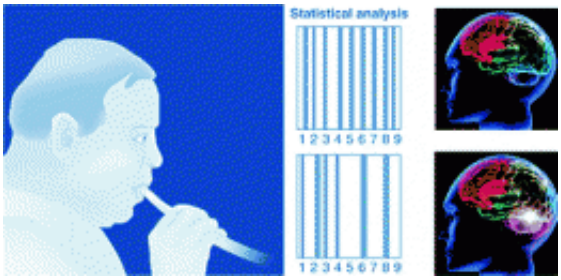
Advance toward a breath test to diagnose multiple sclerosis

October 26 2011



Scientists are reporting the development and successful tests in humans of a sensor array that can diagnose multiple sclerosis (MS) from exhaled breath, an advance that they describe as a landmark in the long search for a fast, inexpensive and non-invasive test for MS -- the most common neurological disease in young adults. Their report appears in the journal *ACS Chemical Neuroscience*.

Hossam Haick and colleagues report that doctors now diagnose MS based on its characteristic symptoms, which include muscle spasms, numbness, coordination problems and slurred speech. One common tool for confirming the diagnosis and making informed decisions on treatment is magnetic resonance imaging (MRI) of the brain. Another tool is a lumbar puncture or "spinal tap" to analyze the fluid that bathes the brain and spinal cord. But MRI scans are costly, and lumbar

punctures are invasive.

To overcome these obstacles, the researchers have identified volatile organic compounds that can be associated with MS from exhaled breath. Based on these findings, the researchers developed a new sensor array that can diagnose MS by analyzing the determined chemical compounds that appear in the breath of MS patients. Using the developed sensors, the researchers carried out a proof-of-concept clinical study on 34 MS patients and 17 healthy volunteers and found that the developed sensors are just as accurate as a spinal tap but without the pain or the risk of side effects.

"The results presented here open new frontiers in the development of fast, noninvasive and inexpensive medical diagnosis tools for detection of chronic neurological diseases," the scientists stated. "The results could serve as a launching pad for the discrimination between different subphases of stages of multiple sclerosis as well as for the identification of multiple sclerosis patients who would respond well to immunotherapy." A large clinical study with the reported sensors is underway and will be reported in the future.

More information: Detection of Multiple Sclerosis from Exhaled Breath Using Bilayers of Polycyclic Aromatic Hydrocarbons and Single-Wall Carbon Nanotubes, *ACS Chem. Neurosci.*, Article ASAP. DOI: 10.1021/cn2000603

Abstract
A cross-reactive array of polycyclic aromatic hydrocarbons and single wall carbon nanotube bilayers was designed for the detection of volatile organic compounds (tentatively, hexanal and 5-methyl-undecane) that identify the presence of disease in the exhaled breath of patients with multiple sclerosis. The sensors showed excellent discrimination between hexanal, 5-methyl-undecane, and other confounding volatile organic

compounds. Results obtained from a clinical study consisting of 51 volunteers showed that the sensors could discriminate between multiple sclerosis and healthy states from exhaled breath samples with 85.3% sensitivity, 70.6% specificity, and 80.4% accuracy. These results open new frontiers in the development of a fast, noninvasive, and inexpensive medical diagnostic tool for the detection and identification of multiple sclerosis. The results could serve also as a launching pad for the discrimination between different subphases or stages of multiple sclerosis as well as for the identification of multiple sclerosis patients who would respond well to immunotherapy.

Provided by American Chemical Society