Nano-Bio-Chip Checks for Oral Cancer

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(PhysOrg.com) -- The gentle touch of a brush on the tongue or cheek can help detect oral cancer with success rates comparable to more invasive techniques like biopsies, according to preliminary studies by researchers at Rice University, the University of Texas Health Science Centers at Houston and San Antonio and the University of Texas M.D. Anderson Cancer Center. A new test that uses Rice's diagnostic nano-bio-chip was found to be 97 percent "sensitive" and 93 percent specific in detecting which patients had malignant or premalignant lesions, results that compared well with traditional tests.

The results of this study, which was led by John McDevitt, were published in the journal *Cancer Prevention Research*. Oral cancer afflicts more than 300,000 people a year, including 35,000 in the United States alone. The five-year survival rate is 60 percent, but if oral cancer is detected early, that rate rises to 90 percent.

"One of the key discoveries in this paper is to show that the miniaturized, noninvasive approach produces about the same result as the pathologists do," said Dr. McDevitt, whose group developed the novel nano-bio-chip technology.

Dr. McDevitt and his team are working to create an inexpensive chip that can differentiate premalignant lesions from the 95 percent of lesions that will not become cancerous. The minimally invasive technique would deliver results in 15 minutes instead of several days, as lab-based diagnostics do now. Instead of an invasive, painful biopsy, the new procedure requires just a light brush of the lesion on the cheek or tongue

with an instrument that looks like a toothbrush.

"This area of diagnostics and testing has been terribly challenging for the scientific and clinical community," said McDevitt, who came to Rice from the University of Texas at Austin in 2009. "Part of the problem is that there are no good tools currently available that work in a reliable way."

He said patients with suspicious lesions, which are usually discovered by dentists or oral surgeons, end up getting scalpel or punch biopsies as often as every six months. "People trained in this area don't have any trouble finding lesions," McDevitt said. "The issue is the next step — taking a chunk of someone's cheek. The heart of this paper is developing a more humane and less painful way to do that diagnosis, and our technique has shown remarkable success in early trials."

Nano-bio-chips are small, semiconductor-based devices that combine the ability to capture, stain and analyze biomarkers for a variety of diseases. Researchers hope the eventual deployment of nano-bio-chips will dramatically cut the cost of medical diagnostics and contribute significantly to the task of bringing quality health care to the world.

The new study compared results of traditional diagnostic tests with those obtained with nano-bio-chips on a small sample of 52 participants. All of the patients had visible oral lesions of leukoplakia or erythroplakia and had been referred to specialists for surgical biopsies or removal of the lesions.

The chips should also be able to see when an abnormality turns precancerous. "You want to catch it early on, as it's transforming from pre-cancer to the earliest stages of cancer, and get it in stage one. Then the five-year survival rate is very high," he said. "Currently, most of the time, it's captured in stage three, when the survivability is very low." The

device is on the verge of entering a more extensive trial that will involve 500 patients in Houston, San Antonio and England.

This work is detailed in a paper titled, “Nano-Bio-Chip Sensor Platform for Examination of Oral Exfoliative Cytology.” An abstract of this paper is available at the journal’s Web site.

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