A 'super sensor' for cancer and CSIs

August 3 2009

Tel Aviv University's "super sensor" sniffs out disease and pollution. Credit: AFTAU

Like the sensitive seismographs that can pick up tremors of impending earthquakes long before they strike, a similar invention from Tel Aviv University researchers may change the face of molecular biology.

Coupling biological materials with an electrode-based device, Prof. Judith Rishpon of TAU's Department of Molecular Microbiology and Biotechnology is able to quickly and precisely detect pathogens and pollution in the environment - and infinitesimally small amounts of disease biomarkers in our blood. About the size of a stick of gum, the new invention may be applied to a wide range of environments and situations. The aim is for the device to be disposable and cost about $1.

"Biosensors are important for the bio-terror industry, but are also critical

for detecting pathogens in water, for the food industry, and in medical diagnostics," says Prof. Rishpon. Her latest research appeared in the journals *Nanomedicine: Nanotechnology Biology* and *Medicine, Electroanalysis and Bioelectrochemistry*.

What makes this particular invention particularly appealing is its small size and the fact that it can be easily connected to a handheld device like a Blackberry or iPhone for quick and reliable results. An electrical signal will pulse "yes" for the presence of a test molecule and a "no" for its absence.

Currently, clinical researchers are testing its application in cancer diagnostics, focusing on the detection of proteins associated with colon and brain cancer and efficacy of anticancer drugs. But the device is capable of detecting various types of substances. "It really depends on what you put at the end of the electrode," says Prof. Rishpon.

"You can put enzymes, antibodies or bacteria on my electrodes to sense the existence of a chemical target. Then we can measure the amount of the target, assessing its potency by using additional enzymes or by looking at the changes of the electrochemical properties on the device," she says.

Enzymes released before the onset of a heart attack can also be detected, so this application has obvious uses in an operating room to give a physician warning of an impending attack during a procedure. It could be fitted into an implant like a pacemaker or another future device to alert the user to impending dangers, thus preventing sudden death.

Prof. Rishpon is also investigating the application of her technology to detect for pathogens in drinking water such as estrogen, a byproduct of the female birth control pill. The presence of these chemicals in America's drinking water is no minor health concern. And before

tackling the problem, water officials need to know what they are up against. Prof. Rishpon's solution could be part of the future toolkit, she believes.

Detecting pesticides in food is another very desirable application. The organic food market is calling for more rigorous testing and regulations to ensure spraying doesn't occur on some farms, and that limits are not breached on others.

Commercial applications of Prof. Rishpon's basic research are already underway in many areas of diagnostics, but clearly there are more to come. "My super sensors are cheap, accurate and highly sensitive, and in principle they could detect and measure the presence of almost every biological-based material," Dr. Rishpon concludes. She is also collaborating on the device with scientists at Arizona State University.

Source: Tel Aviv University (news : web)