

Harnessing nature's diagnostic tools for disease prevention

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(PhysOrg.com) -- The earlier cancer is diagnosed, the better the chance of effecting a cure. A revolutionary new hybrid technology offers the possibility of detecting this and other diseases right at inception.

Within a few years, when the technology comes to market, every doctor's surgery could have a small, inexpensive device which can test blood on the spot and warn of impending illness before any symptoms become apparent.

With a head start of billions of years over human scientists, nature has developed incredibly complex organisms, tools and systems which we are still struggling to understand let alone emulate.

Put simply, there are things evolution has achieved that people can only dream of. And among these are natural diagnostic tools which help us to recognise when something foreign, a cold virus say, has invaded our bodies and to fight it.

When we have a sore throat and a runny nose, it means our body has identified a disease invasion, diagnosed exactly what the disease is, and created antibodies to fight it. We might feel bad, with our bodies being the battlefield, but after a few days the antibodies win out, the cold virus is neutralised, and equilibrium returns.

Nature's tools

Scientists have known for some time how the body sets about diagnosing the problem. But the process is so complex, and takes place at such a microscopic level, it has been impossible for us to replicate it to help in the fight against diseases like cancer which the body cannot usually beat off by itself.

An ambitious EU-funded research project, which goes by the acronym of RECEPTRONICS, is taking an unconventional approach by harnessing nature's tools and combining them with the best of nanotechnology and electronics to produce a revolutionary new method of disease detection.

At the heart of the process is molecule recognition, and specifically recognising individual molecules, something the human body does all the time. For medical purposes, the type of molecule which needs to be recognised is called a biomarker, and its presence can indicate a disease is starting well before there are any other symptoms.

In order to recognise biomolecules, nature has developed receptors, which are mirror images of the molecules being sensed. Every single type of biomolecule has its own receptor in nature.

New level of precision

The researchers on the project have brought together their different disciplines, including biochemistry, bioengineering, nanotechnology and information technology to replicate this process and develop a hybrid device. Results to date show the technology the project has developed is far more precise than anything else which is being used, which allows for much earlier detection of biomarkers.

Explains project coordinator Professor Marco Tartagni of the University of Bologna (IT): “The idea is to use bioengineering to harness the natural

biological process for molecule recognition, and to put it together with state-of-the-art electronics.

“The front end of the system is composed of bioengineered receptors that are very similar to those generated by nature and specifically designed to target molecules, put together with man-made microelectronic systems at the back end. The results are very promising and we could soon unveil the best and most precise method ever developed of sensing single molecules.”

Tartagni points out it can be months or even years after the first biomarkers have appeared before full-blown cancer develops. “What is needed is a very smart sensor which can precisely detect concentrations of a wide range of molecules, and the only way to get the required precision is to count molecules one by one. Nature has developed a way to do this, and we are trying to do exactly what nature does,” he says.

Speeding up drug development

While the three-year project officially ended in September 2008, the partners are so enthused by the results they have already achieved that they have agreed to self-fund at least another year of working together.

“We have pioneered techniques which are working very well, and we now need to tie them together. We are working on a compact and affordable point-of-care biomarker detection device which can be made commercially available,” he says.

While mass production of the devices is probably still a few years down the road, an earlier commercial application of the systems RECEPTRONICS has developed is likely to be in the pharmaceuticals industry.

The development of new drugs takes up to 15 years from the time research starts until they are commercially available. This is because the drugs need to be checked in every possible situation and their interaction with every type of cell surface studied.

“Around 95% of this research involves how drugs interact with, and try to regulate, the receptors hosted in body cells. And our new techniques can be used to make instruments which can check and test the molecules very quickly, thus greatly reducing the time required for the drug-screening process,” he says.

It is no exaggeration to say the techniques developed by the RECEPTRONICS researchers could truly revolutionise both diagnostics and the development of new medicines.

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Link: www.receptronics.org

Provided by [ICT Results](#)

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