

SPED-UP DISEASE DETECTION: Blood is filtered and transferred to nanosensors on a chip, which can detect and measure cancer biomarkers. MARK REED/YALE UNIVERSITY

Nanosensor speeds up cancer detection

By KAT PIPER
Epoch Times Staff

Detecting the biological signs of cancer in blood samples could be quicker and more sensitive thanks to new nanotechnology developed by U.S. scientists.

The new process involving nanowire sensors could significantly simplify the way blood is tested for diseases such as cancer and cardiovascular disease. In a study published in *Nature Nanotechnology*, researchers used nanosensors to detect the biomarkers for prostate and breast cancer.

"Nanosensors have been around for the past decade, but they only worked in controlled, laboratory settings," said lead researcher Dr. Mark Reed from Yale University in a press release. "This is the first time we've been able to use them with whole blood, which is a complicated solution containing proteins and ions and other things that affect detection."

Current methods for biomarker

detection involve separating the plasma from the whole blood sample and then subjecting it to several hours of chemical analysis. The whole process can take several days. In addition, the equipment can only detect biomarkers if they are present in high enough concentrations, and interpretation of the results can be subjective.

The Yale-developed nanosensor can detect the concentration of biomarkers in a matter of minutes and much more precisely, say the researchers.

Biomarkers can include cells, molecules, genes, hormones, or whole system changes that can indicate the risk or presence of a disease. For example, blood cholesterol levels can indicate the risk of cardiovascular disease, or blood pressure the risk of stroke. The presence of certain molecules called antigens in the blood can be used as biomarkers for cancer.

Nanowire-based biomarker detectors have been developed in recent years by other teams of researchers,

but the Yale device is the first to be able to isolate biomarkers from whole blood samples.

"Doctors could have these small, portable devices in their offices and get nearly instant readings," said co-lead researcher Dr. Tarek Fahmy in a press release. "They could also carry them into the field and test patients on site."

The device works by filtering out specific cancer biomarkers from the whole blood sample and capturing them on a chip. As the molecules accumulate, very small concentrations can be detected—the equivalent of detecting a single grain of salt dissolved in a large swimming pool, said the researchers. Several different biomarkers can be detected at the same time.

As well as being labor and time saving, the new technology may also be a cost-effective tool for disease diagnosis. "The advantage of this technology is that it takes the same effort to make a million devices as it does to make just one," Reed said.

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Imagine a brighter 21st century

By DAVID SUZUKI with FAISAL MOOLA

In our short time on Earth, we humans have emerged from a chaotic world, imposing order and meaning in myriad ways, imagining the world into being. That was our great gift. As we enter the second decade of the 21st century, will we prove ourselves to be imaginative beings capable of creating a better world?

Our challenge is to imagine a world where our wealth is in human relations and where we learn to live in balance with the rest of nature. By imagining a future, we can make it happen – as we always have.

If we continue, though, to set human borders and the economy as our highest priorities, we will never come to grips with the destructiveness of our activities and institutions.

In imagining a better future, we must open ourselves to the idea of change. And we'd do well to remember that people with vision have been overturning outmoded ways of thinking and acting throughout our brief history on this Earth – often in the face of great resistance. It wasn't long ago that people in countries such as the U.S. believed slavery was an economic necessity and that abolishing it would destroy the economy and way of life of its "free" citizens.

As far as the cost and the speed of acting in our own best interests, consider how quickly the U.S. was able to build its space program after the Russians launched Sputnik I in 1957. In putting tremendous energy, thought, and resources into getting people onto the moon, the U.S. also sparked innovations such as 24-hour television news channels, cellphones, and GPS navigation.

On the environmental front, world leaders came together in Montreal in 1987 to confront the effect humans were having on the ozone layer with our use of chlorofluorocarbons. The international treaty they signed used trade sanctions and incentives to get countries to phase out the use of chemicals that were contributing to the depletion of the ozone layer. And that agreement allowed developing countries to take longer to phase out CFCs because the industrialized world had disproportionately contributed to the problem.

We really do have to think big – to imagine what a future that offers the most good to the most people

and to all life on this planet would look like. Obviously, reducing poverty, conflict, and human-rights abuses is paramount. Environmental problems exacerbate those issues and so must also be dealt with. Part of the problem is that many of our political leaders are stuck in the mindset that constant economic growth is essential.

For example, consider what Prime Minister Stephen Harper said in a speech to South Korea's National Assembly in late 2009: "Without the wealth that comes from growth, the environmental threats, the developmental challenges and the peace and security issues facing the world will be exponentially more difficult to deal with."

But with constant growth comes depletion of and increasing competition for scarce resources, as well as more waste; in other words, increased environmental threats, developmental challenges, and peace and security issues.

Constant growth is just not possible in a finite world with finite resources. Our focus on constant economic growth also leads to some bizarre anomalies. War and natural disasters, for example, can contribute to economic growth by creating employment and resource-use activity.

In thinking beyond these artificial parameters that humans have set (and remember, they were only set during the middle of the 20th century), we can imagine a more sustainable way of living, as York University economist Peter Victor has done in his excellent book *Managing Without Growth: Slower by Design, Not Disaster*. As Dr. Victor points out, we can't change overnight, but by imagining a future in which humans live within the Earth's capacity to provide for our ongoing needs, we can steer ourselves in the right direction.

Once we have imagined this better future, we can get serious about solving the challenges we have created with our now outmoded ways of thinking. Issues such as climate change, mass extinctions of plant and animal species, pollution and toxic chemicals in the environment, water shortages, and more require scientific and political solutions – along with the efforts and support of citizens throughout the world.

We're well into the 21st century. It's time we started thinking and acting like responsible 21st century citizens. It's time to imagine what we really can be.

Take David Suzuki's *Nature Challenge* and learn more at www.davidsuzuki.org.

Superatoms: Mimicry of elements

By HELENA ZHU
Epoch Times Staff

In the 21st century, scientists are again introducing the topic of alchemy. Three researchers from Pennsylvania State University have recently shown that particular combinations of elemental atoms have electronic signatures that mimic those of other elements.

"The findings could lead to much cheaper materials for widespread applications such as new sources of energy, methods of pollution abatement, and catalysts on which industrial nations depend heavily for chemical processing," said lead researcher A. Welford Castleman Jr., Eberly Distinguished Chair in Science, and Evan Pugh, who is a professor in the departments of Chemistry and Physics, in a press release.

The researchers demonstrated that the atoms that have been identified up to now as being imitated can be predicted by looking at the periodic table. The team applied advanced experimentation and theory to quantify these new and surprising findings.

"We're getting a whole new perspective of the periodic table," said Castleman.

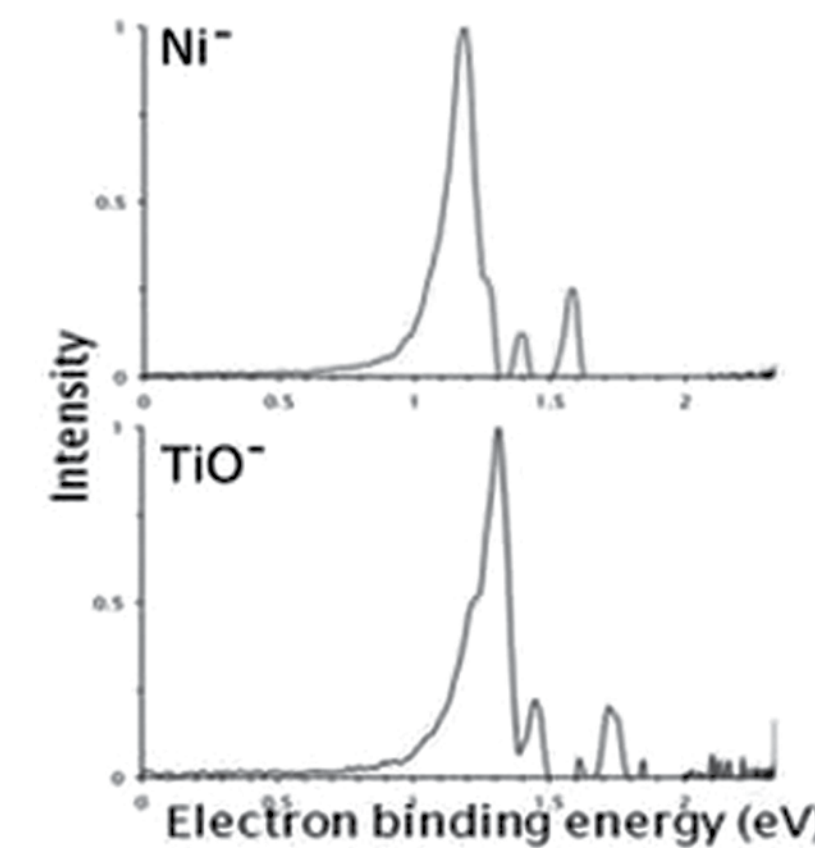
The team's findings were published in the Dec. 29 online issue of the journal *Proceedings of the National Academy of Sciences*.

Castleman and his team used a technique known as photoelectron imaging spectroscopy to examine similarities between titanium monoxide and nickel, zirconium monoxide and palladium, and tungsten carbide and platinum.

"Photoelectron spectroscopy measures the energy it takes to remove electrons from various electronic states of atoms or molecules, while simultaneously capturing snapshots of these electron-detachment events with a digital camera," said Castleman.

"The method allows us to determine the binding energies of the electrons and also to observe directly the nature of the orbitals in which the electrons resided before they were detached."

They found that the amount of energy required to remove electrons from



SUPERATOM'S MIMICRY: Graphical displays of energy peaks were similar between a nickel atom and a titanium-monoxide molecule. CASTLEMAN LAB/PENN STATE UNIVERSITY

a titanium-monoxide molecule is the same as that required to remove electrons from a nickel atom. The same is true for the systems of zirconium monoxide and palladium, and tungsten carbide and platinum.

Therefore, the molecules titanium monoxide, zirconium monoxide, and tungsten carbide are superatoms—clusters of atoms that exhibit some property of elemental atoms—of nickel, palladium, and platinum, respectively.

Castleman said that such similarities between atoms and superatoms can potentially save us a lot of money.

"Platinum is used in nearly all catalytic converters in automobiles, but it is very expensive," said Castleman. "In contrast, tungsten carbide, which

mimics platinum, is cheap. A significant amount of money can be saved if catalytic-converter manufacturers are able to use tungsten carbide instead of platinum. Likewise, palladium is used in certain combustion processes, yet it is mimicked by zirconium monoxide, which is less expensive by a factor of 500. Our new findings are exciting from both a scientific as well as a practical point of view."

Castleman said that he does not know if the pattern will occur across the entire periodic table. At present, he and his team are working through the transition-metal atoms.

In the future, they are planning to take the research a step further to investigate whether or not the superatoms are chemically similar to their respective single atoms.

Study says tailored music therapy can ease tinnitus

LONDON (Reuters)—Individually designed music therapy may help reduce noise levels in people suffering from tinnitus, or ear ringing, German scientists said on Monday.

The researchers designed musical treatments adapted to the musical tastes of patients with ear-ringing and then stripped out sound frequencies that matched the individual's tinnitus frequency.

After a year of listening to these "notched" musical therapies, patients reported a distinct decrease in the loudness of ringing compared with those who had listened to non-tailored placebo music, the researchers wrote in a study published in the *Proceedings of the*

National Academy of Sciences journal.

Tinnitus is a common hearing problem in industrialized countries and the ear-ringing can be loud enough to harm quality of life in between one and three percent of the general population, the researchers said.

A European Union (EU) health panel raised the alarm in January about the potential hearing damage caused by young people playing their MP3 players too loud.

The EU Scientific Committee on Emerging and Newly Identified Health Risks warned that listening to personal music devices at high volume for long periods could cause hearing loss and tinnitus,

and their warning prompted the European Commission to issue new safe volume standards for MP3 players.

The German researchers said the precise cause of tinnitus is not known, but the auditory cortex – the region of the brain that processes sound – is often distorted in those who have it.

Christo Pantev of the Institute for Biomagnetism and Biosignal-analysis at Westfalian Wilhelms-University, Germany, who led the study, said his findings on targeted listening suggested that tinnitus volume could be "significantly diminished by an enjoyable, low-cost, custom tailored notched music treatment."

Strange phenomena in a meteorite crater

Epoch Times Staff

Gulong Village, a round pit with a diameter of 1.8 kilometers, is also known as the Liaoning Xiuyan pit. According to Chinese Science Bulletin, when villagers get water from wells, there is always a layer of oil on top of the water. In addition, after the black soil from this village is dried, it can burn in fire.

Trees, grasses, crops, and other plants grow very well in the village. Currently, there are 64 families in the village, 30 of which are named Feng. The villagers rarely get sick, so the village is known as a longevity village.

The villagers live a self-sustained life as the rural area is very slow in

developing. Without any industry, the environment has little pollution. Because the village is surrounded by mountains, it is very isolated and rarely affected by the outside world. Therefore, these phenomena are likely to be related to the pit itself.

Experts have offered the explanation that tens of thousands of years ago, a large number of plants died and were converted into coal, so the soil became peat. As the soil contains a large amount of coal, it can burn. At the same time, water's inability to flow through the peat results in oil suspension in the wells.

So how was the pit formed? After three years of investigation, a

group of researchers headed by Dr. Chen Ming from the Guangzhou Institute of Geochemistry of the Chinese Academy of Sciences published a paper in 2007 confirming that the Liaoning Xiuyan pit is a meteorite impact crater. After the meteorite strike, the deformation and melting of rock and mineral matter formed the pit.

Chen analyzed the material in the pit and estimated that the meteorite strike happened 50,000 years ago. Water accumulated in the pit to form a lake, and the sediment eventually reached over 100 meters deep. About 39,000 years ago, the lake gradually diminished due to a gap in the east wall of the pit, forming the present bowl-like valley.