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Health Chip Gives Instant Diagnoses

Soon, your family doctor will no longer have to send blood or cancer cell samples to the laboratory. A little chip will give her test results on the spot.

Today, a blood sample whose protein content, genes and so on are to be read needs to be submitted to a series of complex processes, such as centrifugation, heat treatment, mixing with enzymes and concentration of disease markers. This means that samples are sent to central laboratories for analysis, and weeks may pass before the results are returned.

The same thing happens when women are checked for cervical cancer by taking a cell scrape from the cervix. The samples are then sent off and studied under the microscope. Diagnostic error rates can be high when abnormal cell appearance is determined by even experienced eyes.

Automated

The EU's MicroActive project has developed an integrated system based on microtechnology and biotechnology, that will enable a number of conditions to be diagnosed automatically in the doctor's own office.

The new "health chip" looks like a credit card and contains a complete laboratory. The EU project has used cells taken to diagnose cervical cancer as a case study, but in principle the chip can check out a number of different diseases caused by bacteria or viruses, as well as various types of cancer.

SINTEF has coordinated the project, whose other members include universities, hospitals and research institutes from Germany and Ireland. The Norwegian NorChip company had the idea for the chip, and has carried out full-scale tests during the project.

Advanced "credit card"

The chip is engraved with a number of very narrow channels that contain chemicals and enzymes in the correct proportions for each individual analysis. When the patient's sample has been drawn into the channels, these reagents are mixed.

"The health chip can analyse your blood or cells for eight

different diseases," say Liv Furuberg and Michal Mielnik of SINTEF. "What these diseases have in common is that they are identified by means of special biomarkers that are found in the blood sample. These "labels" may be proteins that either ought or ought not to be there, DNA fragments or enzymes.

"This little chip is capable of carrying out the same processes as a large laboratory, and not only does it perform them faster, but the results are also far more accurate. The doctor simply inserts the card into a little machine, adds a few drop of the sample taken from the patient via a tube in the cardholder, and out come the results."

Scientists at SINTEF's MiNaLaB have developed a number of techniques for interpreting the results when the biomarkers have been found. For example, they can read them off in a spectrophotometer, an optical instrument in which the RNA molecules in different markers emit specific fluorescent signals.

"SINTEF's lab-on-a-chip projects have shown that it is possible to perform rapid, straightforward diagnostic analyses with the aid of microchips, and we are now working on several different types of chip, including a protein analysis chip for acute inflammations," says Liv Furuberg.

Mass production

NorChip has just started a new two-year EU project that aims to industrialise the diagnostic chip to the mass-production stage while the company will also evaluate market potential and industrial partners.

Chief scientist Frank Karlsen in NorChip says that the ways in which the chip can be used can be extended to enable patients themselves to take samples at home, and he expects that such special sampling systems will be ready for testing within a few years.

Source: The above story is reprinted from materials provided by SINTEF, via AlphaGalileo.