The pocket laboratory

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Made in Germany, the world's first fully electric biochip can quickly, reliably and automatically detect pathogens or residual traces of antibiotics. For this development, the president of the Federal Republic awarded the German Future Prize to three researchers.
Is it influenza, or only a bad cold with a fever? An instant test gives the physician the answer. **He simply puts a few drops of the patient's blood on an analyzer the size of a credit card**, and just a few minutes later the doctor knows if his patient is suffering from genuine influenza. The system also tells him which medicine will be most effective for the sufferer and what the dosage should be.

Right now, this kind of high-speed diagnosis is still a thing of the future. But the development of an all-electric biochip has laid an important foundation for the pocket-sized laboratory. Sponsored by the Federal Ministry of Education and Research BMBF, Rainer Hintsche of the Fraunhofer Institute for Silicon Technology ISIT has spent the past fifteen years developing the scientific foundations of this technology and its potential for applications on the market. This has formed the basis of an ongoing industrial cooperation venture, led by Walter Gumbrecht (Siemens) and Roland Thewes (Infineon Technologies), to establish a platform for the industrial use of electric biochip technology. The German president Horst Köhler awarded the German Future Prize 2004 to the three researchers for their work. The prize, which was presented on November 11, is worth € 250,000.

But how can a chip that is no bigger than a fingernail be an adequate substitute for elaborate tests in a laboratory? The chip holds numerous

ultra-fine gold electrodes. Attached to these are various physically separate biomolecules – the receptor molecules. Using the lock-and-key principle, they selectively bind specific gene sequences, a particular protein or traces of antibiotics out of liquid samples. If the counterpart bonds with the receptor molecule, an electric signal is triggered which is registered and analyzed by the integrated electronic measuring equipment. “What we are doing is no different from what happens in nature when molecules meet and bond together,” explains Hintsche, head of the Biotechnical Microsystems department at the ISIT. “We know from allergies how accurately nature can identify certain substances.” These processes are artificially simulated on the silicon chip. This makes the electric biochip a highly accurate sensor for DNA, proteins and small molecules. The first measuring systems, each weighing roughly two kilograms, are already on the market. Before the analyzers will fit neatly into your pocket, however, the researchers have a lot more work to do.

Source: Fraunhofer-Gesellschaft