



Fast newcoming technology:

# Bio-medical foresight

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Åke Sellström, FOI-Swedish Defence Research Agency

The near future will bring bio-medical sensors that can be adapted to the unique genetic make up of each individual. These sensors can be set to trigger alarms when irregular values are registered, monitor the presence of toxic agents in the blood, or enable drug delivery directly into the bloodstream. But these are only some of the possibilities. Different scenarios are being analysed in FOBIS, a Nordic Innovation Centre project that studies the implications of biomedical sensors in Nordic health care, and industry, 10-15 years from now.

”By establishing likely scenarios for the technology, applications and markets, the project prepares for the future and enhances Nordic innovative capabilities in the area”, says Ingrid Svagård at SINTEF, the foresight projects’ manager. The other participants in the project are The Sensor Technology Center, VTT, S-Sence, FOI and MedCoast Scandinavia.

#### Valuable lifesaver

By using micro- and nano-technology it will be possible to design small, smart, robust and cost effective sensors with a wide functionality. Bio-medical sensors can monitor blood sugar levels in diabetic patients, or the hearth rhythm in heart patients. The global bio-medical sensor market is estimated to US\$ 2,5 billion, with a yearly growth rate presumed to be 5 – 10%. ”We believe that this study will make Nordic businesses better prepared for the future, and more capable of competing in the market place for bio-medical sensors”, Svagård continues.

#### Embedded monitoring

The real difference from today is that medical sensors can be implanted into the patient’s body, saving them from being hooked up to external sensors. A patient that needs supervision, can

have a bio-medical sensor implanted, and go about life as usual. An alarm can be set to be triggered the second irregularities are registered. Many elderly will have the option of living in their own home much longer, instead of having to move to an institution in order to have their health monitored properly. Within emergency medicine, measuring the body signs of chronically ill patients can save lives.

Bio-medical sensors present brand new medical possibilities, and in a few years it will be the reality we live in. These sensors will play an important role in health care, and the industry has only begun to scratch the surface of this opportunity. Chips implanted in the body will function as a constant onboard doctor, detecting diseases early on. Early detection using bio-sensors enables patients to read and monitor the health status; this will shorten hospital stays and contribute to a better life quality. It will be like having the doctor present, 24/7.



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## Prepared for chaos

Future bio-medical applications can enable safeguarding the health of people sent in to help in natural disaster areas, by having access to sensors that can register the level of chemical content in hazardous environments. The Nordic countries have espoused a policy of international peace-keeping operations for military and civilian personnel. This leads to an increased risk of exposure to nuclear, biological and chemical warfare agents - and to other hazardous substances not normally found in the environment.

As a result, both civilian populations and military often suffer from perplexing illnesses. This became clear to the general public after the first Gulf war, when American soldiers returned suffering from headaches, eczema, memory loss and other symptoms. "In a crisis situation everything is in turmoil. The electricity and sanitary systems

may no longer be working. Factories and mines may have been bombed. The streets look like garbage heaps. Aid workers, soldiers, and police experience rising stress levels, and are often exposed to diseases rarely to be found in the Nordic countries", says Åke Sellström, director of the Swedish Ministry of Defense's research institute (FOI). They participate in the foresight study in order to prepare for potential chaos.

"The cocktail of harmful influences people are exposed to would be illegal if it were given to laboratory rats. We have a duty to do our utmost to alleviate any effects of such exposure", he continues. The quantities of cadmium, uranium, insecticide and poisonous substances in hazardous environments often exceed the threshold values outlined in the laws of the Nordic

countries. The biosensors will be equally useful in situations resulting from natural disasters, or terrorist attacks.

### Long perspective

"In two or three years we will be able to measure damage caused by pesticides. Once we have this prototype, we can add to the list at an ever-quickenning speed", says Sellström. The research must be viewed in a 20-year perspective. One team of scientists develops surfaces that can measure exposure to harmful substances. Another team examines types of symptoms resulting from various types of exposure. The results are combined in a biosensor - a device that can either be used to measure exposure in retrospect, or potentially be implanted to correct the damage as it is being done.

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