Foresight: Biomedical Sensors

Extracts and highlights from the third workshop

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FOBIS – Foresight studies on biomedical sensor

How will biomedical sensors shape the healthcare systems of the future? How can they impact the quality and cost of healthcare and what are the business opportunities in the Nordic region? A Nordic consortium headed by SINTEF (Norway) and with the participants VTT (Finland), FOI (Sweden), S-SENCE (Sweden), STC (Denmark) and MedCoast-Scandinavia is conducting a foresight study on Biomedical Sensors. The project is supported by the Nordic Innovation Centre. The project revolves around a series of workshops, the first on to be held in Copenhagen 6-7th October, the second in Oslo, 2nd November. More information is found on our web-site: www.nordic-fobis.net.

Inside this issue

The next FOBIS workshop will be held in Tampere 7 June 2006 with the theme *What do we do now?*

Key note speakers:

- **Prof Pankaj Vadgama, Director, IRC in Biomedical Materials, Queen Mary, University of London (UK)**
- **Paul Mundill, R&D Vice President, Orion Diagnostica (Finland)**
- **Prof Niilo Saranummi, VTT**
- **Prof Jukka Lekkala, Tampere University of Technology**

Program & registration:

http://www.nordic-fobis.net/workshop/Workshop_4

Introduction

The health care systems of the industrialized countries are expected to undergo major changes within the next 10 – 15 years. The number of elderly people requiring treatment will grow considerably, so-called welfare diseases is increasing, and increasing use of new advanced treatments will occur. This will require a more efficient health care system offering better services. A number of new health care technologies will emerge and several will be adopted by the health care systems.

How will biomedical sensors shape the healthcare systems of the future? How can they impact the quality and cost of healthcare and what are the business opportunities in the Nordic region?

This newsletter reports a summary of the third workshop and presents some biomedical companies in Sweden.

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Project objectives

– To enable a strategic understanding of the possibilities and implications of the use of biomedical sensors for healthcare purposes by establishing likely scenarios for technology, applications and markets.

– To provide for a framework for commercially viable exploitation of biomedical sensor penetration in the Nordic region by enhancing a network of competencies relevant to technology and applications.

The Workshops

The project revolves around a series of workshops, the first two being held in Copenhagen 6 – 7th Oct., the second in Oslo 2nd Nov. and the third one in Stockholm 3rd March. The one will be held in Finland 7th June. The objectives of the workshops are to establish status, needs and perspectives for sensors in relation to health care and in particular the need for biomedical sensors.

3rd Biomedical Sensors Foresight Workshop

Citykonferensen, Stockholm, 3 March, 2006

The third Fobis workshop was organized by FOI, which has been active in the area of biosensors and biomedical sensors for more than 25 years. The workshop was also supported by Uminova Innovation, BioTech Umeå and CMTF, which brings together leading expertise in the area of biomedical engineering from northern Sweden.

Program

The purpose of the third workshop was to try to answer the question “How do we get there?” and discuss and establish technology premises and boundaries. Technology-driven scenarios were discussed and hands-on examples on sensor implementation in the healthcare sector were presented. Other topics for the workshop were to discuss and establish market enablers and restrictions and discuss the role of health care authorities and other public organs. The workshop included world-leading sensor experts and key stake holders and policy makers representing the health care sector and society.

Key note speakers at the 3rd workshop

Prof. Ingemar Lundström, Linköping University
Prof. Brian MacCraith, Dublin City University
Prof. Olof Lindahl, Luleå Technical University
Prof. Bengt Kasemo, Chalmers University

An exhibition was integrated with the workshop and used as an arena to discuss the workshop theme “How do we get there?” where the exhibitors apart from their material could give their comments on how they “got there”, “will get there” or “how their research can be exploited”. Download workshop presentations: www.ittf.no/annet/fobis/workshop/Workshop_3

Exhibitors at the 3rd workshop

IFM – Linköping University (S)
FOI NBC Skydd (S)
Vestfold University College (N)
Umeå University (S)
University Hospital Umeå (S)
Biosensor Applications AB (S)
KTH School of Electrical Engineering (S)
Midorion AB (S)
Q-Sense AB (S)

Keynote presentations

Prof. Ingemar Lundström: ”Use of computer screen photo-assisted technique (CSPT) for biomedical sensors”

The need for simple bioanalytical systems is expected to grow considerable in the future due to increased use in the doctor’s office for home diagnosis. The computer screen photo-assisted technique (CSPT) appears to have many advantages for these purposes. It is a method for the classification of colorimetric assays using a common computer and a web camera as instrumentation. Basically, common diagnostic test kits for quick diagnosis, based on colour changes are used. This colour change is directly measured by the web camera under the screen illumination, and distribution of intensities is obtained. A very attractive feature of this approach is the simple set-up and that almost every home and doctors office has access to it. The CSPT method has already proven valuable in a number of applications including cell viability tests, whole cell assays, ELISA tests and DNA detection. By using a combination test for ten different parameters in urine, all ten parameters could easily be determined.

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The technique also offers other advantages, since the screen illumination can be programmed, light source of any colour can be applied, the light can be chopped, scanned etc, furthermore, the data obtained from the web camera can be directly processed by the computer. A very intriguing possibility that at present time is under investigation is the possibility to connect the CSPT system with Google Earth, such as the test results together with the position of the place for the test can be directly connected to the hospital.

Prof. Bengt Kasemo, "Basics and applications of QCM-D and nanoparticle plasmon sensing"

Lipid vesicles and membranes are platforms for biosensing, cell engineering, drug targeting and screening. At the generic level there are large synergies between different biointerface applications (drugs, sensors, stemcell engineering, etc). But to focus and make a real product and commercialize it is a totally different story; mind set, money, way of working.

Lipid vesicles and membranes are platforms for biosensing, cell engineering, drug targeting and screening. At the generic level there are large synergies between different biointerface applications (drugs, sensors, stemcell engineering, etc). Combined with advanced material science and nanofabrication it is in principle possible to explore bimolecular-surface interactions at a molecular level. But to focus and make a real product and commercialize it is a totally different story; mind set, money, way of working. The Q-sense company and their launching of QCM-D was given as an example.

Prof. Brian MacCraith, "Biosensors - a key to our future health!"

Due to sensor technology, the individual will in the future be able to take more care of their own health outside the hospital. The involvement of hospitals for testing and treatment could be kept to a minimum, which would significantly reduce the cost for health care. New sensor technology and the capacity to use this information, opens challenging perspectives for health care at home, using telecommunication and modern IT technology.

A vision of future health care is revolutionary diagnostic devices that give early warning of life-threatening events, enable the control of chronic diseases and link therapy to monitoring and even personalized medicine. But also devices that monitor well-being for people taking care of their health and devices for home use and point of care.

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A major scientific challenge for the development of medical sensors is to produce smart, rapid and miniature systems that reliably can handle and measure small volumes of complex fluids. Success will also depend on the possibility to increase the detection sensitivity of low level concentrations of biomarkers in human samples. Possibly, the development of more effective dyes and more effective antibodies would assist in reaching this goal. Here the whole picture involving ethics, adoption, costs and reimbursement must be taking into account.

Key drivers for the development of biosensors are miniaturization. Several functions have to be integrated on a "Lab-on-a-chip" using microsystem and nanotechnology. It should also be possible to measure several biomarkers in human samples using multi-analyte sensing system. The production cost must be low in order to make it possible to mass produce single use sensor chip and to attract a large population of users. Biomedical analysis and communication systems have to be combined as well as the integration of several disciplines like Micro- Nano- Bio- ICT-techniques.

The health care costs for chronic diseases, like cardiovascular diseases (CVD), cancer and diabetes are scaring. More than one of us will dye of CVD that is among the top two biggest killers. There has to be focus on cardiac wellness identifying new markers. 300 Million word-wide suffer from diabetes.

In the future diagnostics will become more predictive, therapeutic interventions will become more preventive and healthcare will become more personalised and tailored to the individual. Genomics and proteomics are rapidly elucidating the molecular basis of many diseases. Powerful diagnostic tools to identify genetic predisposition to diseases are developed. POC diagnostics are used to identify patients requiring preventative medication, to select most appropriate medication for individuals and to monitor response to treatment.

The priority areas in biosensors during the next 5 years include engineering technology for immobilising cells/molecules on surfaces, non-invasive, in-vivo diagnostic system, improved sensitivity for in-vivo methods, implantable/injectable nano-devices for diagnosis. And for the next 10 years single molecule analysis, nanosensing of multiple, complicated analytics in-vitro, nanosensing in vivo with telemetrically-controlled, functional mobile sensors, rapid fingerprinting of all components in blood samples.

There are still some problems to overcome with biosensors and these include the biorecognition - receptors, immobilisation with a low non-specific binding, high sensitivity transduction (arrays), calibration stability, as well as in-vivo biomaterials, batteries etc.

Prof. Olof Lindahl

Centre for Biomedical Engineering and Physics (CMTF) at Umeå University is a network centre involving several departments at Umeå University, Umeå University Hospital and some companies in the field. The aim is to develop new product ideas through advanced academic research beneficial to the health-care system.

CMTF is hosting 10 research projects in a network based co-operation. For example, the Non-Invasive-Diagnostics project which involves development of objective, non-invasive and fast diagnostic tools. The ambition is to develop methods for early detection of pathological changes in the skin that signal on the progress of various illnesses. The methods used are NIR-spectroscopy, Bio-Impedance, Digital Photography and Laser Doppler and the obtained data is analysed with multivariate methods.

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Another example is the resonance sensor project which is based on using vibrating piezoelectric sensors to measure different clinically interesting properties of human tissues. The project has two parts. One is to use resonance sensors for measuring intraocular eye pressure (IOP). The other is to use resonance sensors to detect prostate cancer. Both parts aim to develop clinical instruments for diagnosis on humans.

In future applications, resonance sensor can be used in surgery. It will aid surgical operation, decrease mayor surgery, and give feed back to the surgeon.

Example of application in future home health care is the use of resonance sensor for breast cancer. These sensors can be put on the breast and the resulting signals can be sent by mobile telephone for verification if it is cancer or not.

Some conclusion & trends in the future

- Ambient Assisted Living (AAL) for the Ageing Society EU fp6, including home health care.
- Preventive lifestyle and high life quality
- Sensors to monitor our general condition give early warning and prevent illness.
- Implantable devices (retinal- and cochlear prosthesis) Implantable devices (Intelligent clothes)
- Wireless sensor networks
- Smart sensors with low power consumption
- Distance spanning technology
- Micro- and nano sensors
- Triple Helix networks; Science, Industry and Users.
- Limitations: CE-marking, FDA, Ethical committees, Large costs;
- Ethical; new laws which will make the development of home health care systems more difficult.

Panel discussion

(Notes by Dorothy Sutherland Olsen, University of Oslo)

Participants: Ingemar Lundstöm, Brian MacCraith, Olof Lindahl, Bengt Kasemo
Chairperson: Rita Westvik, SINTEF

Questions were collected from the audience during the workshop. The general topic of discussion was the future health of human beings. The panel was posed with several questions.

From the panel discussion

Highlights from the discussion

What is the worst case scenario in future health care?

- That improvements in diagnostic ability advance much more rapidly than the therapeutic ability to cure illnesses. This would put a huge burden on society.
- e-care - there was concern that there may be many wrong diagnoses due to wrongly configured computers or compatibility of software and hardware. Products generating false negatives ie “you do not have cancer” when the patient actually does have cancer. Bad data could generate many errors and create scepticism to the technology and ultimately “kill” a product. It was mentioned that it seems to be more acceptable for a doctor to make a mistake

with a cancer diagnosis, but not a commercial company.

There may be many wrong diagnoses due to wrongly configured computers or compatibility of software and hardware.

- Fear that with our focus on technology we might forget mental health, which is an important reason for many illnesses. Future challenges based on lifestyles - eg. changes in heartbeat when watching a film, or children getting stressed by information overload and communication on the net.
- Healthcare becoming too technical. Most GPs say that patients are in need of human contact, it is seldom they actually need technology. Also some people can have serious illnesses but still be happy and others can suffer from minor ailments, yet be really depressed. There is concern that this problem might be forgotten if the focus is entirely on technology.
- Epidemics like bird flu, or a bio-terrorist attack. The existing health services would have problems coping adequately with situations like these. Most of the modern developments we have been looking at today could also be misused for bio-warfare. (It was mentioned that the USSR probably had bombs with the ebola virus. They were never used because there was dubiety about how the virus would disperse.) Wide spread contamination of water supplies, either deliberate or accidental, before the antidote is found.

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Could the idea of prevention instead of diagnostics lead to difficult choices and new ethical problems?
Hospitals may have to decide who to treat those who have looked after themselves rather than the alcoholic who has perhaps wittingly abused his health?
The question of rationing health care, or even deciding whether to keep people alive or not was discussed. The technology makes it possible for us to keep people alive much longer, but there may be other issues to consider in the future, such as cost and quality of life. The issue of technological development in relationship to its acceptance by potential users was discussed.

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The issue of security of data being produced by the sensors was discussed and the potential for wireless communication and monitoring of this data. Several of the panel members mentioned the role Crighton's book in the public anxiety over nanobots and other more general ethical questions. It will be possible to detect signal transmission and surveillance, however passive nanorobots, would not be so easily detected. The issue of the wrong information being given and transmitted and used again was also brought up. It was however pointed out that this would only be an extension of problems we are familiar with today and will probably have to be resolved by cooperation between policy makers and scientists.

What about insurance of health when we have more information about our health? When do we stop being human and become robo-sapiens?

Neural networks interfacing may be a borderline. Most of the panel believe that as long as the brain is working and one is in control of one's own brain, the rest can really all be mechanical.

Public acceptance of technology

It may appear that society is not so willing to accept new technologies, however it was mentioned that in situations where a relative is ill or dying, almost everyone is willing to accept technology.

Another point taken up was our assumptions about the users of new technologies. For example the blind, who are not interested in technological replacement to interpret body language. 70% of communication is via body language and we as seeing people feel that the blind lack this, however they do not prioritise this.

It was also pointed out by the panel that it is not just a case of developing new technologies; scientists have to be better at communicating them to the public. An example mentioned was the need to communicate advantages and disadvantages of different energy sources in the near future. There will be a need for the public and the policy makers to receive information about the advantages and the dangers of nuclear power and coal. This was related to the way information on clean green coal is being communicated in the US at present.

Who should take the decisions in the future healthcare system? The politicians, who represent the public, or should the market decide?

Rita painted a scenario of our futures – alone, urban, at home and with deteriorating health and asked the panel to comment.

The issue of stakeholders was taken up. Who should take the decisions? Some of the panel are of the opinion that politicians, who represent the public, should take the decisions. Others believe that the market should decide. An example was given of biotechnology companies, who appear to be so preoccupied with increasing their earnings, that they give little obvious impression of an interest in ethics. The assumption being that this preoccupation with profit will decide what technologies will be available to us in the future. It was suggested that the participation of academics without commercial interests could contribute to an improved emphasis on ethics. The conflict between the ideals of the triple helix model of university/industry collaboration and the demands of the bottom line was discussed. The lack of investment in "unprofitable" diseases in the developing world was used as an example. With the exception of the Gates Foundation, it is mainly public money which is being used to develop the very necessary, but less profitable solutions for improving health and reducing disease in developing countries.

It was noted that many consumers or customers as well as investors are actually taken up with ethics and the example of the origins of the recent legal requirements for restrictions on vehicle pollution were mentioned. It was explained how it was actually complaints from the public in LA which led to politicians imposing demands on car manufacturers. These restrictions later became standard via the democratic process. There are many similar examples of public influence in technological development.

New technology will change the way tests are done. Where should personal testing be done in the future?

It was suggested that it would perhaps be quite appropriate to carry out tests in public toilets. The panel believe that some simple tests, in so "safe situations" i.e. not dangerous drugs, could be done at home. Insulin monitoring, could be carried out anywhere.

The next stage however, which is customised therapeutics based on a genetic test, should be carried out nearer to medical expertise. The panel believe that this will soon be available in doctor's surgeries.

Most of the panel were in favour of personal health checks being made easily available, but stressed that these should be voluntary. The risk of obsessionalism is very real and may cause more problems for the health services that it removes.

Certain critical conditions will benefit enormously from improved availability of simple reliable testing. It was highlighted that continuous monitoring and quick reaction is what saves life in diabetics and post operative by-pass patients.

Is the Scandinavian market too small to play a role the development of this field?
American money finances many of the commercial scientific discoveries, both inside and outside Europe. In this field there is often a long delay between the original idea and the commercialisation of technology, the market can change a lot in this time. It is important to ensure that there is a market for the product. Is there any point in continuing research too far if there is no realistic market opportunity? Can a product be taken from the laboratory over to industry very easily? Often the scientists see the potential market or need for the product e.g. a sensor product to find landmines, however they did not manage to develop a product that was reliable enough and the project was abandoned in spite of the "market". Perhaps there should be more attention paid to the practicalities of production and marketing at an earlier stage in the research. This point relates back to the issues on collaboration and involvement of users and manufacturers.
The general market for biosensors was considered and the opinion is that we cannot expect to create many large biosensor companies in Scandinavia. We can, however, make existing companies stronger by giving them new technologies. Sweden is experiencing that many biotech companies are leaving Sweden.

Biomedical companies in the Nordic region – Sweden

FOBIS tries to identify Nordic companies with products or services relevant for biomedical purposes. The overview is not complete, so please send us tips of relevant companies (addressed to Dag.Ausen@sintef.no). In this Newsletter we present some of the actors in Sweden. Other companies may be found at Sweden BIO (www.swedenbio.com). The next issues of this Newsletter will present companies from the other Nordic countries.

RGB Technologies AB

Linköping, Sweden, www.rgb-technologies.com
RGB Technologies is a development company that has developed a software and hardware platform for point of care applications. The company has potential end users among hospitals, primary care and users at home. The platform technology has the potential of replacing a number of medical instrumentation for colorimetric analysis just using a PC and a web camera.

RGB develops ScreenLab™, a software platform for colorimetric tests for medical applications. The unique software platform can potentially make a revolution in the field of colorimetric analysis. The CSPT (Patent pending) technology gives a new dimension to the point of care testing.

The ScreenLab™ software provides a platform that replaces existing medical instrumentation with a PC and a web camera.

CSPT Screenlab uses CSPT (Computer Screen Photo-assisted Technique) where a controlled sequence of illuminating colors delivered by a standard computer screen in combination with a standard web camera is used to characterize bio-chemically sensitive indicators by their optical changes, which are acquired as distinctive spectral fingerprints. During a CSPT measurement, a part of the computer screen is used as an intelligent light source, displaying a custom chosen sequence of colors at a specified rate. This source illuminates the assay, which is in general a 2D array of color changing indicators, and its image under different color illuminations is acquired with a camera capturing individual frames in synchronism with the illumination. The goal of the measurement is to accurately identify color changes in this assay, which indicate responses linked to a particular diagnostic. Indeed, analytical techniques as visible absorption spectroscopy would provide the required color fingerprinting, but for a different cost and ease of use.

Senset AB

Linköping, Sweden, www.senset.se
Senset AB develops measurement systems for liquid phase analysis. These systems are based on the concept of the electronic tongue, and the technique tries to resemble the way our own taste system works. These systems can be trained to measure a large amount of compounds, some of them of great importance in the medical area, such as glucose, urea etc.

Biacore AB

Sweden, www.biacore.com
Biacore is a global supplier of systems for protein interaction analysis which are used in key areas such as antibody characterization, proteomics, lead characterization, immunogenicity, biotherapeutic development and production. The Company offers a range of products to meet specific application needs. Customers include leading life science research centres, all of the leading global pharmaceutical companies, and a large number of companies in the emerging biotechnology sector.

Biacore A100 – unmatched productivity for protein interaction analysis.

Surface Plasmon Resonance (SPR) enables the real time measurement of interactions between two or more molecules by immobilizing molecules (e.g. antibodies, receptors) on the surface of a unique, proprietary "sensor chip" and passing solution containing possible interactants over the surface under controlled conditions using proprietary microfluidics. Any binding to the target molecules can be detected in real time, producing extremely detailed kinetic data.

Attana AB

Sweden, www.attana.com

Attana has developed a chip based analysis tool, Attana 100, providing customers the ability to study molecular interactions in real time without the need of labels. Offering affordable access and high sensitivity, Attana's systems are employed at leading universities and biotech companies in a wide variety of research fields within life sciences.

The Attana´s systems are based on the Quartz Crystal Microbalance (QCM) technique which measure atomic changes in mass. To study these interactions, a target molecule is immobilized on the sensor surface and a sample is transported to the sensor. The system provides information about the kinetics of the interaction.

Åmic AB

Sweden, www.amic.se

The Open Lateral Flow platform from Åmic lets developers of In-Vitro Diagnostic (IVD) tests produce quantitative results in a robust lateral flow format. The core of the platform is a patented micro structured plastic device, 4castchip, which enables state of the art sensitivity, precision and speed. 4castchip has been developed for use in professional Point of Care applications and for next generation clinical laboratory systems based on immunoassays.

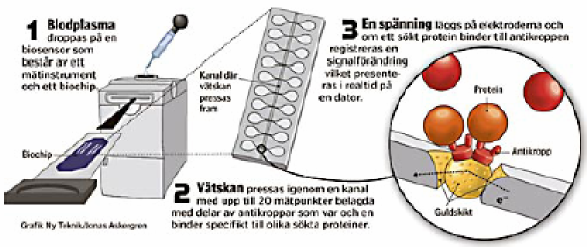
4castchip is a patented, micro structured plastic device. A highly ordered array of micro pillars drive flow of liquid in an open channel by capillary action, Open Lateral Flow.
The flow of liquid through the chip is controlled by the pillar geometry and the channel length. An extremely reproducible manufacturing technology is used which guarantee that the flow rate is the same chip to chip and batch to batch. By utilising the optical phenomena inherent in the 4castchip, Åmic has developed an optical fluorescence detection technology for the Open Lateral Flow platform.

Midorion AB

Sweden, www.midorion.com

Midorion develops and markets analytical biosensor systems for life science applications.

The lab-on-a-chip technology enables medical researchers to acquire unique information previously beyond reach, in order to create better understanding of human diseases. The technology platform can be adapted for numerous different applications. Midorion work with an extensive license program to position quantum detection methods as standard to which all other biosensor instrument suppliers will be compared.



Analytical biosensor system from Midorion

Midorion has invented and developed a new analysis system including a new, sensitive, patent-pending detection method. MEMS technology is used to measure quantum electrical phenomena in real time through changes in electric fields. This analysis system makes possible the study of individual molecules in parallel trials with answers in real time, which produces faster and more cost-effective results.

Q-Sense AB

Sweden, www.q-sense.com
Q-Sense E4 QCM-D offers real time label-free in situ recording of molecular interactions and molecular adsorption to different surfaces. Applications include proteins, lipids, polyelectrolytes, polymers and cells/bacteria interacting with surfaces or with previously bound molecular layers. QCM-D data can be used to extract for example kinetics, affinity, specificity, structure, mass and thickness.

The instrument determines the mass of very thin surface bound layers and simultaneously gives information about their structural (viscoelastic) properties. It is based on the patented QCM-D technique, an extremely sensitive and fast technique providing multi-frequency and dissipation data that are needed to fully understand the state of molecular layers bound to the sensor surface.

The E4 is the latest instrument from Q-Sense, primarily designed for rapid characterization of bio-interfaces.

BioResonator AB

Sweden, www.bioresonator.se
The company core technology is a resonating sensor made out of piezoelectric ceramics. A force/penetration-measuring technique to appreciate the eye pressure has resulted in a patent owned by BioResonator AB. Resonating sensors can be miniaturised (e.g. as small as half an ordinary match) and are suitable for use in diagnostic equipment.
The principle of the biomedical sensor is based on a piezoelectric element that is caused to oscillate at its resonance frequency. The resonance frequency depends on the elements material properties and geometry. When the element is attached to a biological object, a new oscillating system is generated with a changed resonance frequency. By measuring this shift of frequency, an indirect measurement of the tissues stiffness/compliance is obtained.

Biosensor Applications AB

Sweden, www.biosensor.se

The BIOSENS system is a vapour and trace detection system suitable for law enforcement and security applications. The analysis system efficiently extracts and detects traces of narcotics or explosives.

The BIOSENS detection technology is based on a high specificity antibody reaction on a quartz crystal acting as a sensor element. By using antibodies designed to react with the desired target molecules, a high selectivity is achieved with a minimum of false positives.

Millicore AB

Stockholm & Göteborg, Sweden, www.millicore.com

Millicore is a Swedish medical technology company focusing on the development of intelligent MEMS-based digital disposable products. These products will set new technological standards as well as help to create new treatment concepts, concepts that will help the medical professionals in their every day work.

The DigiVent is a thoracic drainage for single use, provided with a MEMS based pressure- and flow meter.

The founders of Millicore have extensive experience of running medical technology companies. Our mission is to satisfy high customer demands by using cutting edge technologies and combining them with modern disposable materials. Millicore was founded in 2003 and has offices in Stockholm and at Sahlgrenska Science Park in Gothenburg. The head office is located in Stockholm, Sweden.

Samba Sensors AB

Gøteborg, Sweden, www.samba.se

The origin of the Samba Sensors is research on the use of fibre optic technology and micro mechanics for pressure measurement done at Chalmers University of Technology in Gothenburg

Samba Sensors was founded in 1992 and has commercialised the prototype developed at Chalmers. The products are generic and can be used in various applications. Samba Sensors' market focus is on pressure measurement in medical applications.

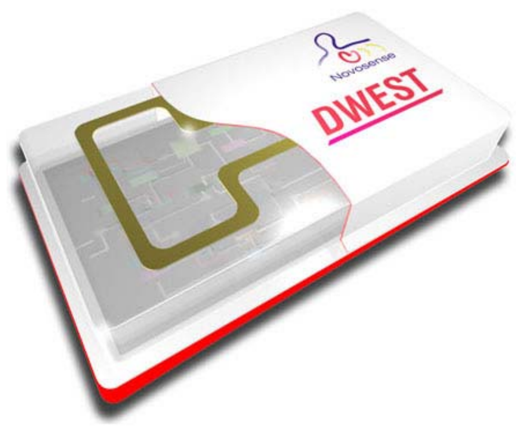
Fiber optic micro pressure transducer from Samba Sensors

The sensor system may be used for orthopaedic, cardiovascular blood pressure, intracranial pressure monitoring, respiratory monitoring and urology.

Novosense AB

Lund, Sweden, www.novosense.se

Novosense AB was founded in July 2004 with the mission to develop a new generation of wireless disposable ECG-sensor , as a result of research collaboration between Acreo AB, Protego AB, Tilly Medical AB and Fredrik Sebelius at Lund Institute of Technology. The planned product is the first of its kind, namely a wireless disposable patch with the ability to record and transmit standard ECG without the use of wires.



Novosense is developing a new generation of wireless ECG equipment.

The main activity of the company has so far been focused on developing the core expertise of the totally wireless ECG solution. The development of the measurement technology has resulted in function prototypes that have been validate in a preclinical trial at Lund University hospital in November 2005.
The company is now preparing the development and marketing phase of the ECG-sensor.

4th FOBIS workshop

VTT, Tampere, Finland, 7 June 2006

In the last workshop we will try to answer the question **"What do we do now?"** and work with strategic recommendations and initiatives, based on results from the previous workshops. The workshop will be held at VTT, Tekniikankatu 1, which is located in Hervanta, nine kilometers southeast of downtown Tampere.

Program

- Summary reports from the previous Workshops

Invited keynote speakers:
- Prof Pankaj Vadgama, Director, IRC in Biomedical Materials, Queen Mary, University of London (UK)
- Paul Mundill, R&D Vice President, Orion Diagnostica (Finland)
- Prof Niilo Saranummi, VTT
- Prof Jukka Lekkala, Tampere University of Technology

Exhibition

Researchers, students and companies are encouraged to exhibit products, prototypes, hands-on demos and/or posters related to biomedical sensors.

Registration

http://www.ittf.no/annet/fobis/workshop/ws4

Invitation

http://www.ittf.no/annet/fobis/workshop/Workshop_4

Just after the workshop, we will continue the informal discussions by a Finnish sauna and a project dinner!