NEWSLETTER FEBRUARY 2009

OSLO BIO UPDATE

A newsletter from Oslo Teknopol covering activities in the life science cluster in the Oslo region

IN THIS ISSUE

RESPONSE TO CRISIS:
GOVERNMENT MILLIONS TO BIOTECH

Several of the financial measures in a special package passed in January was designed to help Norwegian industry cope with the global financial crisis and look set to directly benefit the country's biotech sector.

These include:

• **Innovation Loans governed by Innovation Norway:** Funding increased from £ 32 million to £95 million. These loans may be used as working capital for the biotech companies. Innovation Norway is the country's main industrial development agency. Normal commercial criteria would apply to the loans.

• **£7 million to R&D contracts.** The aim is to stimulate increased cooperation within the industry on research and development. These are to be focused on industry development in the health sector and internationalisation.

• **Tax breaks for individual SMEs:** Companies may deduct £ 0,58 million in tax breaks – this is an increase from £ 0,42 million.

• **Argentum –** the government-owned investment company, and the only investor in Norway who is solely dedicated to investing in private equity funds, (fund-in-fund) gets increased equity capital of £200 million. Now Argentum can increase their investments in private VC funds focusing in life sciences in Norway and abroad. ***www.argentum.no***

Photo: Statsministerens kontor

Norwegian Finance Minister Kristin Halvorsen presenting a well-received response to the financial crisis in January.

Continued on page 7.

Sytse Ybema has literally sailed the seven seas and is thus well placed to comment on Norway's expertise in the aquaculture sector and the new MareLife project.

Photo: Erwin Winter

CAN NORWAY LEAD THE WAY TO A SUSTAINABLE MARINE SECTOR?

Sytse Ybema, Sustainovate

Given its geography and history, Norway is extremely active in all three strands of the biomarine sector – fisheries, aquaculture and ingredients. The MareLife project aims to unify efforts both at a Norwegian and international level to ensure sustainability in marine resource development. Challenges arise in sustainable biodiversity, good marine stewardship and fish stock balance.
The challenge is to create synergy by sharing and cooperation, whilst maintaining healthy competition, the 'Sustainovate way'. Sytse Ybema, owner of Sustainovate business development and solutions, explains the attraction below:

For the last 10 years I have been collecting maritime data. While active in the global business environment, my vision taught me a lot about sustainable innovation, especially how to apply inventions in the context of social and economic value systems. My experience in fisheries surveys and echo sounding resulted in a methodology for data fusion, combining data into new information with an added competitive value. This became particularly clear with regard to marine and maritime data. I identified the same challenges worldwide: how to combine vision, innovation and new business into successful synergy.

Gradually I learned that Norwegians had a much greater appreciation of the bigger picture when it came to marine resources and sustainable development. They were eager to discuss overall sustainability, not just from a parochial domestic point of view, but also from a corporate and global perspective. Consequently I was immediately interested when I learned about MareLife. The openness and vision which I received was extremely refreshing – producing an immediate sense that Sustainovate's contribution would be valued and appreciated.

Regarding the MareLife network, Sustainovate aims to facilitate data exchange and data fusion towards information within the network. Currently the users of the marine environment such as fisheries, authorities, oil and gas industry, windfarming, aquaculture, tourism and cargo are continually gathering enormous amounts of data to optimise their operations. However, the majority of this data is used purely for local and therefore suboptimal decision making, with only a small amount occasionally entering the common domain. Indeed most of it and its value is discarded without being fully exploited, and lost forever.

As a result many industrial and governmental marine organisations operate in what we call 'garbage clouds'. Local data is

Norway is leading the way beyond conventional fish farming to monitoring free roaming shoals.

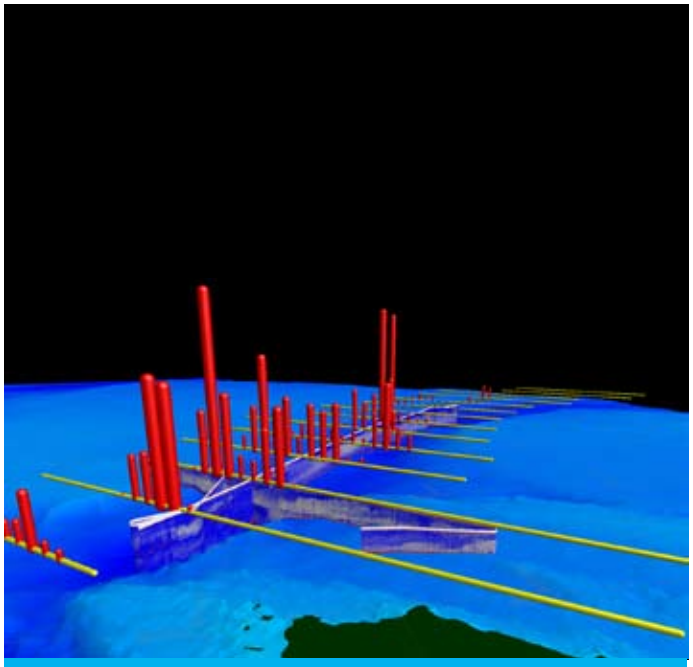
Photo: Marine Harvest

continually trashed, which might contain valuable information to parties outside the local setting. The continuous trashing prevents any possible adoption of a proper and strategic marine business approach.
The 'Sustainovate way' aims to change this situation by ensuring that all data and disparate data is captured, organized and interpreted, in order to create a common platform for stimulating integrated lasting innovation.

Innovation that ensures the marine sector can face up to the changing political, social, legal and competitive challenges of today and tomorrow. It's an enormous task in the international playing field, but one the Norwegians seem to relish.

Sytse Ybema,
Chairman of PGNAPES at ICES (International Council for the Exploration of the Sea) and owner of Sustainovate.

Read more about the biomarine innovation network at
www.marelife.no



This data showing echo sounding tracks and fish abundance is typical of the kind MareLife hopes to draw together to create a platform for innovation. Courtesy of NOAA Alaska Fisheries Science Center.

Photo: NOAA Alaska Fisheries Science Center

BIOTEC PHARMACON GAINS KEY US SKIN CARE PATENT DECISION

A recent decision by the US district court judge in Minnesota largely rules in Biotec Pharmacon's favour in the patent infringement suit brought by Biopolymer Engineering Inc d/b/a Biothera. The dispute centered around Biotec's attempts to market its NBG and SBG ranges of nutraceutical and skin care products in the US.

A delighted CEO Lars Viksmoen of Biotec Pharmacon commented: *"Only two of our fourteen patents survived our motion to dismiss the infringement claims even without having to go to a trial. However, we are confident that our evidence will convince a jury that neither our skin care product nor SBG, our lead pharmaceutical product candidate, infringes either of these two patents in the United States."*

Read more at ***www.biotec.no***

HIV VACCINE REWARD FOR BIONOR IMMUNO

Bionor Immuno has been awarded the Norwegian Research Council's prestigious "Most Innovative Company of the Year" award. The award is determined by a panel of 3,500 business leaders who review 10 leading candidate-companies. The results are analysed by Perduco, a Norwegian based leader in public and private sector analysis and communication. "We are enormously proud of this award", said Birger Sørensen, President and CEO of Bionor Immuno. "Our pursuit of advances in treatment for patients with HIV and other immune-response related illnesses has stepped into high gear, and on behalf of the researchers, management and staff of Bionor Immuno, we're honoured to be recognised." Based in Oslo with an office in Bethesda, Maryland, Bionor Immuno has an ambitious aim to bring modified peptide-based investigational therapies to market for the treatment of patients with HIV, Hepatitis, and Influenza.

More information at ***www.bionorimmuno.com***

NORDIAG TARGETS PERSONAL DNA MARKET WITH ARROW

NorDiag has entered the growing market for small desktop automated DNA extraction systems with the launch of the Arrow. Featuring a new and innovative method for pipetting that will greatly reduce the need for servicing, the Arrow will be able to handle a wide range of samples up to 10 ml. Many smaller labs still use manual methods, which are not only labour intensive and extremely time consuming. However, large systems are often beyond their budgets. NorDiag aims to address this with a starting price of around Euros 10000. Read more at ***www.nordiag.com***

Photo: NorDiag ASA

NorDiag continues to extend its line of liquid handling systems with the Arrow desktop automated DNA extraction system

Photo: Bionor Immuno

CEO Birger Sorensen receives Norway's Innovative Company of the Year on behalf of Bionor Immuno from Sylvia Brustad, Minister of Trade and Industry. The Company has a therapeutic HIV vaccine in Phase 11b trials.

LYTIX CLOSES $10.4 MILLION ROUND

Lytix Biopharma has closed a successful funding round to a total value of 73 million NOK (US$ 10.4 million), the proceeds of which will fund the early-stage clinical development of two novel drugs.

Lytix Biopharma CEO Gunnar Sælid commented, "The Company has made significant progress in the last year, initiating full preclinical development activities for two important projects. LTX-109 is a novel antimicrobial compound that is effective against a broad range of pathogens. Indeed it is so effective, that although the initial formulation is for the treatment of skin infections, we envisage several other indications such as nail fungal infections, acne and oropharyngeal candidaisis. In oncology, LTX-315 (OncoporeTM) is a product aimed at the treatment of solid tumours, potentially in combination with existing therapies. OncoporeTM is currently in preclinical development and has proven efficacy across a range of 40 tumour cell lines, including lines resistant to established chemotherapy. In vivo studies in syngeneic mice demonstrate a potential for a rapid induction of tumour necrosis, and a complete and stable tumour response mediated by the immune-system. Both LTX-109 and LTX-315 will enter the clinical phases during the latter half of 2009." More at ***www.lytixbiopharma.com***

POSITIVE ELACYT™ PHASE II RESULTS FROM CLAVIS

At the recent AHS Conference Clavis Pharma, ASA (OSE: CLAVIS) announced positive interim clinical phase II results for ELACYT single agent therapy in patients with late stage acute myeloid leukaemia (AML). An analysis showed that three of the first twenty patients with this difficult to treat condition have gone into complete remission.

"The results from the first 20 patients are most encouraging and represent a major step forward in our development of ELACYT, for the treatment of cancers of the blood" says Geir Christian Melen, CEO of Clavis Pharma. *"The continued enrolment of patients has been rapid and clinical responses have been reported also in the next cohort of patients."* Read more at ***www.clavispharma.com***

FOSS GOES BIOMARKER HUNTING

HUNT Biosciences, the commercial arm of the HUNT Study and associated biobank has appointed former GE Healthcare director Per Foss as its new CEO. The company provides pharmaceutical and healthcare companies with biomarker discovery and validation services. These are based on the unique HUNT Study, which for the past 25 years has gathered blood samples from the general population of the Nord-Trøndelag region together with detailed phenotype and environmental data. Foss joins just as recruitment for the third phase, HUNT III has closed, again with an astonishing high inclusion rate of 60%. This will bring the total recruitment number of unique individuals to 135,000 and reinforce the core strengths in key public health areas such as cancer, cardiovascular disease, diabetes, obstructive lung disease, osteoporosis and mental health. More than 60 % of the participants have been screened twice, 25 % have participated in all three surveys.

"For both pharmaceutical and biotech companies, HUNT Biosciences is ideally positioned to devise biomarker strategies across a wide range of key disease areas," says Foss. *"The unique combination of biomedical and phenotypic information collected over the past 25 years from a general population rather than specific cohort promises rapid and effective biomarker discovery and validation. "*

Read more at ***www.huntbiosciences.no***

ALGETA RAISES EXTRA $35 MILLION

Abingworth has led an investment group which is injecting $35 million into Norway's Algeta. And the bulk of the money will go to current Phase III clinical trial with Alpharadin and such other studies that are required to secure marketing authorization in major markets for the use of Alpharadin in treating skeletal metastases of prostate cancer origin, initiation and completion of trials to validate potential label extensions for Alpharadin in metastatic prostate cancer, initiation of trials to validate the use of Alpharadin in treating skeletal metastases in breast cancer patients, and further advance the company's R&D pipeline.

Newly appointed Algeta CEO Andrew Kay has already overseen a major US breakthrough for Alpharadin, the company's lead product for hormone-refractory prostate cancer

ALGETA RADIATES US SUCCESS

Shares in Algeta ASA (OSE: ALGETA), the cancer therapeutics company soared after it announced that it is to enroll US patients into its ALSYMPCA phase III trial evaluating Alpharadin as a new treatment for bone metastases in patients with hormone-refractory prostate cancer (HRPC). This decision follows a successful end-of-phase II meeting with the US Food and Drug Administration (FDA), held on 30 January 2009.

Alpharadin (radium-223) is Algeta's lead clinical candidate and has in phase II studies demonstrated strong evidence that it can prolong patient survival times, improves quality of life and offers a placebo-like safety profile.

Andrew Kay, Algeta's President and CEO, said: *"Our recent and previous discussions with FDA have been productive and we believe they have contributed positively to the overall clinical development plan for Alpharadin. We are therefore extremely pleased to enroll US patients into our pivotal ALSYMPCA study following the successful end-of-phase II meeting with the FDA. We will be focusing on initiating the study at key clinical centers in the US over the coming months."* Read more at ***www.algeta.com***

AXIS-SHIELD LINKS WITH BECKMAN

Beckman Coulter Inc. is the latest major diagnostics group to take one of Axis-Shield's innovative tests on board its laboratory analysers. The anti-CCP test for early detection of rheumatoid arthritis (RA) in question is regarded by many experts as the most significant development in recent years in the early diagnosis of RA, facilitating improved management of this widespread and debilitating condition, which affects more than two million people in the USA alone. The disease occurs in all races and ethnic groups and although it often begins in middle age and is particularly prevalent in older people, it can also develop in children and young adults. RA occurs in two to three times more women than men.

Ian Gilham, Axis-Shield CEO, commented: *"The ability to measure anti-CCP using clinical chemistry technology is an important advance in test utility and has resulted from collaboration between Beckman Coulter and Axis-Shield development scientists. We believe the presence of Beckman Coulter in the anti-CCP marketplace will further stimulate the sales growth of this important marker."*

For more information visit ***www.axis-shield.com***

BERGENBIO LATEST TO ENTER RNAI ARENA

The latest addition to the growing cluster of RNAi-based companies in Norway is BerGenBio which has developed an innovative validation and high-throughput discovery technology based on functional genetics called CellSelect RNAi. Although only founded in December, the company has already secured a contract with a top 10 pharmaceutical company. According to CEO Richard Godfrey, the company's strategy is to initially offer target validation services and in 2010 move to target discovery both for customers and to build its own proprietary pipeline.

Read more at ***www.bergenbio.com***

ON THE MOVE

Epitarget, the oncology drug discovery company using ultrasound activation, has moved to new offices and state-of-the-art laboratories at GlaxoSmithKline Innovation Centre in Forskningsveien 2A, Oslo. The Centre is well located between the National Hospital, Oslo Innovation Centre and University of Oslo. The Company's mailing address and telephone numbers will remain unchanged.

www.epitarget.com

PCI SHINES LIGHT ON RNAI DRUG DELIVERY

PCI Biotech has announced the results of a study demonstrating the efficacy of its photochemical internalisation (PCI) technology for delivery of siRNA. The study, which is being published in the journal Current Pharmaceutical Design, was conducted at the University of Utrecht and focused on the barriers and challenges in trafficking of siRNA upon local delivery in general and in particular on endosomal escape. The researchers found that PCI greatly increases the efficacy of RNAi, by enabling the efficient release of siRNA molecules from endosomes.

Per Walday, CEO of PCI Biotech, said: *"This study is another major step forward for the company. Efficient and specific delivery is the key issue in siRNA therapeutics at the moment and these results point to the potential of photochemical internalisation in this area. We will now continue with our previously announced strategy of preparing a full preclinical package for potential licencees."*

For more information visit: ***www.pcibiotech.no***

BioIndex has recently launched a series of mail-in tests for various health parameters including nutrition status.
Read more on page 16.

Photo: Thea Tønnessen

CEO Bjarte Reve looks forward to a year of exciting Oslo Cancer Cluster inspired initiatives including the first European Cancer Cluster Partnering conference, ECCP2009 in September in Toulouse.

OCC ANNOUNCES MAJOR NEW ONCOLOGY CONFERENCE ECCP2009

Oslo Cancer Cluster moves from strength to strength and has just announced a series of activities in 2009 to increase its international profile. In the first half of the year, OCC will be a sponsor of the BioEquity Conference in Munich and Anglo-Nordic Conference in London, as well as exhibiting at BIO2009 in Atlanta. September sees a major new venture with the first European Cancer Cluster Partnering Conference (ECCP). Organised jointly with Toulouse Cancer Bio-Health Cluster and Canceropole, and alternating between Toulouse and Oslo, this unique conference aims to bring biotech, pharma, investors and policy makers together to accelerate development and adopting new cancer diagnostics and treatments.

Read more at ***www.oslocancercluster.no***

Continued from page 1

Oslo Cancer Cluster, a Norwegian industry and research cluster focused on oncology, was amongst those pressing for help for the biotech sector and is naturally delighted with such a raid response. "Oslo Cancer Cluster asked the Norwegian Government in early December to take some crucial measures to help the Norwegian life science sector through the financial crisis. Over 50 percent of the 25 Norwegian oncology companies that are members of the Oslo Cancer Cluster are in danger of running out of cash in the next 12 to 18 months.

"I am delighted we have been heard by the Norwegian Government on the most important measures proposed, - providing additional funds for Innovation Loans governed by Innovation Norway and R&D tax breaks. These loans may be used as working capital for biotech companies," says Bjarte Reve, CEO of Oslo Cancer Cluster.

"This is the most active political move in Europe regarding support to the biotech industry. At this point, it seems to include the necessary measures to bring the Norwegian biotech companies through the financial crisis."

Photo: Statsministerens kontor

The crisis package could have wide implications for the biotech sector in particular by extending support through the critical and expensive clinical trial phases.

AKER BIOMARINE

NETS A HEALTHY HARVEST FROM KRILL

Traditional beliefs in the health benefits of fish-based diets and in particular marine oils such as cod liver oil are now being confirmed by modern science. With its long history in fisheries, Norway has been one of the pioneers in research and promotion. Much of the current popularity of Omega-3 can be attributed to Norwegian scientists and companies. Aker BioMarine is now looking to write the next chapter in the story with its krill-derived oil. Here research director and industry veteran Hogne Vik explains why he believes the work they are doing with their Superba® brand also has widespread significance for human healthcare:

When was Aker BioMarine founded and by whom?
Aker BioMarine was established in 2006 by Aker ASA, one of the world's leading fisheries groups with roots going back to the 1800s. Combined, Aker companies employ over 27,000 people on five continents and had operating revenues in 2007 of NOK 62 billion. In 2007 Aker BioMarine merged with another Aker company, Natural ASA and was listed on the Oslo Stock Exchange. Aker is the largest shareholder with 83%.

What is the business idea?
Our original aim was to create an integrated biotechnology company delivering value added products based initially on Antarctic krill to the animal, human and pharmaceutical markets. We intended to leverage the experience gained in marine harvesting and biotechnology by Aker companies Aker Seafoods Holding, Krill A/S and Natural ASA as well as our existing strong market position.

What has been the progress so far?
After just 3 years we have already launched our Superba Omega 3 human dietary supplement in Scandinavia and are about to do so in the US. This market is growing at 15-20% per annum. We are also receiving increasing interest from diagnostic and pharmaceutical companies looking to utilise the bioactive components of krill-derived compounds. In the feed sector, we have also introduced successfully Qrill oil for fish farming.

What is krill and what is so special about it?
Antarctic krill (Euphausia) is a small shrimp living in cold water and representing the major protein source for several large baleen whale, seal and fish species. To survive in the extreme conditions of the Antarctic, krill has developed several unique biological characteristics. Key amongst these is that krill use phospholipids as their main lipid storage form. More specifically the krill phospholipids are mainly phosphaticdylcholins which have significant amounts of Omega-3 bound to them. This makes krill the only exploitable natural source of phosphaticylcholin with high levels of Omega-3. And as an added bonus, krill oil also contains the powerful antioxidant astaxanthin. For these reasons, we believe krill oil is more bioeffective and resistant to oxidation than other sources of Omega-3.

There are also strong "Eco-arguments" for using krill?
Without doubt. We have calculated that harvesting krill is both far more efficient and more sustainable than using fish as a source of marine oils. For example we only need 60,000 tones of krill per annum compared to the 1 million tons of fish currently being harvested. Indeed to meet the whole world's predicted needs we would need to harvest only 0.05% of the total krill population, leaving more than enough for whales, seals and other dependents.

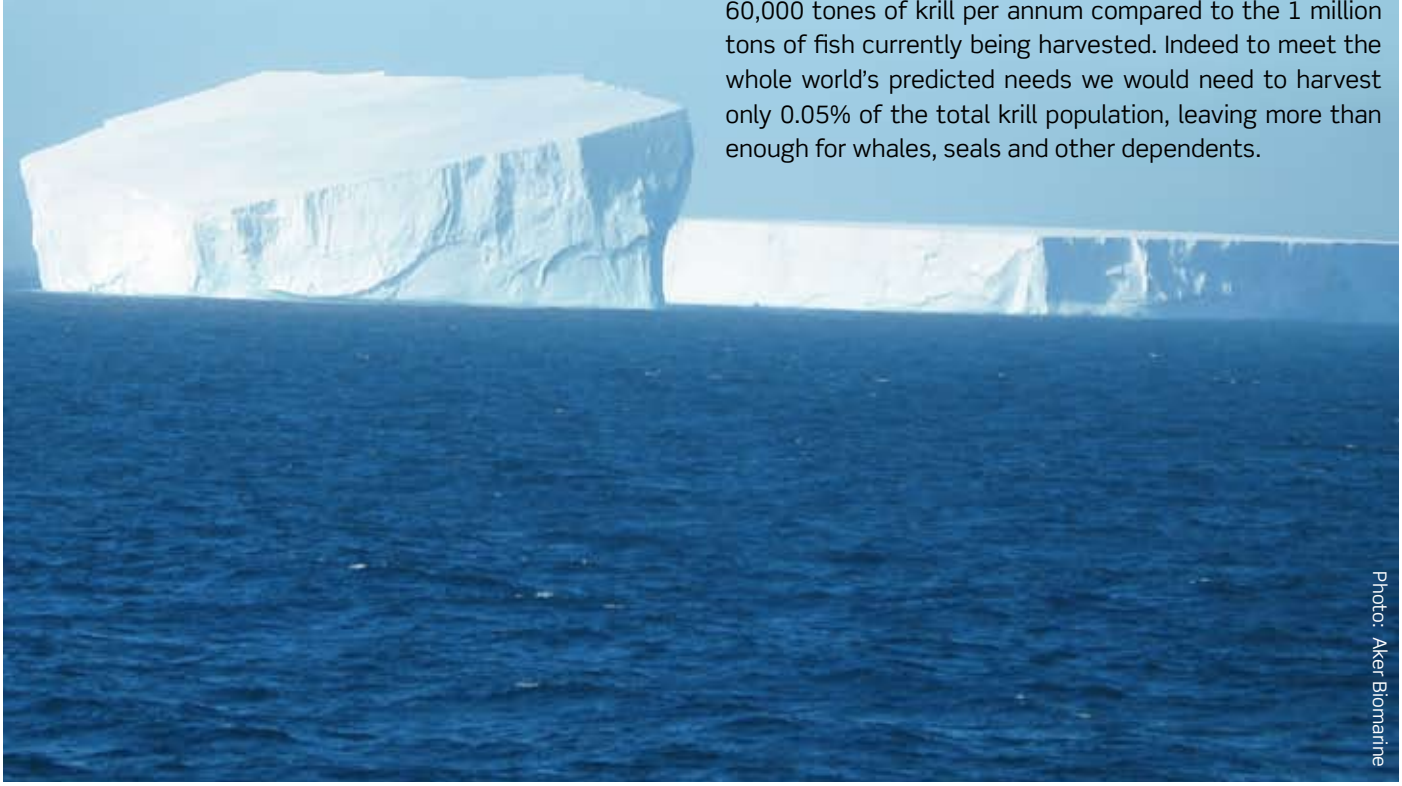


Photo: Aker Biomarine

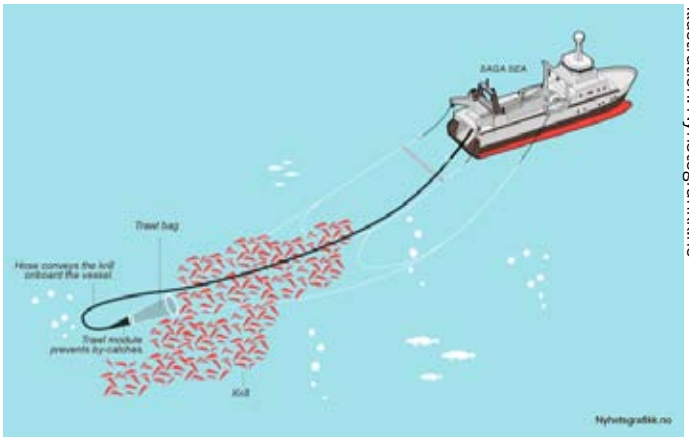


Illustration: Nyhetsgrafikk.no

Photo: Aker Biomarine

Aker BioMarine have also developed special "Eco-harvesting" techniques?

Yes. Firstly we have drawn upon Norwegian fishing traditions of being able to operate in one of the most hostile marine environments known to man – the Antarctic. Secondly, being aware of our social and environmental responsibilities, our purpose-built trawler uses a special ECO-trawling system, see picture above, which avoids both unwanted by-catch and causing stress to the krill. Even though it is not mandatory, we have independent observers on board to monitor our operations. They report to CCAMLR (the Commission on the Conservation of Antarctic Marine Living Resources) and other interested stakeholders. We are also extremely proud to have had our operations endorsed by the WWF. We would have no business without the krill and it is our duty to ensure its longterm sustainability by harvesting it responsibly and protecting its environment.

You also believe personally that Omega-3 and its increased uptake is one of the keys to preventative medicine?

Passionately. When I started in medicine back in the 70s the focus was on technology-based cures such as surgery and pharmaceuticals. Now we are fortunately starting to realise that introducing preventative measures, in particular better nutrition, is essential to really tackle the world's health problems. In Norway, as in other seafaring countries such as Japan and Canada, we have long "believed" in the beneficial effects of marine oils. Now, in the case of Omega-3 in particular, this belief is backed by an almost irrefutable body of scientific evidence in not just cardiovascular disease prevention, but also neurological developmental disorders in children and dementia in adults, and inflammation. We are particularly excited about our krill-derived oil since it seems to have a better bioavailability and faster onset of action than other sources. Another key factor is that we can now measure accurately* through a simple mail-in diagnostic test a person's fatty-oil levels. We are currently conducting clinical trials in Germany to see if we can raise these levels to the optimum 8% level with our Superbra supplement. Initial results are extremely promising.

Next steps?

Well we are launching Superba in the US in the summer and also expect finally a decision from the EU on whether as elsewhere in the world, krill-derived Omega-3 can be classed as a food and thus sold openly. As mentioned, we also hope to have more clinical trial results in 2009. In short, an exciting year ahead.

Read more at ***www.akerbiomarine.com***

**See Bioindex in One to watch section on page 16.*

Photo: Aker Biomarine

Photo: © 1-images.no

MARELIFE INNOVATES AT NORTH ATLANTIC SEAFOOD FORUM

***"In tough economic times it's more important than ever to build for the future,"* says managing director Knut Halvorsen in Oslo Teknopol. This March delegates from around the world will attend the largest seafood conference in the world, North Atlantic Seafood Forum, in Lillestrøm just outside Oslo. This year there will be an innovation workshop on March 5th, organised by the MareLife network supported by Oslo Teknopol, where major industry players will join in building tomorrow's industry.**

MareLife coordinator Øystein Lie will guide the session in reviewing 10 innovative cases covering vaccines, proper feeding of farmed fish, genes and algae characteristics, krill, and more.

"The workshop is unique because we are inviting companies, the best scientific environments, trendsetters in seafood, finance, and the public sector to work together in a constellation that would otherwise not exist. In this way we hope to expand the boundaries of cooperation and exploit synergies and creative energy," says Lie.

The purpose is to open the innovation process for broad participation from sources and companies outside the industry. The program has already generated great interest among participants from three continents. Several of the international delegations will also take the opportunity to visit Norwegian companies along the coast.

MareLife is an industry network focusing on the fish farming industry, and is the first in the Norwegian seafood cluster to merge all three marine segments: farming, fishery, and ingredients. MareLife's mission is to facilitate cooperation between members and unite Norway's marine industry in a functional cluster.

Facts

The 1st international MareLife innovation workshop

- Is part of the North Atlantic Seafood Forum, held for the fourth time on 4-5 March 2009 in Lillestrøm
- NASF is the largest seafood conference in the world
- Last year's conference drew 550 delegates, including fishery authorities from around the world
- The MareLife workshop takes place on the 5th of March

For more information see ***www.nor-seafood.com***, or ***www.marelife.no***

Photo: © Norwegian Seafood Export Council

Photo: Aker Biomarine

TAKING MARINE BIOPROSPECTING TO EXTREMES

The world's sub arctic oceans have been described as the last frontier for drug discovery. BIOPROSP 2009, the Fourth International Conference on Marine Bioprospecting has an exciting speaker line-up, covering all the recent developments – in particular extremophiles from Statoil-Hydro's oil fields. Held over two days on February 24-25 in the world's northernmost university city of Tromsø, BIOPROSP 2009 will look at key issues and applications such as creating libraries, IP, pharmaceuticals, functional foods and natural products. The pharmaceutical session in particular will reveal that exciting new cancer and anti-infective leads have already been discovered.

For more information visit – ***www.bioprosp.no***

Photo: © Napp Design

Photo: Nofima

Inger Kristiansen and Marijana Todorcevic study fat cells that they have cultivated themselves.

NORWAY LEADING IN FISH STEM CELL RESEARCH

Research on the development of stem cells is producing valuable new knowledge – and not just human health. "We now know that we can influence the development and health of fish based on which nutrients we give the stem cells," explains Professor and Senior Researcher Bente Ruyter at Nofima Marin.

Having studied stem cells in salmon for ten years, researchers at Nofima are also the only group to have documented how nutrients influence the development of undifferentiated stem cells into fully developed muscle, fat and bone cells.

NEW FUNCTIONS IN FAT CELLS DISCOVERED

As a result of the stem cell research project, Nofima Marin has produced an extremely useful research tool that makes it possible to study and map the fish cells' flexibility and development patterns.

"We have discovered among other things that the cells perform a greater variety of functions than we used to believe. Fat cells in salmon, for example, secrete hormone-like substances that are important for regulating both energy utilisation and inflammatory reactions. This in turn means that the type and amount of fat contained in the fat cells is more significant than previously thought," says Ruyter.

It also appears that the various fatty acids influence the development of bone, fat and muscle cells. For instance, Omega-3 fatty acids promote bone cell development from undifferentiated stem cells while preventing fat cell development. In practice this may mean that an adequate level of Omega-3 fatty acids in feed is important for the tissue development and health of farmed fish in certain stages of the fish's life.

OPTIMAL FEED FOR VARIOUS STAGES OF LIFE

The research tool provides a sound basis for further, more targeted studies, which in turn may improve health in fish. Just like mammals, fish have a large number of stem cells in the early stages of life, and research results suggest that it is possible to influence the number of these cells at a young age. This may then affect, for example, obesity or muscle quality later in life.

"We can study how stem cells react to different feed ingredients, and with this type of study we can increase our knowledge about the optimal feed composition for the different stages of the fish's life. We can change the anticipated development of a stem cell by adding certain nutrients so that, for example, stem cell precursors from fatty tissue can be redirected towards a muscle cell," says Ruyter.

INTERNATIONAL PIONEERS

"We were the first to isolate stem cells from visceral fat in salmon and get them to develop into mature fat cells. We were also the first to get stem cells from salmon muscle to

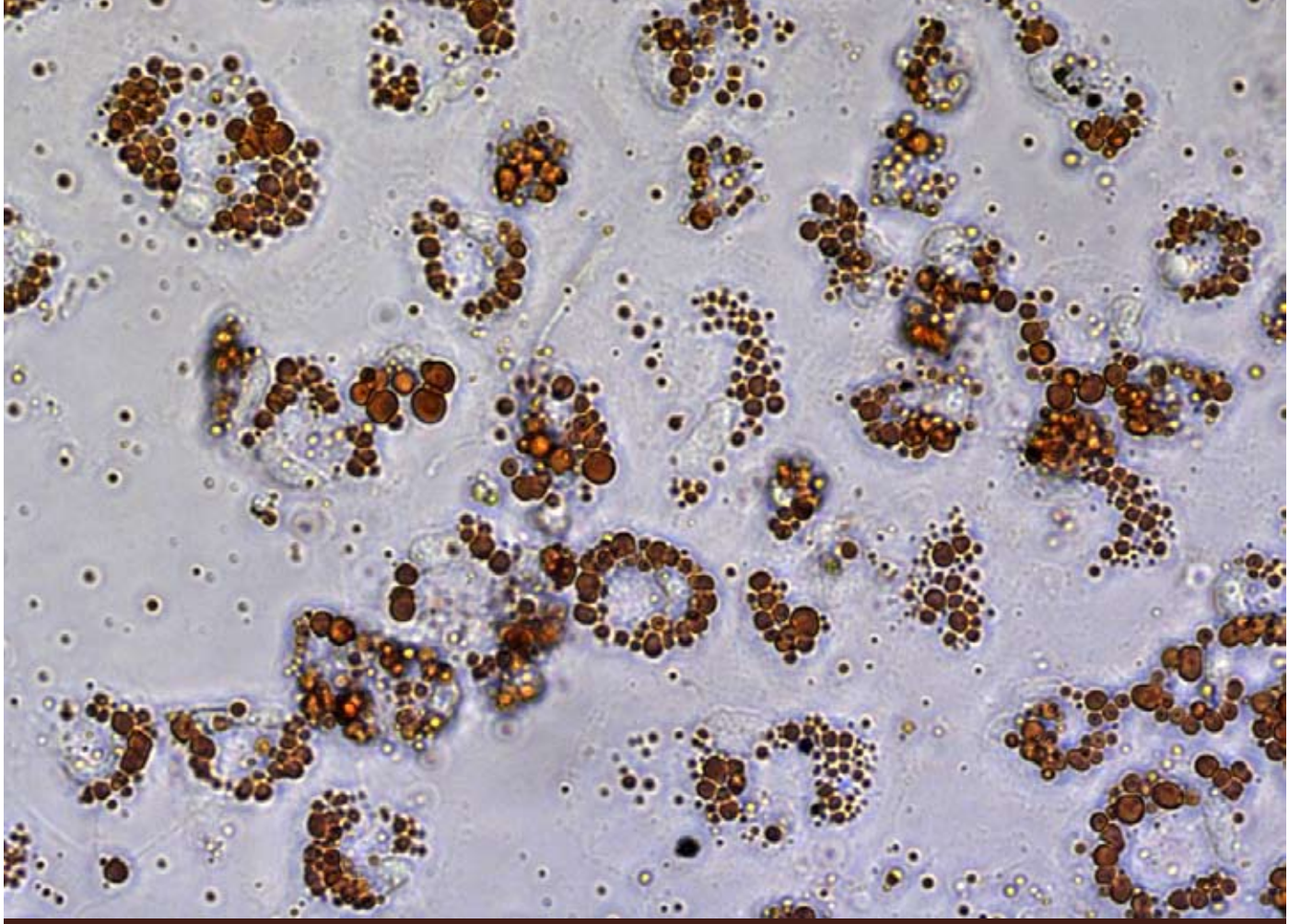


Photo: Nofima

Fat cells of Atlantic salmon. Lipid droplets are coloured red with "Oil Red O".

develop into bone cells. In cooperation with Senior Researcher Aleksei Krasnov and through the use of MicroMatrix technology, we were also the first to describe how a large number of genes help to direct the development of the cells," she explains. The results from these studies show that the development of fish cells has a surprising number of similarities with that described for human cells.

According to Ruyter, it was not difficult to obtain the actual stem cells, which is a relatively simple procedure similar to the one established for human research. There have been much greater challenges associated with adapting, mapping and describing the development of stem cells from an early stage through to mature cells.

"It has taken us several years to reach the point we are at today. Other groups have now begun to work with stem cells from fish, but we are still the pioneers in this field," notes Ruyter, adding that they will soon begin similar analyses of stem cells from cod.

MORE RESEARCH NEEDED ON THE ENTIRE LIFE CYCLE

Bente Ruyter and her colleagues want to follow up on the results of the stem cell research by studying live fish. The type of fatty acids selected is probably more important for fish in the very early, rather than later, stages of life when the composition of nutrients will likely have the greatest affect on the fish's future cell division. Just as findings have shown that the nutrients received by a human foetus are highly significant for the development of obesity later in life, researchers believe that the same conditions apply to fish.

"To increase our knowledge about the significance of nutrient composition, we want to study how access to nutrients affects the broodstock, which in turn affects egg quality, larvae and the harvest size fish. Foetal nutrition is a hot topic in human research right now, and it would be very interesting to follow this up for fish. Although life-cycle studies are expensive, they are the only means we have of being totally certain that our cell results are correct, since there are influential factors that we cannot study at the cell level," Ruyter concludes.

The stem cell project is funded by the Research Council of Norway as part of a five-year strategic institute programme. For more information see ***www.nofima.no***

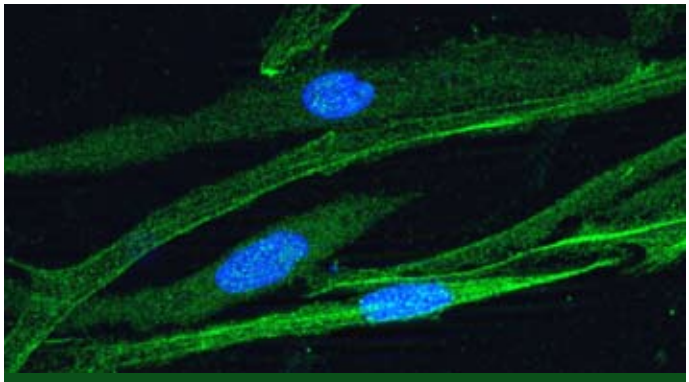


Photo: Nofima

Each green fiber is one muscle cell of Atlantic salmon, with nulceus coloured blue.

Tz-Chiun Gou from Taiwan thrives on the respect she and her research are given in Norway. She is studying salmon virology with a view to developing effective vaccines.

Photo: Guo, Tz-Chun

LIFE IN NORWAY

In this series we interview a cross section of the increasing number of life scientists choosing to study and work in Oslo.

My name is Tz-Chiun Gou and I am originally from Taiwan. I am currently a PhD student at the Norwegian School of Veterinary Science in Oslo. My study area is aquatic medicine focussed on Atlantic salmon viral disease and vaccine development. Norwegian salmon aquaculture is very famous and the fish research, particularly into immune systems and vaccine development, is on top of the world.

I was very fortunate to get the chance to visit NVH in 2004 when I was working on a Taiwanese-Norwegian collaboration project in Academia Sinica, Taiwan. During the stay in NVH, I found the environment very good for studying and therefore applied for the master study in 2005. After 2 years I decided to continue my PhD study in Norway – I found I really like the system here. Firstly I have a lot of freedom to think and discuss with my supervisor about my research work, and most notably, my opinions are always respected. Secondly, the research resources here are pretty sufficient, and in our lab we have a lot of networking with other labs worldwide. Finally, PhD students her are encouraged to attend one international conference a year and we get a lot of opportunities to know other scientists and discuss about science. The expenses for travel and the conference are supported by the budget. Last but not least, the working environment here in Norway is very human friendly, my supervisor cares about my life, in addition to my research work. We also have a very good working atmosphere, and people are always willing to help each other.

Of course there are some bad sides. The living costs are high, and food especially is very expensive. Eating in restaurants can cost several times more than cooking for yourself. Therefore it is wise to learn how to cook! Another difficult thing could be that winter here is quite long, but people who like winter sports will love this place. Overall I recommend students who want to research independently in a supportive environment to come to study in Norway.

Read more at ***www.veths.no***

GETTING PERSONAL ABOUT HEALTH

Recognising pioneering work going on in Norway, the 6th International Workshop on Wearable, Micro, and Nano Technologies for Personalized Health, pHealth, will take place in Oslo on 24-26 of June 2009.

Widely respected, the pHealth Workshop series provides a stimulating forum for discussion, networking, and exchange of experiences about the state of the art and future challenges related to personalised health systems.

Poster submissions are welcome. For additional information, please contact the pHealth 2009 Programme Committee, chairman: Per Hasvold, Norwegian Centre for Telemedicine, per.hasvold@telemed.no.

Read more at ***www.phealth2009.com***

Topics to be covered include:

- Sensors
- Micro systems
- Nano systems
- Wearable systems
- In-vitro and in-vivo sensors and systems
- Implants and actuators
- User interaction and multimodal user interfaces
- Mobile personal health
- Ambient intelligence
- ICT for pHealth
- Behaviour change support systems
- System integration
- pHealth business models
- pHealth future trends

BOOKMARK

ESSENTIAL LIFE SCIENCE WEBLINKS

www.norbiobase.no

The recently updated NorBioBase is the official database of the Norwegian Health and Life Science Sector. It provides a comprehensive overview of Norwegian biotech and medtech companies, as well as other Norwegian suppliers of health products and services.

EVENT CALENDAR 2009

Meet representatives from the Oslo life science sector at the following events:

FEBRUARY
24 – 25 Bioprosp 2009, Tromsø, Norway.
www.bioprosp.no

MARCH
4 – 5 1st International MareLife Innovation Workshop at NASF2009, Oslo, Norway
www.nor-seafood.com

APRIL
23 AngloNordic Biotech Conference, London, UK
www.anglonordicbiotech.com

MAY
18 – 21 Scandinavia Pavilion at Bio International Convention 2009, Atlanta,USA
www.bio2009.org

JUNE
24 – 26 pHealth 2009 in Oslo, Norway
www.phealth2009.com

ONE TO WATCH

BIOINDEX

From pregnancy tests to food allergies, technology advances and consumer demand have changed the face and scope of diagnostic testing. BioIndex is the latest in a line of Norwegian companies stretching back to Nycomed to bring forward new innovations with their Omega-3 and BioIndex tests.

COMPANY MISSION

BioIndex has developed a range of mail-in tests for measuring the biomarkers that indicate how much healthy and unhealthy food you are consuming. The tests involve patients placing a finger prick blood sample on a test filter paper and then mailing it to the BioIndex laboratory for analysis. Patients then log onto the secure BioIndex website, fill in some lifestyle data and get results and relevant advice. Because of the research interests of the founders and the general awareness of the importance in nutritional status in Norway, BioIndex chose to launch in January 2009 with two main tests - Omega-3 and a multi-parameter so-called BioIndex.

MANAGEMENT

Thomas E. Gundersen (Managing Director),
Bjarne Borgersen (Chairman of the Board)

COLLABORATIONS

University of Oslo, Medical faculty
(Prof R. Blomhoff and Prod: Chr. Drevon,
Aker Biomarine ASA)

KEY SCIENTIFIC/MEDICAL PUBLICATIONS

Blomhoff, Drevon and Gundersen have published extensively and key publications can be found at
www.blomoff.no, ***http://folk.uio.no/christia***
http://www.vitas.no/chemicalanalysis_publications.shtml

INVESTORS

Birkeland Innovasjon AS and Vitas AS.

WEBSITE

www.bioindex.no

Oslo Teknopol

– your key to the Oslo region

Oslo Teknopol aims to stimulate innovation and attract foreign investments and talent to Norway's capital region. We offer free assistance and information about business conditions and opportunities within life sciences and other key knowledge-based clusters in the Oslo region:

- Maritime
- Energy and environmental technology
- Information and communication technology
- Life science
- Culture

Oslo Teknopol is a non-profit regional development agency, established by the City of Oslo and Akershus County Council.

OSLO BIO

Oslo Bio is a collaborative network of stakeholders from the life science cluster. Oslo Bio aims to strengthen the cluster and contribute to long term growth through marketing, initiating and facilitating development projects, and international collaboration. Oslo Teknopol act as the secretariat for Oslo Bio.

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