

Umeå: Fast-Growing and Close-Knit

The Umeå life science cluster is Sweden's most northerly. It is one of the fastest-growing groups of life science companies and academic research centres in the country with more than 3,000 people, two-thirds of whom are in academia and one-third in industry. The Umeå life science cluster has significant strengths, particularly within biotechnology and medical technology. Together, the cluster's many contributors are producing cutting-edge research, generating innovations, and building companies to commercialisation. Umeå has a strong entrepreneurial culture and, since 2005, the number of life science companies has increased by 250 percent, and is now around 80 companies. A key element in the cluster's development has been the relationships established across disciplines and the community, involving VINNOVA, regional and municipal bodies, academic organisations, research entities and individuals, companies, and financial investors of varying types.

The Umeå region has the infrastructure necessary to support the cluster and attract life science companies looking for a new operations base. It is well-connected geographically, with frequent international and domestic flights, and excellent rail services to and from Stockholm. It is also well-connected in communications, with state-of-the-art broadband access via one of the world's most extensive networks.

In addition to the University Hospital of Umeå (Norrlands universitetssjukhus, NUS), the city is home to two major universities: Umeå University (www.umu.se/english), the biggest in northern Sweden, and a campus of the Swedish University of Agricultural Sciences (www.slu.se/en). Umeå's two universities and the University Hospital work closely together and, between the three, several joint venture operations have developed. This is evident through Umeå's Centre for Microbial Research (UCMR, www.ucmr.umu.se), an interdisciplinary research centre for medical and molecular microbiology, structural biology, chemistry, and physics, all devoted to research and applications in the fields of microbial pathogenesis, and The Laboratory for Molecular Infection Medicine Sweden (MIMS, www.mims.umu.se) within the Nordic EMBL Partnership for Molecular Medicine. Research is also carried out in plant and forest biotechnology at Umeå Plant Science Centre (UPSC, www.upsc.se), collaboratively established by the Department of Plant Physiology at Umeå University and the Department of Forest Genetics and Plant Physiology at the Swedish University of Agricultural Sciences, and The Swedish Metabolomics Centre in Umeå, Sweden, which provides service for all Swedish universities and research institutes.

Umeå is also the location for a department of the Swedish Defence Research Agency (FOI, www.foi.se/en), one of Europe's leading institutes for defence and security research. FOI collaborates closely with government, industry, and academia, and its CBRNE division in Umeå is home to many leading experts on chemical and biological issues.

Founded in 1965, **Umeå University** celebrated 50 years of innovation in September 2015. This young fifty-year old educates around 31,000 students, has more than 4,200 employees and is a base for world-leading research in a number of fields. It hosts seventeen schools and institutes and offers 31 degree programmes taught entirely in English. The University place a high priority on biotechnology and life science research. Some ten units between the technology, natural sciences, and medical faculties are involved in advanced research in biotechnology, often related to one of the following therapeutic areas: infectious, neurological, and metabolic diseases, as well as diagnostics and medical technology. Some of the University's twenty research centres, in addition to the UCMR and UPSC already mentioned, include:

- Centre for Biomedical Engineering and Physics (CMTF)
- Umeå Center for Functional Brain Imaging (UFBI)
- Umeå Centre for Global Health Research (CGH)]
- Umeå Centre for Microbial Research (UCMR)
- Umeå Center for Molecular Medicine (UCMM)

In October 2015, Akademiska hus - Sweden's leading property company for universities and colleges - approved a comprehensive renovation and reconstruction of the **Biology Building** along with 400 new student apartments to sit alongside another 280 apartments being build by Svenska Studenthus and 1,000 new apartments being built by Campus X. The Biology Building is one of the oldest buildings on campus and will be transformed into an attractive research environment in which experimental and translational research from various scientific disciplines within the Faculty of Medicine are unified into a Medical Biological Centre. The creation of the medical centre should provide a focus for collaborative experimental and traditional research.

CMTF (www.cmtf.umu.se) is a renowned network of research groups from Umeå University and Luleå University of Technology. It works in three-way collaboration with the County Councils in Norrbotten and Västerbotten, as well as industry. The aim is to co-ordinate high-quality research and to produce methods, products, and services for more efficient, better, and safer healthcare.

Knut and Alice Wallenberg Foundation will contribute to a new research centre at Umeå University with a total of nearly € 1.9 M (SEK 175 M) through 2016-2024. In collaboration with Umeå University and the County Council of Västerbotten, the grant will primarily finance career opportunities for young researchers. Umeå university and County Council of Västerbotten are contributing with 80M respectively. The Wallenberg Centre of Molecular Medicine at Umeå University will carry out research on cancer, metabolic diseases like diabetes, brain and nervous system diseases, and severe infections -reflecting the research strengths at Umeå University. The County Council of Västerbotten's population-based biobank - Biobank norr will provide patient and genealogical data.

The Computational Life Science Cluster (CLiC, www.clicumu.se) is Umeå University's bioinformatics platform based at the Chemical Biological Centre (KBC,

www.kbc.umu.se/). A collaborative venture between Umeå University and the Swedish University of Agricultural Sciences, it is also a node in Bioinformatics Infrastructure for Life Sciences (BILS, www.bils.se), a national research infrastructure providing bioinformatics support to life science researchers in Sweden. BILS is also the Swedish contact point to the European infrastructure for biological information ELIXIR. CLiC researchers work on bioinformatics research, genomics, and proteomics, including protein modelling and metabolomics.

The University's Grant Office focuses on supporting international research co-operations, providing researchers with information and assistance regarding EU Structural Funds and the EU Framework Programmes for Research and Development. The Grant Office works to match companies, organisations, and individuals, thereby assisting R&D collaboration and joint ventures. The University's Innovation Office, Innovation Office North (www.innovationskontornorr.umu.se/english/), is the first point of contact for researchers, staff, and students who want to see their ideas realised. Its role is described as operating "in the interface between Uminova Innovation, the Grants Office, the Office for External Relations and Umeå Biotech Incubator." Innovation Office North is one of twelve innovation offices selected by the Swedish government to develop innovation and collaboration.

The Swedish University of Agricultural Sciences (SLU) has several campuses throughout Sweden. In Umeå, it carries out biotechnology-related research, primarily in the field of forest genetics and plant physiology. The research focuses on hormone physiology and population genetics, and one of SLU's significant success stories has been the mapping of tree genomes. SLU describes the ethos of its research and education as its "comprehensive view, interdisciplinary studies and applicability ... and its contacts with industry and society".

The University Hospital of Umeå (www.vll.se/) is responsible for providing quality medical care to the four northernmost Swedish counties. A major teaching hospital, it is the location for most of the activities of Umeå University's Faculty of Medicine. Its staff carries out research, often in co-operation with Umeå University's clinical institutions. The research focuses on a number of diseases and their therapies, such as cancer, stroke, familial amyloid polyneuropathy (Transthyretin Amyloidosis, Corino de Andrade's Disease), and amyotrophic lateral sclerosis (Lou Gehrig's Disease.)

The County Council of Västerbotten is aiming to achieve its vision; to have the world's healthiest population in 2020. One way to accomplish this, and work towards a more effective health care, is through closer collaborations and partnerships with the industry, regarding development and innovations.

Also looking towards the future and what it may hold, in terms of improved healthcare, new treatments etcetera, is the coming acquisition of a 3D bioprinter, planned to occupy an existing cleanroom at the University Hospital of Umeå.

Biotech Umeå (www.biotechumea.se) is a cluster initiative to support growth of the biotech and medical technology sectors in the Umeå region. It is financed by the Umeå University, Municipality of Umeå, Uminova Innovation, FOI (Swedish Defense Research Agency), County Council of Västerbotten, Region Västerbotten and EU European Regional Development Fund. Biotech Umeå works to create growth and better prospects for the region's life science companies, in collaboration with regional, national, and international partners. It promotes the region's businesses and research, both in the media and towards investors and partners.

For commercialising and developing life science business ideas, there are two key incubators in Umeå, **Uminova Innovation** (www.uminovainnovation.se, mainly for medtech concepts, ICT, as well other businesses) and **Umeå Biotech Incubator** (UBI, www.ubi.se, mainly for pharmaceuticals and diagnostics). Their roles are complementary, both assisting entrepreneurs and start-up companies with advice, business know-how, office premises, and, in the case of UBI, laboratory facilities and seed capital.

The aims of Uminova Innovation and UBI are two-fold: to stimulate an exchange of knowledge, ideas, and experience between the university and industry, and to develop innovative business ideas commercially. The incubators see themselves as a gateway to university research for industry and venture capitalists, and a gateway to industry for researchers, as they evaluate research from the point of view of commercial viability.

Located in Uminova Science Park, the incubators have extensive experience of developing ideas into businesses, as well as a number of specialised processes, models, tools, and strategic contacts.

Uminova Innovation was founded in 2003 to focus on entrepreneurship and spin-offs from academia. It receives financing from among others Umeå University, Municipality of Umeå, County Council of Västerbotten, Region Västerbotten, SLU (Swedish University of Agricultural Sciences), and EU European Regional Development Fund. Uminova Innovation runs initiatives to strengthen Umeå and Västerbotten as a life science region (Biotech Umeå), an IT region (Infotech Umeå) and as part of a Clean tech-region (Cleaner growth).

Uminova Innovation supports researchers and companies to find international partners through the Enterprise Europe Network, a network of local organizations represented in some fifty countries. Infotech Umeå is Uminova Innovation's initiative aimed at marketing and improving the ICT innovation environment. Using already-successful models, tools, and networks adapted for ICT requirements, it provides support to individuals, companies, and organisations in Västerbotten with concept development into successful innovations, many of which will have life science sector applications.

Umeå Biotech Incubator is a life science business incubator offering business know-how to innovators with ideas that could develop into thriving companies. UBI focuses on research organisations from Umeå University, SLU, the University Hospital, and FOI. It may support researchers and innovations outside those areas, on the condition that development is done at UBI. UBI may also support spin-off projects from existing companies.

It offers:

- Facilities and infrastructure through specially equipped laboratories for biotechnology development
- Pre-seed financing to verify the business idea before starting a company
- Business development competence from the life science industry to start-up biotech companies

The former Västerbotten Investment Agency are relocating their resources through the brand- **Invest in Västerbotten** (IVB), a regional investment promotion agency dedicated to make the Västerbotten province the most attractive choice for foreign investors and works to attract international companies that are considering establishing or expanding their operations in Sweden. IVB promotes several sectors in the region, including life science, and lists the following five reasons to invest in life science in Västerbotten:

- High quality research in microbial pathogenesis
- World leader in forest and plant biotechnology
- Progressive tech-transfer offices for both academic and clinical research
- Well-functioning collaboration between academia, hospital and industry
- Unique possibilities for processing wild berries for probiotics/nutraceuticals purposes

Umeå Scores Significant International Success

In March 2016, Umeå University once again achieved a top-ranking for international student satisfaction, according to results from the International Student Barometer (ISB) autumn wave 2015 survey. The same month, seven subjects at Umeå University ranked highly in the QS World University Rankings by Subject 2016, which is more than ever. Subjects included biology, medicine, nursing, chemistry and environmental science.

Ear infection diagnosed using smartphone

Claude Laurent, from the Department of Clinical Sciences at Umeå University and colleagues from the University of Pretoria in South Africa have developed a software-based method to simplify the diagnosis of ear infections (otitis media). The app automatically analyses images from a digital otoscope to provide an accurate diagnosis. The research was published in the journal *EBioMedicine* – a new Lancet publication.

Ear infections affects half a billion children worldwide every year. The cloud-based system allows uploaded images to be analysed automatically, providing access to accurate, low-cost diagnoses even from developing countries. Images of eardrums, taken with a digital otoscope connected to a smartphone, are compared to high-resolution images in an archive and automatically categorised according to predefined visual features associated with five diagnostic groups.

Tests showed that the automatically generated diagnoses based on images taken with a commercial video-otoscope had an accuracy of 80.6 per cent, while an accuracy of 78.7 per cent was achieved for images captured on-site with a low cost custom-made video-otoscope.

Medal of Honour for microbiology professor

In October 2016, Professor and Vice-Chancellor Lena Gustafsson will be honoured with the Umeå University Medals of Honour 2016 for their outstanding contributions to the university.

Lena Gustafsson, Professor of Microbiology, has in her role as Vice-Chancellor of Umeå University since 2010 led the University in a meritorious way towards seeing and achieving new objectives in research, education and collaboration. The investment in secure employments has been ground-breaking among Swedish higher education institutions, and her commitment in among other the Swedish Council for Higher Education has contributed to strengthening Umeå University's role as an important party among Swedish higher education institutions.

Umeå University researchers help fight Zika virus

Joacim Rocklöv, epidemiologist at the Department of Public Health and Clinical medicine at Umeå University and colleagues used previous knowledge on Dengue to assess the risk of Zika spreading to Europe. As Dengue and Zika viruses are carried by some of the same mosquito types and share a number of characteristics in terms of how viral infections manifest, by applying knowledge of dengue they were able to describe the transmission season, areas at risk and intervention strategies to help control the spread of Zika.

Umeå University had a highly relevant role in the effort to prevent a global pandemic. Its researchers were in dialogue with the European Centre for Disease Prevention & Control (ECDC) to advise on the many knowledge gaps on Zika.

Umeå University has since 2011 hosted DengueTools, an EU funded research consortium, developing innovative interventions for predicting and fighting the mosquito transmitted virus. This international research effort, which includes 14 partners in 11 different countries, has resulted in a model research infrastructure that became critical in the fight against the Zika virus.