



Life
Science
Nord



Powering Life Sciences in North Germany

Innovation
for Your Health.

SCHLESWIG-HOLSTEIN, HAMBURG

Collaboration across
the region characterizes
North Germany as a
location for life sciences

Our motto is:
Joining Forces for
Success

High potentials accelerating medical progress

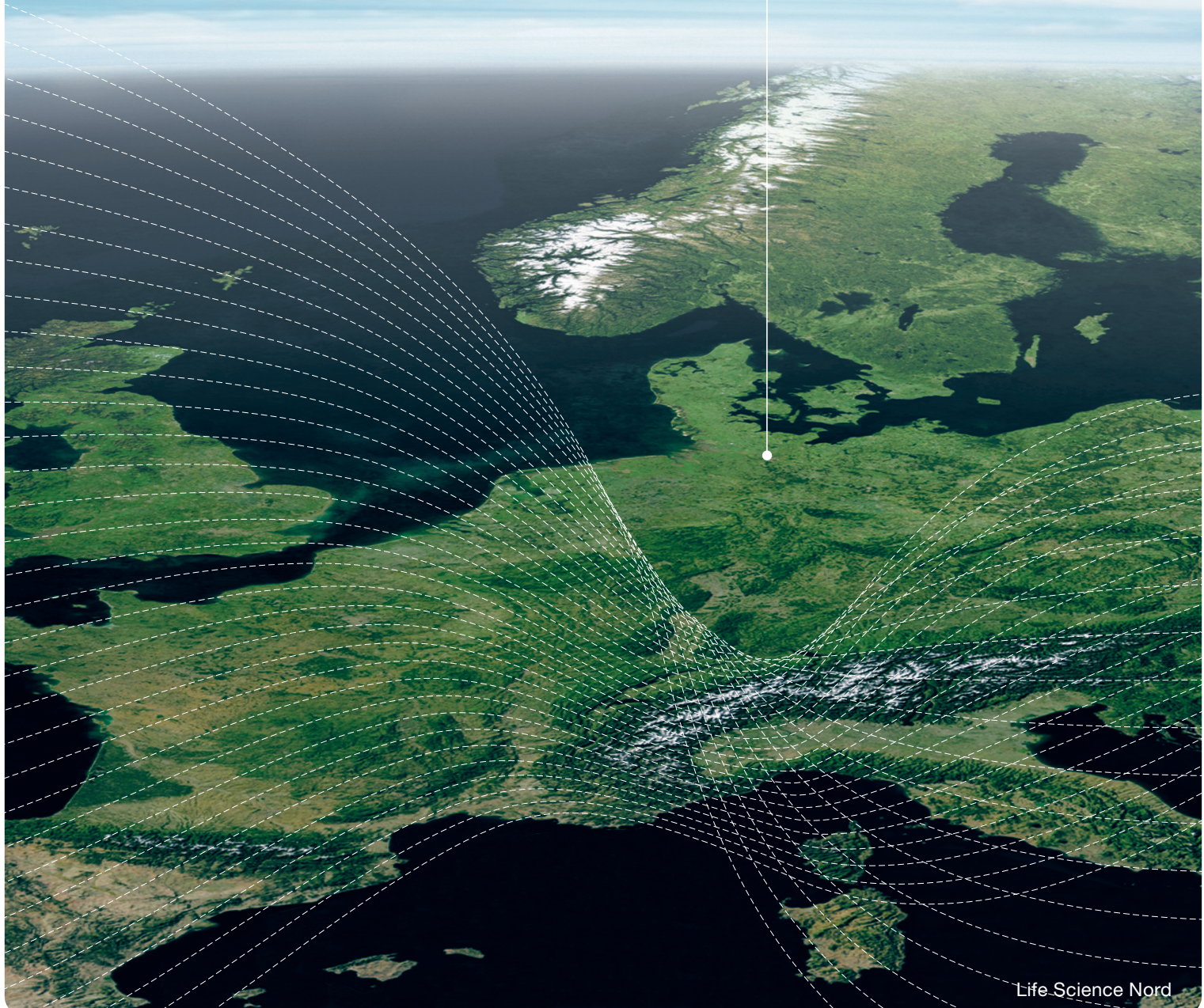
Dear Readers, For researchers and entrepreneurs, there is really only one crucial criterion when it comes to assessing the quality of a location: its attractiveness in every respect. It is not just the superb quality of life that Schleswig-Holstein and Hamburg offer. The infrastructure in particular sets the North apart: for example, the access to thematic networks, the availability of highly qualified staff, and the proximity to the scientific community. In addition, the North offers an industry structure with outstanding networks and development instruments that have been thought through – all underpinned by tremendous political support. Since the Life Science Nord cluster was established, the governments in Schleswig-Holstein and Hamburg have worked in tandem and with great commitment to advance North Germany as a life science location and create excellent conditions for entrepreneurs and scientists – also in comparison with competing regions.

In this brochure, we are pleased to showcase the life sciences in Hamburg and Schleswig-Holstein and their main areas of focus and services. Learn more about our region. We have a lot to offer.

Welcome to the North!

Life Science Nord – in the forefront of medical advancement

Well networked
in the heart of
Europe's medical
industry and
research



Lifestyle and science in the North: our road to success

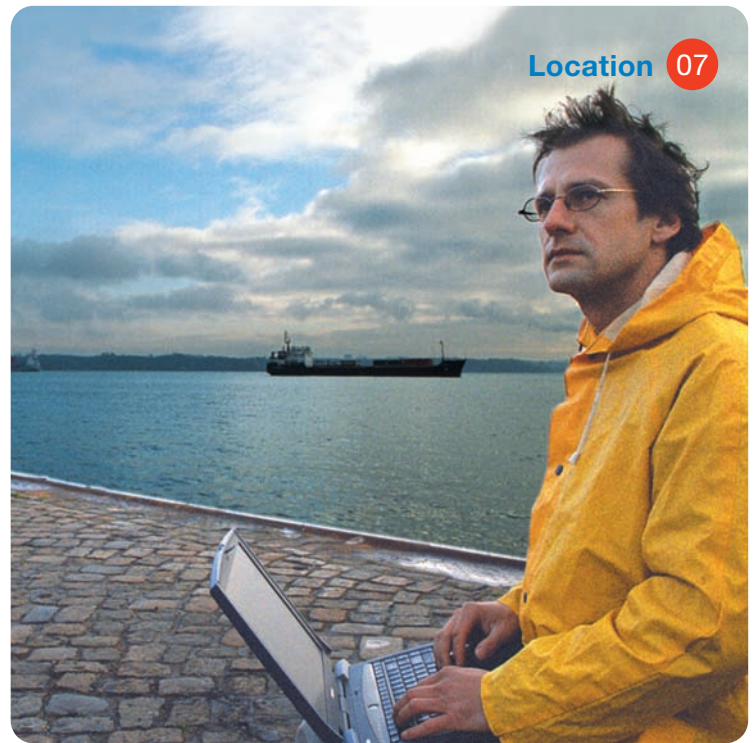
Hamburg and Schleswig-Holstein are home to the Life Science Nord cluster. Between the North Sea, the Baltic Sea, and the Elbe, one of the most significant locations for medical technology and biotechnology has developed.

In our region, business and science work hand in hand.

Today we bring together innovative technologies for the future's medicine

Many of the companies of Life Science Nord, such as Dräger Medical, Olympus, and Eppendorf, are global players with a long history. But internationally recognized scientific institutions such as the Research Center Borstel and the Bernhard-Nocht-Institute as well as the university clinics of Schleswig-

Holstein and Hamburg also shape Life Science Nord. Over decades – in some cases over centuries – they have all created the basis for today's success. The direct link between science and research as well as the broad clinical application of their results makes North Germany, together with its companies, an ideal location for life sciences. The region covers a broad spectrum from basic research to application. All of this makes Hamburg and Schleswig-Holstein a center for innovative medicine both nationally and internationally.



Business, science, and quality of life – North Germany provides the ideal setting for your objectives

With its policy of driving innovation by combining various technologies, Life Science Nord operates in a commercially promising high-growth area. The market for innovative medicine is worth several 100 billion euros, and is growing at double-digit rates.

The Life Science Nord region is well positioned along the value chain for innovative medical products. All areas of research – from development to production and marketing – are occupied by cluster players from the fields of medical technology, biotechnology, and pharmaceuticals. Appropriate platform technologies and services such as funding, quality assurance, or training are also offered in the region.

In Hamburg and Schleswig-Holstein, important areas of application are in therapy, diagnostics, imaging techniques, laboratory equipment, implantology, and operating technologies. However, oncology, neuroscience, and research into inflammation and infections are the dominant fields.

Life Science Nord has developed innovative medical products with the help of selected cooperation agreements and technology transfer. The region's market and competitive position is based on the successful business activities of the individual players in their respective core businesses and under their cooperation arrangements. As a result, Life Science Nord operates successfully in national and international markets.

In particular, the established medical technology firms that mostly operate on a global scale are often outstandingly well positioned in the market. This can be exploited to secure significant synergies in the marketing of solutions generated by cooperation projects.

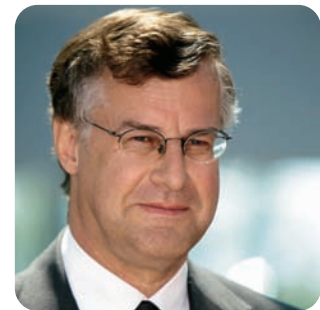


Foto: Ferring

Dr. Frederic Paulsen,
Managing Director of Ferring
Arzneimittel GmbH, Kiel

My family and our company are inextricably linked to North Germany. My father comes from the Friesian island Föhr (Schleswig-Holstein). In 1954, he founded Ferring in Malmö, Sweden. The company's name derives from the Friesian word for Föhr, and up to this day testifies to our North German roots. Business and science in a maritime setting – discover one of the most competitive regions in Germany and Europe. Welcome to the North!



Life Science Nord:
one of the largest cluster
for medical devices

Medical technology – firmly anchored in the North

Traditionally, medical technology has a strong base in Hamburg and Schleswig-Holstein. The North scores in particular thanks to the size and market domination of the companies that operate in the region, and is an ideal location for medical technology. Virtually no other region can boast such a well-developed business structure in medical research and development.

Medical technology is the main sector. About 11,500 employees generate revenues of some 3.9 billion euros a year. In the Life Science Nord region, large companies such as Olympus Surgical Technologies Europe, Philips Medical Systems, Dräger Medical, and Johnson & Johnson Medical develop and produce highly successful solutions for the global medical market. However, small and mid-sized firms, like Weinmann Medical Technology and steco-system-technik, which account for most of the approximately 300 companies, are also very well positioned in this sector. Particular areas of competence are medical imaging and operating technologies.

However, besides the extremely vigorous production side of medical technology in the North, medical research is also broadly based and well networked. The close collaboration between universities and research

institutions, which is characteristic for the Life Science Nord region, play a major role in the success. In the future, developments in medical technology will involve integrating different systems, miniaturizing devices for minimally invasive surgery, and improving optical imaging techniques. In the North, all these fields are the subject of considerable research.

Key areas in medical technology

Medical imaging

The largest companies operate in the field of optical and imaging diagnostics. Hamburg is the center for research, production, and sales for Philips Medical Systems in Germany. The Olympus Europe Group is a further global business that is based in Hamburg. It focuses on endoscopy for diagnosis and therapy, microscopy systems, and analysis systems for clinical chemistry. The Medical Solutions unit of Siemens operates in Hamburg through cooperation arrangements with hospitals and university clinics. The University Medical Centers Schleswig-Holstein and Hamburg-Eppendorf are engaged in the promising field of molecular imaging.

Operating technologies

In Schleswig-Holstein, companies with global operations include Lübeck-based Dräger Medical, a leading worldwide provider of products, services, and integrated solutions for clinical critical care and home care. Johnson & Johnson Medical in Norderstedt is another company with global reach. Hamburg-based Olympus is an innovator in endoscopy and other fields. A number of mid-sized firms such as Möller-Wedel and Söring complement the innovative portfolio in this area. In addition, new methods and products are created in close collaboration with the university clinics, especially in the field of micro- and minimally invasive surgery.

Implantology, endoprosthetics and tissue engineering

Both on the business side and on the scientific and clinical side, Hamburg and Schleswig-Holstein offer outstanding competences, offering potential for successful further developments in this field. From industry, mention should be made of Orthodynamics, Stryker, and Waldemar Link which are driving the development and production of new implants in close collaboration with specialized clinics. In addition, in the Life Science Nord region diverse approaches are being pursued in research with a view to improving heart valve flaps, for example, by means of tissue engineering or providing cartilage replacement material.



Foto: Stéphanie Herrmann



Foto: Stéphanie Herrmann

Growth and diversity, knowledge and vision

Biotechnology in the Life Science Nord region is characterized by a broad corporate base. In Hamburg and Schleswig-Holstein, some 150 companies with about 8,200 employees carry on biotechnological research for medical and industrial applications. Companies from the pharmaceutical industry also have a presence in the region. In both states, the main focus is on red (medical) biotechnology, pharmacy and medicine are the principal applications. There are core competencies in the fields of drug research, molecular diagnostics, and enabling technologies.

Pharmacy is inextricably linked to life sciences. In Hamburg and Schleswig-Holstein, significant drug manufacturers and larger trading companies have a presence. Some of the major international pharmaceutical companies maintain research and production facilities in the region. AstraZeneca, GlaxoSmithKline, Medac, and the Ferring Group develop and sell innovative, biopharmaceutical products in and from Schleswig-Holstein and Hamburg.

North German drug makers focus, among other things, on neurology, oncology, allergy, pain therapy, and dermatology.

Drug research

The technical developments and knowledge gained in the 1990s have also spawned new biotechnology businesses in Life Science Nord over the last 10 to 15 years. In early drug development, the focus is on development platforms, while biotech companies research into and develop chemical or biological substances in the key indications such as neurodegenerative diseases (Evotec), inflammatory diseases (CONARIS and Proteo Biotech) and oncology (Provecs Medical).

Enabling technologies and diagnostics

Besides development platforms for therapeutics, Life Science Nord has numerous small and medium-sized firms that position analytical and diagnostic products and services in the global market. For example, Ependorf AG exploits its high level of competence in laboratory instruments for special diagnostic applications. QIAGEN offers tailor-made analytic and diagnostic equipment for infections based on the academic and scientific know-how of the Berhard-Nocht-Institute for Tropical Medicine. PLS Design uses an especially innovative approach, developing, on the basis of recombinant proteins, new diagnostic methods for insect allergies.

**Dip into
North Germany's
blue
biotechnology**

In Schleswig-Holstein, blue biotechnology is gaining in importance. The opportunities in this discipline are only just beginning to be exploited. To tap this potential, networks are being created and, above all, maritime infrastructure is being extended. At the same time, scientific findings are being translated into new products. At the Leibniz Institute of Marine Sciences (IFM-GEOMAR), KiWIZ, a center for research into active marine substances, was set up for the development of marine organisms for the development of new therapies and drugs. The Fraunhofer Research Institution for Marine Biotechnology also focuses on the potential offered by the seas for biomedicine.

Today's innovative technologies for tomorrow's medicine

Foto: Stefanie Herrmann

We always
find the
needle in the
haystack

Research and application – the North is active and successful in both fields

Hamburg and Schleswig-Holstein offer a varied research sector in life sciences. There are excellent links between business and science that produce impressive results.

The know-how obtained from research at our universities and university clinics repeatedly leads to spin-offs and the establishment of highly specialized companies. In addition, there are numerous highly regarded non-university research institutes.





Fotos: Stefanie Herrmann



Concentrated passion for life science outside our universities

The Bernhard-Nocht-Institute is a member of the Leibniz Association, one of the four major scientific organizations in Germany. It specializes in tropical medicine. As the national reference center for tropical infectious agents, the institute performs a wide range of tasks in treating and diagnosing tropical diseases. It also trains medical personnel.

At Deutsches Elektronen-Synchrotron DESY, scientists use x-rays to decode the structure of biomolecules at the atomic level. The XFEL X-ray laser facility offers unique research conditions for life sciences. The working group of the European Molecular Biology Laboratory EMBL and Max-Planck Unit for Structural Molecular Biology are located at DESY.

The Research Center Borstel, which is also a member of the Leibniz Association, is an interdisciplinary clinical and scientific research institute. It focuses on basic and patient-oriented work in the field of pneumology. The Inflammation-at-Interfaces Excellence Cluster is also located there.

The Fraunhofer Institute for Silicon Technology ISIT develops and manufactures components in microelectronics and microsystems technology, from the design phase – including system simulation – to prototyping and fabrication of samples, up to series production. ISIT's technical facilities and state-of-the-art clean rooms represent an ideal basis for both research & development and production.

The Fraunhofer Research Institution for Marine Biotechnology EMB develops new technologies, methods and equipment in a number of fields, including aquatic technologies, cellular technologies, stem cell isolation and exploitation, as well as cell-based medical and laboratory technology. As part of its stem cell research, the EMB is the only Fraunhofer institute to operate a cell bank for wild animals (CRYO-BREHM).

The GKSS Research Centre is a member of the Helmholtz Association and specializes in coastal and materials research as well as regenerative medicine. In this latest area of research, the GKSS Research Centre's biomaterials have already shown promise in the regeneration of cells, tissues, and organs.

The Heinrich-Pette-Institute for Experimental Virology and Immunology at the University of Hamburg researches into the biology of human virus types, the pathogenesis of viral diseases, the defensive reaction of organisms, and related problems.

The Kiel Center for Marine Natural Products KiWiZ focuses, above all, on researching into and developing drugs from marine microorganisms for medical applications, in particular for cancer and viral diseases, multi-resistant infectious agents, and inflammatory diseases.



Promoting research and teaching: our universities



North Germany provides a broad spectrum of research fields and scientific disciplines

Universities in the Life Science Nord region

The North offers future scientists good opportunities to receive first-class training. A number of innovative courses in different life science subjects are available to students at nine universities and technical universities in Hamburg and Schleswig-Holstein:

- Christian-Albrechts-Universität zu Kiel
- Flensburg University of Applied Sciences
- Lübeck University of Applied Sciences
- Westcoast University of Applied Sciences
- Hamburg University of Applied Sciences (HAW)
- Helmut Schmidt University (University of the Federal Armed Forces Hamburg)
- Hamburg University of Technology (TUHH)
- University of Hamburg
- University Lübeck

Nine universities and technical colleges form the basis for science and research in Hamburg and Schleswig-Holstein. In the Life Science Nord region, both basic and applied research cover all sub-sectors. Conditions in North Germany are therefore ideal for life science researchers and entrepreneurs. An interdisciplinary approach is becoming an increasingly important feature of life sciences. Consistently aligning training to the needs of the job market, interdisciplinary learning, and introducing students to research and technology at an early stage – all these aspects are already being extensively put into practice in life sciences in the North.

University Medical Center Hamburg-Eppendorf (UKE)

In one of the most modern clinics in Europe, specialists from different fields collaborate under one roof. State-of-the-art medical and computer technologies network top-class medicine, research and teaching. Of the 6,000 or so people working at the UKE, 1,140 are doctors and natural scientists. About 1,000 are employed in the laboratories and examination areas. The UKE's clinics, polyclinics,

and institutes, which work together on an interdisciplinary basis, together form 14 centers. At present, research focuses on the following areas: neurosciences, medical care research, oncology, cardiovascular research, congenital metabolic diseases, transplantation and stem cell therapy, molecular skeletal biology, and endoprosthetics.

In addition, new integrative research initiatives arise at the UKE in the fields of infections and inflammations, tissue damage and regeneration, and in gene therapy.

University Medical Center Schleswig-Holstein (UK S-H)

The UK S-H offers medical equipment and research facilities that meet the highest standards. It extends over the two sites, namely the Kiel Campus and the Lübeck Campus. With some 2,400 beds, more than 240,000 outpatients and some 100,000 inpatients or persons receiving partial hospital treatment, the UK S-H is one of the largest university clinics in Germany. In Schleswig-Holstein, it is the only hospital that provides a full range of medical services. As a result, it enjoys a strong market position that enables it to enter into cooperation agreements and achieve a high level of efficiency in operating the clinic.

To combine resources, the specialist departments are organized into 16 medical centers. The main clinical areas are: inflamma-



We make more out of clinical trials

tion and infection, brain, hormones and behavior, reproductive medicine, oncology, transplantation medicine, system-oriented neurosciences, and clinical genome research.

In these fields, the scientists at the two sites work in several large networks and with non-university research institutes – above all the Research Center Borstel.

Clinical research in North Germany: Life Science Nord offers a wealth of experience and top quality

With their university clinics, numerous other clinics, special institutes and service companies, Hamburg and Schleswig-Holstein offer ideal conditions for the implementation of clinical trials, for example in special indications such as chronic inflammatory diseases and various tumor entities, backed by extensive clinical expertise.

One of the key organizations in the field of clinical trials is the Clinical Trial Center North (CTC North), an institute at the Uni-

versity Medical Center Hamburg-Eppendorf (UKE). The CTC North operates a modern station for phase I and II trials and works on behalf of the pharmaceutical and biotechnology industries. In addition, it advises principal investigators and scientists, among other things, on how to overcome the high hurdles presented by the German Drug Act with regard to documentation and quality assurance in their trials. In this way, the planning and implementation of investigator-initiated clinical studies are supported.

The UKE and the research-based pharmaceutical company Wyeth Pharma also cooperate in a so-called Early Clinical Development Center (ECDC). ECDCs are Wyeth-initiated research facilities where early clinical trials are carried out in a concentrated manner.

North Germany is also home to the Lübeck-based company Amedon, an internationally successful service provider for Web-based solutions designed to record, evaluate, and provide medical data and information. It is also home to Clariness, a further service company with an international focus, which provides effective and selective assistance in recruitment of patients for clinical studies.

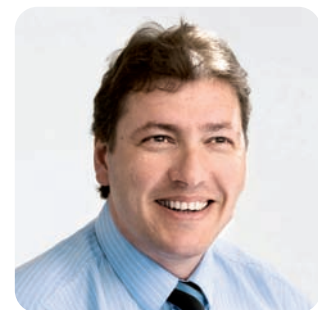


Foto: Agnes Doraszewicz

Dr. Ralf Krappa,
Managing Director MediGate GmbH
(University Medical Center Hamburg-Eppendorf)

The Clinical Trial Center North (CTC North) has set new standards for clinical research at the UKE. Patients can be treated there with the latest drugs and therapeutic methods. Our »Campus Research« is also a signal that we are growing in research. The CTC North is especially successful in early clinical trials. This is essential if we are to play a leading role in later stages. And that is our goal.

Hamburg and Schleswig-Holstein – a very attractive region for life sciences

The freshest
wind always
blows from
the North



Exploiting synergies

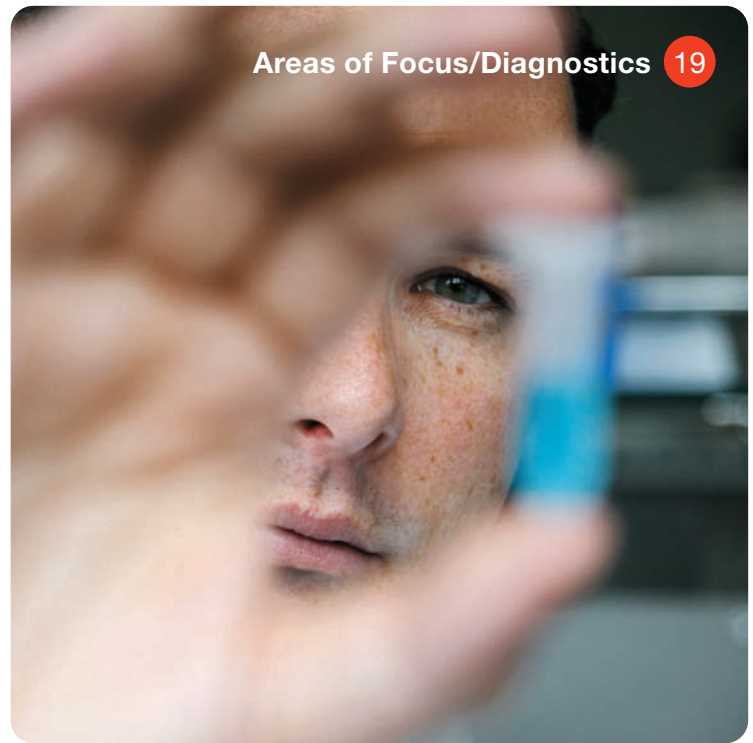
New methods, thanks to strategic cooperation

The scientific and technical knowledge gained in recent years has provided sustained impetus to the development of molecular medicine. Examples are the decoding of the human genome, the development of chip-based and mass spectrometry technologies, and new methods in cell biology. The results of basic research have improved the understanding of the underlying processes and led to a host of tools, especially in the field of innovative diagnostics.

In Hamburg and Schleswig-Holstein, there are a number of companies that exploit this know-how on the biology of illnesses in order to develop corresponding specific diagnostic products. In this connection, both diagnostics in certain indication areas and the application of state-of-the-art technologies play a major role.

In this area of life sciences, the Bernhard-Nocht-Institute and Artus, a spin-off from the former at the end of the 1990s and now owned by QIAGEN, are clearly outstanding players of

North Germany: area of expertise in metabolic diseases



international significance. The institute's knowledge and scientific results on various infectious diseases are consistently translated into diagnostic methods and products. Well-known examples include analytical and diagnostic systems for prion diseases and the SARS virus. The University Lübeck, among others, was also involved in the clarification of the latter.

The capabilities of companies and institutes in Life Science Nord range from laboratory diagnostic products and services to new clinical applications of in vivo diagnostics and »at the bedside« methods, procedures and equipment. The Lübeck-based Euroimmun should be highlighted in particular. The company produces reagents for medical laboratory diagnostics. It focuses on test systems that determine various antibodies in the serum of patients and enable autoimmune and infectious diseases as well as allergies to be diagnosed. The Hamburg company PLS-Design also develops tests for considerably more accurate diagnosis of allergies on the basis of recombinant proteins, paving the way for more effective therapy.

Indivumed creates a bridge between therapy, diagnostics, and technology platforms in the field of oncology. The company has laid the foundation for new approaches in therapy and for a knowledge base in the development of diagnostics with its tissue bank on various tumor entities that has been built up in recent years. Inostics, founded by Indivumed and scientists at the Johns Hopkins University,

also specializes in the individualization of cancer therapies using DNA-based diagnostics.

The DiagNorth Initiative is involved in the value chain from academic research into biomarkers to the clinical launch of a diagnostics product. With the initiative, North German research institutes and companies want to accelerate the development of diagnostic products.

Lipids and diabetes – LIDIA

In a joint project, the University Medical Center Hamburg-Eppendorf and Asklepios Kliniken have pooled their competencies in the field of diabetes. The researchers are helping to explain the links between fat metabolism / obesity, insulin resistance and the development of type II diabetes. Their objective is to detect specific diabetes risks above all for children and young persons much more precisely than in the past, so that preventive measures may be taken at an early stage. The focus is on characterizing early pathophysiological changes, especially in lipid metabolism. If early pathomechanisms can be detected, new biomarkers and drug targets can be found to develop diagnostic tests and preventive therapies. The cooperation partners in Hamburg and Schleswig-Holstein collaborate closely with research groups and institutions as well as the research-based pharmaceutical and diagnostic industry in a regional network.



Foto: Stefanie Herrmann

Dr. Ulrich Spengler,
Managing Director
of altona DIAGNOSTICS

In my view, diagnostics is a field that offers huge medical – and therefore commercial – potential. After successfully establishing artus GmbH and selling it to QIAGEN, I built up a new diagnostics company. It soon became clear that altona DIAGNOSTICS would be based in Hamburg. The city offers a high quality of life, which helps us recruit good staff. In addition, there are a host of private investors and excellent development programs that support committed, innovative start-up entrepreneurs.

When the body switches to attack

North Germany offers ideal conditions for drug research and development



Modern drugs are high-tech products. And modern, forward-looking technology is also required in order to research and manufacture new drugs and medicines. State-of-the-art analytical and synthesis technology, genetic laboratories, powerful computers and robotic systems, and much more besides form the necessary basis for the development of

new and improved drugs. Researchers and their staff must be highly qualified to pave the way for the medicines of tomorrow with their experience, supported by the latest biomedical results and technologies.

In the Life Science Nord region, numerous experts in interdisciplinary teams are researching into new therapeutic approaches, above all for inflammatory, neurological, and cancer diseases. AstraZeneca, GlaxoSmithKline, and

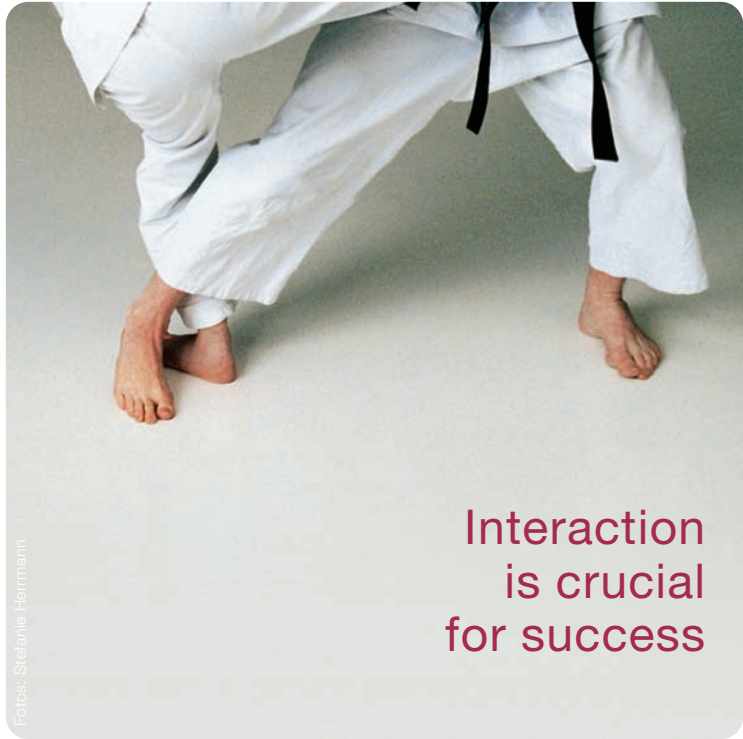
the Ferring Group – all key international pharmaceutical companies – operate research and production facilities in North Germany. They produce and sell innovative biopharmaceutical products in and from Life Science Nord. Besides the major pharma groups, small start-ups, innovative biotechnology companies, and excellent research networks work on new drugs and innovative therapies.

Drug development in North Germany

Examples of drug developers that are also driving forward significant developments in the region


Company	Indication
Provecs Medical GmbH	Oncology
CONARIS Research Institute AG	Inflammation
Jomaa Pharma GmbH	Infections
Cytavis BioPharma GmbH	Oncology
Zentopharm GmbH	Oncology
Oncoscience AG	Oncology
PLS Design GmbH	Allergy
Immunservice GmbH	Oncology
Richter-Helm BioTec GmbH & Co. KG	Infections
Evotec AG	CNS





Interaction is crucial for success

Fotos: Stefanie Herrmann



Areas of Focus/Therapy 21

Neurodegenerative diseases

Neurological diseases also play an important role in the Life Science Nord region. New approaches to fight diseases of the central nervous system are being pursued by the University of Hamburg with its Center for Molecular Neurobiology ZMNH and the Max-Planck Society, which is researching into the basis of Alzheimer's disease with a working group on the campus of Deutsches Elektronen-Synchrotron DESY. From the private sector, Evotec is developing several small molecule drug candidates for various neurological conditions. The pharmaceutical company Desitin, which can look back on a long tradition, is also represented in the market with drugs that treat CNS diseases.

Inflammatory diseases

A **particular area** of development is inflammation research, in which the region has internationally outstanding expertise. Two Kiel companies – Proteo Biotech and CONARIS Research Institute – are developing biopharmaceuticals to treat acute and chronic inflammation. The »Inflammation at Interfaces« research network of the Universities of Kiel and Lübeck and the Research Center Borstel ensure that further advances will find their way from academic research into industrial development. Successes include the development of new therapies for Crohn's disease and the decoding of sarcoidosis.

»Inflammation at Interfaces« – world-class research in Schleswig-Holstein

The »Inflammation at Interfaces« Excellence Cluster is a research network in which 150 scientists from the Universities of Kiel and Lübeck and the Leibniz Association's Research Center for Medicine and Biosciences in Borstel are examining the mechanisms of inflammatory diseases that affect human organs. Such diseases are on the increase worldwide.

Internationally, the pooling of skills and resources in inflammation research creates a unique body of expertise in clinical structural biology, immunology, and infectiology on one of the central challenges facing medicine in the 21st century. The inflammation research network was designated as an excellence cluster in 2007 by the German Federal Ministry of Education and Research as part of its so-called excellence initiative.

Oncology

Tumor diseases are a further area of focus. For example, researchers at the University Medical Center Schleswig-Holstein and the Christian-Albrechts-Universität zu Kiel discovered a family of new cancer genes that are involved in the genesis of acute lymphatic leukemia. Provecs Medical, a company that is researching into an immune therapy for cancer, demonstrates that such developments lead to business start-ups. Late preclinical developments such as those of the company Immunservice GmbH in biomimetics, in immunotherapy, and the clinical development work of Oncoscience testify to the high capability in drug research. Wedel-based Medac, is also engaged in developing tumor

therapy innovations. Among other things, the company has developed a substance with orphan drug status, which is used to detect malignant gliomas during operations. The Radiooncological Center at Kiel, currently under construction, will decisively improve cancer therapy.

NEU²

The **objective** of the North German consortium NEU² is to develop innovative drugs more efficiently. Its members are the Kiel-based Bionamics (project management), the University Medical Center Hamburg-Eppendorf, Evotec, European ScreeningPort, Cedrus Therapeutics, Center for Molecular Neurobiology at the University of Hamburg and the pharmaceutical company Merck. The partners, who are highly specialized in the field of drug development, have devised a plan to considerably speed up the development of new drugs for neurological diseases such as multiple sclerosis, Alzheimer's, and Parkinson's by selectively pooling resources.

Improved visions – better understanding

State-of-the-art technologies
for better images.
In North Germany imaging
has a long tradition



Life Science Nord: merging experts for better insight

Optical and imaging diagnosis has long been an area of expertise, at the very latest since the Hamburg-based company C.H.F. Müller constructed the first X-ray machines back in 1896. It is in this tradition that Philips Medical Systems currently operates the world's most state-of-the-art production site for X-ray tubes in Hamburg. But the North has far more to offer in this field. The global player Olympus Surgical Technologies Europe produces and develops endoscopes in Hamburg. Siemens Medical Solutions also has significant operations in North Germany, while the Schleswig-Holstein-based Möller-Wedel has an international reputation as a producer of surgical microscopes.

In principle, a distinction can be made between imaging methods that are based on optical and those that rely on non-optical devices. In North Germany, both fields are represented – by global players as well as medium-sized, innovative businesses. Apart from scientific expertise, the North also has plenty to offer when it comes to linking different imaging techniques. In the area of surgical microscopes, attempts are currently being made to depict data from the presurgical in vivo diagnosis in the microscope's field of view, to assist the surgeon.

A special area that combines expertise in medical engineering and biotechnology and is deep-seated in the North is molecular imaging.

Molecular imaging in North Germany

Internationally, molecular imaging – the visualization of molecular, biochemical, and cellular events on the basis of non-invasive imaging methods – is considered to be one of the most dynamic fields of innovation and growth in medicine. Its successful development means that, thanks to more specific diagnosis, therapy can be tailored individually to a single patient, thus improving the chances of recovery. In Life Science Nord, the University Medical Centers of Schleswig-Holstein and Hamburg-Eppendorf have cooperated with the technology partner Philips Medical Systems for several years, and have achieved progress in molecular imaging research.

The establishment of the Molecular Imaging North Competence Center – MOIN CC – has elevated the North into the premiere league of molecular, cellular, functional, and micromorphological preclinical imaging. The Center, which was opened in 2009, and its equipment offer a multimodal imaging platform that enables companies and research institutes to strengthen their product development and research projects in an interdisciplinary manner. Schleswig-Holstein in particular has competencies, notably in inflammation research and oncology. As a result, extensive know-how is available to share in networks with experts from medicine, medical technology, biotechnology, physics, and information science, and to exploit synergies.

Institute of Medical Engineering at the University Lübeck

The research interests of the Institute of Medical Engineering's team focus on physical sensing and image acquisition techniques as well as image processing and system modeling in biophysical, medical, and technical applications. The key competence covers the area of medical and technical imaging using tomographic techniques. This includes the development of reconstruction algorithms, signal pre- and post-processing methods, and front-end electronics.



The future comes through the keyhole

In the North, operating methods are optimized and the latest methods applied

Smaller incisions are good for patients – the smaller, the better. In the Life Science Nord region, medicine based on small incisions is very well represented. In recent years, considerable progress has also been made in this field.

High-precision medical instruments are designed for optimal and gentle treatment of patients. North Germany is playing a leading role when it comes to innovative high-tech solutions for the operating room. From three-dimensional imaging methods to centralized control of surgical systems and adaptable implants, pioneering products and instruments are being developed in medical engineering companies in Hamburg and Schleswig-Holstein. Like a puzzle, individual technologies are combined to form an integrated therapy for the future.

Besides gentle treatment and rapid recovery, keeping the costs to a minimum is the major concern of surgeons. This is the key driver behind innovations in surgery – not least microsurgery and minimally invasive surgery. In Hamburg and Schleswig-Holstein, there is a broad technological base in industry and scientific institutes, notably in the fields of preoperative and intraoperative diagnostics as well as in minimally invasive and microsurgical intervention. Hospitals and large specialized practices also have a high level of expertise in applying minimally invasive techniques. Some 40 companies develop and manufacture new devices and services in the fields of surgery and surgical instruments. In addition, 25 companies are involved in imaging and diagnostic technologies. One trend common to all these firms is the integration of preoperative data into intervention procedures and the implementation of intraoperative, simultaneous availability

of diagnostics and visualization to assess therapy options.

Olympus Surgical Technologies Europe, a market leader in optoelectronic, minimally invasive technologies, is based in Hamburg. The Olympus Medical Training Centre (OMTC) opened by the company in Hamburg is one of the most modern facilities for doctors. The heart of the OMTC is the Olympus Advanced ENDOALPHA operating room, a visionary control and communication center that integrates all necessary medical equipment and peripheral systems.

Further partners in modern surgery include small and mid-sized companies such as Söring. For more than two decades, this ultrasound specialist from Quickborn has been supplying the international market with innovative solutions for ultrasound and high-frequency surgery. Thanks to players like PROSYSTEM, an international consultancy company, offering extensive services in quality and project management for the medical device industry, highest quality standards can be implemented and maintained in the development of new products.

Technology leaders with visions

Möller-Wedel is also based in Schleswig-Holstein. The company specializes in the development of high-performance operating microscopes. The systems are used wherever operations on delicate structures such as the eye, brain, or spinal cord are carried out.

Johnson & Johnson Medical, market leader in the development and production of suture

Theme cluster »Gentle Intervention«

In Hamburg and Schleswig-Holstein, the special operating technology competencies have been combined into the »Gentle Intervention« network with a view to working jointly on new challenges and technologies in micro- and minimally invasive surgery, exploiting synergies among the players in their respective fields. Sixty companies, research institutes, and university clinics from Life Science Nord are attached to the theme cluster which is coordinated by Norgenta North German Life Science Agency.



products, implants, and operating therapies, is an important partner for all doctors that undertake surgical procedures. From Lübeck, Dräger Medical distributes products, services, and integrated system solutions for clinical acute and home care throughout the world.

In addition to industry, the scientific sector also offers the perfect basis for the innovations of tomorrow. In particular the Institute for Biomedical Optics, the Medical Laser Center Lübeck, and the Institute for Medical Engineering at the University Lübeck offer crystallization points for scientific expertise in modern surgery.

FUSION – Future Environment for Gentle Liver Surgery Using Image Guided Planning and Intra-Operative Navigation

FUSION – the German consortium promoted by the Federal Ministry of Education and Research – focuses on research and development in the field of gentle methods and processes in liver surgery. Innovative preoperative technologies are combined and made available to surgeons during operations to improve existing treatment concepts. The system is designed on a modular basis, enabling single technical components to be developed and evaluated at different locations. The entire system is put together at one site – FUSION-OP in Lübeck. The project is managed by the Clinic for Surgery at the University Medical Center Schleswig-Holstein, Campus Lübeck.

Implantology and endoprosthesis

In Germany, between 180,000 and 200,000 hip joints, 120,000 to 140,000 knee joints, and 10,000 shoulder joints are implanted every year. The most important endoprosthesis in Germany is the artificial hip. Hamburg and Schleswig-Holstein can offer expertise at company, university, and clinic level, offering the basis for successful further developments in this field. In industry, mention should be made of Stryker, Orthodynamics, and Waldemar Link, which are making progress in the development and production of new implants in close collaboration with clinics and universities.

In this field, the ENDO Clinic, owned by DAMP Holding, is the main facility and enjoys an international reputation in endoprosthesis. The Boberg Trauma Hospital and the Center for Biomechanics and Skeletal Biology at the University Medical Center Hamburg-Eppendorf are further institutes in the region that enable networked research and development to be carried out and synergies to be exploited. Tissue engineering is closely related to implantology, transplants and endoprosthesis. In North Germany, a number of differing approaches are being pursued, for example to improve heart valve flaps through biofunctionalization or to provide cartilage replacement material – in both cases on the basis of tissue engineering. The universities also have considerable competencies in this area. The Hamburg University of Technology (TUHH) in particular can boast expertise in basic and applied research in this field.



Foto: Stefanie Herrmann

Prof. Dr. Hans-Peter Bruch, Director of the Clinic for Surgery University Medical Center Schleswig-Holstein, Campus Lübeck, on the links between surgery and Life Science Nord:

Touch screens, miniaturized cameras, computer-controlled operations – high-tech equipment has become the standard in operating rooms and is a great aid for surgeons. But when you have to work in a concentrated manner with technical devices over many hours, top-class quality is essential. Our region offers first-class operating technologies that are born out of a close interplay between industrial development and clinical implementation.

A healthy basis

Stem cell research, nanotechnology, innovative drugs: the North is well positioned

Fotos: Stefanie Herrmann

Enabling technologies (ET) are important tools and essential in biomedical research and development. They are as important to scientists at universities and research-based industrial companies as dustpans are for gold diggers. The term covers technical methods, for example, for the simple, safe, and rapid handling of small and minute quantities of liquids or equipment used to analyze substances and mixtures.

Such equipment and technologies may either be very large, such as the XFEL (X-ray free-electron laser) at DESY, or very small, thanks to the use of microtechnology or even nanotechnology. Enabling technologies are also described as cross-sectional technologies, because microsystems technology, biological, biochemical, or physical principles and often data processing and handling in the form of bioinformatics are applied to give researchers in biotechnology and biomedicine ideal tech-

nical conditions. Besides this hardware for biotechnology, analytical systems on an enzyme or cell basis also fall under the term enabling technologies. For example, harmful substances are tested, certain validations of biomolecules carried out, or the suitability of a drug candidate as a medicine is examined in preclinical development. Further significant fields of enabling technologies are optical and imaging methods, in other words microscopic technologies and their connection to



We always
have the right tool
in our hands



various light sources or other contrast agents (sputtering or fluorescent dyes). North Germany is well-known as a region that can offer a great deal in all these areas, both in research and industry.

Eppendorf, which operates on a global basis, testifies to the high level of innovativeness in enabling technologies. The company sells systems for life science research, its pipettes, dispensers, and centrifuges can be found in nearly every laboratory worldwide. In addition, Eppendorf provides instruments and systems for cell manipulation, automated liquid handling products, complete systems for DNA replication, and biochips.

High-throughput systems with appropriate miniaturization are also at home in the North. PerkinElmer in Hamburg is an outstanding example of a company with expertise in this field. Besides the major industry players, there are also strong start-ups. CCS Cell Culture Service, a successful spin-off from the Heinrich-Pette-Institute, supplies pharmaceutical and biotechnology firms throughout the world with ready-to-use cell cultures for drug research. GALAB is a company with core competences in analysis and separation technology. The company offers analytical services, contract research services and proprietary tools for the health care, food, and biopharmaceutical industries. Another new company is Sierra Sensors, which provides biosensors for characterization of pro-

tein interactions. European ScreeningPort GmbH and the Fraunhofer Research Institution for Marine Biotechnology EMB are two »lighthouses« that have been established in the North. Their specific competencies are leading to new diagnostic methods and therapeutic approaches.

Fraunhofer Research Institution for Marine Biotechnology EMB

In the past, little research has been conducted on aquatic organisms. The Fraunhofer scientists now want to develop new active substances and methods from these resources for medicine, cosmetics, agriculture, and the chemical industry. The EMB's focus is on isolating, cultivating, and differentiating stem cells, especially from marine organisms. The research findings will be used for regenerative medicine and test procedures in the cosmetics and pharmaceutical industries. A key area is the development of aquatic technologies on the basis of which research can be carried out into biological resources from water, and new products for medicine and food can be manufactured from algae and fish cells. Stem cell research also extends to other fields. For example, an archive known as CRYO-BREHM is currently being established with frozen stem cells from wild animals. The archive is based on methods developed by Prof. Dr. Charli Kruse in 2004 to isolate animal stem cells from different types of tissue.

European ScreeningPort GmbH (ESP)

ESP delivers an industrially organized platform for European research institutes to identify promising substances from academia for future drugs throughout Europe and to advance their development. Integrated into the professional services infrastructure of Evotec, ESP has set itself the goal of accepting programs from an almost unlimited range of academic sources for innovative medicine and to steer them into industrial drug development projects through the process known as screening.

The company offers access to state-of-the-art, high-throughput screening technologies, validated chemical substance libraries, natural products, and biological substances, as well as a bioinformatics system with extensive data evaluation. The involvement of the Norderstedt-based IT company c.a.r.u.s. in ESP also means the successful integration of high-level expertise in bioinformatics.

The project entitled »ViSoR-Virtual Screening Optimizing the Reality« developed by c.a.r.u.s. and established at ESP supports the analysis of chemical substances and their binding properties on the basis of upstream computer-aided methods.

Big in tiny particles

The Life Science Nord
region is a leader
in nanotechnology

Nationally and internationally, the Hanseatic City of Hamburg in particular is considered to be outstandingly well positioned in nano-analytics and chemistry. With well-known companies such as Beiersdorf, Bode, Philips Medical Systems, Eppendorf, PerkinElmer, and a number of smaller companies, it is one of Germany's centers of competence. Research at Hamburg's universities and non-university research institutes is supported and accompanied by specially established nanocen-

ters. While the Interdisciplinary Nanoscience Center Hamburg (INCH) focuses on special questions of basic research, the Center for Applied Nanotechnology, CAN GmbH, is concerned with commercial applications. The objective is to improve and accelerate the exploitation of the basic know-how generated in the city. CAN's scientific director, Prof. Dr. Horst Weller from the Institute of Physical Chemistry at the University of Hamburg, is an outstanding nanotechnology expert. With his

Mini is still
too big,
nano rules
the future



Driven to miniaturization by the interplay of business and science

working group, he supplies the expertise for signal-emitting semiconductors and metal nanoparticles.

Particular attention is paid to the size-related fluorescent and magnetic properties of particles, which deliver the basis for numerous applications, for example in biological and medical fields. One of them forms the basis for the targeted development of new contrast agents for magnetic resonance tomography. Aspects from the self-organization of particles, bioconjugation and incorporation into synthetic vesicles for targeted drug delivery are researched in the network and flow into the region's overall profile.

Schleswig-Holstein is also well positioned in nanomaterials. Schleswig-Holstein's scientific standing in this field is based on 15 working groups at the University of Kiel and two technical universities, the GKSS Research Centre in Geesthacht and the Fraunhofer Institute for Silicon Technology ISIT in Itzehoe. In the private sector, Lübeck's o.m.t.,

Ormecon from Ammersbek, and the Geesthacht-based Hanse-Chemie have operated successfully in nanotechnology for years. Another example is Incoatec, which uses special nanocoating for X-ray mirrors.

CAN GmbH, Center for Applied Nanotechnology

CAN offers contract research and development services for companies and research institutes and takes part in national and international research programs. The activities focus mainly on utilizing new findings from chemical nanotechnology and nanoanalytics, especially in consumables, special polymers, cosmetics, and healthcare. Besides nanostructure characterization, CAN's expertise is mainly in the production of numerous materials in the form of nanoparticles and nanocomposites, drug encapsulation, and the development of nanoparticle biological, medical, and diagnostic markers for molecular monitoring. To meet the standards demanded of it, CAN has world-class equipment and facilities at its disposal. Through its close links to the Hamburg universities and research institutes, CAN can tap into a huge network of outstanding researchers in the fields of nanosciences, nanotechnology, and life sciences. On the basis of targeted developments, CAN promotes the transfer of know-how from basic research into industrial applications.

North German Nanomaterials Initiative (NINa)

NINa was launched in May 2005 with the support of the Innovation Foundation of Schleswig-Holstein with a view to establishing a network in the North and making efficient use of the advantages offered by the region. NINa offers a platform on which scientific developments and application-specific requirements can be regularly discussed, contacts made, and new solution strategies jointly developed. The principal focus is on a sub-area of nanotechnology that deals with nanomaterials. The joint objectives of NINa are research and application relating to nanoparticles in structural polymers and reaction resins as well as nanoanalytics and dispersing nanoparticles. Further subjects are the tribological properties of nanocomposites based on plastic and nanomaterials in medical technology. Prof. Dr. Frank Faupel at the Christian-Albrechts University of Kiel coordinates the network.

We make
the net work
for you

Life Science
Nord helps
you navigate
the net

The best building blocks for you: Life Science Nord

Your partner for medical technology, biotechnology, and pharmacy in Hamburg and Schleswig-Holstein: Norgenta North German Life Science Agency

Norgenta North German Life Science Agency is the project and service company of Hamburg and Schleswig-Holstein that supports life science activities in North Germany. Under the name of Life Science Nord, the agency combines and networks life science activities to create an internationally competitive cluster. As the central point of contact, it also can help you answer all your questions on biotechnology, medical technology, and pharmacy.

Norgenta initiates strategic projects and assists in the promotion of businesses, scientists,

and institutions that contribute to raising the profile of Hamburg and Schleswig-Holstein. As cluster manager, it networks the business and research communities in North Germany. Norgenta can thereby draw selectively on the expertise of the universities and research institutes and utilize their close contacts to companies in the region. The agency is also responsible for the overall presentation and marketing of life sciences in Hamburg and Schleswig-Holstein, both at national and international level. This makes Norgenta the central hub within Life Science Nord.

norgenta

Norgenta North German Life Science Agency

Falkenried 88
20251 Hamburg

T: +49.40.471 96 400
F: +49.40.471 96 444

info@norgenta.de
www.norgenta.de



What can we do for you?

Service cooperation agreements and network

- **We support** you to initiate your innovative projects and connect you to experts and know-how
- **In collaboration** with further institutions, we offer you quick, uncomplicated access to regional, national, and EU assistance programs
- **We integrate** you into existing network structures and support you in positioning yourself in the Life Science Nord Cluster

Service information and communication

- **We provide** you with industry data on medical technology, biotechnology, and pharmacy in North Germany and on economic and technological capabilities
- **We regularly update** you on current developments in business and science in the Life Science Nord region
- **Together with partners**, we create platforms for selective exchange among the various players and support your communications in the cluster



Networks for companies and scientists in Hamburg and Schleswig-Holstein

Life Science Council

Besides Norgenta North German Life Science Agency, further organizations in Hamburg and Schleswig-Holstein are committed to supporting Life Science Nord. As contact, consulting, and service points, they offer numerous business location services as well as economic and technology assistance. To ensure that these can be offered to the players in business and science on a comprehensive and coordinated basis, and that a steady process of improvement adjusts them to current needs, the institutions and networks have set up a platform – the Life Science Council. Joint activities strengthen the economic and innovative capabilities of the Life Science Nord Cluster.

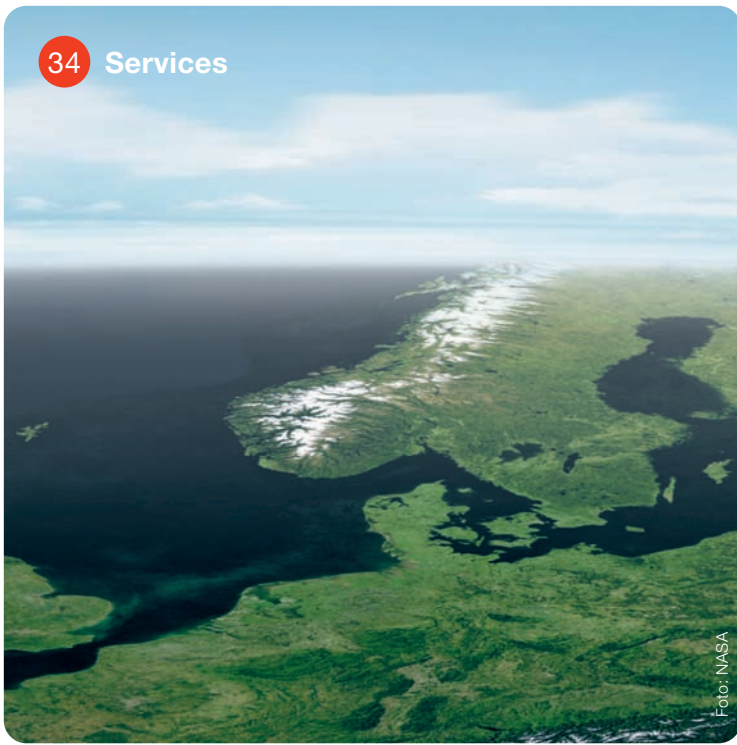
- **Hamburg Chamber of Commerce**
www.hk-24.de
- **HWF Hamburg Business Development Corporation**
www.hamburg-economy.de
- **Chambers of Commerce and Industry (IHK) in Schleswig-Holstein**
www.ihk-schleswig-holstein.de
- **Innovationsstiftung Hamburg (Innovation Foundation)**
www.innovationsstiftung.de
- **ISH-Innovationsstiftung Schleswig-Holstein (Innovation Foundation)**
www.i-sh.org
- **IVH Industrieverband Hamburg e.V.**
www.bdi-hamburg.de
- **Norgenta North German Life Science Agency** www.norgenta.de
- **TuTech Innovation GmbH**
www.tutech.de
- **WTSH Business Development and Technology Transfer Corporation of Schleswig Holstein** www.wtsh.de
- www.life-science-nord.net

AGMT Arbeitsgemeinschaft Medizintechnik Schleswig-Holstein e.V.

The AGMT's goal is to strengthen the medical technology sector in North Germany. Among its members are many traditional global players, smaller businesses, as well as start-ups from the field of medical technology. The AGMT focuses on working closely with universities, clinics, and businesses. In particular, it strives to promote the exchange of experience and know-how among the North German life science players and carries out cooperation projects that promote innovation. www.agmt.de

BAY TO BIO Förderverein Life Science Nord e.V.

BAY TO BIO is the network in biotechnology, biomedicine, and bioinformatics and at the interfaces to medical technology. BAY TO BIO enables the players to exploit synergies in Life Science Nord and offers a real and virtual information and communication platform to that end. It is aimed at start-up entrepreneurs, people with ideas, companies, investors, and consultants in the life science industry in Hamburg and Schleswig-Holstein. www.baytobio.de



Good conditions for life sciences in North Germany

Life Science Nord is anchored in a metropolitan region between the seas. Hamburg, Germany's second largest city, and Schleswig-Holstein, with its centers Kiel and Lübeck, together represent a significant economic area in which 4.5 million people live. The geographical location in the most northerly part of Germany forms a bridgehead to Scandinavia and the Baltic states. As a result, we have excellent access to strong markets and a high level of networking. In Life Science Nord, the life science networks are highly integrated. This closeness offers opportunities for collaboration. For example, Life Science Nord is a member of the ScanBalt network, the European metacluster for biotechnology. Our professional cluster management creates ideal conditions under which businesses can develop successfully and Schleswig-Holstein and Hamburg can further expand the life science sector.

14 Technology and business centers

- 1 KITZ Kiel Center of Innovation and Technology
- 2 Kiel Science Park
- 3 MFC Multifunktionscenter Lübeck
- 4 ICL Innovations Campus Lübeck
- 5 TZL TECHNIKZENTRUM Lübeck
- 6 Dräger Businesspark Lübeck
- 7 GITZ Geesthacht Innovation and Technology Center
- 8 CiM Center for Innovative Medicine Hamburg
- 9 channel Hamburg
- 10 hit Technopark Hamburg-Harburg
- 11 NORDPORT Norderstedt
- 12 IZET Innovation Center Itzehoe
- 13 MariCube CAT Meldorf
- 14 Manfred Eigen Campus

9 Universities and technical colleges

- 15 Flensburg University of Applied Sciences
- 16 Christian-Albrechts-Universität zu Kiel
- 17 Lübeck University of Applied Sciences
- 18 University Lübeck
- 19 HAW Hamburg University of Applied Sciences
- 20 University of Hamburg
- 21 Hamburg University of Technology (TUHH)
- 22 Helmut Schmidt University, University of the Federal Armed Forces Hamburg
- 23 Westcoast University of Applied Sciences

2 University Medical Centers

- 24 University Medical Center Schleswig-Holstein, Campus Kiel
- 25 University Medical Center Schleswig-Holstein, Campus Lübeck
- 26 University Medical Center Hamburg-Eppendorf

12 Renowned research institutes

- 27 IPN Institute for Science Education (Leibniz Association)
- 28 KiWiZ Kiel Center for Marine Natural Products at IFM-GEOMAR
- 29 EMB Fraunhofer Research Institution for Marine Biotechnology
- 30 Research Center Borstel (Leibniz Association)
- 31 GKSS Research Centre (Helmholtz Association)
- 32 BNI Bernhard-Nocht-Institute for Tropical Medicine (Leibniz Association)
- 33 HPI Heinrich-Pette-Institute for Experimental Virology and Immunology (Leibniz Association)
- 34 ZMNH Center for Molecular Neurobiology
- 35 DESY Deutsches Elektronen-Synchrotron (Helmholtz Association)
- 36 Max-Planck Unit for Structural Molecular Biology at DESY
- 37 EMBL European Molecular Biology Laboratory
- 38 ISIT Fraunhofer Institute for Silicon Technology





Innovation for Your Health.

SCHLESWIG-HOLSTEIN, HAMBURG

Foto: Christophe Sorenti, Lesprenger

Join our community!



www.life-science-nord.net



www.facebook.com/LifeScienceNord



[@LifeScienceNord](https://twitter.com/LifeScienceNord)

norgenta

Norgenta North German Life Science Agency

Falkenried 88, 20251 Hamburg

T: +49.40.471 96 400

F: +49.40.471 96 444

info@norgenta.de

www.norgenta.de