EXPERTISE DEMANDS AND -MATCHING

– higher education and the life science industry's needs in Skåne

8.500 life science students in Skåne

Expertise shortage in STEM subjects and legal- and commercial areas

Wanted: more focus on automatization

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European Regional Development Fund

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Greater Copenhagen
LIFE SCIENCE
analysis initiative

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This analysis has been prepared by Øresundsinstituttet as part of the Interreg-project Greater Copenhagen Life Science Analysis Initiative and was written by Jenny Andersson, Kristoffer Dahl Sørensen, Sofi Eriksson, Anna Palmehag and Johan Wessman.

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GREATER COPENHAGEN LIFE SCIENCE ANALYSIS INITIATIVE is an EU-project aimed at increasing knowledge about the region's life science cluster. The focus is on the demand for labourers, future expertise needs, and more. The project has received funding through the EU-programme Interreg Öresund-Kattegatt-Skagerrak and will continue until 30 June 2022. The project's lead partner is Medicon Valley Alliance, and the partner is Øresundsinstituttet. Region Skåne and Region Zealand are co-funding the project.

MEDICON VALLEY is the bi-national life science cluster spanning eastern Denmark and the Skåne region of southern Sweden. Today, the Danish-Swedish region is marketed internationally with the name 'Greater Copenhagen', and its increasing population has reached more than four million residents. In Sweden, the same geographical area is often called the 'Øresund Region'.

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PREFACE

The Danish-Swedish life science cluster of the Greater Copenhagen region, Medicon Valley, is successful and of great import for economic development and employment in both Denmark and Sweden. One key issue determining its continued growth is access to qualified workers.

This report is the third analysis in the Interreg-project "Greater Copenhagen Life Science Analysis Initiative". In the analyses that preceded it, *"Life science in Skåne"* and *"Life science in the Øresund Region"*, we mapped out company- and capital structures and the need for qualified workers in the Swedish part of Medicon Valley, in Skåne, and the transborder business and research conducted across the Øresund Strait.

In this third analysis, "Expertise demands and matching – higher education and the life science industry's needs in Skåne", we have taken a step further and compared Skåne's life science companies' needs for a skilled labour force with the universities' educations and research in the field, investigating whether the educational system in Skåne corresponds well with the expertise that the region's life science companies will need for the future labour force.

The results of the analysis are satisfying as well as challenging. Satisfying, because the need for expert workers in Skåne's life science sector largely correspond to the approximately 120 educational programmes offered by the regional universities. At the same time however, there is a challenge related to matching up the educations and the sector's continued growth and new needs for expertise in e.g. industrial automation and digitalization. As an example, there is a shortage of personnel specialised in the STEM-disciplines (Science, Technology, Engineering and Mathematics), as well as workers with the right expertise in the regulatory and commercial fields.

The analysis is based on surveys of companies and higher educations focused on the life sciences in Skåne and was complemented by a multitude of interviews, and results in seven recommendations from the industry.

Copenhagen and Malmö, 7 February 2022

Johan Wessman
CEO
Øresundsinstituttet

PHOTO: NEWS ØRESUND

Malmö University

PHOTO: NEWS ØRESUND

Lund University

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ABOUT EASTERN DENMARK AND SKÅNE

When we refer to Eastern Denmark and Skåne in this report, we are generally referring to the following geographic classification: the Danish island Zealand, and the southern Swedish province Skåne. There are also public and administrative geographies. On the Danish side, the Capital Region of Denmark includes the capital city Copenhagen and the surrounding municipalities, up to northeast Zealand and including the island Bornholm. Region Zealand comprises the remaining parts of Zealand and islands such as Møn, Lolland and Falster. On the Swedish side of the Øresund, the province of Skåne is geographically equivalent to Region Skåne. Together, the three Danish and Swedish regions comprise the Øresund Region, whose population was 4.1 million at the end of 2020, with two-thirds living on the Danish side. The Medicon Valley cluster shares the geography of the Øresund Region. The term Greater Copenhagen is used as an international place brand for the Danish-Swedish region, and it also designates a political collaboration that encompasses the three abovementioned regions as well as Region Halland. The Greater Copenhagen region has a population of 4.4 million.

7 HIGHLIGHTS FROM THE REPORT

FIVE INSIGHTS FROM THE STUDY

The survey of the life sciences conducted in 2019-2020 includes input from more than 120 companies from the sector and provides five insights into expertise needs- and shortages in Skåne
Greatest recruitment needs in R&D and sales and marketing
Expertise shortage in STEM subjects and legal and commercial areas
Definite satisfaction with Skåne's educational offering – but there is room for improvement
Around every other life science company has experienced difficulty recruiting
Employment on the rise in all subsectors and regions in Skåne

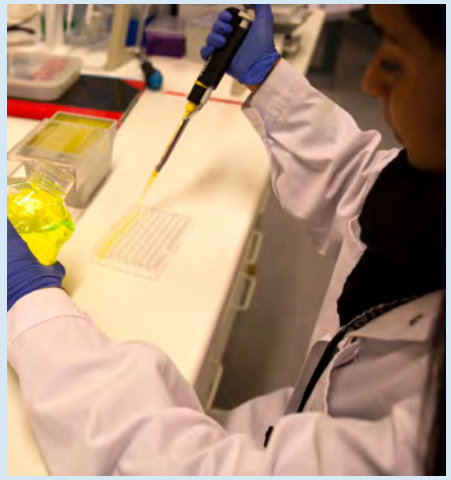

PHOTO: NEWS ØRESUND

For more on expertise needs and how actors from the sector recommend improving the compatibility of expertise needs in the industry and the educational sector, see page 11.

PHOTO: POLYPEPTIDE

7 500 EMPLOYEES IN SECTOR

Around 7 500 people regionally work in 426 life science companies in Skåne; Øresundsinstituttet showed this in the 2020 report *Life Science in Skåne*. Over the past five years, employment in the sector has risen, with 1 500 new positions in the life science companies identified in Skåne, and around one hundred companies were founded – most of them in Lund. Malmö is the city in Skåne in which the greatest number of private employees work in the life science sector, however.

LTH, LUND'S FACULTY OF MEDICINE, MALMÖ UNIVERSITY AND THE STUDENT ORGANISATION SYNAPSE HAVE THEIR SAY

For this report, representatives were interviewed from LTH School of Engineering, Lund University's Faculty of Medicine, Malmö University, and the Danish-Swedish student organisation Synapse – Life Science Connect. LTH has various levels of industry links, for example with project courses in which companies are involved, diploma projects, and guest lectures. The Faculty of Medicine and Malmö University direct their efforts more on contact points with the healthcare sector, which is the focus of the majority of their educations. According to the student organisation Synapse, there are insufficient links to the industry for those in life science educations in Lund. It calls for more activities to provide understanding of what is expected of students when they enter the labour markets.

PHOTO: LUND UNIVERSITY/MIKAEL RISEDAL

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universities offer educations in the life sciences in Skåne – that is, all of them: Lund University, Malmö University, the Swedish University of Agricultural Sciences, and Kristianstad University.

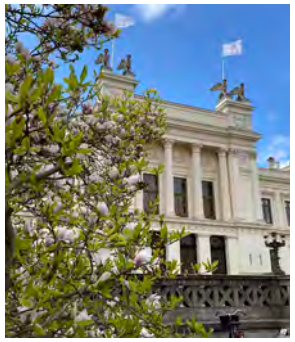

PHOTO: NEWS ØRESUND & KRISTIANSTAD UNIVERSITY

NUMEROUS HEALTHCARE EDUCATIONS IN SKÅNE

More than half of the approx. 8 500 students in the life sciences in Skåne in 2020 (full-time students in study programmes) were in a programme in the field of health, e.g. medicine, nursing, or dentistry.

Other programmes targeted the life science sector more directly, for instance educations for biomedical analysis, chemical civil engineering, bioengineering, medicine and engineering, as well as master's programmes in e.g. Biomedical Surface Science, molecular biology and pharmaceutical technology.

A total of 115 educational programmes in the life sciences were offered in 2020. These included programmes focused more directly on the life science sector or healthcare, as well as programmes with some applications or potential careers in the life science sector and programmes that feature the life sciences.

In addition to the programme educations, the universities offer hundreds of individual courses in the life sciences that are not included in the above figure.

PHOTO: NEWS ØRESUND

"CLOSELY CONNECTED"

PHOTO: NEWS ØRESUND

"Picking up on existing needs is rather easy; we are all quite closely connected here in Skåne. If a party feels that we should have more education in a particular area, there is every possibility to influence that via the meeting venues we have in place", says Kerstin Tham, vice-chancellor of Malmö University.

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Of the 20 subjects that generated half of Medicon Valley's scientific publications in life science research between 2006-2016, 15 were cited more frequently than the international average. This was revealed in a study by the Dutch research institute CWTS. The largest research areas are biochemistry and molecular biology; endocrinology and metabolism; oncology; and neurosciences.

THE EDUCATIONAL TRAINING ON OFFER CORRESPONDS WELL TO THE SECTOR'S NEEDS – BUT THERE IS MORE TO BE DONE

Around 7 500 people in Skåne are employed to research, develop, and produce medicines, healthcare solutions, and medical equipment in 426 life science companies identified in Skåne, most of which are in Malmö and Lund. This information was presented in the report "Life Science in Skåne", published by Øresundsinstituttet in 2020. The life science sector has experienced positive employment growth over the past five years, and according to the majority of the life science companies interviewed for the survey, the educational programmes on offer for the approximately 8 500 life science students in Skåne correspond to the industry's expertise requirements. Nonetheless, more focus on certain key skills such as automatization, more information, more contact with the industry and more individual courses may improve links between the industry and the educational sector.

Satisfaction with the education on offer – but more focus on e.g. automatization, digitalisation and regulatory affairs

The balance between the educational training on offer in the life sciences in Skåne and the needs for expertise in the life science industry is generally excellent, according to the 120 life science companies identified in Skåne. Confidence is thus pronounced that Skåne's educational system matches up with the expertise required by the expertise that the region's life science companies will require from the labour market in the future, according to the survey conducted by Øresundsinstituttet. Some from the sector believe however that the educational sector needs to focus more on industrial automatization, digitalisation, regulatory affairs, and quality assurance, as well as sales and marketing and entrepreneurship related to the life sciences. Entrepreneurship training is already offered at Lund University today as master's programmes that may be studied following undergraduate studies. Malmö University and LTH both divulge that digitalisation will be increasingly incorporated in all training programmes as time goes on. Read more on pages 30-34.

Demand for – and shortage of – expertise in STEM, regulatory affairs, and sales and marketing

Although the sector is generally confident that the educational training on offer in Skåne is pertinent, around every other life science company in Skåne had experienced challenges with recruitment according to the survey conducted by Øresundsinstituttet. The other half of the around 135 companies interviewed had not experienced recruiting difficulties, however; this indicates that recruitment difficulties may be experienced in extremely different ways from company to company. This may depend on e.g. the area within the life sciences in which the company in question is active and the resources that each company can dedicate to searching the labour market and attracting professionals regionally, nationally, or from abroad. According to the survey, the skills momentarily in demand by most life science companies in Skåne, regardless of subsector and company size, are also those in short supply: expertise in the STEM fields (Science, Technology, Engineering and Mathematics) and within the regulatory- and commercial fields. In other words, it may be difficult to recruit microbiologists, biostatisticians, clinical project managers, production technicians, regulatory experts, or salespeople with professional knowledge of the field. Read more on pages 14-15.

Numerous life science educations in Skåne directed at the industry – hands-on-trend

Many of the region's life science training programmes target healthcare, but many are also aimed at the life science sector. Examples include the civil engineering educations at LTH, in everything from chemical- and bioengineering to those focused on medicine and technology, training programmes for biomedical analysts, which are offered by Malmö University and Kristianstad University, and a biochemistry programme –one of many examples at Lund University's Faculty of Science. The medicine programme at Lund University also deserves mention, as it is common for individuals trained in medicine to work in e.g. pharmaceutical companies. In relation to the shortage of expertise mentioned by companies, LTH and Chalmers University of Technology in Gothenburg are the institutions in Sweden that offer education in process engineering, e.g. in the bioengineering programme. Students with this educational background are considered highly attractive on the labour market. LTH also offers a popular course in regulatory requirements and quality assurance. A current trend is the extremely high demand for 'hands-on people' capable of advanced tinkering – for example process engineers and process operators – but only few students apply for educations in these fields. For this reason, LTH has closed its three-year chemical engineering training; only the five-year programme remains. Read more on pages 32-33.

Educational institutions and students view industry links differently

LTH focuses heavily on contact between educational training and the industry. Lund University's Faculty of Medicine also has links to the industry, particularly for PhD students in biomedicine. Contact between learning institutions and the industry takes place via e.g. industry councils associated with educational programmes, career advisory centres, and guest lectures. LTH wants more systematic dialogue with the sector for expertise needs. Read more on pages 32-33. Despite various opportunities today, such as company internships and project courses in which companies participate in the course design as well as conduct teaching, life science students in Skåne feel that the contact between students and the industry is quite limited. The result is that students are frequently at a loss as to what the industry requires from them, according to the student organisation Synapse – Life Science Connect; see the interview on page 34-35. There is potentially an information gap between the opportunities students perceive for contact with companies during their studies and the opportunities that factually exist at the learning institutions. More coordination is necessary, according to LTH, and traditional educations, contract educations, and vocational colleges should be scrutinised to address the expertise shortage.

Educational programmes want to offer more freestanding courses

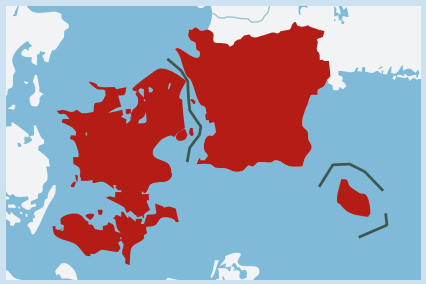
There is a pronounced trend for educational institutions to invest more in freestanding courses as a flexible component of and an important element in continuing professional development in the healthcare sector as well as in life science companies. The government has allotted more resources to learning institutions as part of the lifelong learning initiative, they report, and they are calling on companies to contact them to commission contract educations. These can be tailored to fit individual needs and give employees university credits. LU and LTH are both developing their course offerings and encouraging companies to make use of their contract educations to enhance their employees' skills. The sector is calling for more continuing education opportunities at universities. As starting new programme educations at learning institutions is a difficult process due to financial systems and because it takes a long time, more freestanding courses may be an alternative. Read more on pages 28-29.

Four strong research areas in Medicon Valley

A robust research environment is a must if a completely new educational programme is to be established. Research in the life sciences in the Danish-Swedish Medicon Valley cluster is excellent in an international context, as a 2018 survey conducted by the Dutch research institute CWTS at Leiden University showed. Medicon Valley's four main research areas in terms of the number of scientific publications are biochemistry and molecular biology, endocrinology and metabolism, oncology, and neuroscience. These research topics have traditionally been excellent in the region, and they are frequently showcased by the universities themselves. The links to companies in the region are also many, e.g. Novo Nordisk, Lundbeck and Genmab on the Danish side of the Øresund and Hansa Biopharma, Alligator Bioscience and Camurus on the Swedish shores.

MEDICON VALLEY EMPLOYS 50 000

The companies in the Danish-Swedish Medicon Valley cluster employ more than 50 000 people in the Øresund Region.



MEDICON VALLEY is the bi-national life science cluster spanning eastern Denmark (Region Zealand and the Capital Region of Denmark) and the Skåne region of southern Sweden. Today, the Danish-Swedish region is marketed internationally with the name 'Greater Copenhagen', and its increasing population has reached four million residents. In Sweden, the same geographical area is often called the Øresund Region'.

COMPANIES' EXPERTISE NEEDS

Shortage of expertise in STEM- and sales and marketing, and the demand for life science business activity in Skåne

Around 7 500 people are employed in the research, development and production of new medicines, health solutions and medical devices at the 426 life science businesses identified in Skåne. Ensuring the sector's access to the right employees is important for public health as well as the economy, as the sector has been highlighted as a commercial area of strength in Skåne with employment growth of around 25%, according to a survey of the sector by Øresundsinstituttet conducted between 2019-2020. The majority of Skåne's larger- and smaller scale life science businesses are located in Malmö and Lund, making the task of ensuring optimal access to employees especially important in those two cities. The expertise required by different areas in Skåne varies depending on company composition; generally speaking however, the natural sciences, technical, legal and commercial are the primary areas in which all subsectors of the identified life science companies in Skåne note a shortage of expertise and the need to recruit.

In the past five years, 426 private pharma-, biotech-, medtech- and contract research organisations identified in Skåne have grown from employing around 6 000 people to around 7 500, as detailed in the report Life Science in Skåne, published by Øresundsinstituttet in November 2020. The life science industry is in an expansion phase and has been highlighted as a regional strategical strength by Region Skåne; in addition, it has also demonstrated its robustness against fluctuations during the coronavirus pandemic – all of this makes securing the right expertise for the sector important.

"Today, Skåne's life science industry is concentrated around Malmö, Lund, and Helsingborg."

In general, the STEM disciplines (Science, Technology, Engineering and Mathematics) and in regulatory and commercial fields are the primary areas in which the identified life science companies in Skåne, regardless of subsector, see a shortage of expertise. These are also the areas in which the companies hope or expect to expand their staff, regardless of uncertainties related to Covid-19, according to the survey. In other words, it can be difficult to recruit microbiologists, biostatisticians, people with experience developing clinical projects, production technicians, regulatory experts, or sales people with professional knowledge of the field. 52% of 138 life science companies in Skåne to which Øresundsinstituttet spoke for this study report that they have not experienced difficulties recruiting specific expertise in Skåne. The remaining 48% report on the contrary that recruiting certain expertise has been a challenge.

Despite the shortage of expertise in certain areas for life science businesses in Skåne, around 90 of the 120 life science businesses in Skåne interviewed responded when asked that there is a good balance between the educational programmes in the life sciences on offer in Skåne and the expertise needs in the region's life science industry. Thus, when it comes to educational programmes on offer in the region being in concordance with the expertise required by the industry, there is pronounced satisfaction and confidence in the sector, according to some businesses. Read more on pages 14-15.

Today, Skåne's life science industry is concentrated around Malmö, Lund, and Helsingborg. With that said, most of Skåne's life science sector is focused in Malmö and Lund – the two main cities in the so-called MalmöLund Region. 341 of the 426 life science companies in Skåne were identified in the two urban centres when Øresundsinstituttet did a survey of the sector in 2019-2020. In addition, around 68% of the people employed in the life science companies identified in Skåne are in these two cities. Both cities have seen employment rise since 2015, but there has been particular growth in the companies identified in Malmö, which employ about 2 700 today. In Lund, around 2 400 work in the identified companies, compared to 2 000 in 2015. The task of ensuring that the life science companies in Skåne have access to the right, qualified employees is thus particularly significant for

decision-makers in the Malmö-Lund region, where no fewer than seven of Skåne's ten largest life science businesses are located. McNeil, HemoCue, Nolato, Atos Medical and Gelita are examples of other, larger scale life science companies with manufacturing facilities outside the Malmö-Lund region, where the task of securing the right expertise is also important.

As reported in the survey conducted by Øresundsinstittuttet, there may be differences in the expertise needed in different parts of Skåne, as each geographic area has its own different focus. Although both urban centres have university and incubation environments for the life sciences, the cities' life science environments differ. In Malmö for example, the companies are fewer, but larger; there is a strong representation of headquarters, national offices, and contract research and -manufacturing activities. Lund's profile has a stronger research orientation, with larger universities and science parks, and there are a greater number of smaller R&D companies and a prominent biotech subsector. Whilst the life science environment in Malmö and Lund spans more broadly across a variety of subsectors, in northwest Skåne, a smaller total number of life science companies focus primarily on

Medeon Science Park's new building in Malmö, Forskaren.

PHOTO: NEWS ØRESUND

medtech and pharma. Despite geographic variations, the overall situation based on the survey of businesses is that the natural sciences, technical, legal and commercial areas are the primary areas in which the identified life science companies in Skåne, in all subsectors, see a shortage of expertise, as stated earlier.

SEVEN RECOMMENDATIONS FROM THE INDUSTRY

1. STRENGTHEN PHARMACY EXPERTISE IN SKÅNE
Pharmaceutical professionals, who work with the research and development of pharmaceuticals or in pharmacies, must be recruited to Skåne, e.g. from the pharmacy practice school Pharmakon in Hillerød, Zealand, which admits around 260 students annually. This may be a challenge for life science companies in Skåne, not least due to the commuting distance. An educational shortage in this area is thus perceived in Skåne, although distance education from Skåne is possible according to the trade union the Swedish Pharmacists Association. The educational institutions are located in Uppsala, Gothenburg, Umeå and Kalmar. A new pharmacy programme was established at Malmö University in 2016, but admissions were halted in 2017 due to financing issues at the university.

2. STRENGTHEN VOCATIONAL EDUCATION ON OFFER – E.G. PROCESS OPERATOR TRAINING – AS MIDDLE-LENGTH PROGRAMMES
Professionals such as management operators and process operators with a medium-length vocational training specialised in pharma are important for the pharmaceutical industry, where production is becoming increasingly digitalised, automatized and complex. Companies report that professionals such as process operators with knowledge of automatization are in great demand in Skåne. Such production professionals receive training in e.g. Umeå and Lund.

3. BOOST EDUCATION PROGRAMMES AND COURSES IN REGULATORY AFFAIRS AND QUALITY ASSURANCE
Professionals with expertise and experience in regulatory affairs (RA) and quality assurance (QA) are in shortage in Skåne and in the Øresund Region in general, according to players from the sector, and rules for the life science industry have grown stricter in recent years with new EU regulations in 2021 and 2022. There is a shortage of courses on offer/education in RA and QA in Skåne, and these could both be offered as electives in university programmes or as independent courses or educational programmes, say some companies.

4. STRENGTHEN AUTOMATION AND DIGITALISATION EXPERTISE IN SKÅNE
Professionals with expertise in automation and digitalisation related to the life sciences and pharmaceutical development may be difficult to recruit in Skåne, according to people from the sector. Data software is becoming more important for accelerating the development of new medicines, and the coronavirus pandemic has shifted the formulation of new ways in which life science companies can e.g. test and connect with patients into overdrive; according to some companies, the foundation is already in place to increase education opportunities in these fields in Skåne.

5. COMBINE SALES, MARKETING AND ENTREPRENEURSHIP WITH LIFE SCIENCE EXPERTISE IN SKÅNE
Transdisciplinary profiles with an understanding of marketing, sales and entrepreneurship combined with a background in research or more general knowledge in the life sciences, e.g. pharmaceutical development, are in shortage in the region, according to numerous companies. The professional combination of sales, marketing and entrepreneurship and research/life science expertise could be strengthened on e.g. the university level; this is seen as able to commercialise academic research more, as well as further increase the specialisation of sales and marketing profiles in the companies. Efforts to commercialise research are already a reality, e.g. via the life science incubators SmiLe in Lund and BioInnovation Institute in Copenhagen.

6. BOOST CONTINUING EDUCATION OPPORTUNITIES IN SKÅNE
More semi-private continuing education opportunities for Skåne's life science professionals are in demand in the sector, although universities offer tailored programmes that can be designed to meet companies' wishes. In Zealand, Atrium offers courses and educational programmes in Copenhagen. Atrium is part of the Danish Association of the Pharmaceutical Industry. Pharmakon –Danish College of Pharmacy Practice in Hillerød is also a central actor in education and heads the pharmaconomy training programme. It is owned by the Association of Danish Pharmacies.

7. ESTABLISH A LEARNING- AND DEVELOPMENT CENTRE FOR STUDENTS AND THE INDUSTRY
Actors from the sector agree that universities in Skåne maintain a high level of professionalism, but establishing a semi-private learning centre in Skåne for life science students could offer advantages; among other things, STEM students could learn more about industry expectations, and students could begin developing the right practical competences during their studies, increasing life science students' familiarity with e.g. lab work. When interviewed for the 2021 State of Medicon Valley report, Novo Nordisk also pointed out that a learning- and development centre for e.g. test-, demo- and upscaling activities on the Danish shores of the Øresund could support greater collaboration between the industry and the health sector, where students could contribute solutions.

ABOUT THE RESULTS. From 2019-2020, Øresundsinstituttet communicated via e- mail, telephone, and surveys with ca 135 life science companies of various sizes and from different subsectors in Skåne for the report *Life Science in Skåne*. The aim was to generate new knowledge relevant to the labour force about the sector's regional expertise needs- and shortages. One aspect of plotting out this knowledge was also analysing how the private life science industry views the balance between the education on offer in Skåne in relation to the need for specific expertise in the industry. In other words: Does the educational system in Skåne match up with the expertise that the region's life science companies will need for the future labour force? The question is complex, and this mini-analysis develops the material gathered by Øresundsinstituttet between 2019-2020 to offer a response. While the results can neither be generalised nor considered comprehensive for the sector as a whole, they provide indications of how private players from the sector view the question and how regional and national initiatives can be utilised to strengthen one of Skåne's commercial positions of strength. Three out of four life science companies in Skåne deem that the educational programmes on offer correspond well with the demands for expertise in the regional life science industry, while approximately 30 companies believe that the conditions could be improved. Øresundsinstituttet collected qualitative elaborations on this from around half of these companies. For reasons of confidentiality in the surveys, identifying features about the companies have been removed.

Life science survey offers five insights on expertise needs and -shortages in Skåne

The areas of expertise for which life science companies in Skåne consider it difficult to recruit are predominantly related to the STEM disciplines (Science, Technology, Engineering and Mathematics). Companies report that expertise in regulatory affairs and quality assurance, as well as in sales and marketing, also pose a recruitment challenge. This is one of the five main conclusions about expertise needs and -shortages that can be drawn from Øresundinstituttet's mapping out of the life science sector in Skåne in 2019-2020. The results that follow are extracted from the report Life Science in Skåne, published in November 2020.

Recruitment needs greatest in R&D and sales and marketing

Of the various potential areas for recruitment, the majority of the 126 life science companies that responded to this question would like to recruit more personnel with scientific expertise and skills in sales and marketing. That indicates that more personnel with a background in the natural sciences would promote and further the companies' development. The companies' central intention to recruit within sales and marketing also indicates that more companies are now in a position in which their research has matured and their clinical development has advanced and is ready to be translated into a commercial business.

Unmistakable satisfaction with the educational programmes on offer in Skåne – but there is room for improvement

According to around 90 of the 120 life science companies surveyed in Skåne that responded to this question, there is a very good balance between the education in the life sciences on offer in Skåne and the expertise needs in the regional life science industry. Around 30 companies state however that a number of initiatives could improve this correspondence). Read more on page 15.

Around every other life science company faces recruitment challenges

52% of the 138 life science companies that responded to this question in the survey report that they have not experienced difficulties recruiting specific expertise in Skåne (Table 15). Around 48% of the businesses interviewed report that recruiting certain expertise has been a challenge. Around every second life science company in Skåne has thus experienced or faces relative difficulties recruiting specific expertise to their businesses.

Shortage of STEM expertise and in legal and commercial areas

Regardless of subsector, the expertise that life science businesses in Skåne deem to be in short supply is related to the STEM programmes (Science, Technology, Engineering and Mathematics) and legal and commercial areas. In other words, certain natural science profiles such as microbiologists, data managers, programmers, clinical project managers, regulatory experts, researchers with business development expertise or salespeople with specific professional knowledge can be difficult to recruit, according to life science companies and others active in the sector. Thus, the expertise and professional profiles that Skåne's private life science sector would like to recruit more extensively are the same as the expertise and professional profiles in short supply.

Increasing employment in all subsectors and regions in Skåne

More than half of the life science companies in Skåne have increased their number of employees in the past five years. This information is based on data gathered on 402 of the 426 life science companies identified. The positive employment development between 2015-2020 is seen in all subsectors in the life sciences in Skåne, independently of geography. Around 7 500 people are thus employed by the life science companies according to the most recent figures available. The rise in employment corresponds to ca 25% as compared to 2015, when approx. 6 000 people were employed in the life science companies surveyed.

THE COMPANIES PLAN TO RECRUIT IN THESE AREAS

Area for recruitment	Number of companies
R&D	65
Sales	50
Marketing	31
Laboratory	31
Production	21
IT and Technology	16
Regulatory Affairs	15
Economy	14
Storage and logistics	12
Communications	11

MEDTECH
- R&D
- Sales
- Marketing

BIOTECH
- R&D
- Laboratory
- Marketing

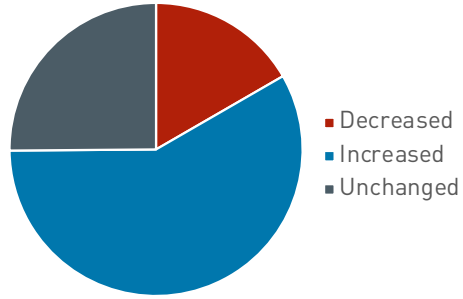
PHARMA
- R&D
- Sales
- Laboratory

Source: Questionnaire with 126 respondents from life science companies in Skåne. Responses in multiple categories were possible.

METHOD

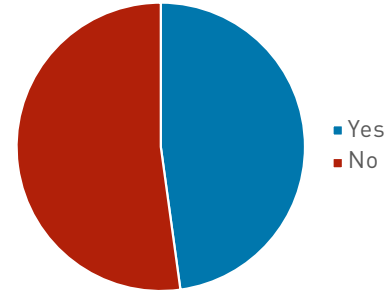
All of the life science companies in the core segment in Skåne – comprising pharma-, biotech-, medtech companies and contract research and manufacturing organisations – were contacted via telephone between late 2019 and the summer of 2020. Companies with the greatest number of employees were prioritised first. 126 life science companies in Skåne with varying staff sizes contributed input specifically for the survey of expertise: 23 pharma companies, 43 biotech companies, 48 medtech companies and 21 contract research and/or manufacturing organisations. Around 120-140 life science companies in Skåne responded to other questions in the survey conducted by Øresundsinstituttet.

CHANGE IN THE COMPANIES' EMPLOYEE NUMBERS SINCE 2015



Based on data from 402 companies. Source: Bisnode, data from the companies

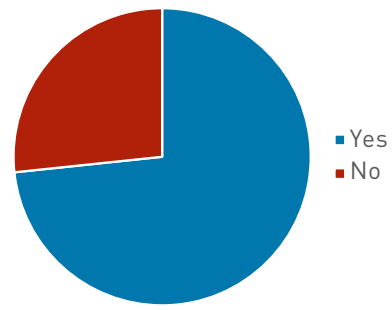
IS IT DIFFICULT TO RECRUIT SPECIFIC EXPERTISE?



Based on survey responses from 138 companies.

PHOTO: NEWS ØRESUND

DO TRAINING AND EDUCATION CORRESPOND WELL TO THE DEMAND FOR EXPERTISE?



Based on survey responses from 120 companies.

Important to increase knowledge of e.g. automation, digitalisation and entrepreneurship

A good research environment, a high level of education, and good infrastructure: these are factors that the majority of the life science companies interviewed by Øresundsinstituttet between 2019-2020 consider valuable in Skåne. When it comes to future required expertise, various efforts will be necessary to strengthen the climate in the sector. Greater focus on the educational system for industrial automation, digitalisation, regulatory affairs, quality assurance, sales and marketing and entrepreneurship is important, according to a number of players from the sector and industry leaders.

POLYPEPTIDE. The rapidly growing contract manufacturer **PolyPeptide Laboratories** employs around 300 people and is one of Malmö's largest life science businesses. As the company triples its manufacturing capacity in Malmö in the coming years, it will be decisive to bring to the company expertise in the core business of peptide chemistry in conjunction with process technology, digital platforms, and automation. The only challenge is that the automation and digital competences utilised in conjunction with fundamental knowledge of pharmaceutical production are in shortage in Skåne, as Global HR Director **Jacob Nilsson** stated in the report *Life Science in Skåne*.

FOTO: POLYPEPTIDE GROUP

– We have a need for more process knowledge, which means chemists and engineers with talent for processes and automation. Recruiting chemists is easy enough, but people who know automation and Manufacturing Execution Systems are more difficult. There are a lot of companies fighting over them.

FOTO: NEWS ØRESUND

NOVO NORDISK. **Novo Nordisk Scandinavia** in Malmö is part of the Danish diabetes concern and employs around 17 000 people in Medicon Valley and about 100 at its Swedish offices in Malmö, and has a need for employees with sales and marketing expertise who can both understand and navigate among the regional and national decision-makers at hospitals and within the political system in Sweden. According to Country Manager **Niels Abel Bonde** in the report *Life Science in Skåne*:

– It's more than sales and marketing personnel. Our potential growth area as I see it is in government affairs and related to obesity. [What's needed is] people who can work with those responsible for making decisions in Swedish society or in the Swedish healthcare system on a national or regional level.

– We're aiming to move toward greater insight into the Swedish health care system, so we can grow from focusing only on our products to becoming a part of the healthcare system and being in a position to help with improved diabetes treatments in Sweden. And there's more to it than just knowing your insulin well – understanding the healthcare system within which you're working is also important.

FOTO: POOLIA

POOLIA. Medicon Valley has a shortage of expertise in quality assurance (QA) and regulatory affairs (RA) – fields in which life science companies' employees ensure that medical equipment and pharmaceuticals fulfil the safety and efficacy requirements set out by authorities. One reason for the deficit is the tightened legal requirements in the life science sector due to new EU regulations in 2021 and 2022, as **Anders Marcusson**, manager of the Swedish recruitment agency **Poolia Life Science & Engineering**, stated in the report *Life Science Across the Øresund*.

– We are seeing a shortage of expertise in QA and RA in general. This is not specific to Skåne; it's being seen in the sector as a whole. There are also challenges being faced in areas in which the borders are blurred between the life sciences and IT, as they often demand more senior expertise with complex, cross functional knowledge that has not yet matured, as many of the functions are relatively new.

ALBRIGHT PARTNERS. Covid-19 has accelerated the need for more digital development expertise in the life science sector, as there has been an increase in life science businesses' focus on e.g. conducting decentralised clinical studies, in which patients can participate digitally rather than physically reporting to a hospital. As **Henrik Brabrand**, CEO of the recruitment agency **Albright Partners** in Copenhagen put it in the report *Life Science Across the Øresund*:

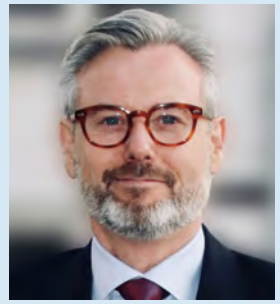


FOTO: ALBRIGHT PARTNERS

– Digitalisation is happening on all platforms, all over the value chain and in development processes, and a lot of that experience is outside Denmark's national borders. There is a huge shift toward digitalisation. We still have a way to go in Denmark.

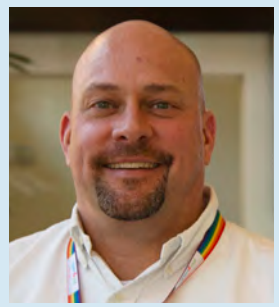


FOTO: NEWS ØRESUND

MCNEIL. The production facility of Skåne's largest medicinal company, **McNeil**, in Helsingborg employs around 850 people in Medicon Valley and has become increasingly automatized as its production volume has increased. The company thus has a particular need for people who understand and can implement technical solutions for problems in the process, as CEO **Jody Lodge** said in the report *Life Science in Skåne*.

– Looking toward the future, we see more technology involving more robots and automatization than what we use today. The need for employees who can support that technology will still exist in the future. That's not to say we don't have that technology now; it means that we'll be putting more focus on it.

FOTO: NEWS ØRESUND

ASGARD THERAPEUTICS. According to **Fábio Rosa**, co-founder of Lund-based biotech company **Asgard Therapeutics** – which has received funding from Swedish and Danish investors and been part of incubation activities at the Novo Nordisk Foundation-supported BioInnovation Institute in Copenhagen and SmiLe Incubator in Lund – Skåne has the potential to promote research and innovation of early-stage technologies by increasing researchers' entrepreneurial knowledge aimed at technology commercialization, and knowledge of market analysis and other important aspects of innovation. In the report *Life Science in Skåne*, he said:

FOTO: NEWS ØRESUND

– A programme that stimulates this type of entrepreneurial thinking would greatly benefit innovation-related economic growth in Skåne.

FOTO: NEWS ØRESUND

ARJO. Generally speaking, the publicly traded medical devices company **Arjo**, which produces equipment for hospitals and employs around 200 people at its global headquarters in Malmö and another 6 200 around the globe, has not had significant problems recruiting in Malmö. Many employees commute to the company from Denmark and other parts of Skåne. Nonetheless, in terms of education, there is potential in going over the education on offer regionally in Skåne in regulatory affairs, as **Joacim Lindoff** said in the report *Life Science in Skåne*.

– One thing that's still missing is education in the regulatory aspects, either as independent training or as a complement to e.g. engineer training programmes. While I'm not exactly sure how things are nowadays, I think that venturing out and investing more in that aspect could lead to an even better foundation.

MORE THAN 900 BORDER COMMUTERS

The life science sector's labour force moves back and forth across the Øresund Region. A total of over 900 border commuters were identified in the region. At least 800 people commute from Skåne to work at life science companies in Zealand. At least 100 commuters from Zealand were identified as working in the life science sector in Skåne. These figures are the result of extensive contact between Øresundsinstituttet and the companies between 2020-2021. One often hears about highly educated workers who are active across the Øresund. Novo Nordisk is the Medicon Valley company with the largest number of border commuters. 200 people travel from Sweden across the Øresund to work at the company in Denmark.

The study was conducted for the report *Life Science Across the Øresund*, which was presented in June 2021 by Øresundsinstituttet.

PHOTO: NEWS ØRESUND

Examples of life science companies in Zealand with border commuters from Sweden	Number of border commuters from Sweden
Novo Nordisk A/S	206
Ferring Pharmaceuticals A/S	110
LEO Pharma A/S	66
H. Lundbeck A/S	40-45

+20

At least 20 Danish CEOs/managing directors work in large, medium-sized and small life science companies in Skåne. The number of Danish directors has risen since 2017.

Søren Bregenholt, new CEO of Alligator Bioscience in Lund.

Simon Østergaard, new CEO of CellaVision in Lund.

PHOTO: NEWS ØRESUND & CELLAVISION

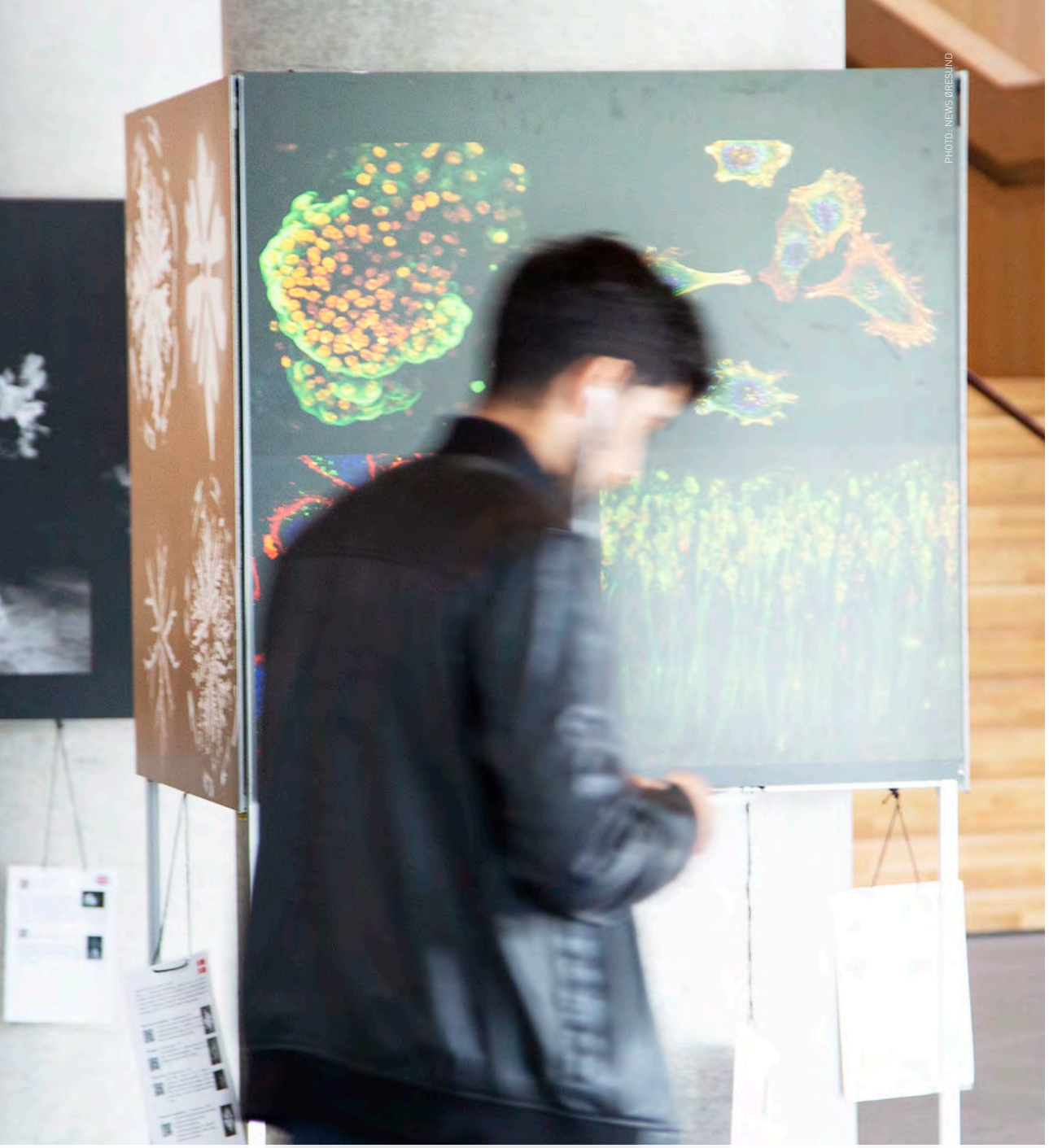
CORONAVIRUS PANDEMIC GIVES BORDER COMMUTERS TAX HEADACHES.

Working more from home due to the pandemic is making it difficult for border commuters – in the life science and other sectors – to fulfil the requirement of working at least half of the time in their country of employment. This has created extra administration and additional costs for companies and could also mean that border commuters may be hit with back taxes.

MORE FOREIGN CEOS IN ZEALAND

Around three-fourths of the life science companies that are listed in Sweden and have headquarters or manufacturing facilities in Skåne are headed by Swedish CEOs. In Denmark however, around two-thirds the life science companies with headquarters and listings in Denmark are headed by Danish CEOs. The share of foreign CEOs in the segment is thus larger in Denmark than in Skåne. Larger, listed Danish companies such as Novozymes, H. Lundbeck, Zealand Pharma, Orphazyme and Ambu for example have recruited chief executives from abroad in the past five years.

PHOTO: NEWS ØRESUND



EDUCATION

Nearly 120 educations are linked to the life sciences

Education is central to providing expertise within Skåne's life science sector. In many cases, Skåne's life science educations have numerous points of contact with the industry, allowing for example dialogue on expertise needs and showing students different career possibilities. One current trend within education is a greater focus on freestanding courses; this is part of the government's focus on lifelong learning. According to many of the representatives of the region's seats of learning interviewed for this report, this will enable more flexibility in continuing professional development and play an important role in the seats of learnings' capacity to adapt to rapid changes in the labour market.

117 different bachelor- and master's educations in Skåne are completely or partially situated in the life sciences, and in 2020 there were a total of 8 500 full-time students in the life sciences in the region; this figure does not include students studying single courses. Lund University educates the greatest number of people in the life sciences, but life science programmes are also offered at Malmö University, SLU in Alnarp and Kristianstad University. Many of the region's life science programmes target healthcare, for instance the professional educations and trainings offered at Malmö University, Lund University, and Kristianstad University. These institutions train the healthcare personnel of the future: doctors, nurses, occupational therapists and more. Naturally, there are more contact points with the healthcare sector than with the industry within those educations.

Dialogue with the healthcare sector is highlighted as decisive for how many students can be trained in these fields in the region, as a large part of the education is spent in practical placements, meaning that there need to be opportunities to receive students within care, says Maria Björkqvist, vice dean of the Faculty of Medicine at Lund University. The number of students that can be admitted to profession education- and training programmes, e.g., the medicine and nursing programmes at Lund University, Malmö University, and Kristianstad University, are also determined by the government.

At LTH School of Engineering the focus is more on industry, and many of the students who complete an education in one of the many programmes linked to the life sciences go on to work in the life science industry; examples are the Master's of Science in Engineering programmes in medicine, engineering, and biotech. When it comes to designing educational programmes, LTH is not restrained by the same limitations as other seats of learning, since it does not operate within the same government tasks as the professional education- and training programmes do, and it makes its own decisions about where to invest resources.

In interviews with Malmö University and Lund University, it emerged that universities have various types and points of contact. This has been highlighted as important if these seats of learning are to fulfil the industry's needs for expertise, as well as to show students possible career paths and what will be expected of them in the labour market. This is facilitated by e.g. career centres, sector councils linked to individual educations, guest lecturers, educational visits and diploma projects in collaboration with companies. There is also a demand for more exchange between academia and the industry: the Danish-Swedish student organisation Synapse – Life Science Connect offered a response to the question of what would be required to improve the educational system in the life sciences in Skåne:

– Although we are seeing a positive development within many programmes, offering courses with industry contact and an increased focus on the transition between student life and your first job, there is still a long way to go. The contact between students and the industry is quite limited, says Malavika Sreekumar Nair, who heads Synapse's activities in Sweden from Lund.

Introducing new programmes is a lengthy process for learning institutions, and the vice-chancellor of Malmö University Kerstin Tham points out that it can also be difficult economically as contributions from the state primarily target existing educational programmes. The pandemic has hastened the development of freestanding courses however, as the government has designated more funds for learning institutions as part of the lifelong learning initiative. Several interviewees pointed out that freestanding courses are an important and adaptable way of meeting the frequently changing needs of the industry and healthcare in the future.

Learning institutions are also calling on companies to contact them for contract educations at a cost, which can be bespoke and in which employees can earn university credits. It is common for the healthcare sector to request contract educations at Lund University's Faculty of Medicine, while LTH has primarily provided them to the food industry.

PHOTO: NEWS ØRESUND

LIFE SCIENCE EDUCATIONS IN SKÅNE

In 2020, approximately 8 500 students studied one of the programme educations in or related to the life sciences offered by learning institutions in Skåne. These educations – listed below – were at Lund University, Malmö University, Swedish University of Agricultural Sciences in Alnarp and Kristianstad University.

Colour key:

- Probable: career in the life science- or health sector
- Some applications or career opportunies in the life sciences
- Programme includes life science elements

Lund University	Programme	Number of students
Faculty of Medicine	Advanced level training for nurses	186
	Audiology	55
	Biomedicine	109
	Medicine	1 358
	Nursing	513
	Occupational therapy	181
	Physical therapy	217
	Radiography	102
	Speech therapy	112
	Biomedicine – Master's programme	53
	Medical Science – Master's Programme	45
	Public Health – Master's programme	83
Faculty of Science	Biology – Bachelor of Science	76
	Chemistry – Bachelor of Science	52
	Chemistry/Molecular biology – Bachelor of Science	23
	Molecular biology – Bachelor of Science	70
	Bioinformatics - Master's programme	25
	Biology – Animal ecology - Master's programme	16
	Biology – Conservation biology - Master's programme	24
	Biology – Plant science – Master's programme	7
	Biology, Aquatic ecology - Master's programme	8
	Biology, general - Master's programme	19
	Biotechnology, Master's programme	34
	Chemistry – Biochemistry – Master's programme	4
	Chemistry – Synthetic and analytical chemistry – Master's programme	8
	Food technology and nutrition, Master's programme	43
	Molecular biology – Medical biology – Master's programme	20
	Molecular biology – Microbiology - Master's programme	19
	Molecular biology, general – Master's programme	15
	Molecular biology, Molecular genetics and biotechnics - Master's programme	18
	Nanoscience – Master's programme	2
	Pharmaceutical technology: Research, development and production – Master's programme	4
	Physics – Biological physics and computational biology - Master's Programme	4
	Hospital physicist	42
	Chemistry – Physical chemistry – Master's programme	2
	Mathematical statistics – Master's programme	4
	Mathematics – Bachelor of Science	112
	Mathematics – Master's programme	18
	Physics – Bachelor of Science	119
	Physics – Materials science – Master's programme	4
	Physics – Particle physics – Master's programme	2
	Physics – X-ray and neutron science – Master's programme	n/a
	Physics, general – Master's programme	n/a
	Theoretical physics – Bachelor of Science	35
	Applied climate strategy – Master's programme	49
	Environment and health protection – Bachelor of Science	12
	Environmental changes at higher altitudes (EnCHiL)	Started in 2021
	Environmental science – Bachelor of Science	52
	Environmental science, chemical environmental hazards and ecotoxicology – Master's programme	25
	Environmental science – Nature conservation – Master's programme	3
	Environmental science – Soil conservation - Master's programme	n/a
	Environmental science – Strategic environmental development - Master's programme	13

Selection and colour coding:
These programmes were selected based on information provided on the websites of the seats of learning. Data on the number of students was provided by the universities. Undergraduate programmes were included in some cases as their higher-level programmes potentially focus on the life sciences. The colour coding showing the relationship of the education to the life sciences was done during the analysis phase to render the list of educations more accessible and to show why particular educations were included in the list. It is schematic, and an education may belong to multiple categories.

Sources: Lund University, Malmö University, SLU in Alnarp and Kristianstad University

PHOTO: NEWS ØRESUND

Lund University

Lund University	Programme	Number of students
Faculty of Engineering LTH	Biotechnology – Master of Engineering	272
	Chemical engineering – Master of Engineering	211
	Medicine and engineering – Master of Engineering	202
	Biotechnology, Master's programme	34
	Food technology and nutrition, Master's programme	43
	Pharmaceutical technology: Research, development and production – Master's programme	4
	Nanoscience – Master's programme	2
	Computer technology – Bachelor of Science in Engineering	n/a
	Food technology – Bachelor	n/a
	Industrial Electrical Engineering and Automation – Bachelor of Science in Engineering	n/a
	EIT Master in food systems	n/a
	Engineering mathematics – Master of Engineering	n/a
	Engineering physics – Master of Engineering	n/a
	Mechanical engineering – technical design – Master of Engineering	n/a
	Nanoscience – Master of Engineering	n/a
	Phototonics, Master's programme	n/a
	Civilingenjörsutbildning i Ecosystem technology – Master of Engineering	n/a
	Computer technology – Master of Engineering	n/a
	Industrial electrical engineering – Master of Engineering	n/a

PHOTO: NEWS ØRESUND

Malmö University

Malmö University	Programme	Number of students
	Nursing programme	676
	Biomedical analysis	154
	Dental technician	82
	Dentistry	336
	Sport science: Physical activity and health	75
	Nursing specialisation, elder care	10
	Nursing specialisation, paediatric- and juvenile healthcare	30
	Nursing specialisation, psychiatric care	26
	Biomedical Surface Science, two-year Master's programme	13
	Health care – Master's programme	34
	Sexology, Master's programme	81
	Computer Science: Applied Data Science	49
	Mechanical- and material engineering – Bachelor of Science	79
	Computational materials science, two-year Master's programme	10
	Environmental science programme – Humans, society and the environment	147
	Sport science: Sport in society, two-year Master's programme	22

PHOTO: SLU - JENNY SVENNÅS-GILLNER

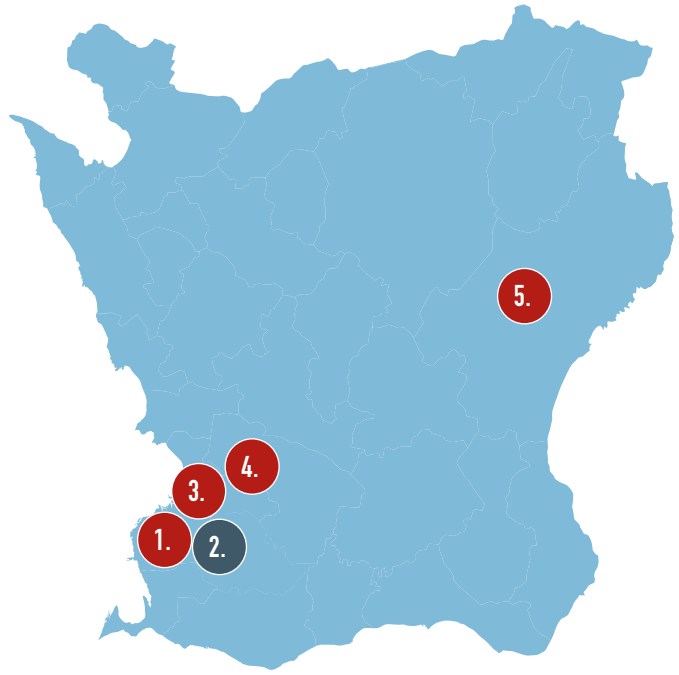
The Swedish University of Agricultural Sciences in Alnarp

Swedish University of Agricultural Sciences in Alnarp	Programme	Number of students
	Outdoor environments for health and well-being – Master's programme	87
	Farm foreman – Bachelor programme	1
	Farm foreman – Bachelor programme	152
	Forest officer	51
	Forest warden	1
	Forestry with multiple objectives	2
	Horticulture	30
	Landscape engineer programme – Design	1
	Landscape engineer: Cultivation – Bachelor programme	206
	Landscape engineer: Design – Bachelor programme	87
	Agroecology - Master's programme	48
	Euroforester - Master's programme	30
	European Master in Sustainable Forest and Nature Management, year 2	1
	Horticultural Science - Master's programme	30
	Plant Biology for Sustainable Production – Master's programme	16
	Sustainable Food Systems - Master's programme	3

Kristianstad University	Programme	Number of students
	Biomedical laboratory science programme – Bachelor	102
	Dental hygienist programme	34
	Nursing programme	583
	Public health and health promotion with specialization in behavioral science	27
	Supplementary training for biomedical laboratory scientists with degrees from abroad	14
	Integrated health science – Master's programme	25
	Environmental strategist – Soil, water and urban development	58
	Gastronomy	72
	Landscape science	56
	Water- and wastewater engineering programme	33

UNIVERSITIES, REGIONS AND RESEARCH INSTITUTIONS

The largest scientific institution in the life sciences in Skåne in terms of research as well as student numbers is Lund University. Many researchers are also employed at hospitals by Region Skåne. Life science research is also conducted at Malmö University, Swedish University of Agricultural Sciences in Alnarp, and Kristianstad University.



Universities

Regions

Source: The universities' and research institutions' own numbers.
Life science researchers include professors, associate professors, lecturers, post docs, doctoral students, etc. See footnotes in the Appendix for more information about the figures.
* Researchers at the hospitals in the region often conduct research part-time. Some of the researchers at the hospitals also have part-time positions at the universities in the region.

From State of Medicon Valley 2021. Data on the number of students is new for this analysis.

PHOTO: NEWS ØRESUND

1. MALMÖ UNIVERSITY

Life science researchers: 226
of which professors: 33
of which doctoral students: 99
Life science students: 1 824

PHOTO: NEWS ØRESUND

2. REGION SKÅNE*

Life science researchers: ca 1 800
of which professors: 108
of which doctoral students: 776
Life science students: -

PHOTO: NEWS ØRESUND

3. THE SWEDISH UNIVERSITY OF AGRICULTURAL SCIENCE IN ALNARP

Life science researchers: 210
of which professors: 20
of which doctoral students: 74
Life science students: 746

PHOTO: NEWS ØRESUND

4. LUND UNIVERSITY

Life science researchers:
1 546
of which professors: 243
of which doctoral students: 466
Life science students: 4 764

PHOTO: KRISTIANSTAD UNIVERSITY

5. KRISTIANSTAD UNIVERSITY

Life science researchers: 70
of which professors: 20
of which doctoral students: 14
Life science students: 1 005

“Long-term investments in freestanding courses can make us an important presence in the life science sector”

Lund University’s Faculty of Medicine trains the health care personnel and the biomedical professionals of the future. Government assignments largely determine the form of professional education and training, leaving little room for the faculties themselves to make modifications. During the pandemic however, the university received increased funding to invest more in freestanding courses; Vice Dean Maria Björkqvist sees this as an opportunity to contribute more to industry as well as to healthcare for future labour market needs.

Doctor, nurse, occupational therapist, physical therapist, audiologist, speech therapist and radiologist. These are the seven professional educations and trainings offered at Lund University’s Faculty of Medicine. All of them include a practical placement period in a municipality and at the region’s hospitals. Lund University has very little leeway when it comes to how the educational programmes should be designed, in part because the number of places in the programme is subject to regulation directions, and in part because it depends on how many placements are available.

Maria Björkqvist is the vice dean of the Faculty of Medicine and also responsible for education at the faculty. She says that there is continuous dialogue with Region Skåne, Skåne University Hospital and the municipalities.

– Clinical activities are what determines how many students we can admit to the programmes. We are continuously in discussion and try to align our educational programmes and the healthcare sector, she says.

Through dialogue with the different parties involved, the faculty also strives to meet the need for healthcare personnel in the future, and according to Maria Björkqvist, efforts are being made to increase the number of students in the physical- and occupational therapy programmes.

– We’d like to be able to augment those two professional groups to meet the demands brought by the ageing population, she says.

More flexibility and industry focus in biomedicine training

There is also a biomedicine programme at the faculty, at the undergraduate as well as master’s levels, and students frequently go on to life science companies or university research. As it is not a professional education that targets the healthcare sector, the faculty has greater opportunities to modify it according to their own wishes.

– We just made English the programme’s official language, for example, and we’ve seen tremendous student interest, so we’ve opened up for more places in the programme, says Maria Björkqvist, emphasising that they always try to adapt to the labour market’s needs.

There is a career centre at the Faculty of Medicine for students planning to go into the industry and those who plan to continue with university research. Doctoral students are its primary target group. There are also various points of contact interwoven in the biomedicine education, for example via company representatives holding lectures and in diploma projects.

– We train incredibly many research students, and not all of them can continue in academia. We need to show career paths outside the university as well, says Maria Björkqvist.

Structural changes hastened by the pandemic

Because of the pandemic, the Faculty of Medicine had no choice but to make changes faster than they had ever thought possible, Maria Björkqvist says. As part of the government’s labour market-political efforts, national seats of learning received money to make more investments in lifelong learning, for example with freestanding courses.

Maria Björkqvist says that a new freestanding course can usually be designed in half a year, and a new education may take years to establish. During the pandemic however, the faculty designed a contract education in acute respiratory support in two weeks for healthcare personnel working with covid patients.

The investments in more freestanding courses came quickly, and the pandemic has meant that the faculty has worked hard to help healthcare in every way possible, so they have not yet had an opportunity to closely analyse and evaluate which courses are needed most.

– Since it all happened so quickly, we had to reach out to teachers and employees and ask whether they had suggestions for freestanding courses, and we carried out the courses where the student interest was greatest. Now we’re back in a calmer phase and can do evaluations, says Maria Björkqvist.

Hoping for news on continued funding for long-term investment

Maria Björkqvist believes that freestanding courses as a complement to other educations are here to stay, both in basic and advanced level training. It is uncertain however whether the resources for them will continue to be allotted after 2022, she says.

– To make a proper effort, the government needs to confirm that the resources are permanent. If so, I believe that we can become an important character for the life science sector, and that parties will, after dialogue with us, be able to request education and training. The freestanding courses could then help us make contributions to the labour market in a variety of ways, and we would be able to adapt more quickly to the needs of the industry.

Already today, the healthcare sector and companies have opportunities to give their personnel additional training by purchasing contract educations from the Faculty of Medicine. According to Maria Björkqvist, it is extremely common for them to offer contract educations to the healthcare sector, but relatively rare that companies contact them.

– Perhaps companies don’t really know what kinds of opportunities are available when it comes to further education. When a company purchases a contract education from us, it can offer that same course to all of its employees and to an extent even decide when it should be held.

PHOTO: LUND UNIVERSITY

PHOTO: NEWS ØRESUND

Malmö University's vice-chancellor: Difficult to procure funding for new educational programmes

Malmö University's life science programmes generally lead to the public sector rather than to private industry. According to the university's vice-chancellor Kerstin Tham however, there are good possibilities to create tailor-made programmes, if companies desire. Starting up new undergrad programmes is more difficult due to the structure of the funding system, she says, but she is still hoping that the university will be able to reopen the pharmacy technician programme, which has been put on hold because of insufficient resources.

The pharmacy technician education at Malmö University was started in 2016 and attracted many applicants, but admissions were halted after just one year. According to Kerstin Tham, the programme – which gives graduates expertise to work in pharmacies or e.g. in pharmaceutical companies – was a success in many respects, but the funding was simply not sufficient.

– Starting up the programme went very well; students were interested, and we have excellent research in the subject area, but in the end, we had to stop admitting students because the department didn't have enough resources.

The lacking funds were the result of difficulties procuring state funding to start new educational programmes, Kerstin Tham says.

– Getting new resources is incredibly difficult; instead, we have to redistribute those we have. Then we have to reprioritise funds, which can be hard because the departments are independent and they distribute their resources internally. However, we are going to try to start up in the field again; not only is it something society truly needs, but we also have strong research that influences educational quality positively, she says.

While there is no concrete schedule in place today, according to Kerstin Tham discussions are being held at the Health and Society department.

A long tradition of collaboration

Among the programmes currently on offer at Malmö University, odontology, biomedical science, and nursing are some of the subjects most firmly in the life sciences. These areas generally lead toward work within the public sector and healthcare rather than in the private life science sector. The university's educational profile is largely the same as it was when Malmö University was founded – when it still was officially a college and had not been granted university status – as many of the programmes that were offered by Lund University but located in Malmö moved to the newly founded college.

The interdisciplinarity of that era also lives on and is important for Malmö University and its aim to closely link education and research to societal needs. One of the university's five multi-disciplinary research centres is Biofilms and Biointerfaces, which brings together around a hundred researchers involved in biomedicine and odontology, but also engineering.

Industry encounters in councils and organisations

Kerstin Tham mentions that she is on numerous advisory boards in which expertise in healthcare and the life sciences is a topic of discussion, for example the Swedish government's National Health Competence Council and the Research and Innovation Council of Skåne, Firs.

But there are also spaces in which the university can tune into the private life science sector's needs, she says, for example via the trade association Medicon Valley Alliance, Firs, and Malmö's science park Medeon.

– Picking up on existing needs is rather easy; we are all quite closely connected here in Skåne. If a party feels that we should have more education in a particular area, there is every possibility to influence that via the meeting venues we have in place, says Kerstin Tham.

As she sees it, shorter courses could be a good way to help people and companies with the additional training needed to deal with various changes in society. She uses digitalisation and AI as examples of areas in which seats of learning should play an important role by steering their educational programmes in that direction.

– With all of the societal shifts today, we need more engineers, and we need digitalisation expertise in all areas, says Kerstin Tham.

– We're very dependent on educational programmes now, but we'd like to free up more space for more specialised, five-week courses where we do research that is relevant for society and where there may be a need for knowledge in different areas, she continues.

Work on that is already underway, she says, since the university received new government funding for courses within the scope of lifelong learning.

Belief in contract educations

"We'd like to see companies that perhaps get together and order training programmes and finance them together."

Kerstin Tham points out however that not all training capacity can be redirected to areas like technology, healthcare, and other life sciences.

– We have a great deal of social sciences interspersed at Malmö University, for example in human rights, global political studies, and in the humanities. That educational training is not offered as a clear-cut professional education, but it imparts knowledge that society also needs. There is of course an important question that needs to be asked: how many doctors, nurses, etc should we train relative to the other subject areas? Society needs both knowledge and education.

Kerstin Tham believes that the number of tailor-made educational training programmes will increase in the future, and she would like to emphasise that companies have the possibility to contact the university themselves if they have specific wishes, for example in the life sciences.

– We'd like to see companies that perhaps get together and order training programmes and finance them together. The possibility exists, and the training can be bespoke, and the company's employees can earn university credits that will enrich their CVs, she says.

Contact points with the industry a major focus for LTH – but more systematic dialogue is sought on expertise issues

LTH School of Engineering (LTH) offers educational training that includes many of the areas of expertise sought by Skåne's life science companies, including process engineering, digitalisation, and economy. The educational training offered depends on many factors, both internal and external, and the content is adapted continuously as new research emerges – this is particularly true in bioengineering, which has now developed to become an independent field. There are contact points with the industry on various levels – but LTH's Vice Dean Kristofer Modig would like to see more systematic dialogue with companies when it comes to the issue of expertise specifically.

There are ten Masters of Engineering programmes at LTH School of Engineering today and almost as many master's programmes, as well as a number of Bachelors of Science in Engineering training programmes linked to the life sciences. Among them are Masters of Engineering programmes in bioengineering, medicine, and engineering, as well as a master's in pharmaceutical technology.

Vice dean of LTH Kristofer Modig and bioengineering lecturer Carl Grey say that the same basic educations have been offered for quite a long time, but the offering also varies over time as the fields themselves change.

– The educations on offer change gradually depending on many different factors; for example, new and interesting areas emerge, and things tend to become narrower and broader at the same time. As an example, chemical engineering was split into bioengineering and chemical engineering in the early 2000s, when bioengineering had grown to become an independent field. Biomedical engineering also developed from electro-engineering as the need grew for engineers with medical engineering knowledge.

When it comes to the master's educations offered, things work a bit differently.

– In that case it's important that we see a niche that indicates that we can take a share of the market, and that the students will be given a master's education they can continue to build on. We invest a great deal in international educations with clear applicability. But it's important that the foundation is in place at the departments themselves in the form of research expertise, enthusiasm, and the will to run the master's programme in the long-term, says Kristofer Modig.

Business council and sector councils generate dialogue with companies

LTH's dialogue with the industry happens on many different levels. A business council for all of LTH sometimes discusses educational issues with emphasis on expertise. Every individual programme also has a sector council that includes representatives from the industry. At the same time however, Kristofer Modig finds that there is more to be done.

– We try to catch signals from all directions, but not in a terribly organised fashion, and year after year we have talked about doing it more systematically, he says.

Carl Grey also points out that the sector councils are not large enough to claim to represent the entire sector.

– Of the some 400 companies in the life sciences in Skåne, 10-20 are included there, so it's difficult to say whether what is discussed there applies only to those represented or if it represents a greater trend, he says.

An additional challenge when it comes to collaboration with the industry is the shift in recent years, where the largest companies are being replaced by a greater number of smaller businesses.

– We really make an effort to bring many of those smaller companies to our sector council; it's all too easy to stop at for instance Ericsson and Tetra Pak. But there are a lot of employees at the smaller companies, which are growing fast, says Kristofer Modig, adding that they tend to recruit a lot of LTH students.

More contact points between students and the industry

While the department's sector councils and LTH's business council represent contact points between LTH and the industry, there are also numerous links between companies and individual students. Diploma projects are often done at or in collaboration with a company. A specific, elective, practical course offered in all undergraduate educations allows students to spend time at a company where they see the engineer role in action; the student council arranges career fairs every year, and educational visits are common. Project courses are also offered, and companies both help with the course design and -execution.

– It might be that companies make suggestions for the project courses, for example, and then students deliver a response, and companies are of course very interested in that, so they come and there is a natural encounter between students and companies, says Carl Grey.

Kristofer Modig also points out however that the extent of connection between the courses and the industry depends to a degree on the teacher's links to the industry, as well as the teacher's contacts.

Difficult to attract students to occupations with skilled labour shortages

For the report in hand, many of the 400 life science companies in Skåne surveyed for the report Life Science in Skåne responded to questions about the expertise they need and the competences they find difficult to recruit. Certain elements were mentioned repeatedly, such as process operators- and engineers. Kristofer Modig and Carl Grey are unsurprised. They explain that LTH and Chalmers have put a lot of focus on process engineering and process design in their educations, including in bioengineering.

– We have understood that our engineers in the bioengineering education who are studying process engineering are going to be attractive on the labour market. That is a niche for us, says Kristofer Modig.

LTH no longer offers an exclusive process operations education however; there was previously a three-year chemical engineering education that has since been dismantled as student recruitment was too difficult.

PHOTO: LUND UNIVERSITY

PHOTO: PRIVATE

– I'd say the demand for process operators is a general trend; there is a real shortage of hands-on people like them. It's not exclusive to process engineering, but also in electrification. People who can truly tinker on a sufficiently high level are scarce, and they're in demand everywhere. But it is very difficult to recruit students to those educations, unfortunately – it's a worry, and it's the reason the programmes have been shut down everywhere, says Kristofer Modig. Parallel to the general shortage of engineers today, he adds, there is also 'a chronic shortage' of engineers in chemistry and computer technology.

Other expertise in demand by companies in the report includes proficiency in economy, digitalisation and automatization combined with the life sciences – which corresponds well with material that LTH plans to incorporate more into its educational programmes in the future.

– Precisely digitalisation, management of large volumes of data, and machine learning are contemporary subjects that will be included in all educations in the future. We also include economy in all training programmes today, says Carl Grey.

LTH to develop freestanding courses on offer

Lund University's Department of Medicine and LTH both highlight freestanding courses as a new trend in continuing professional development; this is also related to the 'lifelong learning' efforts. Seats of learning have thus received increased funding for e.g. offering more freestanding courses. There are numerous freestanding courses at LTH today, but most of them target people seeking to broaden their general knowledge, and there is little focus on continuing education and expertise development, says Kristofer Modig.

– We're currently developing our freestanding courses on offer; there is a clear trend, and we see that it will continue to grow in the years to come, Carl Grey adds.

For companies that wish to invest in expertise development in specific fields, LTH also offers contract educations that can be tailored to better suit companies' wishes.

– That isn't extremely common in the life sciences on the whole; today, we mostly offer contract educations in the field of food, they say.

Kristofer Modig adds that a broad view is necessary for finding solutions to the sector's future expertise needs.

– Contract education is one part, and determining the role that vocational education and training can play is another. I think a joint effort is necessary for finding solutions to the problem with regard to the future, he says.

New education in membrane engineering underway

As mentioned earlier, the basic offering of educations offered at LTH has remained relatively unchanged in recent years. The most recently added educations are the master's programme in pharmaceutical technology, which started several years ago, and the bachelor's degree in food technology, which was previously only offered as higher education. Among the news underway is a new, international programme in membrane engineering, a subject area that is highly applicable – for example in the life sciences.

– It will be a collaboration with other international seats of learning, and students will study one of the later parts here, so it will be offered here in Lund in the autumn of 2023 at the earliest, says Carl Grey.

They add that although the educations on offer seldom change, the content is under constant revision as new knowledge and research emerge.

– In bioengineering for example, there are ongoing discussions about what the specialisation areas should encompass; there are still incredible strides being made in the field, for example in biopharma. Changes are also planned for the master's in bioengineering, says Carl Grey.

Synapse Sweden: Contact between students and the industry is quite limited

Whilst there is no problem with the content of Skåne's life science educational programmes, many life science students in Skåne need more knowledge about what the industry will require of them after graduation, as the Swedish faction of the student organisation Synapse – Life Science Connect sees it. Visits to companies, guest lectures, projects with the industry and internships are necessary efforts that may strengthen students' competences, they say.

In response to the goal of facilitating contact between life science students in the Øresund Region and the region's many biotech firms, pharma businesses and other companies, in 2020 the student organisation Synapse, which receives support from the Novo Nordisk Foundation, expanded and started a new branch in Lund. Around a year after the founding of the Lund-division, more interaction between the industry and academia is still an area for improvement for Skåne's educational system, in order for life science students to be better prepared for positions in the sector, say volunteers from Synapse Sweden.

– Although we are seeing a positive development within many programmes, offering courses with industry contact and an increased focus on the transition between student life and your first job, there is still a long way to go. Contact between students and the industry is quite limited, they say.

Synapse is primarily aimed at thousands of bachelor-, master-, and PhD students, as well as post-docs,

FOTO: SYNAPSE

This photo was taken when Synapse officially formed the first board team for Synapse Sweden, and it shows three of the four current board members. From left to right: Chair of the board Enrika Miltenyte, board member Ida L Neinhardt and vice-chair of the board Malavika Sreekumar Nair.

FACTS ABOUT SYNAPSE – LIFE SCIENCE CONNECT

Student-led, non-profit organisation created at the University of Copenhagen in 2014. The organisation works to bridge the gap between academia and the life science industry for a smoother transition from student- to professional life by e.g. arranging networking events, company visits, and summer schools. Synapse – Life Science Connect consists of two organisations: Synapse Sweden and Synapse Denmark. Synapse Denmark has branches in Copenhagen and Aalborg. A Synapse team was formed in Lund in 2020, and in 2021 it established an independent organisation in Sweden called 'Synapse – Life Science Connect Sweden', the mission of which is to spread Synapse's mission in all of Sweden.

in the faculties for the natural sciences and medicine at Malmö University, Lund University, including LTH Faculty of Engineering (LTH), and Synapse Sweden's volunteers emphasize that that they see occasion for efforts in relation to the professional level and expertise in Skåne's life science educations.

– The life science education in Skåne is extremely difficult to beat in terms of academic research, access to competent, accomplished professors and opportunities for students to develop as biomedical scientists. The infrastructure in place enables countless opportunities for internships and research projects within academia, according to volunteers from Synapse Sweden.

Instead, the challenge begins when life science students in Skåne have finished their educations and need to find work in e.g. Skåne's life science sector, where some 7 500 people are employed by around 450 companies.

– The gap is not in life science education, but in the way students are approaching the industry. Students usually do not know what the industry requires of them, and their applications are thus frequently unsuccessful, say Synapse Sweden volunteers, who also mention that they have the impression that the challenge is linked to something structural and rooted in tradition.

– We believe that academia and industry are more closely intertwined in Denmark, whilst they're very separate in Sweden; one is almost asked to choose between the two upon graduating.

Fortunately, there are already numerous initiatives such as career fairs and conferences where life science students and company representatives can meet, but even more efforts are necessary to bridge the gap between the industry and academia, according to Synapse Sweden.

– More career-centred subjects could be introduced at the universities, both at the BSc and MSc levels, and career orientation could be added where students could explore different career choices and specialisations related to their degrees, suggests Synapse Sweden.

The organisation also hopes that more life science companies in Skåne will follow the example of the Malmö-based, global, medicinal company Arjo, which is collaborating with Lund University School of Economics and Management on lectures and business cases and takes on students for internships, as well as employs student workers.

– It could be a good idea for universities to cooperate more with local companies on different parts of the education, possibly through study visits, lectures, and internships. This will help us as students to know which 'competences' we need to have, they say.

PHOTO: NEWS ØRESUND

RESEARCH

Above average citation frequency for 15 of 20 research areas in the life sciences

Molecular biology, endocrinology, and oncology are three research areas of excellence in Medicon Valley, and their history in the region is long. Scientific publications produced by the region's researchers in each of these three fields have all been cited notably more frequently than the international average for the respective areas. This was revealed by a survey conducted by the Dutch research institute CWTS at Leiden University.

CWTS' study of the scientific publications and citations in the life sciences in Medicon Valley, which covered the period 2006 to 2017, showed that Medicon Valley is an excellent research cluster. Of the 20 fields that comprise half of the total life science research in the region, 15 have been cited more than the international average.

As stated above, the three largest fields are biochemistry and molecular biology, endocrinology and metabolism, and oncology. These are followed by neurosciences. In all of the cases, university research is complemented by research and development in companies in the region, such as e.g. Novo Nordisk, Lundbeck and Genmab on the Danish side of the Øresund and Hansa Biopharma, Alligator Bioscience and Camurus on the Swedish side.

"Of the 20 fields that comprise half of the total life science research in the region, 15 have been cited more than the international average."

The three areas in which Medicon Valley-researchers were cited most frequently according to CWTS' review are medicine: general and internal; cell biology; and genetics and heredity. All of these are included on the list of the 20 main research areas in the life sciences in the region.

Although life science research in Medicon Valley is a strong contender in an international comparison, the competition in Europe is stiff. CWTS' analysis also includes a comparison of ten excellent European clusters in the area; in it, Medicon Valley places just below the middle in terms of the number of scientific publications as well as citations. It is worth noting however that the number of scientific publications in the life sciences in Medicon Valley increased significantly during the decade studied by CWTS – it was the greatest percentual increase seen in the ten clusters in the comparison.

The life science clusters in the comparison include both larger clusters, such as London-Cambridge-Oxford and Netherlands, and somewhat smaller clusters like Île de France (Paris) and the German-French-Swiss cluster BioValley. In general, Medicon Valley is often closer to Stockholm-Uppsala, which is another cluster in the comparison.

Denmark's latest life science strategy, from April 2021, asserts that "the life sciences are a Danish strength". "Sweden should be a leading life science nation" is the opening line of the Swedish national life science strategy, presented in December 2019. Investments in research are one tool for achieving the goals set in the respective countries. Initiatives in Denmark include extending the increased tax deductions that companies are allowed to make for R&D costs and a multidisciplinary working group to improve the framework for clinical research. Sweden's goals include strong trans-sectoral research in the life sciences and broader exploitation of research infrastructure. The two countries' strategies meet on the shores of the Øresund and in the cluster called Medicon Valley.

A factor that markedly increases the number of citations of scientific publications is international collaboration, CWTS' analysis shows. In Medicon Valley, there are many research collaborations across the strait, primarily between individual researchers or research groups. As far as structural collaborations are concerned, many of the people interviewed in the report "Life Science across the Øresund" in June 2021 assert that these should be able to be broadened and become more plentiful. National focus when it comes to research funding and different taxation and health insurance systems are two examples of obstacles that were pointed out.

UNIVERSITY OF COPENHAGEN RANKS HIGHEST IN MEDICON VALLEY

The University of Copenhagen is consistently among the top 100 on the three largest international ranking lists – its highest placement is Shanghai Ranking, which ranks the university number 30 in the world. It is usually followed by Lund University, which is the most highly ranked university in Skåne and places number 87 on QS World University Rankings. Another university in Skåne that appears frequently on the major ranking lists is the Swedish University of Agricultural Sciences, which has a campus in Alnarp, Skåne; it typically places between 200 and 300.

On the subject-based ranking list for the life sciences and medicine published by QS World University Rankings, the University of Copenhagen comes in number 19, whilst Lund ranks number 80.

PHOTO: NEWS ØRESUND

PHOTO: KENNET RUONA - LUND UNIVERSITY

Erik Renström, vice-chancellor of Lund University.

POTENTIAL FOR MORE RESEARCH COLLABORATION ACROSS THE ØRESUND

According to Erik Renström, the vice-chancellor of Lund University, there is solid bottom-up engagement and a great deal of collaboration between Lund University and the University of Copenhagen in the life sciences. The collaborations are primarily for research between individual researchers and research groups; collaborations on a structural level are fewer, he said in an interview in June 2021 for the report *Life science across the Øresund*. He mentions border issues in relation to the challenge of procuring research funds that can be used across the Øresund.

– I'm sorry to say that we have many structural obstacles impeding collaboration. There are many challenges. Interreg-projects are extremely valuable however, as we have a great deal of national projects in which we'd like to have Danish partners, he says.

ESS AND MAX IV HAVE SWEDISH AND DANISH CONNECTIONS

Danish and Swedish actors are building up an advanced research infrastructure in Lund at European Spallation Source (ESS) and MAX IV Laboratory.

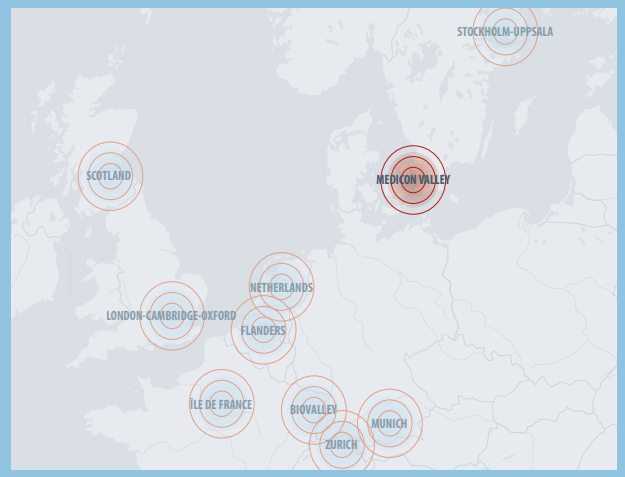
The research institutions European Spallation Source (ESS) and MAX IV Laboratory are both situated in Lund. In 2023, will ESS be the world's largest and most advanced neutron source and will furnish new knowledge in e.g. materials research, which can be used to develop new drugs, materials, fuels and more. Denmark and Sverige are host countries for the ESS facility, whose data centre is located at Copenhagen Bio Science Park (COBIS). Not far from the ESS facility is Sweden's national MAX IV Laboratory, which is part of Lund University. Research within e.g. materials science, chemistry and structural biology take place there. A number of Danish public organisations and universities, as well as the Novo Nordisk Foundation, are helping build up advanced research infrastructure in both of these research institutions in Lund. Bifrost and Heimdal at ESS and DanMAX and MicroMAX at MAX IV Laboratory are the names of advanced instruments financed by Danish public- and private actors.

PHOTO: NEWS ØRESUND

PHOTO: NEWS ØRESUND

BIOCHEMISTRY AND MOLECULAR BIOLOGY LARGEST IN LIFE SCIENCES IN MEDICON VALLEY

Of the 20 fields that comprise half of the total life science research in the region, 15 have been cited more than the international average between 2006-2017. This was shown by an analysis conducted by the research institute CTWS at Leiden University in Netherlands on behalf of Medicon Valley Alliance. The region's three largest fields in the life sciences are biochemistry and molecular biology, endocrinology and metabolism, and oncology. The analysis also shows that Medicon Valley places approximately in the middle in a comparison of ten excellent European life science clusters.



A unique comparison of ten European clusters

On behalf of Medicon Valley Alliance, the Dutch research institute CWTS at Leiden University performed a bibliometric comparison of ten leading European life science clusters based on their total influence in the research world.

20

MAJOR FIELDS OF RESEARCH. The 20 largest fields of research were responsible for more than 50% of the total number of scientific publications in the life sciences in Medicon Valley during the period examined.

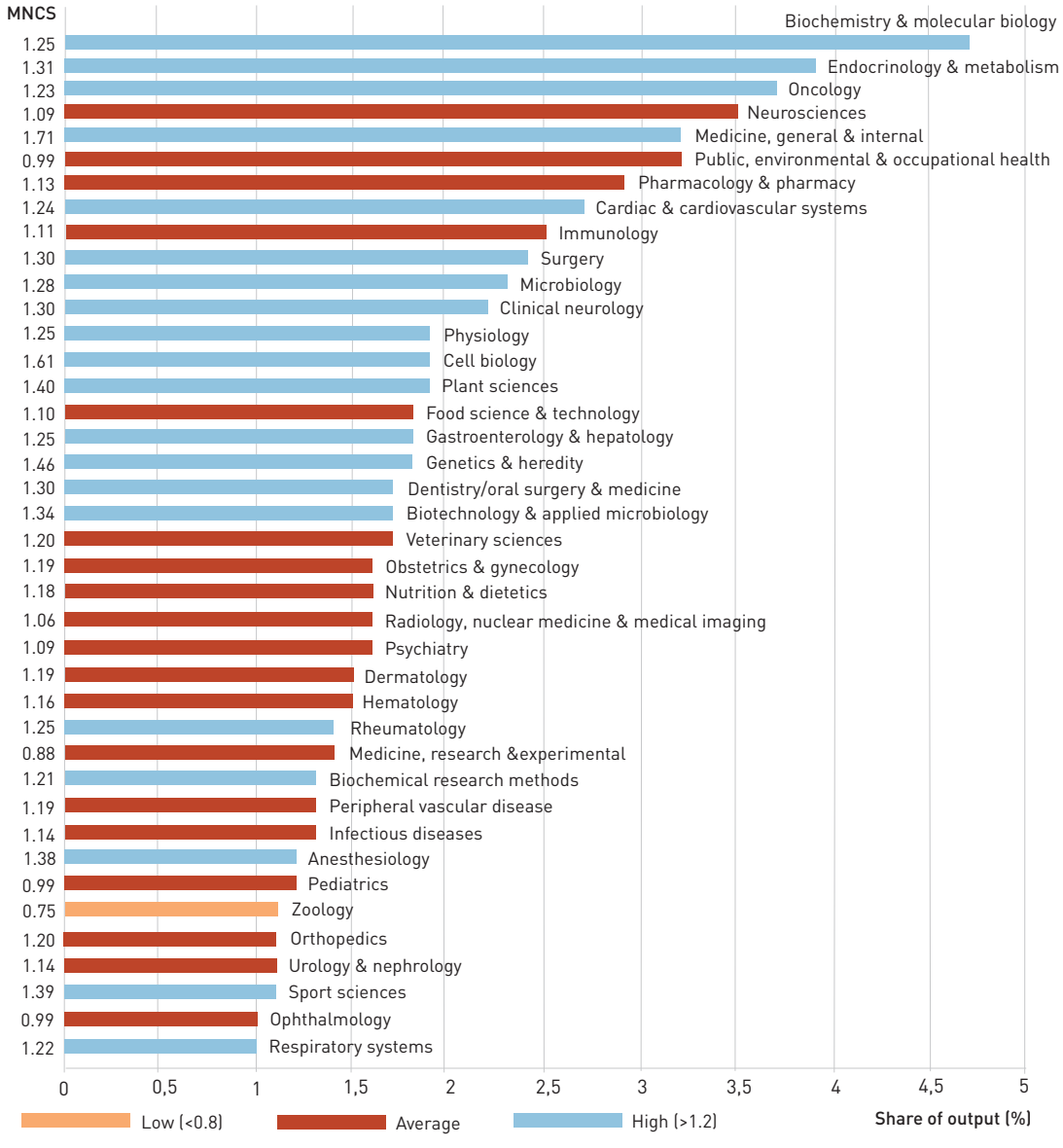
Greatest increase

The number of scientific publications in Medicon Valley increased 23% from the period 2006-2009 to the period 2013-2016; the increase was percentually greater than in any other cluster in the study.

54% The percentage of the scientific publications in Medicon Valley that resulted from international collaborations. 26% were published in cooperation with other researchers in the same country, and 19% were by researchers or groups without collaborative partners.

MAIN FIELDS OF RESEARCH AND THEIR IMPACT

The diagram shows the 40 subject areas in which research institutions in Medicon Valley produced the greatest number of scientific publications from 2006-2016, as well as the citation degree of these publications in relation to the international average in each respective research area (MNCS) from 2006-2017. 1 indicates that a publication has been cited as frequently as the calculated average for its field of research. In the diagram, the colour blue indicates an MNCS score over 1.2 (above average), red an MNCS score of 0.8-1.2 (average), and orange an MNCS score below 0.8 (below average).



Source: CWTS B.V.

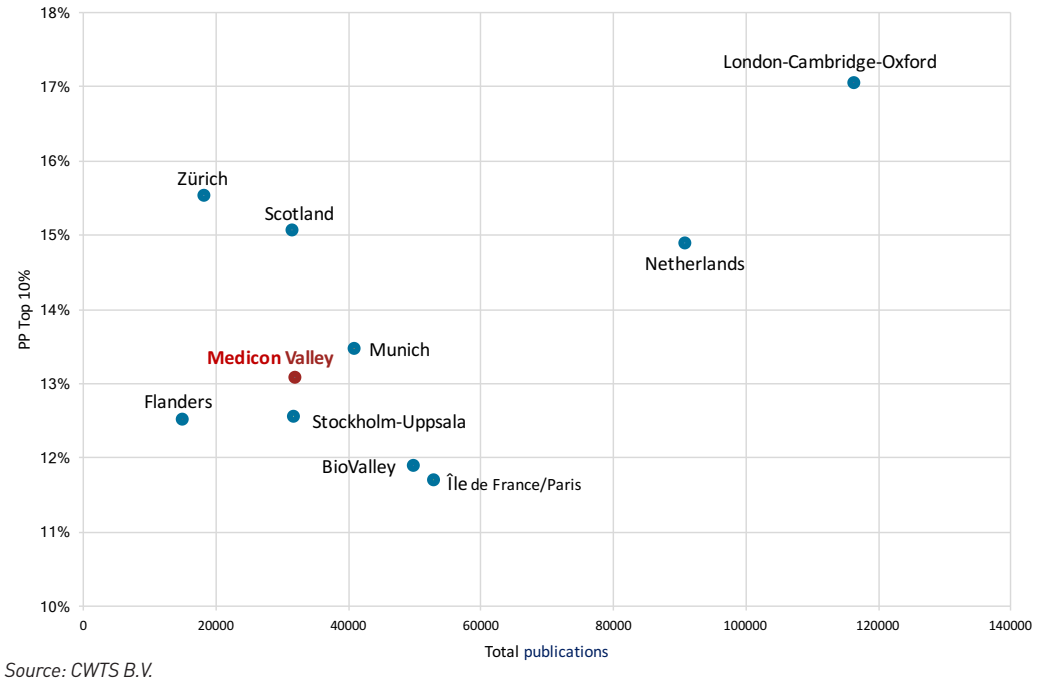
• The five subject areas in which Medicon Valley's research institutions produced the greatest number of scientific publications from 2006-2016 were Biochemistry & Molecular Biology (4.7% of total publications), Endocrinology & Metabolism (3.9%), Oncology (3.7%), Neuroscience (3.5%) and Medicine, General & Internal (3.2%).

OVERALL VISIBILITY OF THE REGIONS (2006-2016/17)

• Researchers in Medicon Valley published 32 027 scientific articles in the field life science between 2006-2016, according to CWTS' review of Web of Science.

• Around 13% of the publications from Medicon Valley were in the 10% most frequently cited for their fields in the entire period of 2006-2017.

• In relation to the nine other life science clusters included in the study, Medicon Valley places in the middle. As far as the number of publications is concerned, Medicon Valley holds a sixth place, and when it comes to the frequency with which these articles are cited in their respective fields, it also comes in sixth. According to CWTS, the group of clusters is very strong.



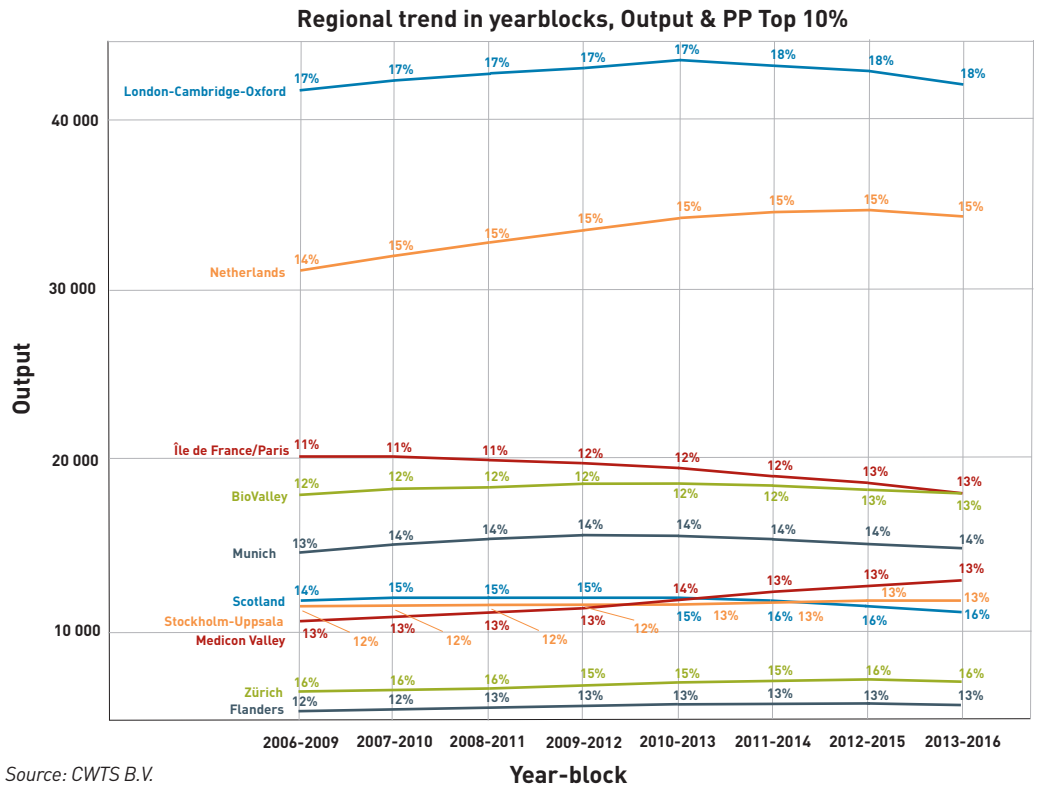
Source: CWTS B.V.

The diagram shows the total number of publications from 2006-2016 and the number of these that are among the 10% most frequently cited in their fields (PP Top 10%) from 2006-2017.

DEVELOPMENT OVER TIME, 2006 TO 2016/17

• Since 2006, the number of publications in life science by researchers in Medicon Valley has increased steadily, going from just over 10 465 in the first interval studied (2006-2009) to around 12 902 in the most recent interval studied (2013-2016). In absolute numbers, this increase is greater than in any of the other clusters in the comparison, with the exception of the Netherlands. Percentually, it is the greatest increase of all. Most of the other clusters have remained at approximately the same level when it comes to publications in life science for all of the time intervals in the period.

• From 2006-2017, the number of articles among the 10% most frequently cited in their fields remained at the same level – 13% – for Medicon Valley's life science researchers, with the exception of the period from 2010-2013, when the number temporarily increased to 14%. The majority of the other clusters in the comparison have increased their respective numbers of publications among the most frequently cited 10% by one percentage point, or in some cases two.



Source: CWTS B.V.

The diagram shows the number of publications (output) for each four-year interval from 2006-2016, and how many of these were among the 10% in their fields (PP Top 10%) from 2006-2017.

A UNIQUE COMPARISON OF TEN EUROPEAN LIFE SCIENCE CLUSTERS

• On behalf of Medicon Valley Alliance, the research institute CWTS at Leiden University conducted a comparison of the bibliometric performance of ten life science clusters in Europe, one of which is Medicon Valley:

- London-Cambridge-Oxford
- Netherlands
- Île de France/Paris
- Flanders
- Stockholm-Uppsala
- Scotland
- Medicon Valley
- Zurich
- BioValley (a German-French-Swiss cluster that includes Basel, Alsace, Freiburg, Karlsruhe, Mulhouse and Strasbourg)
- Munich

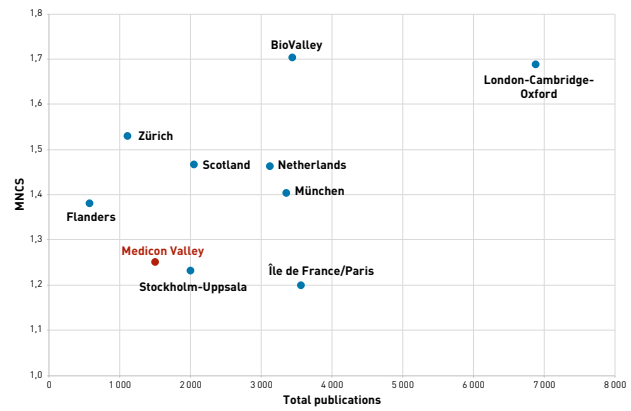
• In the report, clusters are defined as areas in which universities and other research institutions are fairly densely located in a specific geographic area, where internal collaboration is customary or habitual, and where there is an established cluster organisation of some kind. The clusters differ in terms of size and the number of research institutions. Some clusters are larger, more well positioned and conduct more research than others. The objective has been to represent the clusters' significance and research positions in relation to one another, and not to show how each cluster performs according to its own unique conditions – a project that would require a significantly larger scope than the present one. For more on how the compilation of the clusters was carried out, see the report State of Medicon Valley 2018, published by Medicon Valley Alliance and prepared by Øresundsinstituttet.

• The comparison has been done for the years 2006-2016. Citations have also been counted through 2017. The source was the research database Web of Science, and the publications selected for these regions were limited to those designated to the higher-level category of "Medical and Life Sciences".

• All of the scientific publications in the relevant categories and journals from each region were counted, regardless of whether the research was conducted at e.g. a university, university hospital, other research institutions, or at a commercial enterprise.

The diagram below shows the number of scientific publications (total publications) in the respective subject area from 2006-2016, as well as the citation degree of these publications in relation to the international average in the respective research areas (MNCS) from 2006-2017. 1 indicates that a publication has been cited as frequently as the average for its respective field of research.

BIOCHEMISTRY AND MOLECULAR BIOLOGY

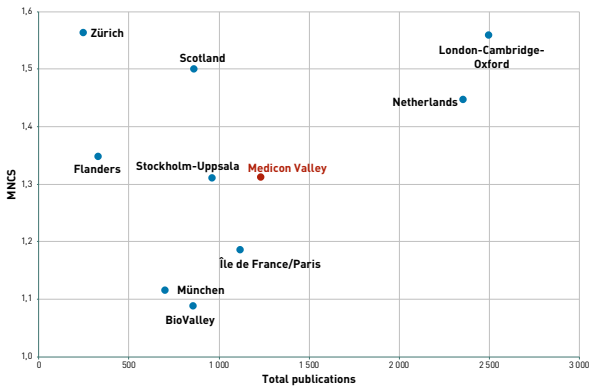


Source: CWTS B.V.

• Compared with the other life science clusters in the analysis, Medicon Valley places eighth for both the number of publications and for the citation frequency of the publications in relation to the international average in each respective field of research.

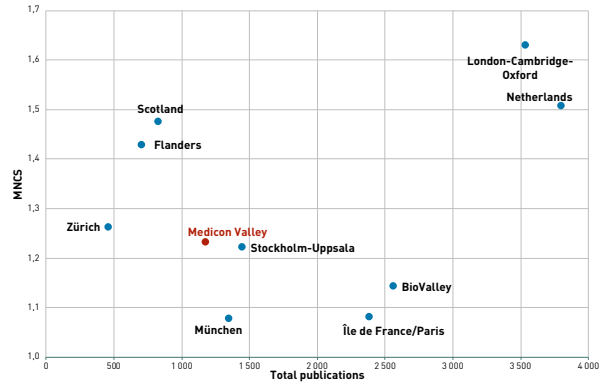
The diagrams below show the number of scientific publications (total publications) in the respective subject area from 2006-2016, as well as the citation degree of these publications in relation to the international average in the respective research areas (MNCS) from 2006-2017. 1 indicates that a publication has been cited as frequently as the average for its respective field of research.

ENDOCRINOLOGY & METABOLISM



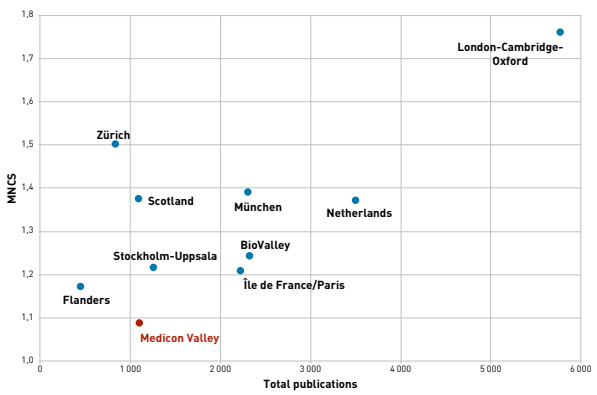
• Medicon Valley places third compared to the other life science clusters in the analysis. Only London-Cambridge-Oxford and the Netherlands produced a greater number of scientific publications than Medicon Valley during the period in question.
• In terms of the number of citations with regard to the international average in each respective field of research, Medicon Valley is at the middle and shares sixth place with Stockholm-Uppsala.

ONCOLOGY



• Medicon Valley is just below the average compared to the other life science clusters in terms of both the number of citations (seventh place) and citation frequency (sixth place).

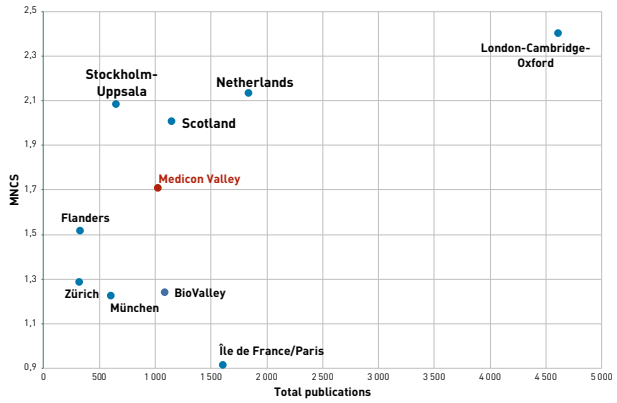
NEUROSCIENCES



• Medicon Valley's citation frequency is the lowest of all ten clusters in the comparison, and it places seventh for the number of publications.

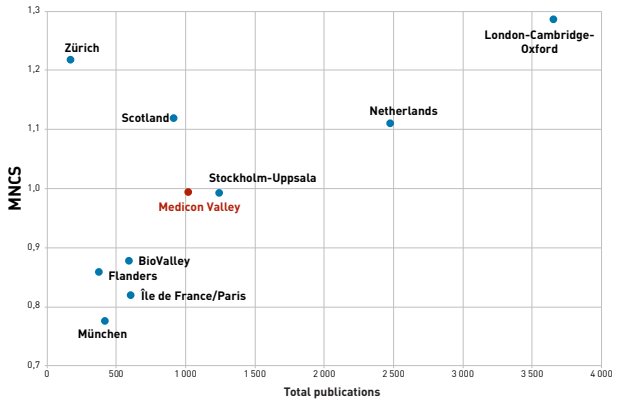
The diagrams below show the number of scientific publications (total publications) in the respective subject area from 2006-2016, as well as the citation degree of these publications in relation to the international average in the respective research areas (MNCS) from 2006-2017. 1 indicates that a publication has been cited as frequently as the average for its respective field of research.

MEDICINE, GENERAL & INTERNAL



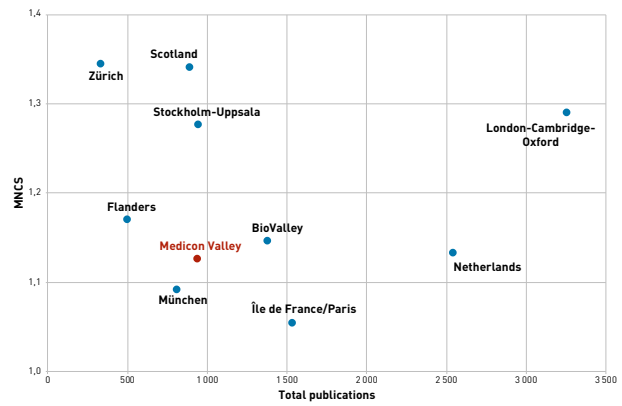
• Medicon Valley is close to the median compared to the other life science clusters, despite the high MNCS score of 1.71. Medicon Valley places fourth for citation frequency and sixth for the number of publications.

PUBLIC, ENVIRONMENTAL & OCCUPATIONAL HEALTH



• Medicon Valley is close to the middle compared to the other selected life science clusters, despite the relatively low MNCS score. Medicon Valley places fourth for the number of publications and fifth for citation frequency.

PHARMACOLOGY & PHARMACY



• With an MNCS score of 1.13, the region shares seventh place in a comparison of the life science clusters' citation frequency. Medicon Valley comes in sixth for the number of scientific publications.

ABOUT THIS REPORT

This is the third report for the EU-funded Greater Copenhagen Life Science Analysis Initiative project, led by Øresundsinstituttet and Medicon Valley Alliance from 2019-2022. The analysis has been prepared by Øresundsinstituttet.

The report focuses on how companies' needs for expertise match up with the university educations on offer in Skåne. The description of Skåne's life science companies' expertise needs was first published in November of 2022 in the report *Life Science in Skåne*, which was based on interviews conducted with life science companies in Skåne, as well as their responses to a questionnaire. A corresponding report for eastern Denmark will be published in 2022.

The chapters on companies' expertise needs and on education focus on the perspectives and wishes of the life science sector in Skåne regarding recruitment and the life science educations offered at universities in Skåne. The chapter on research comprises all of Medicon Valley; i.e., it also includes eastern Denmark.

ABOUT THE FIGURES

Companies' expertise needs, pages 10-19
Data on life science companies' expertise needs is from the report *Life Science in Skåne*, published in November 2020 as part of the Interreg-project Greater Copenhagen Life Science Analysis Initiative. Around 420 life science companies were identified in Skåne for the report *Life Science in Skåne*. 126 of these were interviewed about their expertise needs and future recruitment plans. Of these 126 companies, 23 were pharma companies, 43 biotech companies, 48 medtech companies and 21 contract research and/or manufacturing organisations. An additional 120-140 companies responded to more in-depth questions posed in a questionnaire developed by Øresundsinstituttet. The interviews with companies were conducted between the winter of 2019 and the summer of 2020.

Life science educations in Skåne, pages 22-26
The compilation of educations offered was prepared by Øresundsinstituttet based on information provided on the websites of the seats of learning, and with feedback from the respective universities. The educations at SLU in Alnarp were compiled by the university itself.

To be included in the compilation, the education needed to probably lead to a career in the life science- or health sector, to contain some applications or offer some career opportunities in the life sciences, or the educational programme itself needed to contain life science elements.

Data on the number of students in each educational programme was provided by the respective universities.

Universities, research institutions and regions, pages 22-27
Figures for the number of researchers and students have been provided by the universities and the region themselves. All figures on researchers are headcounts and from 2020 unless otherwise noted. Student numbers indicate either the number of full-time equivalent students or the number of students in the 2020 autumn term – see the information for each individual learning institution.

Lund University. The numbers apply to the total number of researchers at the Faculty of Medicine and a select number of researchers at the Faculty of Science and researchers who primarily work in the life sciences at the following departments at Lund University's Faculty of Engineering (LTH): Immunotechnology, Automatic Control, Food Technology, and Chemical Engineering. There are also researchers in the life sciences at the Department of Biomedical Engineering, the Department of Computer Science, the Department of Transport & Roads and the Department of Technology and Society at LTH. Of the doctoral students, those who are employed elsewhere have not been counted this year. The number of students indicates full-time equivalent students in educational programmes related to the life sciences in 2020.

Malmö University. The number of students indicates those admitted to educational programmes related to the life sciences in the 2020 autumn term.

The Swedish University of Agricultural Sciences in Alnarp. The number of students indicates full-time equivalent students for the academic year 2020/21.

Kristianstad University. Data on the number of researchers is from 2019. The number of students indicates full-time equivalent students in educational programmes related to the life sciences in 2020.

Region Skåne. All professors also have part-time positions at Lund University. Headcount for researchers – many conduct research part-time. The number of professors refers to positions funded or partially funded by Region Skåne; there may also be professors with external funding.

INTERVIEW LIST

- **Maria Björkqvist**, Vice dean, Lund University's Faculty of Medicine, video interview, 6 Dec 2021
- **Carl Grey**, Bioengineering lecturer, LTH School of Engineering, video interview, 7 Dec 2021
- **Kristofer Modig**, Vice dean, LTH School of Engineering, video interview, 7 Dec 2021
- **Kerstin Tham**, Vice chancellor, Malmö University, video interview, 3 Dec 2021
- **Synapse Life Science Connect Sweden**, email, 11 Dec 2021

REFERENCES

- Benchmark Life Science Regions Research for Medicon Valley Alliance 2006-2016/17. CWTS, 2018
- Greater Copenhagen Life Science Analysis Initiative, Life Science across the Øresund, June 2020
- Greater Copenhagen Life Science Analysis Initiative, Life Science in Skåne, November 2020
- Kristianstad University
- Lund University
- Malmö University
- QS World University Rankings
- Shanghai Ranking – Academic Ranking of World Universities
- State of Medicon Valley – An Analysis of Life Science in Greater Copenhagen. Medicon Valley Alliance, 2018, 2019 & 2021
- The Swedish University of Agricultural Science in Alnarp
- Times Higher Education – World University Rankings

PHOTO: NEWS ØRESUND

GREATER COPENHAGEN LIFE SCIENCE ANALYSIS INITIATIVE

Between 2019-2022, Øresundsinstituttet will survey the life science industry in the Øresund region in collaboration with the cluster organisation Medicon Valley Alliance in an EU-funded Interreg-project by the name of Greater Copenhagen Life Science Analysis Initiative.

The project aims to generate more knowledge about the region's life science businesses, which employ around 50 000 people. Among other things, the report examines the demand for employees and the sector's future expertise needs. Over the course of the project, Øresundsinstituttet is both interviewing and visiting companies, preparing and analysing statistics on employment numbers, and categorising Medicon Valley's life science businesses. The analytic work thus far has resulted in two interim reports to date: The report *Life Science in Skåne* published in November 2020 provides a thorough overview of the life science cluster in Skåne. The report *Life Science Across the Øresund* was published in June 2021 and provides in-depth descriptions of many sector links, as well as similarities and differences between the sector in the Copenhagen area and in Skåne. The third interim report, due in the spring/summer of 2022, concerns the life science sector in the Copenhagen area and Zealand.

GREATER COPENHAGEN LIFE SCIENCE ANALYSIS INITIATIVE is an EU-project aimed at increasing knowledge about the region's life science cluster Medicon Valley. The focus is on the demand for labourers, future expertise needs, and more. The project has received funding through the EU-programme Interreg Öresund-Kattegatt-Skagerrak and will continue until 30 June 2022. The project's lead partner is Medicon Valley Alliance, and the partner is Øresundsinstituttet.

The primary objective of the GCLSA-project developed and managed jointly by the Danish-Swedish organizations Øresundsinstituttet and Medicon Valley Alliance is to

1) analyze and increase knowledge about the need and demand for competencies and skills and

2) support the development of the integrated labor market in the Danish-Swedish life science cluster, Medicon Valley.

Furthermore, the project will establish a bi-national forum which can push this agenda on an ongoing basis, thereby addressing an issue of crucial importance for growth and employment on both the Danish and the Swedish side of the Greater Copenhagen region.

Targeting national, regional and local Danish and Swedish policy makers and key opinion leaders from industry and academia, the analysis work and the deliberations of the established Competencies and Skills Forum aim to provide a more qualified point of departure for developing initiatives which

- increase awareness of the supply and demand of labor in the regional life science cluster and facilitate mobility on the bi-national regional life science labor market
- optimize relevant life science educations in Sweden and Denmark including a more coherent approach to the prioritization and distribution of resources for R&D and educational institutions specifically addressing the needs of the life science industry
- highlight the scientific, commercial and societal strongholds of the Medicon Valley region and market the general attractiveness of the region as a first-class destination for both talent and business.
- investigate which factors are decisive when life science companies in the region successfully develop and expand
- provide national and regional stakeholders working with labor market life science related issues a common statistic point of departure and methodology
- help to eliminate obstacles to the free movement of labor (commuting) between Sweden and Denmark

In sum, the analysis work provided and the forum established will not only help Medicon Valley prosper and grow scientifically, but also help fine-tune and fuel the growth engine created by public and private stakeholders during the last 20 years, which has helped Medicon Valley to firmly establish itself as the leading and most dynamic and vibrant life science cluster of the Nordics.

ØRESUNDSINSTITUTTET

Øi is an independent Danish-Swedish centre for analytics and information that brings together more than 100 actors from the industry, the public sector and academic institutions with the aim of strengthening knowledge about societal developments on both sides of the Øresund Strait. As a member of Øresundsinstituttet, you become part of our strong Danish-Swedish network – and gain access to network meetings, facts, analyses and news about developments in the Greater Copenhagen region.
www.oresundsinstituttet.org

MEDICON VALLEY ALLIANCE

MVA is a Gold Label-certified, non-profit member organisation in the Danish-Swedish life science cluster Medicon Valley. Its 300 members include universities, hospitals, human life science businesses, regional governments and service providers that represent the Region's 'double triple-helix'. The activities in MVA focus on strengthening collaborations for a vibrant life science ecosystem in Medicon Valley through networking events and increased collaboration across borders and sectors.
www.mva.org

THE VISION

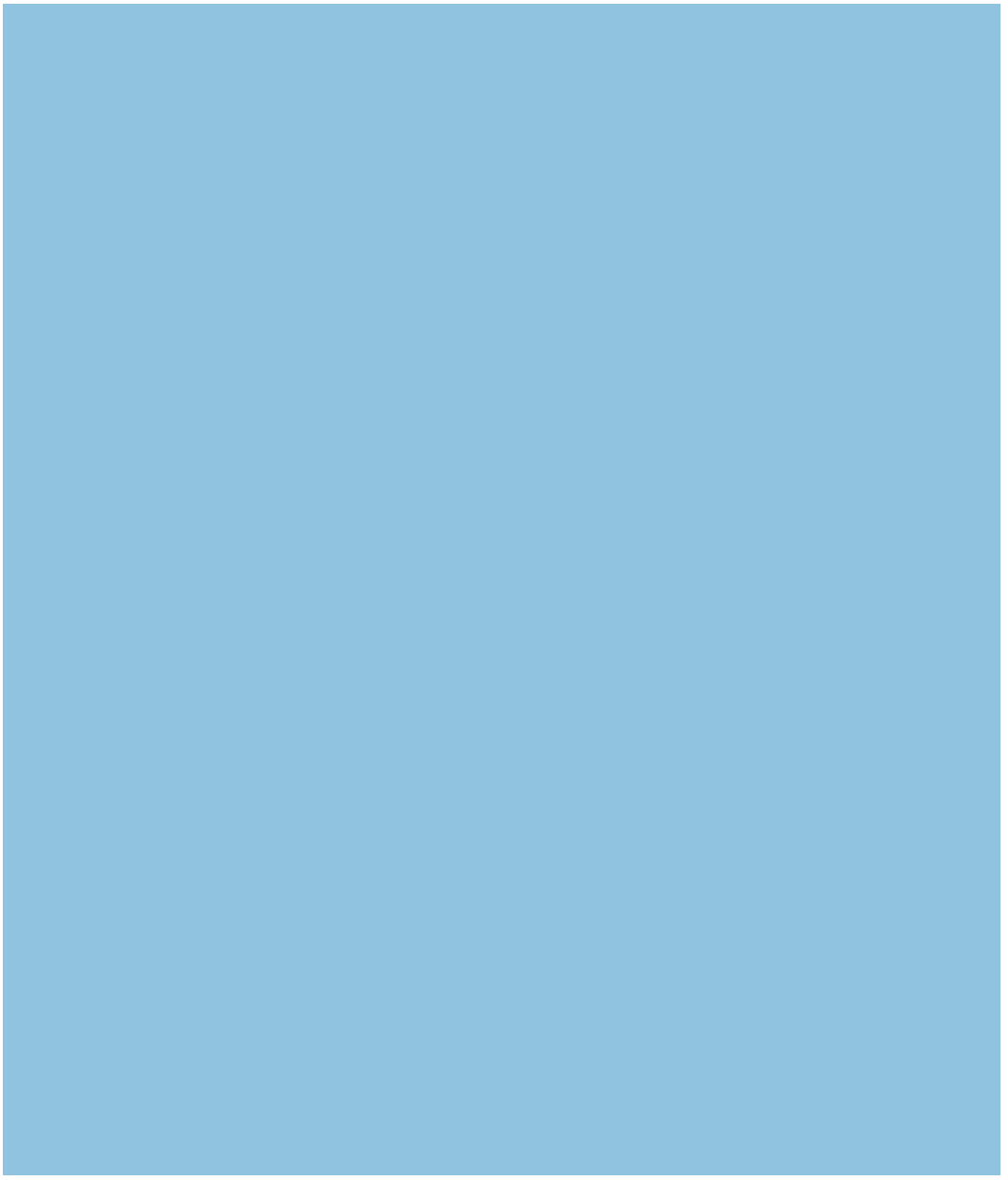
The vision is to be a well-known and respected member-driven contributor to the realisation and positioning of Medicon Valley as the most competitive and vital life science cluster in Northern Europe.

THE MISSION

MVA is committed to realising Medicon Valley's potential by facilitating networking, knowledge-sharing, and collaboration, analysing challenges and potentials, and mobilising support from key opinion leaders.

CALL TO ACTION

Read more about the Danish-Swedish life science cluster organisation Medicon Valley Alliance's events and activities on www.mva.org, where you can also find more information about how YOUR company can benefit from a membership.



medicon valley alliance
Creating Opportunities

ØRESUNDS INSTITUTTET

Interreg
Öresund-Kattegat-Skagerrak
European Regional Development Fund

EUROPEAN UNION

Greater Copenhagen
LIFE SCIENCE
analysis initiative