

National and regional cluster profiles

Companies in biotechnology, pharmaceuticals and medical technology in Denmark in comparison with Sweden

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Companies in biotechnology, pharmaceuticals and
medical technology in Denmark
in comparison with Sweden

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Preface

In December 2006, VINNOVA was assigned by the Swedish Government to carry out an international study to shed light on the competitiveness of the Swedish sectorial innovation systems of pharmaceuticals, biotechnology and medical technology in international comparison.

The study includes analyses of three main focus areas from an innovation system perspective:

- Key players in the Swedish innovation system, who they are and their position in an international comparison
- Trends, initiatives and commitments in other countries/regions
- Comparative case studies to investigate the competitiveness of the Swedish innovation system

The main question is what structure, growth and development capacity does the Swedish pharmaceuticals, biotechnology and medical technology industry have compared to other countries/regions excelling in this field?

The present report is one of the studies carried out as part of the project. The aim is to analyse the structure and dynamics of the life science industry in Denmark with the same methodology as previously applied to Sweden, VINNOVA VA 2007:16. In the study, a comparison has also been made with an earlier survey of the Medicon Valley region's companies and employees using data from 2003. The present report makes a limited analysis of the implications of the results identified. A more in-depth discussion on this can be found in the VINNOVA VA 2008:09 study of the benchmarking project.

Project manager for the Government assignment is Anna Sandström from VINNOVA's Strategy Development Division. The authors of the report are Stina Gestrelus, Medicon Valley Alliance, Anna Sandström, VINNOVA and Tage Dolk, Addendi AB.

Göran Marklund
Director and Head of the Strategy Development Division
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Abstract

This study reports on 263 companies with a total of 40,000 employees in the Danish life science industry and involved in manufacturing, consultancy, product development and/or research and development (R&D) during 2006. The companies are grouped by business segment, type of activity and where in Denmark they operate. Companies focusing only on sales and marketing are not included.

Since the life science industry is mainly concentrated on Zealand which, with Skåne in Sweden, makes up the life science cluster known as Medicon Valley, a comparison is also made for the bi-national cluster.

The Danish life science industry is dominated by Novo Nordisk, with nearly 25% of the total employees. The industrial structure also includes another 26 companies with over 250 employees and 46 medium sized companies (51-250 employees) plus a large number of smaller firms (77 with 11-50 employees and 113 with 1-10 employees).

Over 90% of the employees are located in eastern Denmark. Over the period 2003-2006, the companies in the Danish part of Medicon Valley increased their number of employees by nearly 10% on average. If only companies founded 1997 or later are included, the increase of employees is about 30%.

Skåne, the Swedish part of Medicon Valley, showed an increase for all companies with 300 employees, equivalent to +5% from 2003 to 2006. In fact, the life science industry in Medicon Valley is larger than in Denmark or Sweden and also shows the most rapid growth.

The report also contains a comparison between Denmark and Sweden. In 2006, Sweden had some 600 companies with about 34,000 employees involved in manufacturing, consultancy, product development and/or R&D (VINNOVA VA 2007:16).

This was essentially unchanged from 2003. Sweden has twice as many companies compared to Denmark, while the number of employees is lower. The same is true for enterprises established between 2000 and 2006, with 170 new companies in Sweden compared to 120 in Denmark. None of the new Swedish companies had over 50 employees and only 17% had ten or more, while 34% of the Danish companies had passed the micro-stage and six had grown beyond 50 employees in 2006.

A case study on the life science industry in Denmark (VINNOVA VA 2008:09), entitled "Why is Danish life science thriving?" gives more details on the structure and factors that shaped and promoted the development of the life science industry in Denmark and what can be learnt from a Swedish perspective.

1. Introduction

Life science is considered a crucial foundation of long term innovation and growth in many countries' industry and society. In Denmark the life science industry is a very important sector, with a turnover of nearly DKK 100 billion or over 5% of the Danish gross domestic product in 2006.

The overview presents different aspects of the Danish life science industry and is based on a life science company database created by Medicon Valley Alliance for VINNOVA. Data has been compiled since the official NACE categories (usually used to classify companies by industry) cannot easily be used for life science companies, as they are scattered among many categories. NACE categories can thus be used to identify some of the relevant companies and in the present study that data has been combined with other sources of information to obtain the total company population. It should be noted that there is a delay between registration of a new company and that company employing personnel and publishing its first annual report. Also, other

changes due to mergers, acquisitions and liquidations may appear with some delay in the statistics.

The companies have been classified into different sectors, business segments and core activities. The sectors are defined as the medical technology sector, the biotechnology sector and the pharmaceutical sector and the companies are also divided into business segments. The companies' activities are categorised into the following activities: manufacturing, consultancy, product development and research and development (R&D). The way the companies have been categorised into business segments and activities will be described in the following section.

The cluster profile is based on the distribution of individual companies in sectors, the size of the companies in terms of employees, business segments, geographical location and activities. This gives a snapshot of the life science industry as of the beginning of 2007. In addition, R&D-intensive companies are classified based on whether they have a product, service or licence on the market and are conducting broad or narrow R&D.

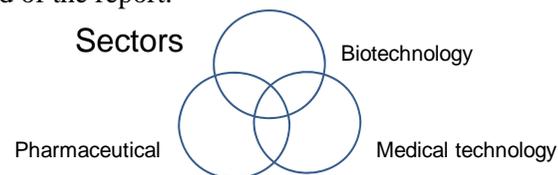
2. Variables

Sectors and business segments

Each company has been individually categorised into both a business segment and the sector or sectors to which the company belongs according to its main business. Companies with their main activity in business segments other than those listed below are not included in the study. There are companies whose activity can be categorised as belonging to more than one sector, due to the definitions of the three sectors. For instance, there are many companies within drug discovery that could be defined neither as exclusively pharmaceutical nor as exclusively biotechnology companies. Therefore, each company has been classified into one specific business segment, whereas there is an overlap between the three sectors.

The characteristics of companies falling into the medical technology sector are that they develop medical products that are not drugs. The characteristics of companies falling into the pharmaceutical sector are that they develop drugs and various other kinds of therapeutic products or methods. The pharmaceutical sector also includes diagnostics. The biotechnology sector is characterised by companies developing the application of science and technology to living organisms as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services. In the sector categorisation of each individual company, the approach or method used to solve a problem or satisfy a customer or patient need was often crucial to this categorisation.

Together, these three sectors constitute what is known as the life science industry. The business segments included in this study are described below. The sectors under which companies in a particular business segment may have been categorised are also indicated below. The OECD definition of biotechnology activities has been used to identify biotech companies and is listed at the end of the report.



Business segments

Drug discovery and development

Companies found in *Pharmaceuticals* and *Biotechnology*.

- Research and development of new drugs and therapies. Very few pharmaceutical companies develop new drugs without using biotechnological tools. Large biological molecules are targets for the drugs developed, even if they are small molecules produced by organic chemical synthesis. However, in Denmark many companies develop biopharmaceuticals, i.e. drugs based on large biological molecules such as proteins. In some cases, manufacturing, sales and marketing is also included in the individual company.

Manufacturing of biopharmaceuticals in drug discovery and development companies with over 500 employees is characterised as *Bioproduction*. The companies seek to develop new therapies to put on the market or licence to pharma companies generating up-front and milestone payments, royalties and possibly revenues from sales on divided markets, depending on the agreement.

Drug delivery

Companies found in *Pharmaceuticals* and *Biotechnology*.

- Companies in the drug delivery business segment are conducting research on how the active substances in medicines can be made to reach their target molecules in the body and how a satisfactory uptake of these substances can be ensured. Their clients are mainly biotech and pharma companies involved in drug discovery and development. An increasing business area includes developing new formulations for existing drug substances so that they can be used for new indications. Using existing substances reduces development time, as they have already passed the regulatory process for another indication. The field of nanobiotechnology is expected to generate new solutions on how to administer drugs more specifically. Polymer chemistry, nanotechnology and surface chemistry are examples of possible required expertise.

Biotech medical technology

Companies found in *Biotechnology* and *Medical technology*.

- Provides health services with that part of medical technology which has a biotech basis according to the OECD definition, including equipment and instruments for in-vitro fertilisation, cell cultivation, cell therapies, substitute plasma, blood management, plus the use of biodegradable biomaterials to replace or repair damaged tissue.

Diagnostics

Companies found in *Pharmaceuticals*, *Biotechnology* and/or *Medical technology*.

- The companies develop tools and techniques for diagnostics and most of their customers are healthcare sector organisations, clinical laboratory analysis companies and end consumers for home use. In the company population in question, all biotechnology diagnostic companies, often developing antibody-based tests, also fall into the pharmaceutical classification. Medical technology diagnostic products can be technical appliances for measuring or visualising diagnostic results or in-vitro diagnostic tests. One difference compared to companies developing new drugs is that the process from concept to commercialisation of diagnostic products, processes and services is usually shorter.

CRO companies

Companies found in *Pharmaceuticals* and/or *Biotechnology*.

- CRO (Contract Research Organisation) companies include clinical research organisations dealing with products and services for assisting other companies in clinical trials and regulatory processes. Clinical research organisations need to be familiar with international regulations and regulatory bodies as well as having well-developed contacts in clinical research, hospitals and authorities. Some CROs have developed a technology platform or analysis system that is managed within the company and accessible to companies in the pharmaceuticals and/or biotechnology sectors via contract research.

Drug production (not biotech)

Companies found in *Pharmaceuticals*.

- Companies specialising in drug production and without their own research operations are included in this business segment. The use of biotechnology in the manufacturing of drugs is not included. Rather, those companies are found

in the Bioproduction category. Important issues include development of cost-effective process and production technology as well as regulatory requirements.

Biotech tools and supplies

Companies found in *Biotechnology*.

- The companies develop products and services for use in production, processes, research and development. This includes equipment for bioseparation, biosensors, biomolecular analyses and bioinformatics. Their customers mainly consist of other biotechnology companies, the pharmaceutical and medical technology sector and university research teams but also other industries basing their products on biological raw materials, for instance in the food, forestry and agricultural sectors. Their expertise lies in the application of interdisciplinary expertise combining technologies such as electronics, ICT, mechanics, optics and materials engineering with life science to develop their products and services.

Bioproduction (healthcare related)

Companies found in *Biotechnology* and *Pharmaceuticals*.

- Biotech production of drugs, biomolecules, cells or microorganisms for use in healthcare-related products such as diagnostics and pharmaceuticals. These are specialist manufacturing companies whose clients include the pharmaceutical sector, other biotech companies or research groups. The biomolecules are often enzymes or antibodies. The companies' core expertise is development of cost-effective production solutions - adapting their activity to internationally stipulated regulatory requirements on quality and safety, plus an ability to adapt to customer requirements.

Agricultural biotechnology

Companies found in *Biotechnology*.

- Plant-related products. Plant or tree breeding utilising biotech methods as tools in the cultivation work. However, few companies use gene technology as a method for obtaining specific properties in the end products (genetic modification). Also included is plant protection based on naturally occurring microorganisms or biomolecules as well as the processing of land-based raw materials with the aid of biotechnology. Companies working with genetic modification for agricultural purposes need to be aware of, and have a strategy for addressing, attitudes in society regarding the use of gene technology in plant cultivation.

Environmental biotechnology

Companies found in *Biotechnology*.

- Biotech solutions to environmental issues such as water purification, land decontamination (bioremediation) and waste management, and laboratory analysis. Their customers include municipalities, construction companies, and industries requiring purification of water used in manufacturing processes. Companies within this field have very diverse focuses and it is therefore difficult to highlight a common core expertise. Some of these companies use non-pathogenic, naturally occurring microorganisms and the laboratory analysis companies develop specific testing methods and analytical measurement tools, to measure toxic substances for instance. However, biosensors are included in the Biotech tools and supplies business segment.

Food-related biotechnology

Companies found in *Biotechnology*.

-The products of companies in the field of food-related biotechnology include biotechnically-produced components or ingredients for the development of foods with positive health benefits, e.g. probiotics. The term functional food denotes a product with a documented, well-defined, product specific diet-health relationship. The aim of these products is to reduce the risk of developing diseases rather than cure them. Examples of other possible areas found in the category include use of enzymes in food processes or as additives, or the development of quality control in the food sector by means of new biotechnological techniques. These companies are often intermediaries between academic research and the food industry. They need expertise within their niche, e.g. within microbiology, nutrition, process technology, plus a knowledge of potential markets, public attitudes/demand and the needs of the food industry. The food industry, which uses biotech tools in its processes, is not included in the population.

Industrial biotechnology

Companies found in *Biotechnology*.

- Process development of biotechnology applied to industrial processes for large-scale biotechnological production, e.g. designing an organism to produce a useful chemical or using enzymes as industrial catalysts to produce valuable chemicals. Industrial biotechnology solutions tend to consume fewer resources than traditional processes used to produce industrial goods. The forest, pulp and paper industry and the food industry has not been included

since the core competence in those companies is not biotechnology even if the technology is used to some extent.

Healthcare equipment

Companies found in *Medical technology*.

- Companies producing fittings and furniture for health services such as lighting, patient lifts, examination couches and treatment tables. To be included, their major business must be products for the healthcare sector. The companies are often manufacturing companies with an understanding of needs within the healthcare sector.

Active and non-active implantable devices

Companies found in *Medical technology*.

- Implantable orthopaedic or other medical devices which may be biologically active, such as pacemakers. Specialist expertise is needed in different medical fields, materials science and tissue response to materials; concerning the risk of infection for instance. Materials may be titanium, ceramics and steel. Implants are usually developed in close collaboration with the healthcare sector.

Anaesthetic/Respiratory Equipment

Companies found in *Medical technology*.

- Development of anaesthetic equipment and solutions for supervision or control of respiration. The products are mainly used for critically ill patients i.e. within the intensive care unit (respiratory equipment) and in the operating theatre (anaesthetic and/or respiratory equipment). Anaesthetics may be delivered to the patient intravenously or by inhalation. Products are developed in a combination of medical expertise, including the anaesthetic properties of different gases, various engineering fields such as mechanics and electronics for pneumatic systems, valves and sensor technology, and computer programming for monitoring and control systems.

Dental devices

Companies found in *Medical technology*.

- Development of instruments and technical appliances used by dentists. Includes the development of dental implants and screws and the manufacture of disposables and supplies for use in dental clinics. Dental laboratories, on the other hand, are not included.

Electromedical and imaging equipment

Companies found in *Medical technology*.

- Technical equipment used for patient care and supervision or visualising of conditions. This business segment includes a broad range of products used in many medical fields such as magnetic resonance imaging, computed tomography, positron emission tomography and dialysis equipment. Many companies are large with diversified business and may also develop products which fall into other business segments. The companies identified require technical as well as medical expertise, in such fields as radiotherapy, haematology, cardiology, dialysis and oncology.

Audiological devices

Companies found in *Medical technology*.

- Companies dedicated to audiometry or medical appliances within the field of audiology. The required expertise ranges from acoustic communication, including speech perception to diagnosis of auditory function in clinical and technical audiology. Products include audiometric measurement equipment and components for hearing aids, including integrated bone-anchored designs.

Ophthalmic devices

Companies found in *Medical technology*.

- Companies dedicated to surgery or medical appliances within the field of ophthalmology. The required expertise ranges from ophthalmic surgical technology like cataract surgery. Products include laser vision products, cataract products and computer software for imaging the inside of the eye. The latter may be used for diagnosing eye conditions.

Surgical instruments and supplies for electromedical and imaging applications

Companies found in *Medical technology*.

- Includes instruments and tools used in patient care or surgery, and accessories for electromedical and imaging equipment. This business segment includes companies developing products that may facilitate different medical procedures, i.e. scalpels, forceps, dissectors and clamps. The required

expertise ranges from production of instruments to knowledge within the different surgical fields. There are also companies developing products connected to surgery, such as hypothermia products.

Medical disposables

Companies found in *Medical technology*.

- Disposable products used in patient care, such as dosage cups, hypodermic needles, sponges, contrast agents, wound care products etc. Some of the products can be used in research and at clinical laboratories. These companies are often manufacturing companies. Knowledge of industrial processes, sterilisation techniques and material chemistry is important. Some companies are characterised by a knowledge of wound healing processes and optimum wound care conditions.

CRO medtech

Companies found in *Medical technology*.

- Medical technology contract research organisations provide services for development, manufacturing and quality control of medical technology products. They often develop software or IT solutions for problems arising within the medical technology sector or provide expertise in developing medical products and devices. However, instead of selling a product, they provide a service based on their technical platform or other expertise. The expertise of some companies includes knowledge about regulatory requirements and how to achieve market approval.

IT and training

Companies found in *Medical technology*.

- Companies developing software and IT solutions for patient care or supervision etc. Also included is training software for patients and personnel in the healthcare sector. The products often facilitate the handling and integration of large volumes of information or provide analytical tools for clinicians that could function as diagnostic support.

Activity category

Broad research & development

Companies with exploratory research and development within a broad field of expertise or with several parallel development projects/product lines. Within some companies there is also sales and marketing activity and manufacturing.

Companies without products on the market are shown in a separate field. In this context, co-operative agreements and revenue-generating licensing have also been counted as “products on the market”.

Narrow research & development

Companies with exploratory research and development within a narrow field of expertise or concentrating on one development project/product line. Within some companies there is also sales and marketing activity and manufacturing.

Companies without products on the market are shown in a separate field. In this context, co-operative agreements and revenue-generating licensing have also been counted as “products on the market”.

Product development

Companies which principally develop their own products/services, i.e. incremental product development without elements of exploratory research.

Consultancy

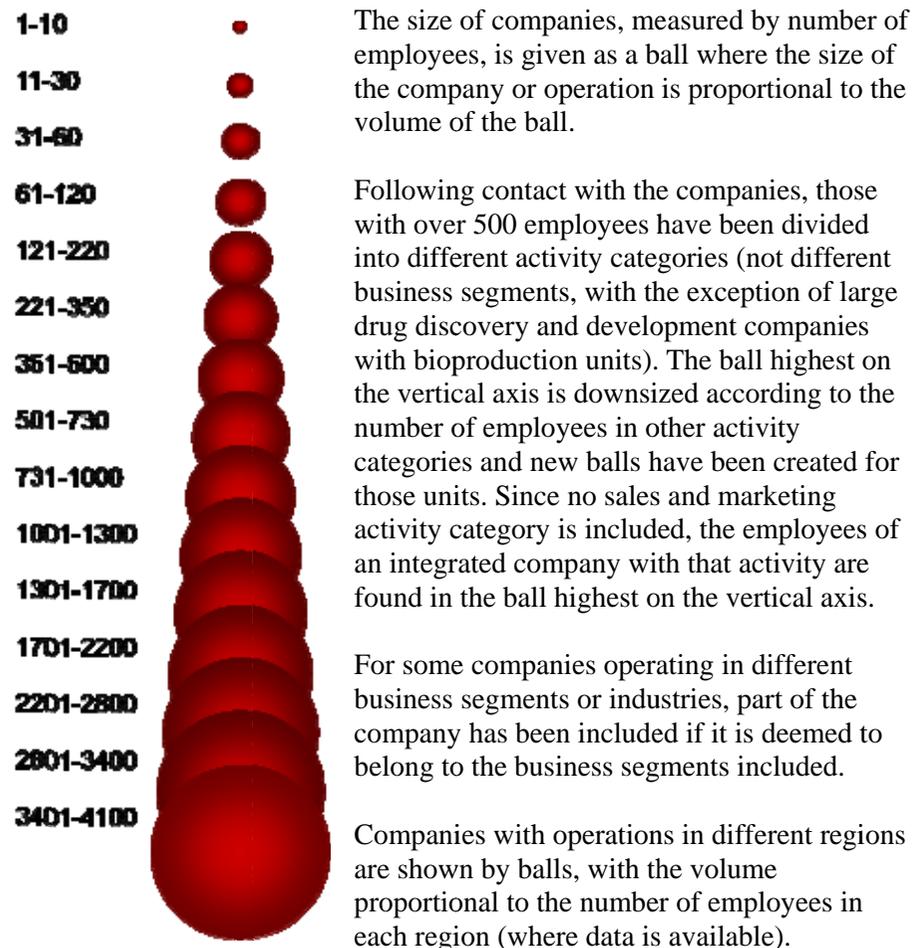
Companies which principally carry out consultancy and commission activity. All CRO companies are included here.

Manufacturing

Manufacturing of biotech products, drugs or medicotchnical products. Includes companies specialised in manufacturing but also the production units of integrated companies with more than 500 employees.

Number of employees

What is shown as “number of employees” in the report is the mean value of the number of full-time equivalent employees in 2006, i.e. the number reported by companies in their annual reports. The actual number of people employed in companies may be 20-30% higher due to part-time posts, leave of absence etc.



Regions

Medicon Valley DK (Danish side)

Comprising the regions of Sjælland and the Capital region (Copenhagen), i.e. the Danish regions on Zealand that are part of the Medicon Valley cluster.

NCS Denmark

Comprising the regions of North Denmark with Aalborg, Central Denmark with Aarhus and Southern Denmark with Odense.

Medicon Valley SE (Swedish side)

Comprising Skåne region with Malmö/Lund. This region has been included to provide the picture for the whole cluster of Medicon Valley as part of the report.

Comments

Companies included

Companies which have their major activity within the previously described selection of business segments with at least one employee in 2006 are included in the ball diagram and are listed later on in the present report. The business segment of audiological devices was not relevant to the Swedish report but is included as an important segment for Denmark.

Companies not included

Companies devoted to sales and marketing of life science products are not included. Subcontractors to companies within the selection of business segments which do not have their core activity within these fields of expertise are not included. This may apply to such enterprises as design companies, companies within manufacturing (if the operation is not entirely concentrated on included business segments), mechanical, optics and electronics companies, PR agencies, venture capital companies and patent and business advisers. The scope of these activities is very difficult to estimate. Companies conducting laboratory analysis services, often service laboratories to the healthcare sector, plus orthopaedic and dental laboratories and companies developing products sold by opticians have not been included at all in the present study. Companies within fields such as disability aids (e.g. rollators and wheelchairs), prostheses and orthopaedic devices or laboratory equipment which can be used in many sectors are not included in the ball diagram.

Division of companies into regions and different activity categories

For companies with operations in several regions, their activity in each region is shown. Companies with over 500 employees are also divided into different activity categories shown as separate balls; showing the number of employees within manufacturing for instance.

Assessment

Details of business segments, activity categories and markets are not available in general statistics, but require assessment based on information from different sources. The categorisation has been made by Medicon Valley Alliance according to the principles used by VINNOVA.

Companies with fewer than 500 employees and several activity categories within the company have been placed in the activity category which is highest on the vertical axis. This means if the company has both product development and manufacturing as activities, it has been placed under “Product development” on the vertical axis.

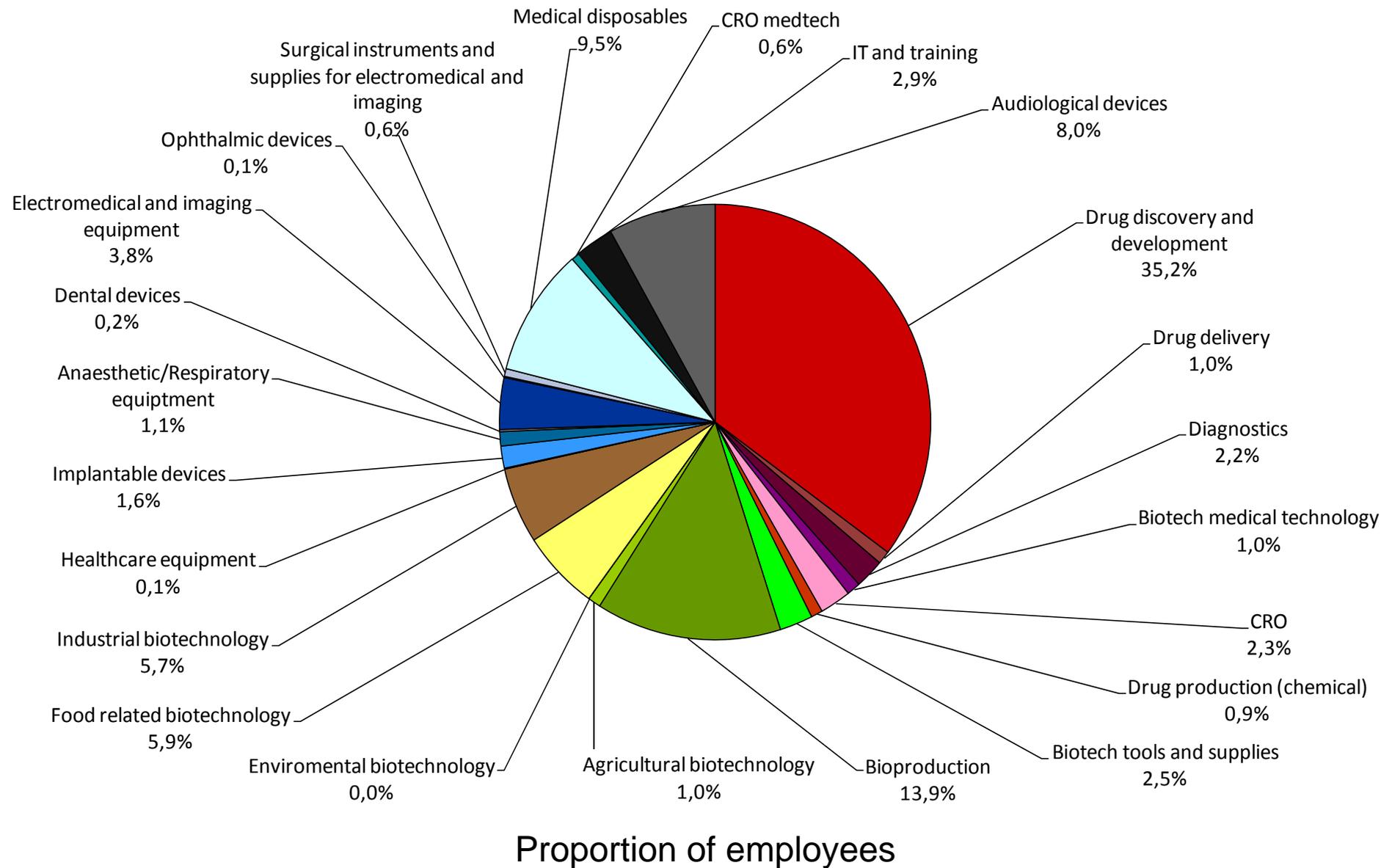
Ball diagram

The ball diagram used in this study shows four variables simultaneously:

- Geographical location (horizontal axis)
- Activity category (vertical axis)
- Business segment (colour)
- Company size in terms of the number of employees (ball size)

Readers may thus draw their own conclusions based on different combinations of the variables.

3. The Life Science Industry 2006



All companies

The total number of companies active in research and development, product development, consulting or manufacturing within the included business segments of biotechnology, pharmaceuticals and medical technology in Denmark is close to 270 companies with a total of 40,000 employees (full time equivalents). This number does not include the companies focusing on sales and marketing. 60 of these companies/units with a total of nearly 3,000 employees are active in the Northern, Central or Southern regions. Companies without employees are not included in the ball diagram or figures.

Research-intensive companies and manufacturing companies far outnumber the companies in other activities and jointly make up 90% of all included life science companies. Among the companies with broad R&D, the vast majority have a product or licence on the market. There are some cases of small companies conducting broad R&D. They were typically young and rapidly growing drug discovery companies which had not yet made any licence deals in 2006. Young medical technology companies are often found to be developing a single project or product and thus fall in the Narrow R&D category.

It should be kept in mind that the business segments add up to the total number of employees whereas the three different sectors do not. This is because there is an overlap between the sectors. A list of all companies included appears at the end of the report.



The large companies

Large companies or company groups with over 500 employees involved in different activities have been separated so that the employees are assigned to the proper types of activities (vertical axis). Units in different regions have also been considered (horizontal axis).

Most of the larger business segments include a few big companies which have major impact on the size of that business segment. This applies to drug discovery and development in particular, which is dominated by Novo Nordisk with some 10,000 employees (including the bioproduction units), corresponding to 25% of the total life science employment. However, Leo Pharmaceuticals, H. Lundbeck, SSI and Nycomed also have over 1,000 employees in the drug R&D segment. Novozymes dominates industrial biotechnology and NNIT (owned by Novo Nordisk) is the largest unit in the IT segment. Coloplast is the largest medical technology company, but ten other medtech companies have over 250 employees, among them three audiological device firms (Oticon, Widex and GN Resound). None of the multinational companies with only marketing activities are included.

The Life Science Industry 2006

Companies with broad R&D

-Product on the market

-Without product on the market

Companies with narrow R&D

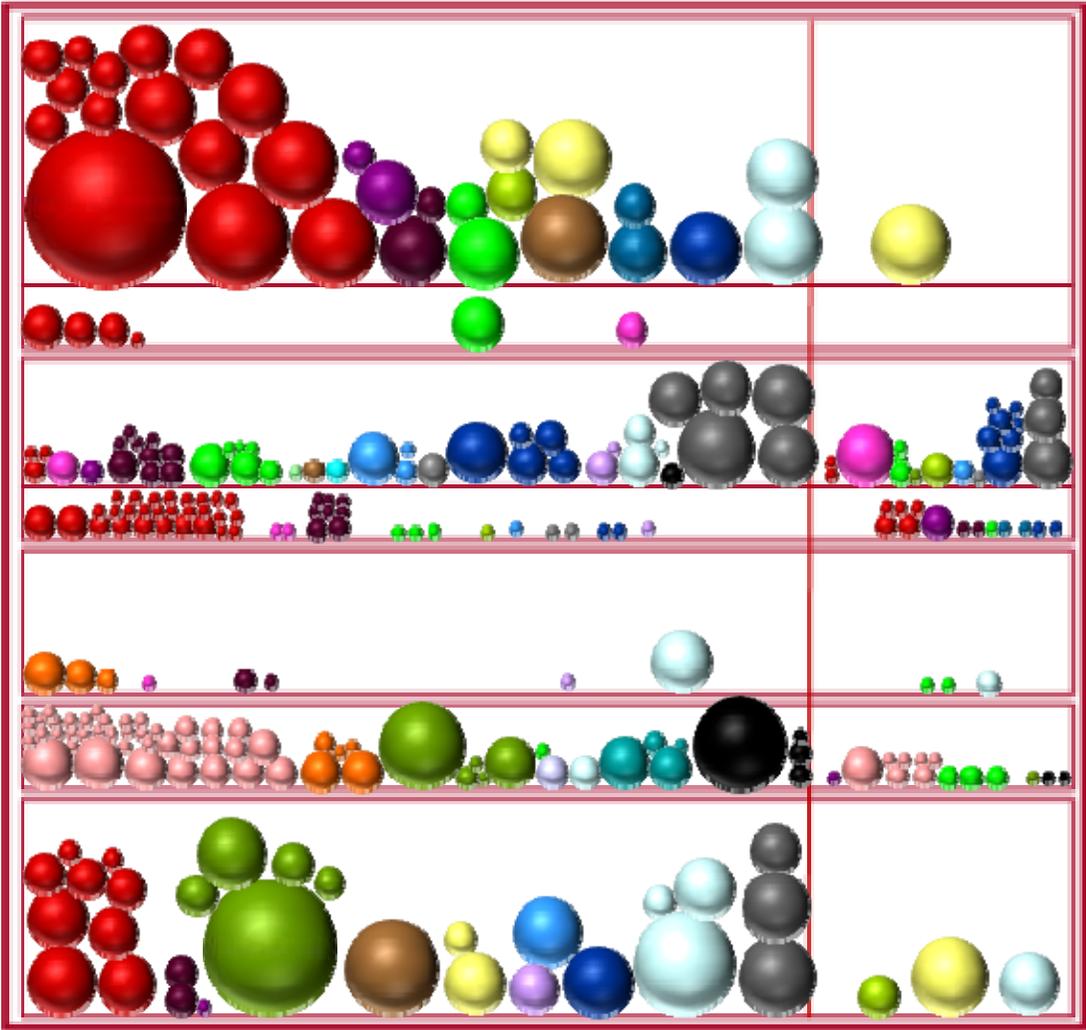
-Product on the market

-Without product on the market

Companies developing own products but without exploratory research

Consultancy activity

Production



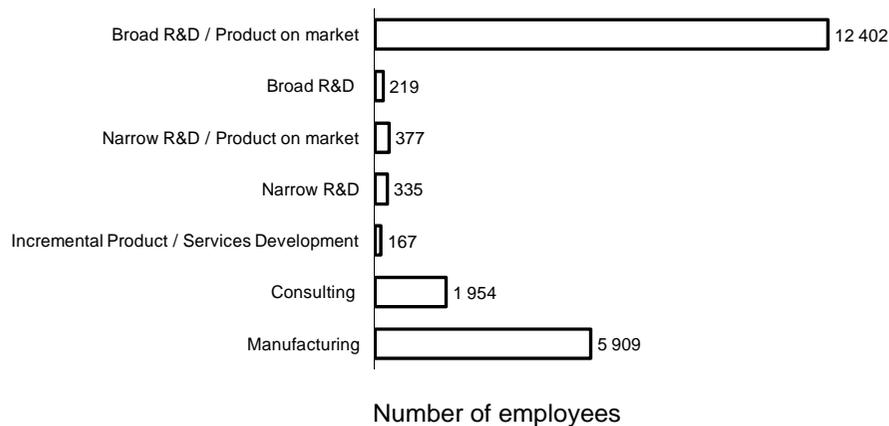
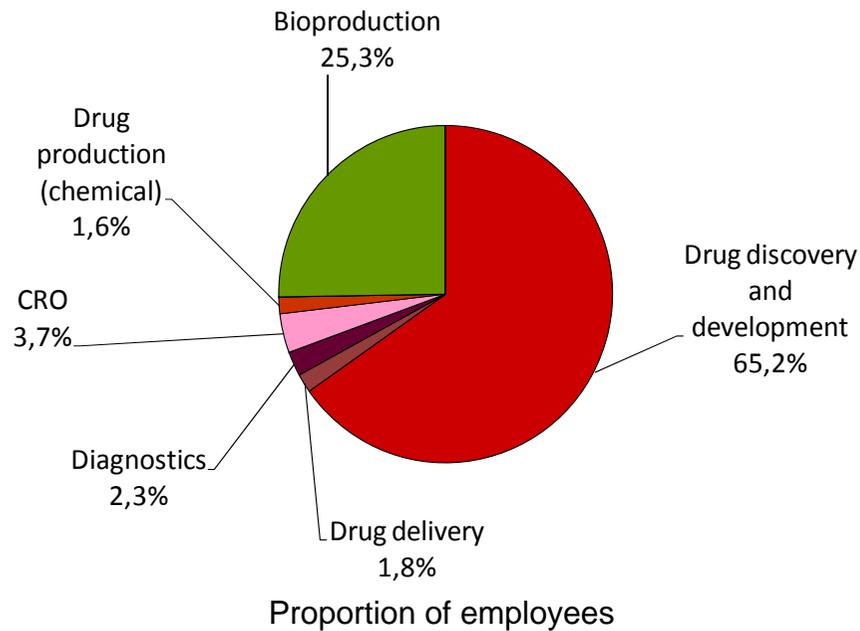
Zealand Denmark

NCS Denmark

- Drug discovery & development
- Drug delivery
- Biotech medical technology
- Diagnostics
- CRO
- Drug production
- Biotech tools and supplies
- Bioproduction
- Agricultural biotech
- Environmental biotech
- Food-related biotech
- Industrial biotech
- Healthcare equipment
- Implantable devices
- Anaesthetic /Respiratory eq.
- Dental devices
- Electromedical and imaging eq.
- Ophthalmic devices
- Surgical instruments
- Medical disposables
- CRO medtech
- IT and training
- Audiological devices



Pharmaceutical companies



Comments

The pharmaceutical sector comprises about 21,000 employees in 130 companies with R&D and/or production in Denmark. It is dominated by Novo Nordisk, which constitutes half of the pharmaceutical sector in terms of the number of employees. Drug discovery and drug development is by far the largest business segment, with Leo Pharmaceuticals, H. Lundbeck, SSI, Nycomed and Ferring Pharmaceuticals contributing a significant number of employees in this business segment. Drug delivery and diagnostic companies are also included in the pharmaceutical sector. In 2006, total Danish pharmaceutical exports amounted to DKK 40 billion according to the Danish Association of the Pharmaceutical Industry (Lif).

About two thirds of the research-intensive companies, i.e. categorised in the R&D activity category in the present study, are in the category of narrow R&D and less than 20% of these firms have a product on the market. Among the companies which have reached the market with a product or licence, the vast majority perform broad R&D. Product development does not involve many of the employees in the sector. Companies developing new drugs are predominately found in the categories including exploratory research, whereas some of the companies developing diagnostic tests are in the product development category. There are some 40 CROs (contract research organisations) which contribute 9% of the employees. Many of the employees in the drug discovery and development business segment are in the manufacturing activity category, due to large manufacturing units of Novo Nordisk and the other large pharmaceutical companies.

Novo Nordisk, H Lundbeck and Leo Pharma are all controlled by foundations which secure the companies' continued independence and activities in Denmark as well as abroad.

Pharmaceutical companies

Companies with broad R&D

-Product on the market

-Without product on the market

Companies with narrow R&D

-Product on the market

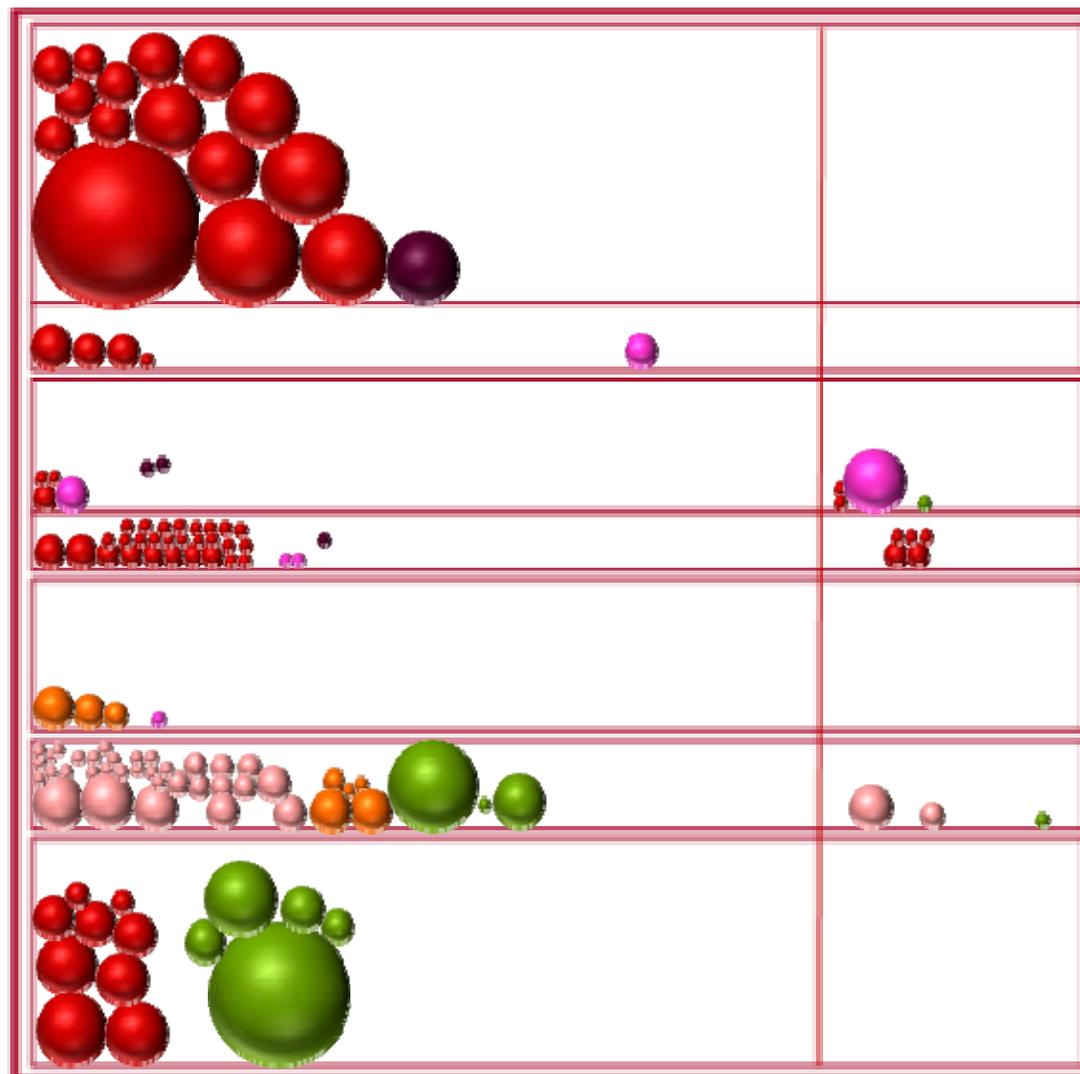
-Without product on the market

Companies developing own products but without exploratory research

Consultancy activity

Production

Drug discovery & development
 Drug delivery
 Diagnostics
 CRO
 Drug production
 Bioproduction

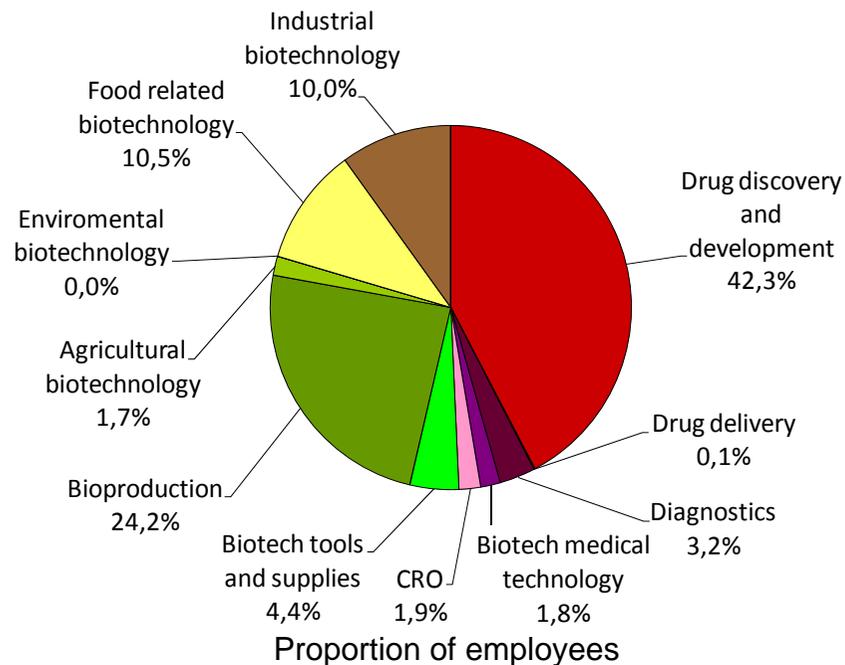


Zealand Denmark

NCS Denmark



Biotechnology companies



Comments

The biotechnology sector includes about 22,000 employees in almost 140 companies. Nearly half of these companies are involved in drug discovery and development, diagnostics and healthcare related bioproduction. A very large part of Denmark's pharmaceutical industry is based on biotechnology; this is true for Novo Nordisk, SSI, Ferring and about 50 young companies. This gives a remarkable overlap between the pharma and biotech sectors.

Beyond the drug related segments are other large companies. Novozymes, controlled by the Novo Nordisk Foundation, dominates industrial biotechnology with 2,200 employees. Chr Hansen and Danisco (except the now divested sugar division) jointly have 2,300 employees working in such areas as enzymes, probiotics and cultures for food, health and industrial biotech. About half of the personnel of these three companies are active in R&D.

It should be noted that the large biotechnology companies are also active within energy/environmental biotechnology (e.g. bioethanol), not shown in the pie diagram.

Biotech tools and supplies is another important segment, with Nunc Brand Products as the largest company.

The biotechnology sector dominates the life science industry in the Northern, Central and Southern Regions with about 1,600 employees, very much due to the presence of Danisco and DLF Trifolium but there are also new companies such as Agro&Ferm from 2002 (cf. chapter 4).

A majority of the industrial biotechnology, food related technology and "biotech tools and supplies" companies have products on the market, whereas this is less common among the small and medium sized biotech "drug discovery and development" companies.

Overall, about one third of the employees in the sector are active in manufacturing. This is similar to the situation in the pharmaceutical sector (28%) and it should be remembered that many companies are included in both sectors.

Biotechnology companies

Companies with broad R&D

-Product on the market

-Without product on the market

Companies with narrow R&D

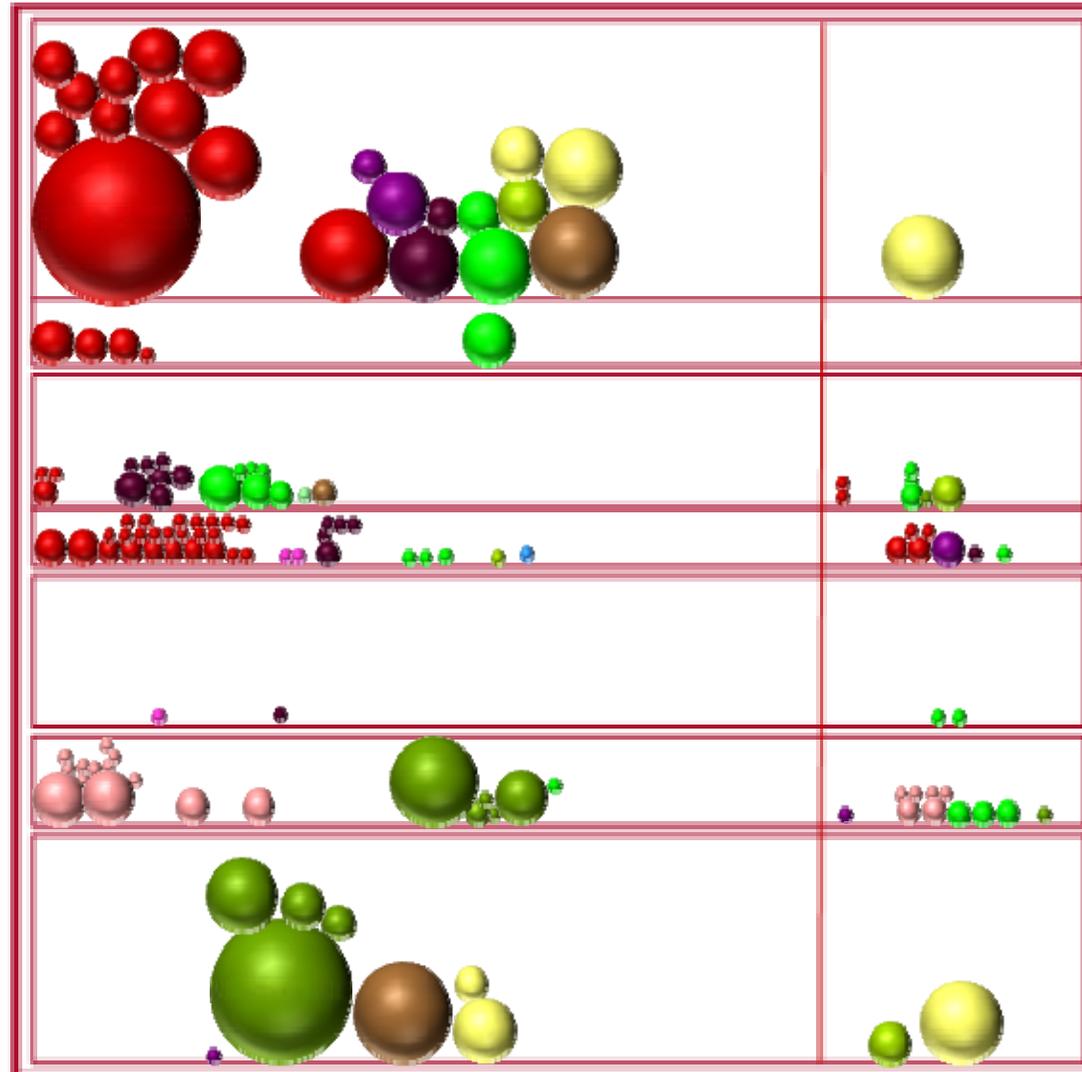
-Product on the market

-Without product on the market

Companies developing own products but without exploratory research

Consultancy activity

Production



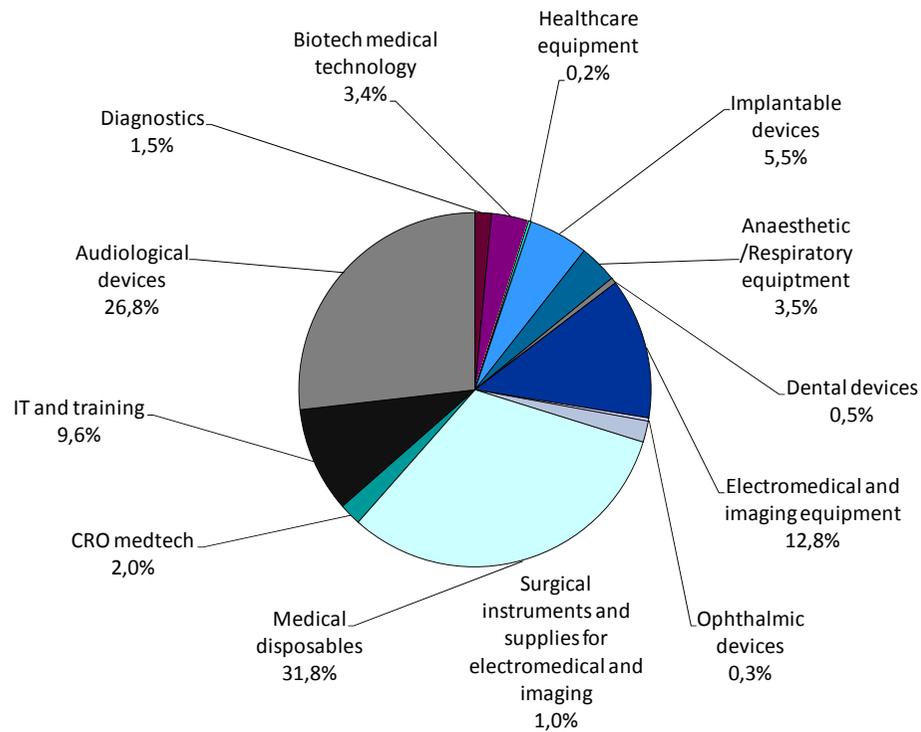
- Drug discovery & development
- Drug delivery
- Biotech medical technology
- Diagnostics
- CRO
- Biotech tools and supplies
- Bioproduction
- Agricultural biotech
- Environmental biotech
- Food-related biotech
- Industrial biotech



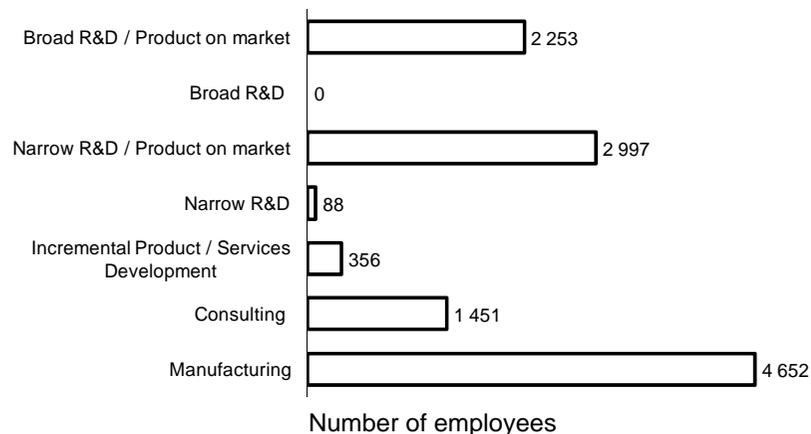
Zealand Denmark

NCS Denmark

Medical technology companies



Proportion of employees



Comments

The medical technology sector employs about 12,000 people in 90 companies with R&D and/or production in Denmark. Novo Nordisk is active in medical devices but has been excluded from this analysis.

The sector is dominated by the three business segments of medical disposables, electromedical & imaging equipment and audiological devices.

Medical disposables is the largest segment with about 3,500 employees, predominantly at Coloplast but also at Unomedical and Dansac. Second in size in terms of employees is the audiology segment with over 3,000 Danish employees in total. The largest companies are Oticon, Widex and GN Resound. This audiology cluster is remarkable since it accounts for about 40% of the world market of hearing aids. Electromedical & imaging equipment is dominated by Radiometer Medical. In other segments, large companies include William Cook Europe (implantable devices) and Ambu (anaesthetic/respiratory equipment).

Some of the medical technology companies are owned by foundations, in similar fashion to many pharmaceutical companies. Examples include the Oticon and Danfoss foundations.

The vast majority of the medical technology companies have a product on the market before they broaden their research. Most young companies were considered to have narrow research and, in a segment such as diagnostics, a significant portion of the companies had not yet reached the market.

Although much manufacturing of medical technology products takes place outside Denmark, the number of employees involved in manufacturing in Denmark is nearly 40% of all those in the sector.

Companies within fields such as disability aids (e.g. rollators and wheelchairs), prostheses and orthopaedic devices are not included in the ball diagram.

Medical technology companies

Companies with broad R&D

-Product on the market

-Without product on the market

Companies with narrow R&D

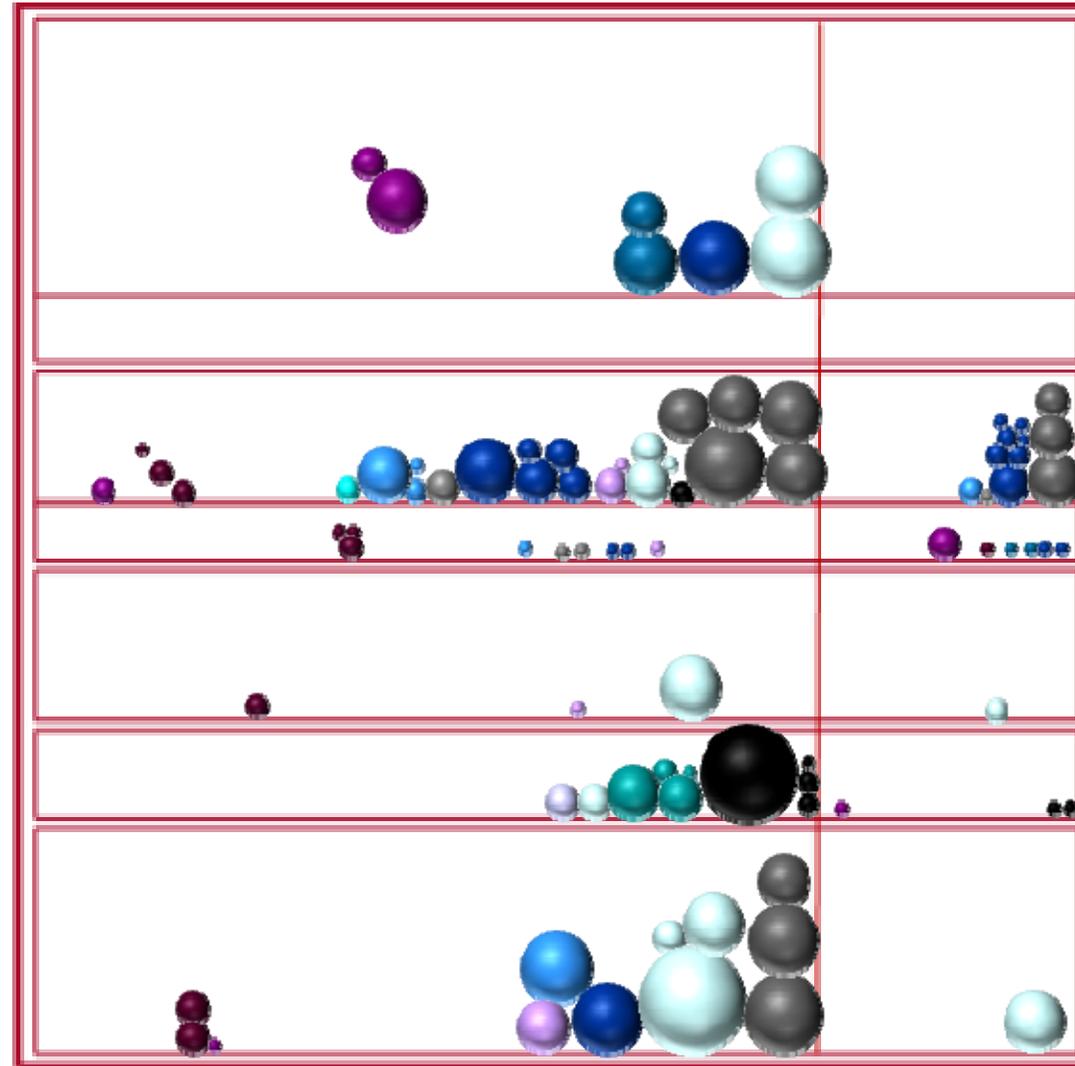
-Product on the market

-Without product on the market

Companies developing own products but without exploratory research

Consultancy activity

Production



Zealand Denmark

NCS Denmark

- Biotech medical technology
- Diagnostics
- Healthcare equipment
- Implantable devices
- Anaesthetic /Respiratory eq.
- Dental devices
- Electromedical and imaging eq
- Ophthalmic devices
- Surgical instruments
- Medical disposables
- CRO medtech
- IT and training
- Audiological devices



4. National and regional comparisons

Medicon Valley

Medicon Valley is a bi-national cluster spanning the island of Zealand with the capital Copenhagen in eastern Denmark and the Skåne region of southern Sweden.

Medicon Valley is one of Europe's strongest life science clusters with over 43,500 employees in the life science industry. This is equal to 92% of all Danish plus 20% of all Swedish employees in companies with R&D and/or production and/or consultants, making the life science industry in this region of 3.5 million people region larger than in either of the two countries.

The cluster relies on an interaction between businesses, hospitals, universities, public research organisations and other public players – the triple helix model. Based on this model, Medicon Valley Alliance provides initiatives to facilitate interaction and network activities among the different public and private life science players. This interaction aims to ensure a dynamic environment of innovation and knowledge-sharing as a prerequisite for the growth of established companies and successful formation and growth of new companies.

In 2006, there were about 350 companies, 205 on the Danish side with 37,000 employees and 145 in Skåne with 6,500 employees. Companies with only sales and marketing were not included. Due to a wider definition of medical technology, this mapping cannot be directly compared to the one for 2003 (with a total of 255 companies). However, if only the companies included in 2003 plus the ones started between 2003 and 2006 are studied, then the number of full time equivalents have increased by nearly 9% (+10% on the Danish side and +5% in Skåne). This makes Medicon Valley the fastest growing region in Sweden as well as in Denmark.

The largest companies in terms of full time equivalents (FTE)

1,001-10,000 FTE

Novo Nordisk A/S
Leo Pharmaceuticals A/S
Novozymes A/S
Coloplast Denmark A/S
H. Lundbeck A/S
Oticon A/S
Statens Serum Institut
NNIT A/S

600-1,000 FTE

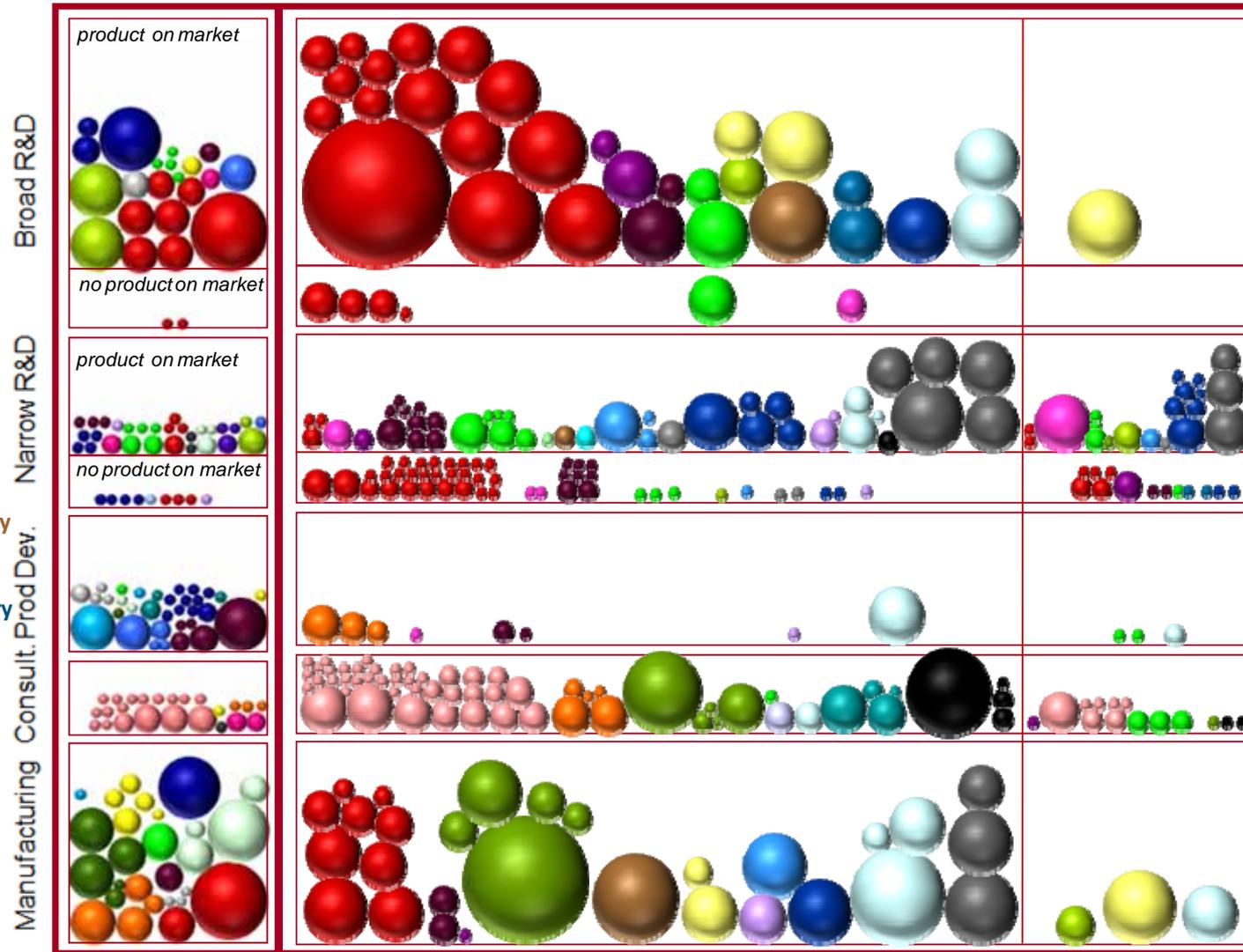
Astra Zeneca R&D Lund
Gambro AB
Radiometer Medical A/S
Chr Hansen A/S
McNeil Sweden AB
NNE Pharmaplan A/S
Unomedical A/S
Widex A/S
Nycomed A/S
William Cook Europe A/S

The 18 largest companies are active in drug research, development & production including bioproduction (8), industrial and food-related biotechnology (2), and medical technology related to implantable devices & medical disposables (3), audiological devices (2), electromedical & imaging (2), IT & training (1).

Another 12 companies had over 250 employees in the region in 2006: ALK-Abelló A/S, Ambu A/S, Actavis A/S, Becton Dickinson Infusion Therapy AB, DAKO A/S, Dansac A/S, Ferring Pharmaceuticals A/S, Ferrosan A/S, GN Resound A/S, HemoCue AB, Nunc Brand Products A/S and Sahva A/S. Together these 30 companies had about 75% of all employees.

Cluster Profile Denmark and Skåne/Sweden

- Drug discovery & development
 - Drug delivery
 - Biotech medical technology
 - Diagnostics
 - CRO
 - Drug production
 - Biotech tools and supplies
 - Bioproduction
 - Agricultural biotechnology
 - Environmental biotechnology
 - Food related biotechnology
 - Industrial biotechnology
 - Healthcare equipment
 - Implantable devices
 - Anaesthetic/Respiratory
 - Dental device
 - Electromedical and imaging eq.
 - Ophthalmic devices
 - Surgical instruments
 - Medical disposables
 - CRO medtech
 - IT and training
 - Audiological devices
- 



Skåne/Sweden Zealand/Denmark NCS Denmark

Medicon Valley

Companies established 2000-2006

About 120 Danish life science companies were established between 2000 and 2006. By 2006, one third of them have reached the market with a product or a licence agreement.

A majority of the new companies are found in the biotech and pharmaceutical sectors and they are predominately involved in drug discovery and development (including contracting) or diagnostics.

CMC Biopharmaceuticals (now CMC Biologics) with 160 employees, was founded by six experienced managers in 2001 as a new contract organisation for bioproduction. Three drug discovery companies founded in 2000-2001, Maxygen, TopoTarget and Symphogen, had 60-70 employees each in 2006. Nordic Bioscience and Agro&Ferm also had over 50 employees.

A comparison to the 170 Swedish companies founded 2000-2006 shows there to be a larger number of newly established firms in Sweden but that the Danish companies have more employees. New firms that have taken over commercial activities from established companies (such as medical chewing gums at Vejle, healon production in Uppsala, dextran production at Køge or contact allergy tests at Hillerød) are not included in the comparison.

No. of companies per size group (number of employees 2006)	Denmark	Sweden
>50	6	0
21-50	12	11
11-20	21	17
1-10	76	143

Danish Companies established 2000 - 2006

Companies with broad R&D

-Product on the market

-Without product on the market

Companies with narrow R&D

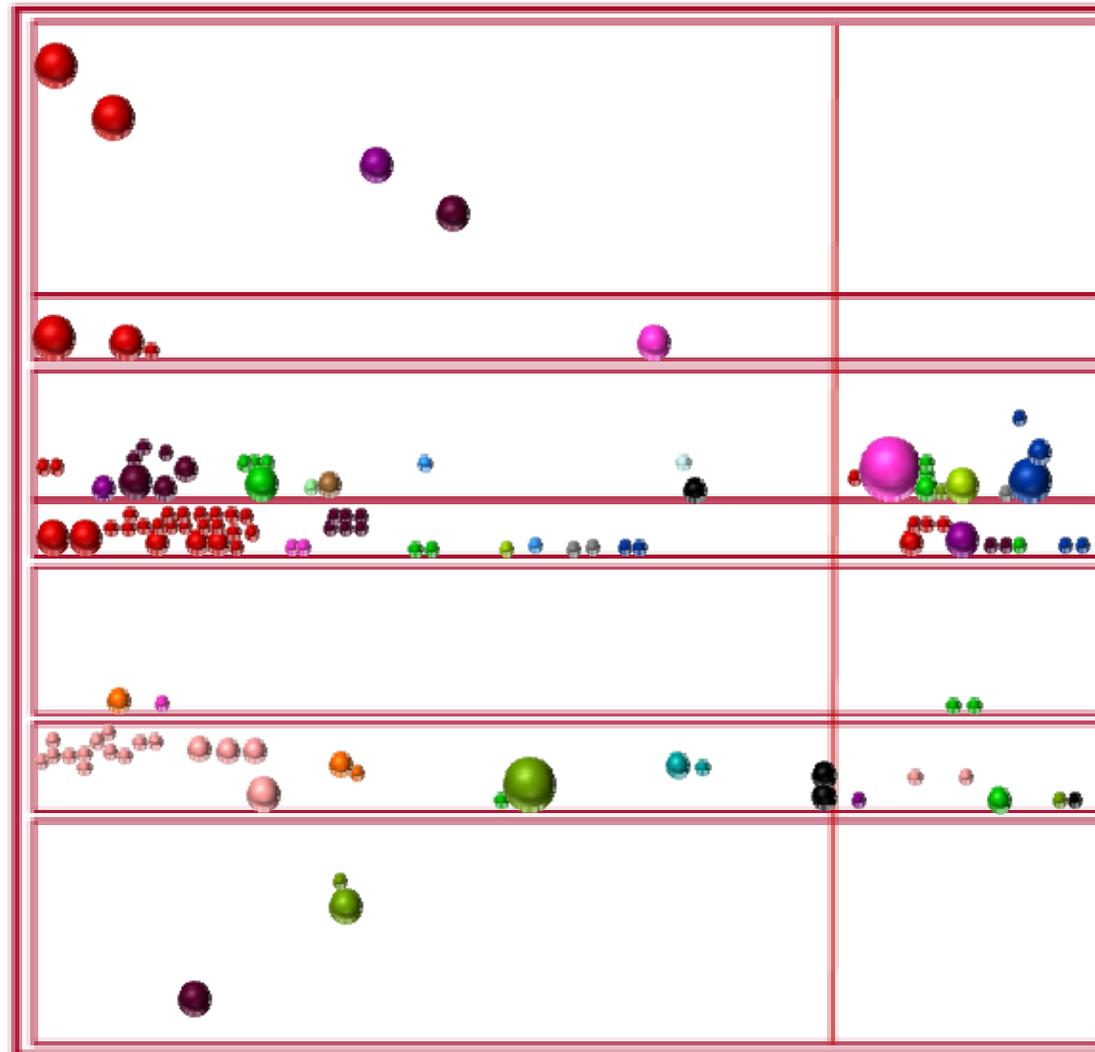
-Product on the market

-Without product on the market

Companies developing own products but without exploratory research

Consultancy activity

Production



Zealand Denmark

NCS Denmark

- Drug discovery & development
- Drug delivery
- Biotech medical technology
- Diagnostics
- CRO
- Drug production
- Biotech tools and supplies
- Bioproduction
- Agricultural biotech
- Environmental biotech
- Food-related biotech
- Industrial biotech
- Healthcare equipment
- Implantable devices
- Anaesthetic /Respiratory eq.
- Dental devices
- Electromedical and imaging eq.
- Ophthalmic devices
- Surgical instruments
- Medical disposables
- CRO medtech
- IT and training
- Audiological devices

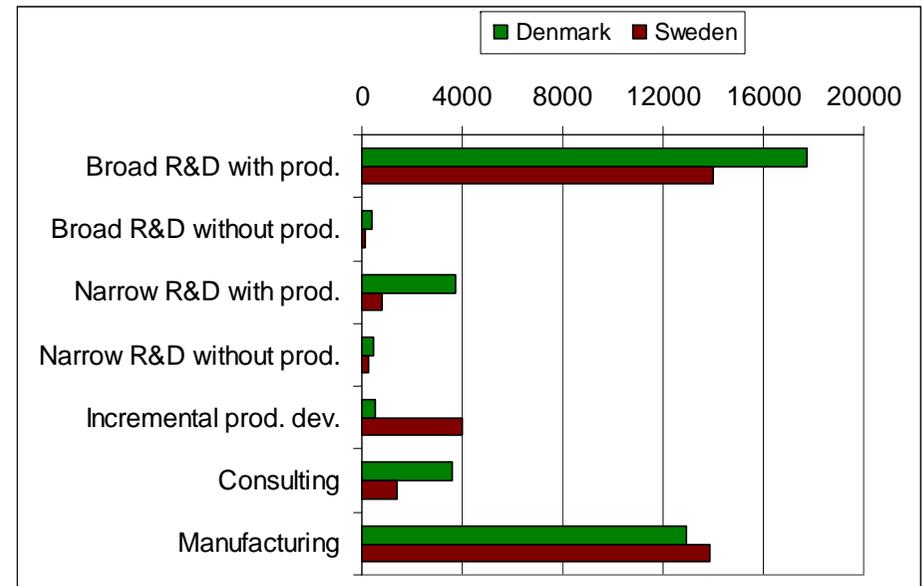


Comparison between Denmark and Sweden

In 2006, Sweden had almost 600 companies with 34,400 employees involved in manufacturing, consultancy, product development and/or R&D. This was essentially unchanged from 2003. Thus, there were twice as many companies in Sweden as in Denmark, while the total number of employees was lower. The explanation is that Sweden had over 300 micro-companies but relatively few medium-sized and large companies.

Share of companies [%] per size group (number of employees)	DK [%]	SE [%]
>250	10	4
51-250	17	8
11-50	29	28
1-10	44	60
All	100	100

Over half of all Danish employees (54%) worked in R&D companies with a product on the market (including licences). The comparable proportion in Sweden was 43%. A higher share was employed in manufacturing in Sweden, about 40% compared to 33% in Denmark. Consulting plus product development was also somewhat higher in Sweden, 15% versus 11%.

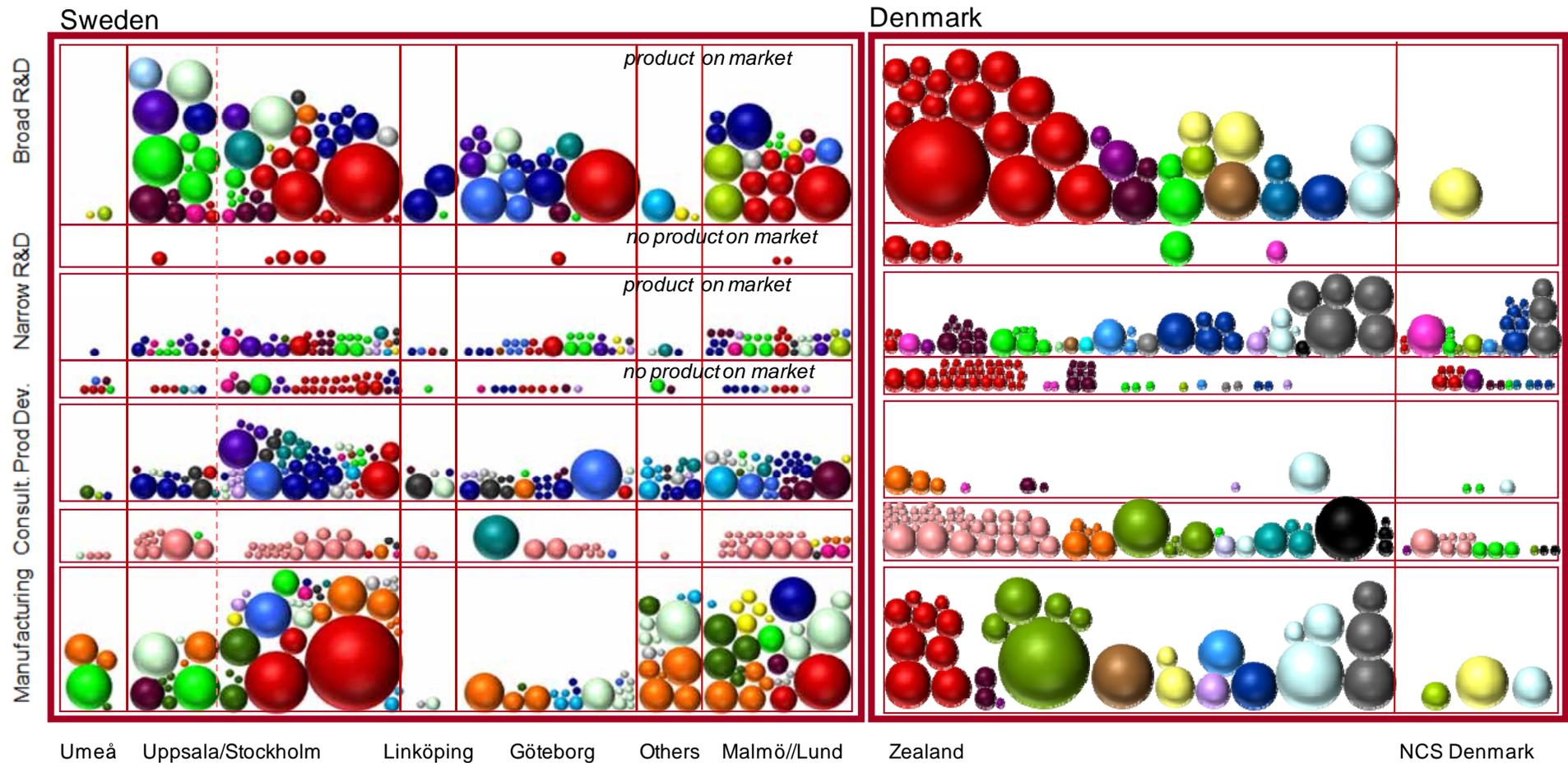


Comparison of business segments reveals that drug discovery and development is the dominant area in both countries. When drug production and health-related bioproduction are added, the pharma companies had half of all employees (50% in Denmark, 51% in Sweden). AstraZeneca had about 10,000 employees in Sweden in 2006, while NovoNordisk had the same number in Denmark.

The medical technology sector employed about 30% of the life science work force in Sweden and almost as many in Denmark (28%). Audiological devices are a Danish speciality, while Sweden has more Electromedical and imaging equipment (e.g. Gambro, Getinge, Electa).

In the biotech sector, Denmark had much more employees in industrial and food-related biotechnology (jointly 12%), while Sweden had a higher share of the employees in Biotech tools and supplies (GE Healthcare) and Biotech medical technology (e.g. Q-Med and Octapharma).

Cluster Profile Sweden and Denmark 2006



5. List of Danish companies

Drug discovery and development

> 250 employees

Ferring Pharmaceuticals A/S
H Lundbeck A/S
Leo Pharma A/S
Novo Nordisk A/S
Nycomed A/S
Statens Seruminstitut A/S

51-250 employees

ALK Abelló A/S
AstraZeneca A/S (R&D part)
Bavarian Pharma A/S
Genmab A/S
Maxygen A/S
Neurosearch A/S
Pharmexa A/S
Santaris Pharma A/S
Symphogen A/S
Topo Target A/S
Zealand Pharma A/S

11-50 employees

7TM Pharma A/S
ACE Biosciences A/S
Arpida A/S
Astion Pharma A/S
Borean Pharma A/S
Enkam Pharmaceuticals A/S
Hagedorn Research Institute
NatImmune A/S

NsGene A/S
Nuevolution A/S
Rheoscience A/S
Zymenex A/S

1-10 employees

2CureX A/S
Action Pharma A/S
BSP Pharma A/S
CellCure A/S
Colotech A/S
Dandrit Biotech A/S
Evolva Biotech A/S
Forward Pharma A/S
Gastrotech Pharma A/S
Genesto A/S
Glycanova (Medimush) A/S
Glycom A/S
ImmuPharm A/S
Interface Biotech A/S
Lica Pharmaceuticals A/S
Meabco A/S
Myco TeQ A/S
Nordic Phytopharma A/S
Nordic Vaccine A/S
OncoTac Pharmaceuticals ApS
Osteologix A/S
Prozymex Pharmaceuticals A/S
QSI Pharma A/S
ReceptIcon A/S
Sanos Bioscience A/S
T-Cellic A/S
Valderm A/S
Vipergen A/S

Drug delivery

> 250 employees

Fertin A/S

11-50 employees

Curalogic A/S
Egalet A/S
Life Cycle Pharma A/S

1-10 employees

LiPlasome Pharma A/S
Zgene A/S

Diagnostics

> 250 employees

DAKO A/S

51-250 employees

Nordic Bioscience A/S

11-50 employees

Alpine Biomed ApS
Atonomics A/S
BioPorto Diagnostics A/S
Chemometec A/S
Chempaq A/S
Fisher BioImage A/S
Immunodiagnostic Systems A/S
Medtronic A/S
MEKOS Laboratories ApS
PreciSense A/S
Scandinavian Micro BioDevices A/S

1-10 employees

Alsensa A/S
BioMonitor ApS
BioNano Photonics A/S
CIPHERGEN Biosystems A/S
Eldon Biologicals A/S
Fluimedix A/S
Medical Prognosis Institute A/S
Quantibact A/S

RefLab A/S
RSP System ApS
Virogates ApS
FCMB ApS

Biotech medical technology

> 250 employees
Ferrosan A/S

51-250 employees
Genzyme A/S

11-50 employees
Millimed A/S
Vivolution A/S

1-10 employees
Cytotech ApS
Stemcare A/S

CRO companies

51-250 employees
Capio Diagnostik A/S
Center for Clinical and Basic Research A/S
Cyncron Aps
LAB Scantox A/S
Taconic M&B

11-50 employees
aCRONordic A/S
Bioneer A/S
Clauson-Kaas A/S
DB Lab A/S
Encorium ApS
Eurofins A/S
KLIFO A/S
Lonza Copenhagen ApS

Norma ApS
Omnicare Clinical Research A/S
PhaseOne Trials A/S
Pipeline Biotech A/S
Quintiles A/S
TrialFormSupport A/S

1-10 employees
Alphalyse A/S
Analysis
AP Pharma Exchange A/S
AROS Applied Biotechnology A/S
Array Diagnostica A/S
BioAdvice A/S
Biomodics A/S
Covance Caps Nordic A/S
Empas Consulting A/S
Formbion A/S
Gfk Danmark /Healthcare) A/S
Huntingdon A/S
ImmunoSigns A/S
IPC Services A/S
Jubile kinase ApS
KJ Ross-Pedersen A/S
Larix ApS
Loke Diagnostics ApS
MedChem ApS
Medico-Kemiska Laboratorium ApS
MSC ApS
Pre-clinical Services ApS
Smerud Medical Research ApS
Synarc A/S
TAG Copenhagen A/S
Xendo Pharma Service A/S
Zelo A/S

Drug production (chemical)

> 250 employees
Actavis A/S

51-250 employees
FEF Chemicals
GEA Pharmaceutical A/S
Pharmacosmos A/S
Polypeptide Laboratories A/S
Scanpharm A/S
Syntese A/S
Unikem A/S

11-50 employees
Dansk Farmaceutisk Industri A/S
Pharmavinci A/S
PK Chemicals A/S
Propharma A/S
Sterigenics Denmark A/S

1-10 employees
HB-Medical ApS
Particle Analytical ApS

Biotech tools and supplies

> 250 employees
Nunc Brand Products A/S

51-250 employees
Carlsberg Research Center
Exiqon A/S
Medicult A/S

11-50 employees
CLC Bio A/S
DNA Technology ApS
Pedersen's Laboratorium

Proxeon Biosystems/Bioscience A/S
Sophion Bioscience A/S
Unizyme Laboratories A/S
Upfront Chromatography A/S
Versamatrix A/S

1-10 employees

Biotech IgG A/S
Bio-Test Aps
Caslo laboratory Aps
Cym1p A/S
Ilochip A/S
Jurag Separation
Kem-En Tec Diagnostics A/S
KinaseDetect ApS
Microlytic ApS
PentaBase ApS
RiboTask Aps
tebu-bio ApS
Toxispot A/S
Unit-One A/S

Bioproduction (healthcare)

> 250 employees

Novo Nordisk A/S
NNE Pharmaplan A/S
Statens Seruminstitut

51-250 employees

Biofac A/S
CMC Biologics A/S
Polypeptide Laboratories A/S

11-50 employees

Biogen Idec Denmark Manufacturing

1-10 employees

Schafer-N ApS

Cobento A/S
The Antibody Project ApS

Agricultural biotechnology

51-250 employees

Agro & Ferm A/S
DLF Trifolium A/S

1-10 employees

Aresa A/S

**Environmental
biotechnology**

1-10 employees

BioLocus ApS

Food-related biotechnology

>250 employees

Chr Hansen A/S
Danisco A/S

11-50 employees

Bifodan A/S

Industrial biotechnology

>250 employees

Novozymes A/S

11-50 employees

Fluxome Sciences A/S

Healthcare equipment

>250 employees

Sahva A/S
11-50 employees
Heka Dental A/D

1-10 employees

Trier Research Lab ApS

**Active and non-active
implantable devices**

> 250 employees

Coloplast A/S
William Cook Europe ApS

11-50 employees

NeuroDan A/S
PNN Medical A/S

1-10 employees

Cartificial A/S
Contura International A/S

**Anaesthetic/Respiratory
equipment**

>250 employees

Ambu A/S

51-250 employees

Dameca A/S

1-10 employees

Direct Hailer A/S
Mermaid Care A/S

Dental devices

51 -250 employees

XO Care A/S

1-10 employees

Aproxi ApS

Dentofit A/S

Medotech A/S

Electromedical and imaging equipment

> 250 employees

Radiometer Medical ApS

51-250 employees

B-K Medical ApS

Bang&Olufsen Medicon A/S

Ellab A/S

11-50 employees

3D Danish Diagnostic Development

Cortex Technology ApS

Danfoss Bionics A/S

Danish Myo Technology A/S

Danmeter A/S

Ellipse A/S

MedArt A/S

RTX Healthcare A/S

1-10 employees

Advalight ApS

Cephalon A/S

Fiomed ApS

Stressmeter A/S

Urodan ApS

Audiological devices

>250 employees

GN ReSound A/S

Oticon A/S

Sonion A/S

Widex A/S

51-250 employees

GN Otometrics A/S

Interacoustics A/S

11-50 employees

Siemens Hearing Solutions

Ophthalmic devices

11-50 employees

Chempilots A/S

Surgical instruments and supplies for electromedical and imaging applications

51-250 employees

Lina Medical ApS

SP Medical (Accoat) A/S

1-10 employees

Emunio ApS

Exacon A/S

Union Medico ApS

Medical disposables

> 250 employees

Coloplast A/S

Dansac A/S

Unomedical A/S

51-250 employees

Codan Steritex ApS

PBN Medicals Denmark A/S

Vitrex Medical A/S

11-50 employees

Capp A/S

H Dam Kærgaard A/S

1-10 employees

Continence Care A/S

CRO medtech

51-250 employees

Elos Pinol A/S

Knudsen Plast A/S

11-50 employees

Danchip A/S

1-10 employees

Cardio Capacity A/S

IT and training

> 250 employees

NNIT

11-50 employees

ICE A/S

Medical Insight A/S

Visiopharm A/S

1-10 employees

Anybody Technology A/S

Neurotech A/S

SMI Danmark ApS

Tables

		Broad R&D / Product on market	Broad R&D	Narrow R&D / Product on market	Narrow R&D	Incremental Product / Services Development	Consulting	Manufacturing	TOTAL
Total	Companies	31	6	63	61	11	75	33	280
Total	Employees	17 760	394	3 706	479	532	3 603	12 901	39 375
Pharmaceuticals	Companies	16	5	10	36	4	44	14	129
Pharmaceuticals	Employees	12 402	219	377	335	167	1 954	5 909	21 363
Biotechnology	Companies	22	5	25	44	4	31	11	142
Biotechnology	Employees	12 837	350	418	426	20	1 486	6 771	22 308
Medical Technology	Companies	7	0	37	15	4	13	13	89
Medical Technology	Employees	2 253	0	2 997	88	356	1 451	4 652	11 797

Distribution of companies and employees according to activity category

		Drug discovery and development	Drug delivery	Diagnostics	Biotech medical technology	CRO	Drug production (chemical)	Biotech tools and supplies	Bioproduction	Agricultural biotechnology	Environmental biotechnology	Food related biotechnology	Industrial biotechnology	Healthcare equipment	Implantable devices	Anaesthetic/Respiratory equipment	Dental devices	Electromedical and imaging equipment	Ophthalmic devices	Surgical instruments and supplies for Electromedical and...	Medical disposables	CRO medtech	IT and training	Audiological devices	Total	
Total	Companies	66	6	25	6	46	8	26	10	4	1	6	3	1	6	4	4	18	1	5	12	4	7	11	280	
Total	Employees	13 871	386	864	405	917	342	976	5 463	375	3	2 336	2 225	28	646	416	63	1 513	35	228	3 751	238	1 134	3 161	39 375	
Pharmaceuticals	Companies	66	6	4	0	35	8	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	129
Pharmaceuticals	Employees	13 871	386	501	0	800	342	0	5 463	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21 363
Biotechnology	Companies	49	3	16	5	19	0	26	9	4	1	6	3	0	1	0	0	0	0	0	0	0	0	0	0	142
Biotechnology	Employees	9 433	24	712	392	433	0	976	5 398	375	3	2 336	2 225	0	1	0	0	0	0	0	0	0	0	0	0	22 308
Medical Tech	Companies	0	0	10	6	0	0	0	0	0	0	0	0	1	6	4	4	18	1	5	12	4	7	11	89	
Medical Tech	Employees	0	0	179	405	0	0	0	0	0	0	0	0	28	646	416	63	1 513	35	228	3 751	238	1 134	3 161	11 797	

Distribution of companies and employees according to business segment

Sources

This study was based on the database built up within the framework of the previous VINNOVA report on Medicon Valley (VINNOVA Supplementary Report with Medicon Valley:VA 2005:2), membership lists for pharma, biotech and medtech companies, RANK 2006 (the annual ranking list published by Ingeniøren at www.ing.dk), and new information based on contacts with Science Parks, University holding companies and Venture Capital firms operating within Life Science.

The data was supplemented by data lists from Købmandsstandens Oplysnings Bureau (KOB/Experian), especially for companies with NACE codes 331. Concerning companies identified by a NACE code, only those with at least one employee were categorised.

Companies were categorised on the basis of information from the companies' websites, other information on the Internet, patent applications, various studies and analyses of companies within the field and telephone conversations with some of the companies included. Information about the number of employees and year of establishment for each company was extracted from official databases but had to be confirmed, especially in regard to the distribution of employees by geographical region.

Information for Sweden was taken from the new VINNOVA report (VA 2007:16) National and regional cluster profiles. Companies in biotechnology, pharmaceuticals and medical technology in Sweden.

Biotech definition

OECD biotechnology definition:

The application of science and technology to living organisms as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services

OECD list-based definition of biotechnology techniques:

DNA/RNA: Genomics, pharmacogenomics, gene probes, genetic engineering, DNA/RNA sequencing/synthesis/amplification, gene expression profiling, and use of antisense technology.

Proteins and other molecules: Sequencing/synthesis/engineering of proteins and peptides (including large molecule hormones); improved delivery methods for large molecule drugs; proteomics, protein isolation and purification, signalling, identification of cell receptors.

Cell and tissue culture and engineering: Cell/tissue culture, tissue engineering (including tissue scaffolds and biomedical engineering), cellular fusion, vaccine/immune stimulants, embryo manipulation.

Process biotechnology techniques: Fermentation using bioreactors, bioprocessing, bioleaching, biopulping, biobleaching, biodesulphurisation, bioremediation, biofiltration and phytoremediation.

Gene and RNA vectors: Gene therapy, viral vectors.

Bioinformatics: Construction of databases on genomes, protein sequences; modelling complex biological processes, including systems biology.

Nanobiotechnology: Applies the tools and processes of nano/microfabrication to build devices for studying biosystems and applications in drug delivery, diagnostics etc.