



# DTU BIOSUSTAIN

The Novo Nordisk Foundation Center for Biosustainability at DTU



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Published: July 2024.  
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## ***“We research for a sustainable future”***

The Novo Nordisk Foundation Center for Biosustainability was established in 2011, based on a donation from the Novo Nordisk Foundation (NNF), to harness the power of microbial biotechnology for enabling the green transition. Based at the Technical University of Denmark (DTU), at the time of inception it was the first interdisciplinary research centre in sustainability and is now a global leader in the field.

Our world-class scientists study, engineer, and use microbes to enable discovery, development and production of molecules that serve as replacements for petroleum-based products, as well as novel compounds for materials, chemicals and foods. We thereby aim to catalyse a transition to a bio-based economy that can tackle the threat of climate change.

In this booklet we invite you to learn about our mission and how we work to achieve it.

# Biotechnology for sustainability

Enabling the development of the know-how and technologies that are needed for the transformation of industrial production to sustainable bio-based processes, we use an integrated workflow to engineer microbes that serve as sustainable producers of many compounds.

### Microbial cell factories

We engineer microbial production hosts that serve as cell factories, producing the desired molecules that replace unsustainable petroleum-based counterparts. Specifically, our research and development efforts focus on three categories of products: Natural Products, Microbial Foods and Sustainable Chemicals.

We do this by studying, creating, developing, and using: i) technologies in silico, in vitro and in vivo; ii) high-quality data generation and analyses, machine learning and artificial intelligence; and

iii) genome-scale metabolic modelling, synthetic biology, biochemistry, and all classical tools of molecular and cell biology.

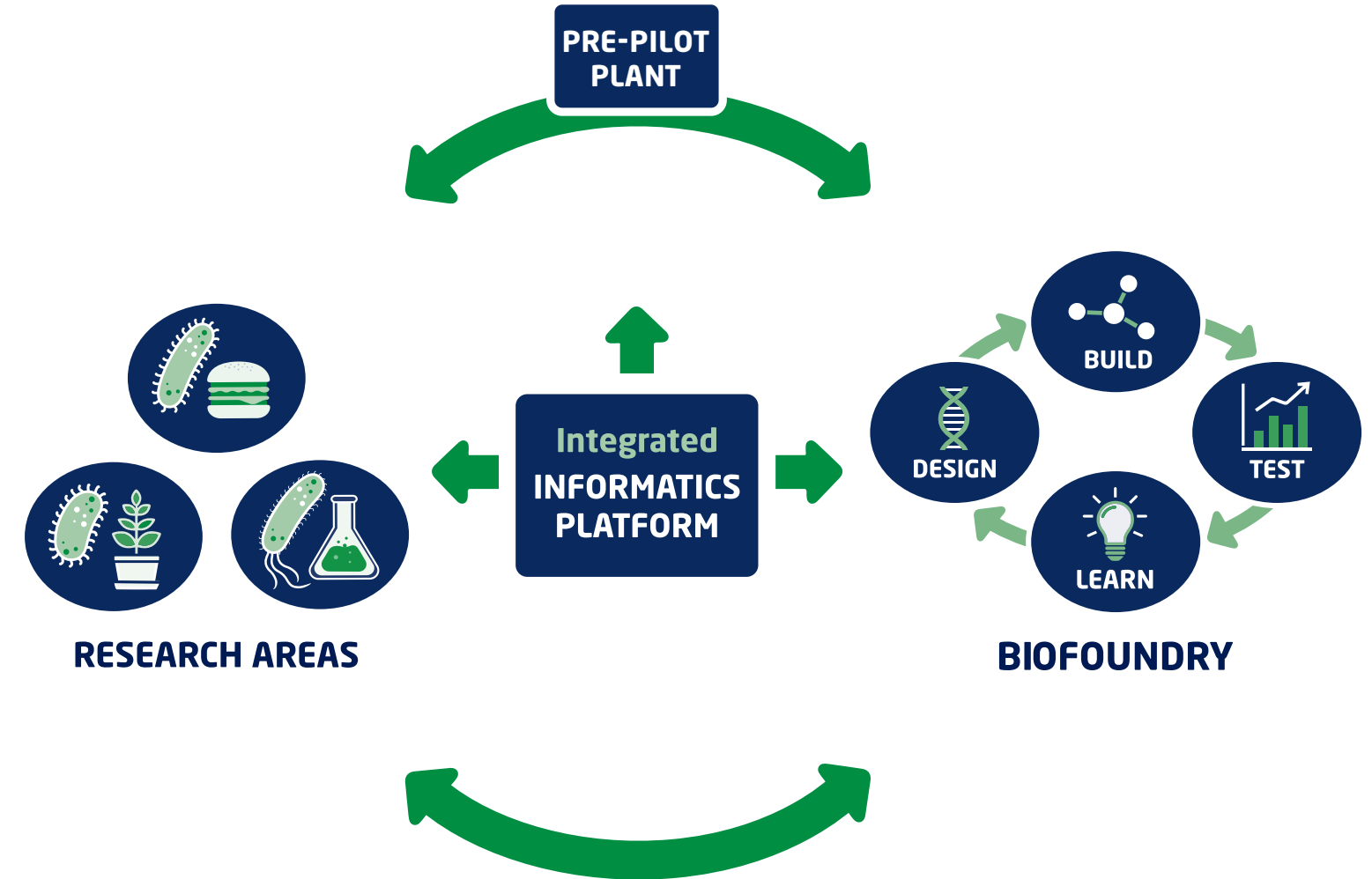
### Translational research

Our research is inherently integrated with translation and innovation. We continuously engage with industry to provide applied solutions and we create several spinouts annually. The entrepreneurial spirit is cultivated through continuous education and practical support at the Centre, at university level, and through external strategic partners such as the BioInnovation Institute and other platforms.

## Framework

Our basic and translational research activities are conducted in: i) the Biofoundry, which integrates omics technologies and the design-build-test-learn cycle; ii) the three research areas: Natural Products, Microbial Foods and Sustainable Chemicals; iii) the teams developing the data science and iv) the Pre-Pilot Plant which develops bioprocesses and commercialisation of bio-based products.

All the centre activities are tightly integrated via the Informatics Platform, which provides cross-centre exchange of data, analyses, and interpretation.



## RESEARCH FOCUS

# Designing microbes for sustainable solutions

We study, engineer, and use microbes, microbial communities, and molecules that microbes produce, to address global sustainability challenges. Meeting a growing population's needs for chemicals, polymers, materials, energy and food, requires creating new bio-based industries and changing old industries' petroleum-dependent technologies that pollute the environment and drive global warming.

### **Sustainable Innovation Office**

While bio-based processes are assumed to be inherently more sustainable than petroleum-based ones, ill-designed processes or products can be as unsustainable and polluting as any. We have therefore established a Sustainable Innovation Office (SIO), a multi-disciplinary unit that continuously assesses the extent to which the centre's research and innovations output contribute to improving state-of-the-art research and production and suggests strategies for maximising economic and environmental performance thereof.

To that end, SIO's first mission is to drive, guide, and develop technologies and tools to quantify sustainability criteria and advise the Centre's management and scientific group leaders. Its second mission is to inspire, educate, foster, and support innovation at the Centre, DTU, and partners in the Danish bioeconomy.

Based on the sustainability criteria, we have decided to focus on three research areas that were identified as significant for enabling a bio-based economy and the green transition. These are to develop: i) Natural Products that use natural biosynthetic pathways to produce compounds of interest that cannot be obtained otherwise; ii) Microbial Foods that will reduce dependence on animals and animal products; and iii) Sustainable Chemicals that will reduce dependence of petroleum-based products.



## Our research activities fall into 3 categories

### Natural Products

The Natural Products research area develops new biocatalysts and cell factories to produce chemicals for a multi-million euro market, including food and textile colours, agrochemicals, and pharmaceuticals.

A major challenge in the natural products field is sourcing and producing sufficient quantities of these often scarce compounds that are derived from limited and protected natural habitats. Our engineered cell factories and enzymes enable a sustainable, cheaper, and environment-friendly way of developing these products, first as proof-of-concepts, then as products for commercialisation.

To achieve our goal, we develop and employ advanced state-of-the-art methodologies for pathway discovery, and strain and enzyme engineering. These include high-throughput engineering and screening of genomes, enzymes, molecules, innovative biosensors, metabolic modelling, machine learning, regulatory network reconstructions, and transporters characterisation and engineering.

### Microbial Foods

The Microbial Foods research area takes on the challenge of the environmental footprint and uneven resource distribution of food intensifying because of population growth and climate change.

We do this by applying an absolute-sustainability framework to maximise the impact of our research. We develop practices for optimising macro- and microbial diversity, bioprotection and biocontrol, and resource efficiency in the food system, by transforming waste streams and biomass into healthy and nutritious foods.

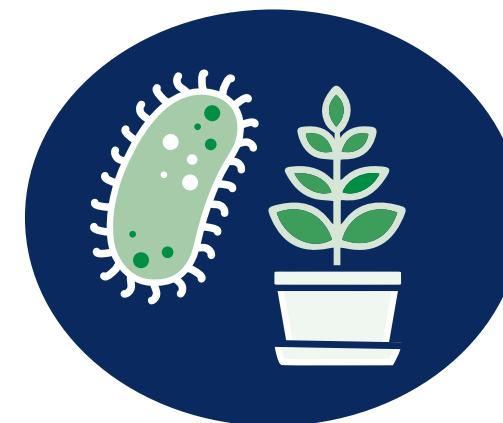
Our work is interdisciplinary, spanning data science, modelling, ecology, molecular microbiology and synthetic biology, social science, economy, and gastronomy.

### Sustainable Chemicals

The Sustainable Chemicals research area focuses on identifying and producing proof-of-concepts of commercially viable chemical products that can be realised using microbial production strains. We continually assess our products and processes with respect to sustainability, socio-economic, techno-economic and life-cycle analyses.

Our production strains are microbes that we engineer using synthetic biology tools or via laboratory evolution. These host cells can operate at naturally non-optimal temperatures, densities, and with naturally non-optimal feedstock. The cell factories can contain heterologous or endogenous pathways, sometimes carrying numerous genetic modifications.

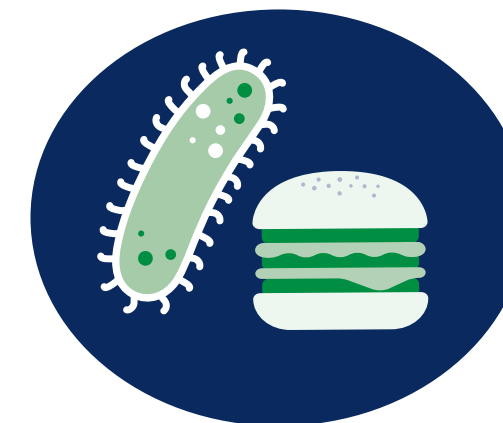
The resulting products have a large-scale impact on the sustainability of the chemical industry by providing more sustainable alternatives for biofuels, solvents, monomers, and polymers.



## NATURAL PRODUCTS

Developing new microbial cell factories to sustainably produce natural and novel products

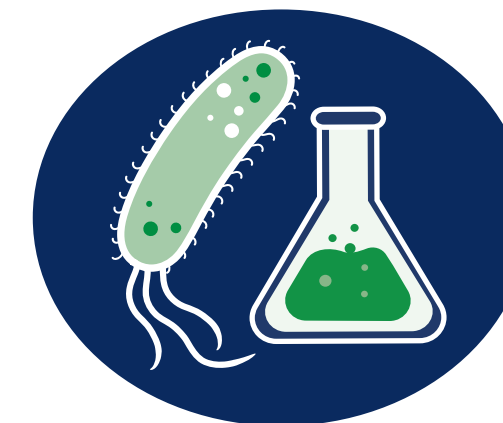
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## MICROBIAL FOODS

Rethinking food production for sustainable development of foods using microbes

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## SUSTAINABLE CHEMICALS

Developing bioprocesses for sustainable and scalable production of relevant chemicals

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# Putting the engineering cycle to work

The Biofoundry is an integral part of the operations at DTU Biosustain. While the Biofoundry supports all the research groups of the Centre, its overall aim is to advance selected research projects in developing cell factories for chemical or protein production. Subsequently, these projects can be handed over to the Pre-Pilot Plant for process optimisation, scale-up, and a potential final spin-out or licensing package. To ensure that projects are economically feasible and can have a significant impact on biosustainability, the Biofoundry maintains strong interactions with the Informatics Platform, the Sustainable Innovation Office, and the IP & Commercialisation Office.

The Biofoundry is a data-driven technology platform that enables rapid cell factory design for chemical and protein production. It has been established based on a Design-Build-Test-Learn cycle and comprises eight technology teams listed in the figure to the right. Data analysis is a unique element of the Biofoundry.

The Design and Learn teams of the Biofoundry develop and use multiple tools and interoperable databases to transform data into biological meaning, while the Build and Test teams deliver the next efficient cell factory using automation, synthetic biology, adaptive laboratory evolution, and physiological characterisation.

The Biofoundry supports three types of projects:

### 1. Large Biofoundry projects

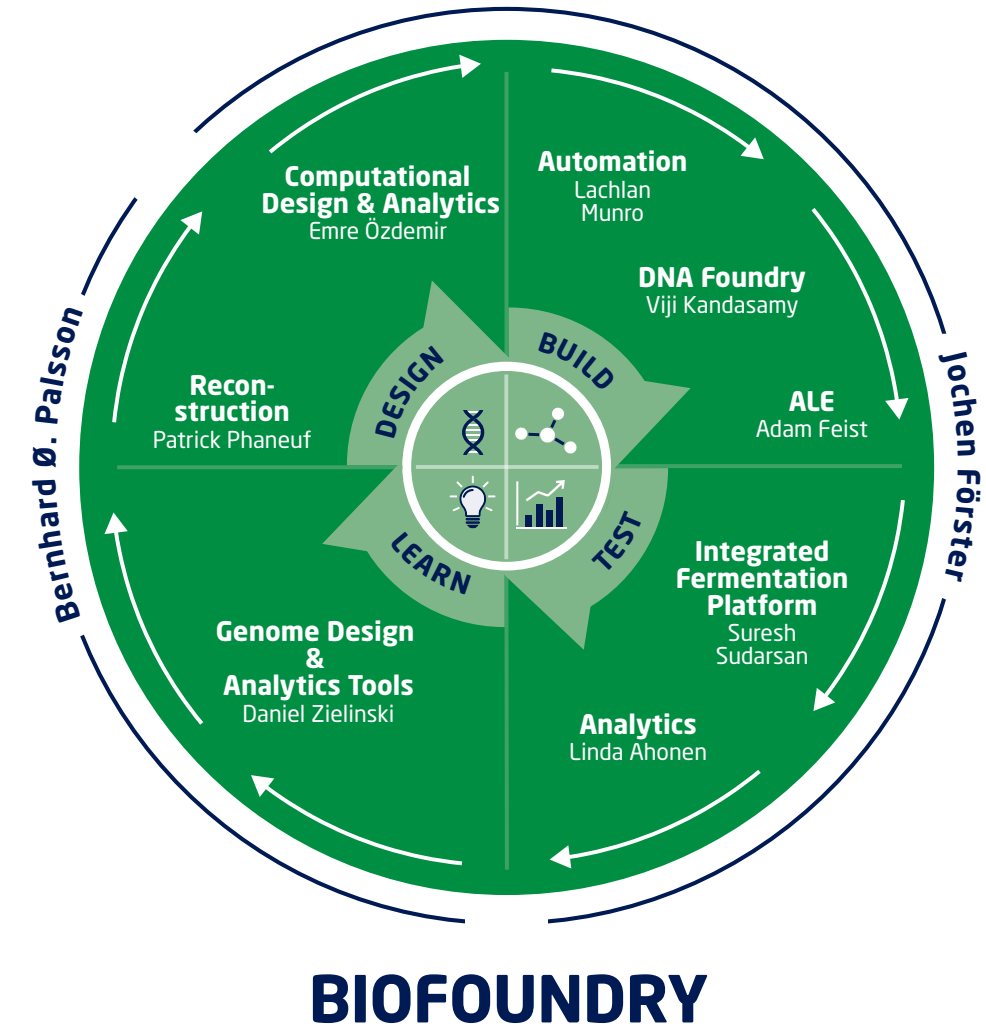
The Biofoundry provides additional resources to promising research group projects and supports a rapid development to a first prototype (TRL 4). The project can then be transferred to the Pre-Pilot Plant for process optimisation and scale-up to TRL 6, culminating in a potential spinout or licensing package.

### 2. Biofoundry support projects

The primary aim is to conduct smaller, typically lower risk tasks requested by the research groups. We also collaborate with external partners, including universities and industry.

### 3. Biofoundry technology development projects

Such projects focus on upgrading our technology platform or adding novel technologies that will enable optimised cell factory development.



## From data to contextualised knowledge

The Informatics Platform is leading our digital transformation utilising the combined power of software engineering, computational biology, and data engineering, with FAIR (Findable, Accessible, Interoperable, and Reusable) data principles as a fundamental enabler.

Our mission is to develop systems that turn big data into contextualised knowledge. With these systems we can establish deep insights, augmenting the ability to solve some of the world's greatest challenges for a sustainable future using engineered microbes.

The unit consists of multi-disciplinary teams with diverse specialties in software, computational biology, and data engineering.

### **Research Data Management (RDM) team**

The RDM team develops and maintains the data infrastructure, supporting the Centre's RDM efforts by introducing FAIR data 'by default' and specifically increasing data interoperability through close collaboration with the Data Science team.

### **Data Science team**

This team develops data science tools and provides data science support to increase the Centre's data literacy. The team also provides context and information for the RDM team to increase data standardisation and thereby data interoperability.

### **Research Software team**

This team develops software tools and solutions that streamline data processes, ensure data traceability, and uphold governance standards. By

leveraging technology, the team makes solutions that allow researchers to focus more on their core work.

### **Integrating FAIR principles**

FAIR data principles are guiding principles to make data findable, accessible, interoperable, and reusable. They are an important prerequisite for being able to derive the maximum value from research data for human and machine learnings.

We make the FAIR principles an integral part of our culture to increase data utilisation and ensure maximum return on our research and data generation investments by effectively supporting the entire data value chain: from data, through information, to contextualised knowledge.





## PRE-PILOT PLANT

# Translating research to sustainable technology

The Pre-Pilot Plant (PPP) is a unique translational research and development asset and a core section in the Centre. It facilitates bioprocess development and commercialisation of bio-based products, from ideation through first prototype to pilot production. This enables demonstrating proof-of-concept scalability and sustainability of our products and technology, thereby shortening the time to market for our bio-manufactured solutions. The PPP connects the bioprocess to the cell-factory design and engineering, thereby enabling true socio-economic impact.

### Commercial-level performance

Within PPP we use operational units that are capable of accelerating and developing cell-factories and bioprocesses toward early commercial-level performance (Technology Readiness Level TRL 4-6). We apply industrial standards, compliance, mindset, and workflows in an integrated manner. Our international and interdisciplinary staff consists of technicians, engineers, and scientists, many with an industry career background.

### Partnerships with industry

We actively collaborate with industrial partners, who have decades of production and manufacturing experience, to provide scalable solutions that can be implemented at industrial scale or at commercial manufacturing organisations.

### Innovative technologies

We develop and employ a broad range of innovative technologies, including automated liquid-handling robotics, bioinformatics solutions on design, data capture, management, monitoring and visualisation, and a broad range of in-process-control analytics for both online and offline measuring. Our fermentation and cultivation platforms span the whole range, from plate-based primary and secondary screening technologies to automated high-throughput cultivation platforms and various scale stainless steel scale-up and scale-down bioreactor systems.

The downstream suite for separation and purification of desired products or co-products is equipped with various unit operations from laboratory scale to

pilot scale. We operate solid-liquid separation, the whole range of crossflow filtration techniques, liquid-liquid separation, evaporation, extraction and simple distillation, homogenisation, multiple chromatography columns and screening units. For prototype formation and product development we deploy crystallisation and precipitation and freeze-and spray-drying.





## Key figures

as of February 2024

Raised from investors approx.

**2.9 billion DKK**

Sold BioPhero ApS to FMC Corporation

**1.4 billion DKK**

## INNOVATION AND COMMERCIALISATION

# Taking research closer to market

We have a strong focus on translational activities and innovation, which we actively develop and support via our own on-site IP & Commercialisation Office.

This office educates and trains our employees, and merges our science and technology advances with intellectual property strategies, start-up mentality, and financing skills. The office collaborates very closely with DTU's Legal and Technology Transfer team and the Skylab Incubator at DTU.

### Industry's access to the Centre's services

In addition, the IP & Commercialisation Office is the industry's access to the Centre's technologies, projects, and products available for licensing and to our various services. We establish research collaborations, license agreements, and new ventures with the goal of building enduring, mutually beneficial partnerships with industry.

## Key figures as of February 2024

Notification of inventions received	208
Patent applications filed	122
Startups incorporated with centre employees	36
New jobs created from startups approx.	450
Commercial grants received from Danish sources	29
Patent families licensed	61
License/Equity/Option/Sale/Research Agreements executed	67
Commissioned research agreements executed with industry	24

# Startup companies

## 2011

### **UNION Therapeutics A/S:**

Website: [uniontherapeutics.com](http://uniontherapeutics.com)

UNION is a clinical-stage, diversified pharmaceutical development company focusing on immunology and infectious diseases. Our current pipeline is comprised of two differentiated medicinal compound classes (orismilast and niclosamide) with well-characterised modes of action that have significant potential to address unmet medical needs.

## 2012

### **Labster ApS:**

Website: [labster.com](http://labster.com)

Labster is developing and delivering fully interactive advanced laboratory simulations that use gamification elements such as storytelling and scoring systems inside an immersive and engaging 3D universe. The system integrates easily with the already available learning management systems and is used worldwide.

### **Biosyntia ApS:**

Website: [biosyntia.com](http://biosyntia.com)

Biosyntia is a start-up within synthetic biology and metabolic engineering having a unique technology and world-leading fermentation processes for production of various B-vitamins and selected nutraceuticals.

## 2014

### **Biopetrolia AB / Melt&Marble AB:**

Website: [meltandmarble.com](http://meltandmarble.com)

Melt&Marble AB focusses on the sustainable production of fatty-acid derived products for chemicals, food ingredients, personal care products and pharmaceuticals.

### **Sira Pharmaceuticals Inc:**

Sira Pharmaceuticals is developing Nerve Growth Factor fusion proteins for improving nerve growth regeneration and/or survival.

## 2015

### **SNIPR Biome Ltd:**

Website: [sniprbiome.com](http://sniprbiome.com)

SNIPR Biome is pioneering a novel use of CRISPR/Cas technology for microbial gene therapy. Focus is on the development of novel, highly selective anti-bacterial drug candidates for use in difficult-to-treat conditions.

### **Clinical-Microbiomics A/S:**

Website: [clinical-microbiomics.com](http://clinical-microbiomics.com)

Clinical Microbiomics offers expert microbiome analysis for clinical, pre-clinical and animal health studies - including DNA extraction, sequencing and profiling, and biostatistics linking the microbiome to clinical data and outcomes.

## 2016

### **BioPhero ApS:**

Website: [biophero.com](http://biophero.com)

BioPhero's mission is to lead the global transition

towards sustainable agriculture, where safe pheromone-based products become the primary method for pest control in row crops. BioPhero has been acquired by FMC Corp. in June 2022.

### **ODity IVS:**

ODity is developing an innovative laboratory device measuring the growth of cells non-invasively enabling both speed-up and cost reduction in the bioindustrial research segment.

### **CloneOpt AB:**

Website: [cloneopt.com](http://cloneopt.com)

CloneOpt uses proprietary technologies to 'synthetically evolve' a TIR so that it is highly compatible with host cell ribosomes. The process involves the generation of clone libraries that contain approx. 50,000 TIRs. Protein production levels from each TIR are then experimentally evaluated and the most efficient TIR is selected.





## 2017

### **eCoute IVS:**

eCoute is developing an app making it possible to listen to abstracts from published scientific papers instead of time-consuming reading on a PC resulting in enhanced productivity.

### **PreDiagnose IVS:**

Website: [prediagnose.com](http://prediagnose.com)

The mission of Prediagnose is to provide health care givers diagnostic tools to make confident diagnostic decisions to prolong the lives of the patients and enhance the life quality. It is the ambition to revolutionise the way microbial diseases are diagnosed by introducing simple, reliable and fast diagnostics that within a minute can identify an early infection or a virulent colonisation.

### **Hemostasis ApS:**

Development of therapeutics for prevention and treatment of bleeding in elective surgery and trauma settings.

### **Lactobio ApS:**

Website: [lactobio.com](http://lactobio.com)

Lactobio Aps identifies, develops, and delivers the best microbial solution for targeted problems and health related microbial dysfunctions. Lactobio has been acquired by L'Oréal in November 2023.

### **Utility Therapeutics Ltd:**

Website: [utilitytherapeutics.com](http://utilitytherapeutics.com)

UTILITY therapeutics is dedicated to identifying, developing, and launching effective antibiotic treatment options for resistant infections.

### **Simo ABJ:**

Simo ABJ has converted into Accelerbiotics, read more below.

## 2018

### **Octarine Bio IVS:**

Website: [octarinebio.com](http://octarinebio.com)

Octarine is perfecting a biological approach to

producing natural, novel, and improved cannabinoid and psychedelic molecules with tailored modes-of-action. Its proprietary technology utilises synthetic biology, yeast fermentation and enzymatic derivatisation to develop IP protected drug candidates validated in pre-clinical models.

## 2019

### **Mycropt IVS:**

Website: [mycropt.com](http://mycropt.com)

Mycropt offers tailored solutions for biotech, biopharma and research companies that want to improve their protein production or diversify their product portfolio. We apply our unique platform technology to help customers enable the production of novel, difficult-to-express targets and enhance the yield of existing products.

### **CysBio ApS:**

Website: [cysbio.com](http://cysbio.com)

Cysbio uses advanced metabolic engineering and

synthetic biology approaches to construct bacterial cell factories for transforming the production of biochemicals from renewable feedstocks.

### **Chrysea Ltd.:**

Website: [chrysealabs.com](http://chrysealabs.com)

Chrysea develops precision healthy-lifespan nutritional interventions supported by rigorous clinical research, aimed at maintaining naturally occurring anti-ageing mechanisms.

### **Accelerbiotics ApS:**

Website: [accelerbiotics.com](http://accelerbiotics.com)

Accelerbiotics develops solutions for the biotechnology and life science field. It develops electrophoresis, nucleic acid and protein purification, electroporation and electro-extraction, and other technologies.

### **Artisan Bio ApS:**

Website: [artisancells.com](http://artisancells.com)

Artisan Bio crafts customised cell engineering solutions to solve the most challenging problems in

## STARTUP COMPANIES

human health applications. With facilities in Denver, Colorado and Toronto, Ontario, Artisan is building a foundry for CRISPR-driven cell therapy engineering.

### **Dum Data:**

Dum Data is developing a simple and easy to use LIMS System.

### **Enduro Genetics ApS:**

Website: [enduro.bio](https://enduro.bio)

Enduro is an independent service and tech provider committed to improving large-scale fermentations. By applying game-changing synthetic biology technology, they empower their partner companies to maximise performance of all cells cultivated from their production strains. By changing the desire of cells to produce, Enduro increases competitiveness of current and future green bioproduction.

## 2020

### **LuaBio / SecondCircle ApS / again APS:**

Website: [again.bio](https://again.bio)

again uses synthetic biology to convert carbon dioxide into chemical compounds that are sold back to industry. By capturing CO<sub>2</sub> at the point of emission and transforming it into valuable products, we help industry turn their emissions from a cost into a revenue opportunity.

### **Unseen Biometrics ApS:**

Website: [unseenbio.com](https://unseenbio.com)

Based on a thorough analysis of the microbiome, Unseen Biometrics provides personal dietary recommendations aimed at increasing biodiversity and improving gut health for the individual.

## 2021

### **Conarium Bioworks Inc.**

Website: [conariumbioworks.com](https://conariumbioworks.com)

Conarium Bioworks is upscaling and producing biobased Melatonin with the aim of selling that both as a supplement and as a therapeutic.

### **Neulmmune, Inc.**

Website: [neuimmune.com](https://neuimmune.com)

Neulmmune develops innovative vaccines and biopharmaceuticals through the precision glycoengineering and delivery of biologics that address important medical and public health needs.

### **Scicular ApS / MATR Foods:**

Website: [matrfoods.com](https://matrfoods.com)

MATR Foods transforms the plants and vegetables that the food system has rejected because of their appearance or size and give them new life through fermentation.

### **Nordhavn Manufactory ApS:**

Website: [nordhavneddikebryggeri.com](https://nordhavneddikebryggeri.com)

Nordhavn Manufactory is a fermenting food producer entwined with the philosophy of the New Nordic movement, and with a central goal of putting true circularity into action. Nordhavn Manufactory products are aimed to be a true exercise in taste, organic produce, localism and resourcefulness.

## 2022

### **Ergosyn Ltd:**

Ergosyn is upscaling and producing biobased Ergothioneine with the aim of selling that as a supplement.

### **Unveil Bio ApS:**

Website: [unveil.bio](https://unveil.bio)

Unveil Bio provides sequencing services to biotech and pharma companies.

### **Biomia ApS:**

Website: [biomia.com](https://biomia.com)

Biomia is upscaling, producing and developing Monoterpenoid Indole Alkaloids as pharmaceutical drugs.

## 2023

### **BioHalo ApS**

BioHalo is using cutting-edge biofluorination technology, to offer a greener and more sustainable alternative to conventional fluorochemistry practices, e.g., replacing harmful PFAS forever chemicals in various industrial formulations without compromising on performance.

## 2024

### **Enzidia ApS:**

Enzidia has developed a high-performance technology platform to engineer enzymes for more efficient bioprocesses.



## ORGANISATION

# A mission-driven organisation

The Novo Nordisk Foundation Center for Biosustainability at DTU (also called DTU Biosustain) was made possible by a philanthropic donation from the Novo Nordisk Foundation (NNF) to the Technical University of Denmark (DTU). Inaugurated in 2011, it initially had only a few dozen staff consisting of an international team of world-leaders in metabolic engineering and metabolic modelling, and a handful of employees. From these beginnings, it quickly grew to 300 members of staff and students, not only based in Denmark, but also at satellites in Sweden and the USA.

Today, approximately 80% of our members are located in Denmark, at the DTU site in Lyngby (just outside of Copenhagen), while the rest are located mostly at our satellite at the University of California in San Diego (USA) and Chalmers University of Technology (Göteborg, Sweden). Our international collaborating organisations are all around the world: the Joint BioEnergy Institute (USA), University of

Queensland (Australia), Korea Advanced Institute of Science and Technology (South Korea), and we continuously expand our strategic national and international partnerships.

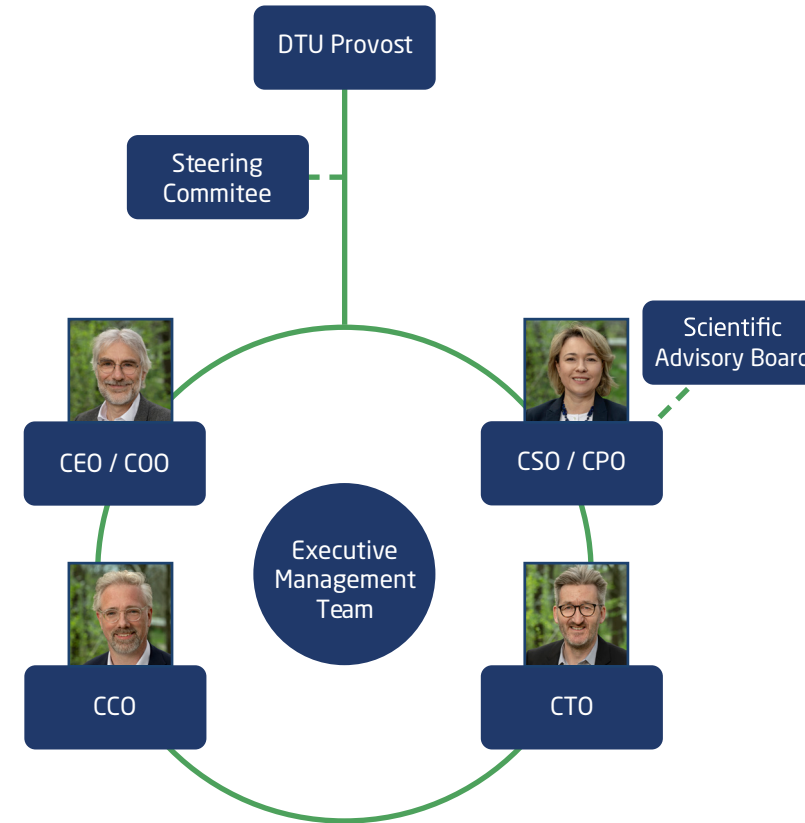
### Governance

The Centre has a Steering Committee with members from the DTU leadership and relevant industrial stakeholders, a Scientific Advisory Board with international members who are leaders in their respective fields of scientific research, and an Executive Management Team.

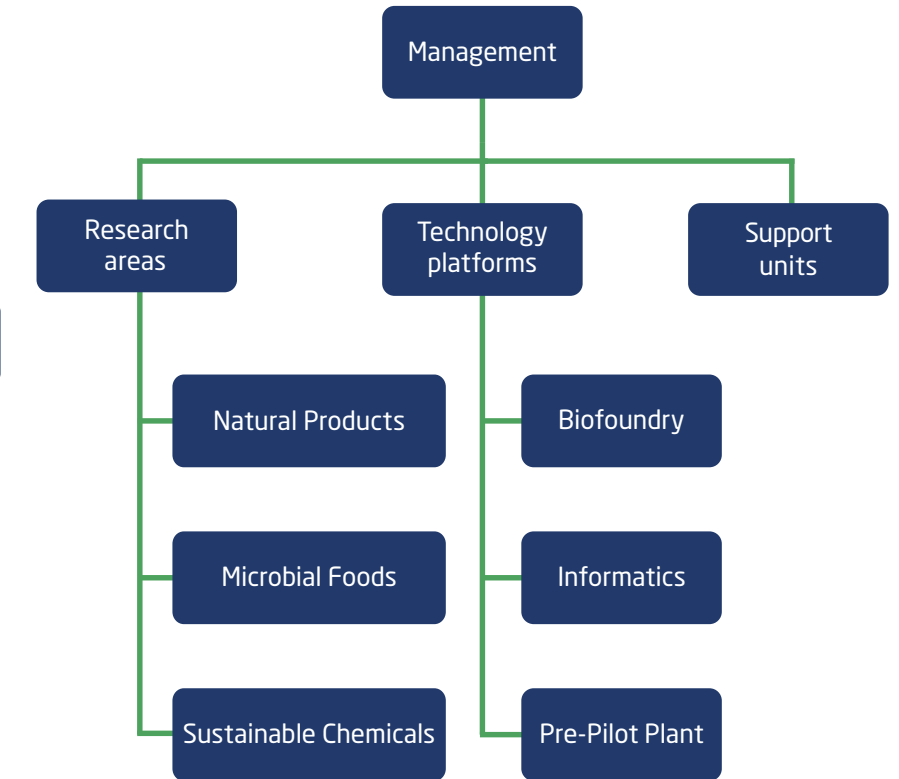
The Executive Management Team has four members and is headed by the Chief Executive Officer (CEO), who also serves as the Chief Operations Officer (COO) and consists of the Chief Technology Officer (CTO), the Chief Scientific Officer (CSO), who is also the Chief Partnership Officer (CPO), and the Chief Commercial Officer (CCO).

The Centre's C-suite management structure contrasts that of a conventional university department. It reflects the mission-drive and applied nature of our focus, organisation, processes, and responsibilities. Each CxO has his/her own areas of responsibility, and the management team meets at least weekly to coordinate and prioritise the tasks within research, technology, partnerships, commercialisation, education, and innovation, and strategise the future direction.

## STRUCTURE OF THE MANAGEMENT



## STRUCTURE OF THE ORGANISATION



## FUNDING

# Funding and defining moments

The Centre 1.0 and 2.0 core programmes were established and funded by strategic donations from the NNF.

The funding for the first 10 years included: the Core Grant 1.0 (2011-2020, 700 mill DKK); an expansion of the Core Grant 1.0 with the CHO Grant (2012-2020, 280 mill DKK); the Internationalisation Grant (2013-2020, 131.25 mill DKK); the Computational Biology Grant (2016-2020, 90 mill DKK); and the Pre-Pilot Plant Grant (2017-2022 / extended to 2025, 117.8 mill DKK).

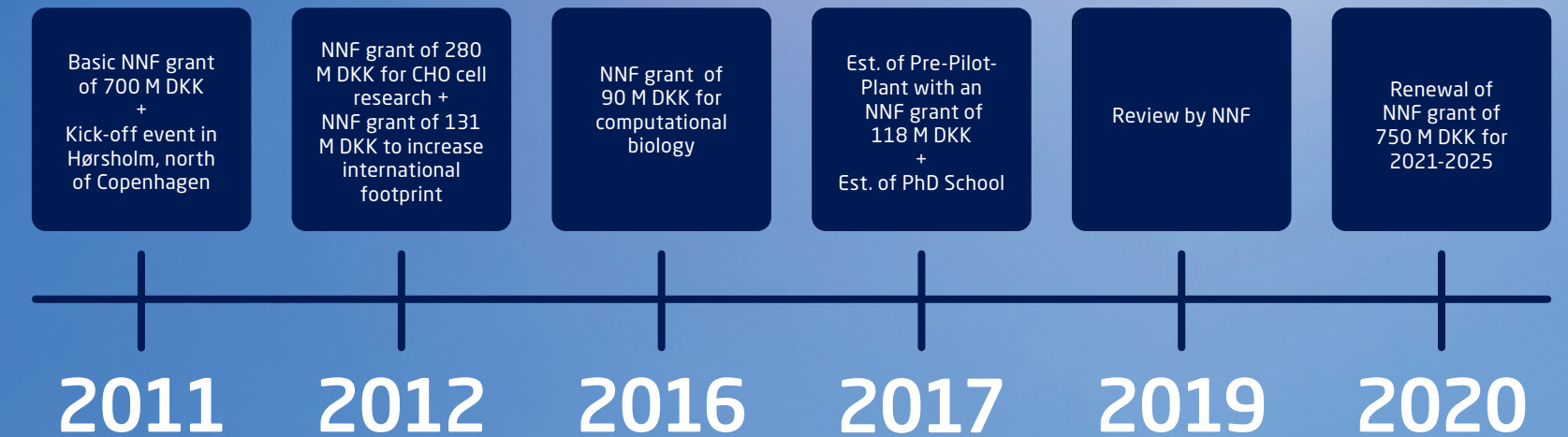
In 2020, the Centre was awarded a new Core Grant 2.0 (2021-2025, 750 mill DKK).

In addition, our individual researchers fundraise significantly in open competition for research or innovation from NNF and other Danish public and private organisations and foundations, as well as from the EU and other international funders.

The DTU provides funding for the building and most of the overhead costs.

Strengthening sustainability using biotechnology and bioprocesses

## Defining moments





## PEOPLE

# Nurturing diverse talent

Our biggest asset is our people: the students and staff who carry out the research, education, development, and innovation. We create and nurture a diverse and inclusive environment rooted in our five core values which were identified by a bottom-up process that involved all members of the Centre: respect, empathy, sustainability, enjoyment, togetherness (RESET). The core values are implemented by the Core Values Team, individuals and the organisation itself.

The average age at the Centre is about 35 years. We bring together 43 different nationalities and numerous disciplines, including computational science and information technology, chemical engineering, biochemistry, molecular biology, chemistry, and philosophy, liberal arts and humanities.

# 141

Graduated PhDs



# 43%

Women



# 57%

Men



# 79%

Scientists in wet lab



# 21%

Scientists in dry lab



# 42%

Student researchers



# 58%

Non-student researchers



# 71%

Researchers



# 15%

Staff scientists



# 14%

Support staff

## Fostering next-generation biotechnology talent

We dedicate extensive efforts to educate the next generation of scientists, future leaders, and highly skilled technical staff, at the cross-section of biotechnology and data science, to strengthen the Danish and international bioTech industrial and academic ecosystems.

We provide courses for bachelor, master and PhD level students and contribute to the professional development of researchers in both academia and industry. We also contribute to the standard undergraduate classroom courses, offered by our colleagues at DTU. Our courses range from lectures and workshops to hands-on lab or pilot plant training, and computational exercises.

### Specialised research courses

We offer specialised courses related to our research and technologies, for example in computationally aided cell factory design, Python for data analyses, and automation in biology, and advanced synthetic biology and bioengineering.

### Translational courses

We develop and cater to the biotech industry's growing demand for fermentation experts, which includes courses on: biomanufacturing; innovation tools and mechanisms; and sustainability assessment of bio-based products.

### The Microbes Initiative at DTU

Moreover, we have established a university-wide platform called the Microbes Initiative at DTU (Microbes@DTU), where we share knowledge, training, education, technology platforms, invited guests' lectures, membership to the Medicon Valley Alliance, and mentoring and career development support for more than 360 microbiologists of DTU, from undergraduate to professor level.





# Research Centre of Excellence with global impact

Since our launch, the impact of DTU Biosustain has steadily grown. Our academic, technical and support scientists work persistently on discovering and creating biobased solutions and disseminating scientific breakthroughs in high quality publications. Several of our researchers are some of the most cited in their fields worldwide, with 55 publications that have resulted in high impact rankings. Thus far, we have published over 1,800 papers, with more than 114,613 citations, including numerous to journals such as Cell, Science and Nature.

In addition to the stable and generous funding from the Novo Nordisk Foundation, our scientists have raised in total over 1 billion DKK (€134 million) in competitive peer-review grants, nationally and internationally, including prestigious grants such as the Horizon 2020, European Research Council, Novo Nordisk Foundation Laureate Research Grants, Marie Curie Initial Training Networks, and BioInnovation Institute.

Along with scientific excellence, we pride ourselves on educating the next generation of biotechnology

scientists. As the number of staff has grown - from 78 in 2011 to 312 in 2023 - so has the outflux of talent who have so far transitioned to integral positions in Danish industry (213), international industry (71), as well as universities in Denmark (99) and abroad (121).

DTU Biosustain has a strong culture of innovation, which has resulted in 208 notifications of invention, 122 patent applications filed, and 36 spin-outs that give our biotechnology solutions possibilities of achieving direct global impact at scale. Many of the spin-outs have gained a footing in the industry and raised the substantial amount of 2.9 billion DKK (€388,600,000) from investors and created 430 new jobs.

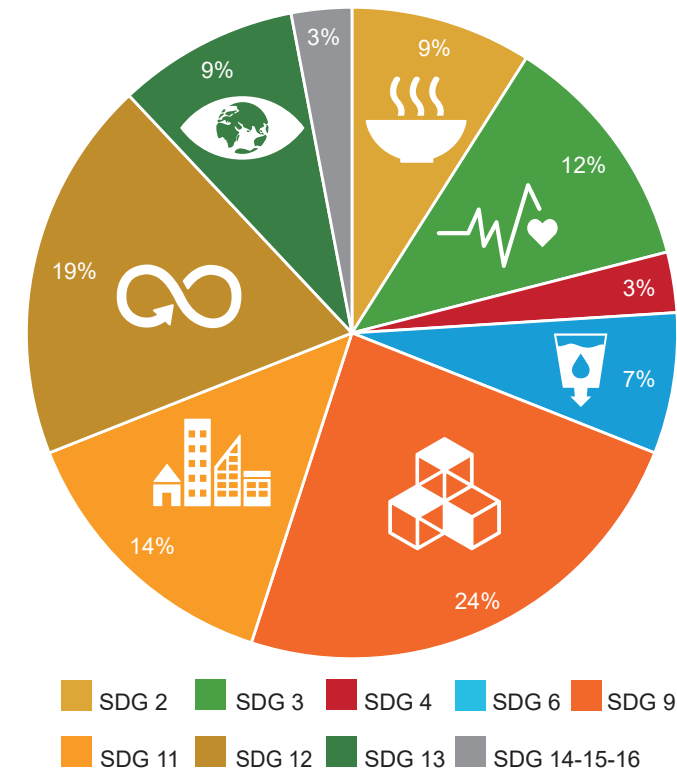
We place great value in each of the 238 academic and industrial collaborations and partnerships that have been established across DTU in the form of joint research projects and shared PhD programmes, as well as with companies, universities, and research institutions around the world.

Our research contribute to a number of the UN Sustainable Development Goals, primarily 9, 11 and 12. We contribute to upgrading the industrial sector's technological capabilities (target 9.5.2, 24% of our projects); and we create new biosolutions using repurposed or industrial by-products as raw material, as well as find substitutes for petrochemicals (target 12.5.1, 19% of our projects).

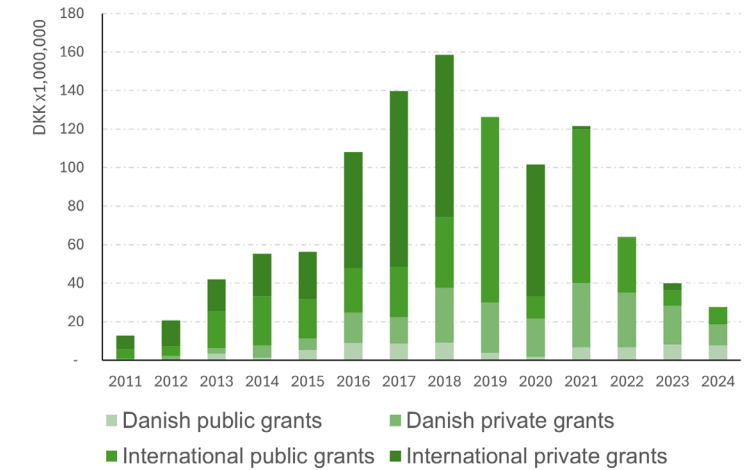
The Centre also has an outreach component that provides media input and advocates for scaling of biosolutions by addressing issues around regulatory roadblocks, investment, political will, and consumer acceptance.

DTU Biosustain's scientific influence in terms of new discoveries and technologies, industrial and academic collaborations, traditional and Lifelong Learning education and training, as well as talent transfer, makes for a Research Centre of Excellence with global impact.

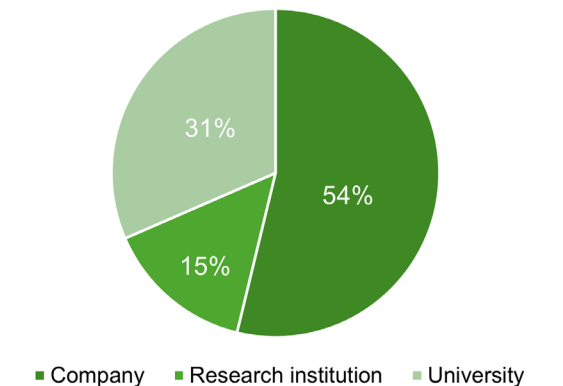
Projects contributing to UN Sustainable Development Goals



Competitive fundraising



Strategic partnerships for impact



We develop technology  
for the benefit of people,  
societies, and the world.

Let's work together.





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novo nordisk **fonden**