Danish Cancer Society Research 2021

ANNUAL RESEARCH IMPACT REPORT

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Danish Cancer Society

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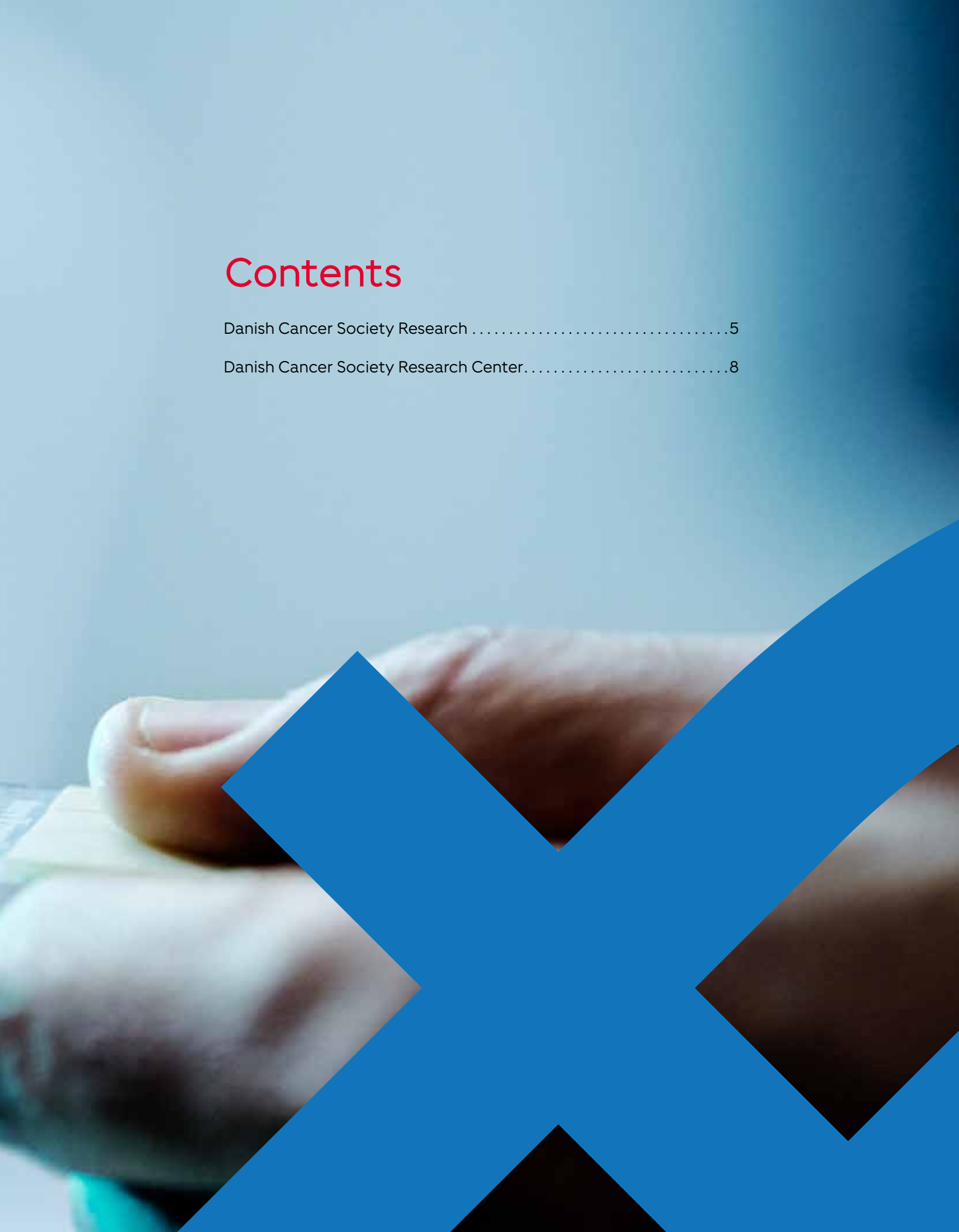


In this report, we introduce a series of charts of the funding granted by the Danish Cancer Society to research and of the funding received by the Danish Cancer Society Research Center for cancer research projects. Funding granted by the Danish Cancer Society to campaigns, information efforts, and short travel grants are not included. The books were closed on 7 January 2022. As pledged grants are involved, adjustments could be made, if grants are returned, etc.

Danish Cancer Society Research

The Danish Cancer Society has a strong tradition of supporting research. Throughout Denmark, we fund a broad array of research annually, ranging from basic, biological discoveries over clinical testing of new diagnostics methods to treatment and patient support. The efforts combine to ensure that we are constantly working towards our goal of a life without cancer.

Cancer is a group of more than 200 different diseases, each of which can be divided into subgroups based on their biological and molecular profiles. Similarly, cancer patients are different as regards risk factors, treatment tolerance, and individual preferences concerning treatment and rehabilitation. Our knowledge about such disease and patient profiles has improved in recent years, and when they are combined into customised treatment offers, the concept is known as personalised medicine: the best choice for individual patients regarding both treatment and follow-up options.

In 2021, the Danish Cancer Society began to work on a new research policy, which is to set the direction of our combined research efforts. We are looking towards both Denmark and the EU, where a series of initiatives and cooperation projects are in the works. At the same time, the Danish Cancer Society's research must follow and complement other research efforts. Moreover – along with other research funding players – we can make a considerable contribution and offer solutions to the challenges of cancer experienced by society and citizens.

Research funding is an investment which makes a difference, and 61 % of the Danish Cancer Society's net budget goes to research. We support three lines of research: independent research, strategic research, concerning which our central board decides general themes, and research by the Danish Cancer Society Research Center. Research funding from the Danish Cancer Society hence reaches widely, including Danish researches abroad, who bring their results back to Denmark.

We also ambitiously communicate what the research funds are spent on and what results from the research efforts. In this annual research impact report focused on the Danish Cancer Society's Research Center, we present some of the new projects, which received funding in 2021, and offer examples of results achieved in the course of the year. You can also visit our website: www.cancer.dk/research and social media to meet some of the researchers we support.

We are grateful for the commitment that we experience and for all the funds donated by Danes to the Danish Cancer Society. The Danish Cancer Society has more than 47,000 volunteers and more than 400,000 members, who help raise awareness about cancer and the challenges we must meet via dedicated research efforts.

Together, we can contribute to a better life after cancer and pave the way for a life without cancer.

Happy reading!

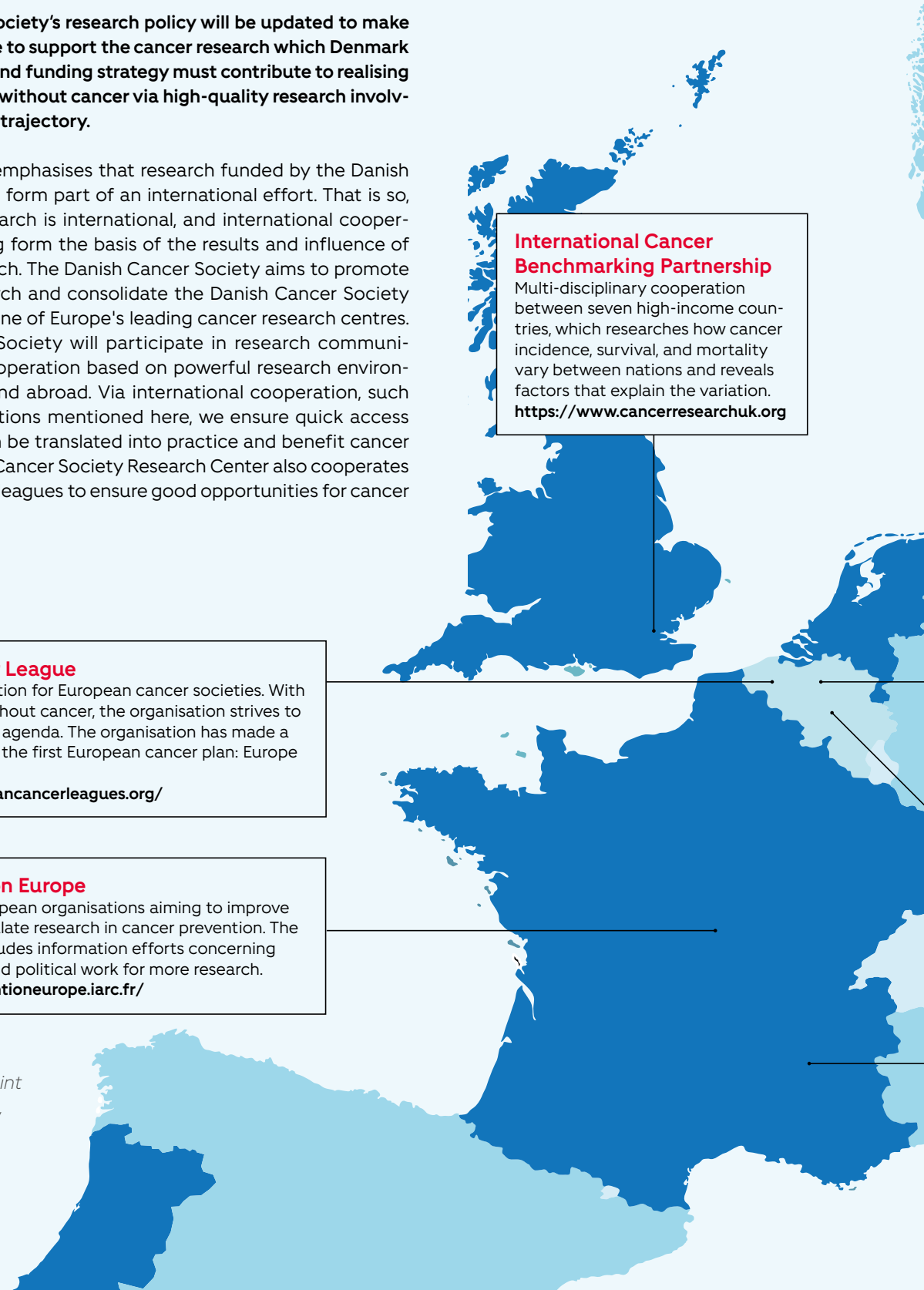
Mef Nilbert
Scientific Director until 1 February 2022

Jesper Fisker
CEO

The Danish Cancer Society will have a new research policy

The Danish Cancer Society's research policy will be updated to make sure that we continue to support the cancer research which Denmark needs. Our research and funding strategy must contribute to realising our ambition of a life without cancer via high-quality research involving the entire cancer trajectory.

The research policy emphasises that research funded by the Danish Cancer Society must form part of an international effort. That is so, because cancer research is international, and international cooperation and networking form the basis of the results and influence of Danish cancer research. The Danish Cancer Society aims to promote Danish cancer research and consolidate the Danish Cancer Society Research Center as one of Europe's leading cancer research centres. The Danish Cancer Society will participate in research communities and research cooperation based on powerful research environments in Denmark and abroad. Via international cooperation, such as with the organisations mentioned here, we ensure quick access to advances that can be translated into practice and benefit cancer patients. The Danish Cancer Society Research Center also cooperates with international colleagues to ensure good opportunities for cancer research in the EU.

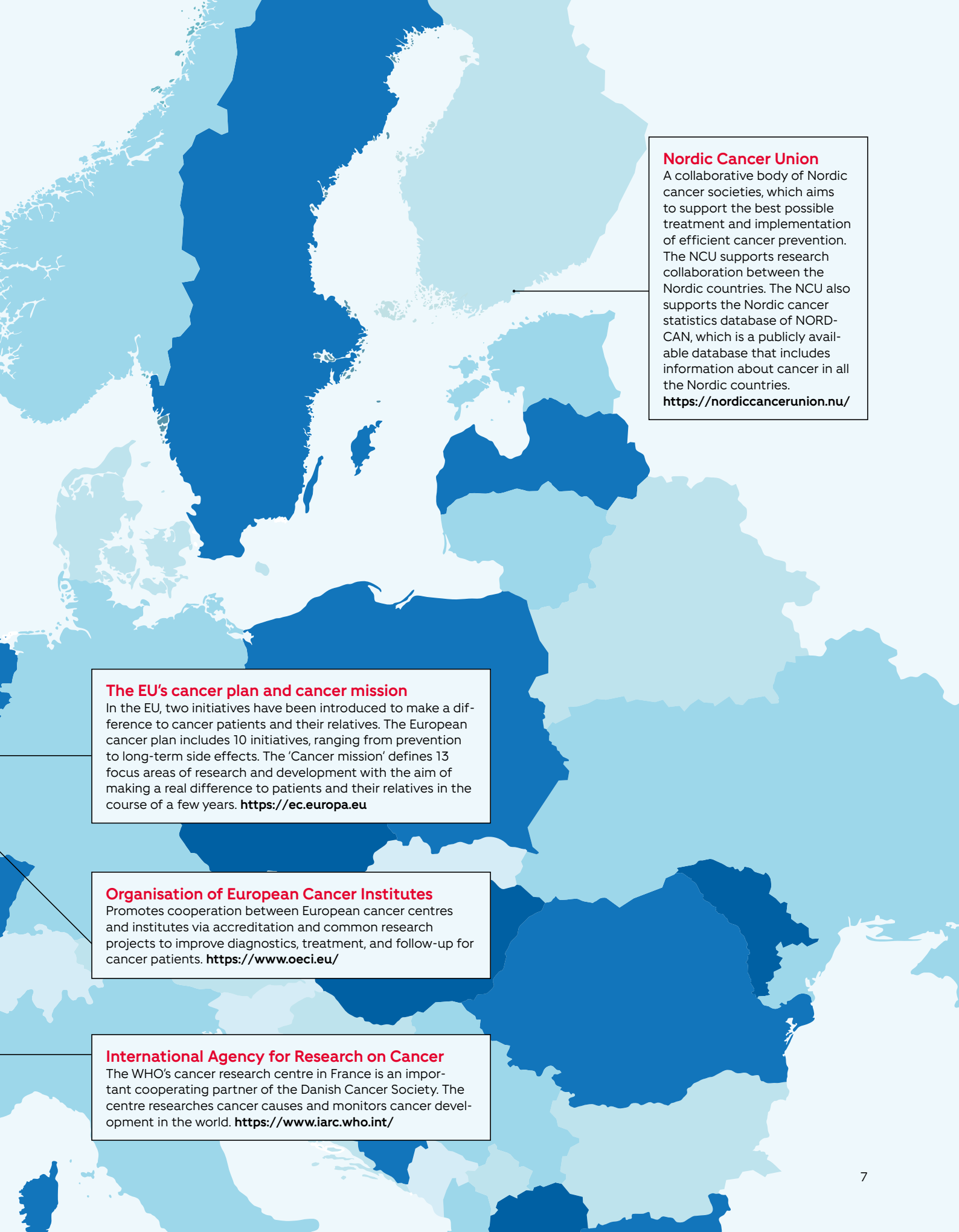


International Cancer Benchmarking Partnership
Multi-disciplinary cooperation between seven high-income countries, which researches how cancer incidence, survival, and mortality vary between nations and reveals factors that explain the variation.
https://www.cancerresearchuk.org

European Cancer League
An umbrella organisation for European cancer societies. With the vision of a life without cancer, the organisation strives to put cancer on the EU agenda. The organisation has made a great contribution to the first European cancer plan: Europe Beating Cancer.
https://www.europeancancerleagues.org/

Cancer Prevention Europe
A consortium of European organisations aiming to improve knowledge and stimulate research in cancer prevention. The cooperation also includes information efforts concerning cancer risk factors and political work for more research.
https://cancerpreventioneurope.iarc.fr/

The organisations point at one of the nations, from which they are administered.



Nordic Cancer Union

A collaborative body of Nordic cancer societies, which aims to support the best possible treatment and implementation of efficient cancer prevention. The NCU supports research collaboration between the Nordic countries. The NCU also supports the Nordic cancer statistics database of NORD-CAN, which is a publicly available database that includes information about cancer in all the Nordic countries. **https://nordiccancerunion.nu/**

The EU's cancer plan and cancer mission

In the EU, two initiatives have been introduced to make a difference to cancer patients and their relatives. The European cancer plan includes 10 initiatives, ranging from prevention to long-term side effects. The 'Cancer mission' defines 13 focus areas of research and development with the aim of making a real difference to patients and their relatives in the course of a few years. **https://ec.europa.eu**

Organisation of European Cancer Institutes

Promotes cooperation between European cancer centres and institutes via accreditation and common research projects to improve diagnostics, treatment, and follow-up for cancer patients. **https://www.oeci.eu/**

International Agency for Research on Cancer

The WHO's cancer research centre in France is an important cooperating partner of the Danish Cancer Society. The centre researches cancer causes and monitors cancer development in the world. **https://www.iarc.who.int/**

Danish Cancer Society Research Center

The Danish Cancer Society Research Center employs leading scientists from 27 nations. The research covers a broad range of subjects, from cancer cells' ability to divide and DNA repair to personalised medicine and patient support models.

Photo: Morten Bengtson

The Danish Cancer Society Research Center cooperates closely with the Danish Cancer Society, but also focuses greatly on the world around us. This is reflected by the fact that we welcome both visiting researchers and new students with various educations and from different fields of research every year and hence contribute to training future cancer researchers in an attractive educational environment.

The centre is also actively engaged in making sure that research results reach patients and private citizens as well as national and international researchers. Consequently, the scientists are actively engaged in research communication, and in 2021, the work on a new, ambitious visitors centre began.

The visitors centre, which will be established by the entrance of the Danish Cancer Society's headquarters in Copenhagen, is expected to open in late 2022. It will inform visitors about cancer and attempt to make specifically children and young people take an interest in science and research.

Follow-up and evaluation make sure that resources are spent on high quality research

The Danish Cancer Society Research Center's research groups are funded by the Danish Cancer Society in the shape of limited salary funds and via access to resources involving e.g. sophisticated microscopy and statistical analyses. Moreover, the centre's approximately 155 researchers apply for funds in an open call process, and the majority of the employees are consequently paid via external funds.

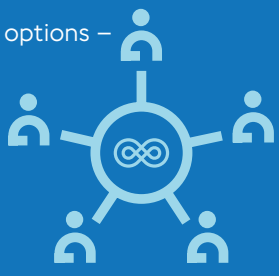
Research management initiate regular follow-up to ensure high quality research by the Danish Cancer Society Research Center. Some of the key figures can be found on page 12 of this report. Here we present key figures for scientific articles published by the Danish Cancer Society Research Center as well as an overview of the center's funding and areas of research. Apart from annual status interviews with individual research groups the entire centre is subjected to external evaluation by the Scientific Advisory Board, SAB, every second year.

Read more about the Danish Cancer Society Research Center here: **www.cancer.dk/research**

United towards common goals

Development and cooperation are two important areas to the Danish Cancer Society Research Center. In 2021, the scientists consequently prepared a description of the characteristics of the common research effort, as summarised by the four points below:

- We give priority to research that benefits patients by being part of a powerful patient organisation and are actively engaged in patient involvement in research
- We answer research questions based on unique resources in the shape of exceptional and large population-based databases and biobanks
- We take research from molecule to society by means of research within our niches and fields of expertise, ranging from basic to translational insight and cooperation
- Our discoveries are important to public health via the development of new options – from vaccines to new treatment principles and patient support



RESULT FROM 2021

Future 3 in 1 treatment: one pill against arthritis, COVID-19, and breast cancer?

Arthritis drugs might be efficient against some types of breast cancer and even give COVID-19 patients a milder disease trajectory. The results are the first from a new field of research, that aims to give patients less medication and fewer side effects.

Scientists from the Danish Cancer Society Research Center have identified seven approved drugs that can prevent invasive growth of aggressive breast cancer cells and eliminate aggressive ovarian cancer cells in the lab. Some of the drugs are examined by other scientists to find out if they can be used to treat severe COVID-19 symptoms or whether they can treat or perhaps prevent COVID-19. Others are efficient against bird flu, HIV, herpes, etc.

– Many cancer patients have several diseases and take different kinds of medication, that might influence each other or cause side effects. If we can discover drugs that are efficient against several diseases, we can offer improved treatments with potentially fewer side effects, says Tuula Kallunki, group leader of the Cancer Invasion and Resistance research group who directed the new experiments.

The results are published here: Hansen MB et al.: Identification of lysosome-targeting drugs with anti-inflammatory activity as potential invasion inhibitors of treatment resistant HER2 positive cancers. Cellular Oncology Online. 2021, May 03

The Danish Cancer Society supports the research

The project 'Finding new treatment options and evaluation methods for ErbB2-positive, invasive breast cancer' received DKK 1.9 million from the Danish Cancer Society's Scientific Committee.

RESULT FROM 2021

Noise and breast cancer

Road and railway noise could increase the risk of breast cancer. Probably because the noise disturbs our sleep.

Research by the Danish Cancer Society Research Center shows that every time road noise rises by 10 dB, as recorded at the least exposed façade of the building, the risk of breast cancer increases by 3.2 %. This corresponds to about 90 annual cases of breast cancer due to road noise. In the case of railway noise, the same rise results in an increased risk of breast cancer of 2.3 %. The risk particularly increases, when the noise exceeds 50 dB. The scientists found that when they examined noise at the most exposed façade, the link with breast cancer was not as evident.

– The bedroom is often located in the most quiet part of the building. Previous research indicates that noise is unhealthy, because it disturbs our sleep, and that is probably also the explanation in this case, says Professor Mette Sørensen from the Work, Environment and Cancer research group who headed the new study.

The results are published here: Sørensen M et al.: Road and railway noise and risk for breast cancer: A nationwide study covering Denmark. Environ Res. 2021, Jan 15.

Previous studies have shown that when noise disturbs our sleep, it has a negative health effect. Perhaps because night noise disturbs the circadian rhythm, or noise might have a negative affect on our lifestyle. Stock photo: Colourbox

Key figures

In 2021, the Danish Cancer Society Research Center published 329 peer-reviewed articles within a broad range of fields. Key performance indicators like the ones indicated below are one of the methods used to monitor research and ensure high quality. They are combined with internal monitoring and external scientific evaluation and advice from the Scientific Advisory Board.

A combined analysis carried out in January 2022 based on Scopus and covering the 2016-2021 period follows below:

Citations indicate the number of articles by other research groups quoting articles from a Danish Cancer Society Research Center research group. Citation principles differ between research fields. Consequently, what is reported is the 'weighted citation index', that compares the total number of citations obtained by one scientist to similar publications within the same field of research. A citation index of 2.2 means that publications by the Danish Cancer Society Research Center are quoted 2.2 times as often as the average group within their field of research.

Views indicate how many times articles by the Danish Cancer Society Research Center have been downloaded. Publications published as 'open access' are articles that are freely available to all readers.

Collaborations are measured by the share of articles, in which authors representing other academic institutions or private companies appear as co-authors.

Key figures for scientific articles published by the Danish Cancer Society Research Center

Citations

Mean	23
Weighted citation index	2.2
Publications in the top 10 % of cited journals	51%

Views

Mean downloads	42
Publications published as 'open access'	70%

Collaborations

Percentage of co-authored publications with international institutions	66%
Academic-corporate collaborations	7%

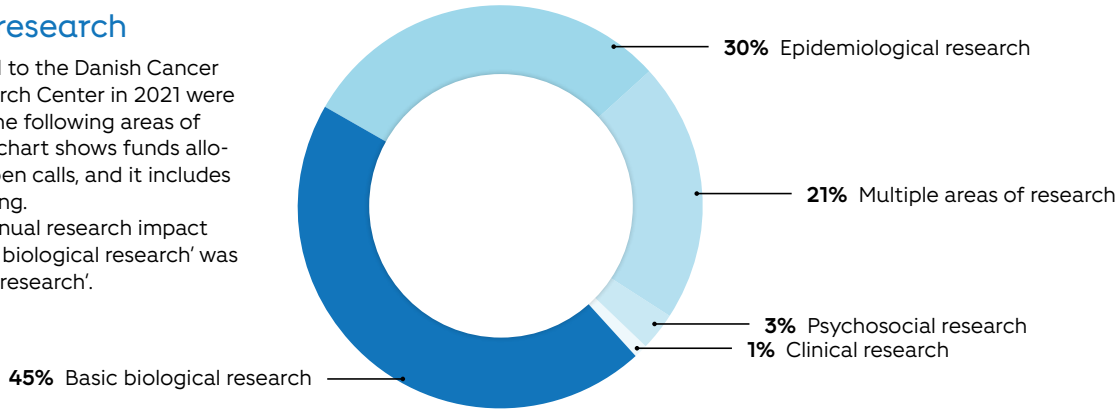
Funding

In 2021, the budget of the Danish Cancer Society Research Center consisted of a basic budget from the Danish Cancer Society of DKK 104.2 million. Of these, DKK 37.8 million were allocated to rent and IT, DKK 5.2 million to research evaluation and communication expenses, and DKK 61.1 million to the 23 research groups and common facilities. Of the total budget, basic funds from the Danish Cancer Society make up 53 %.

In the course of 2021, scientists from the Danish Cancer Society Research Center moreover received confirmation of research grants worth DKK 74.6 million from a large number of foundations. The money will be spent on research projects in the years to come. Read more about the Danish Cancer Society's financial position and see annual results at the society's website: www.cancer.dk.

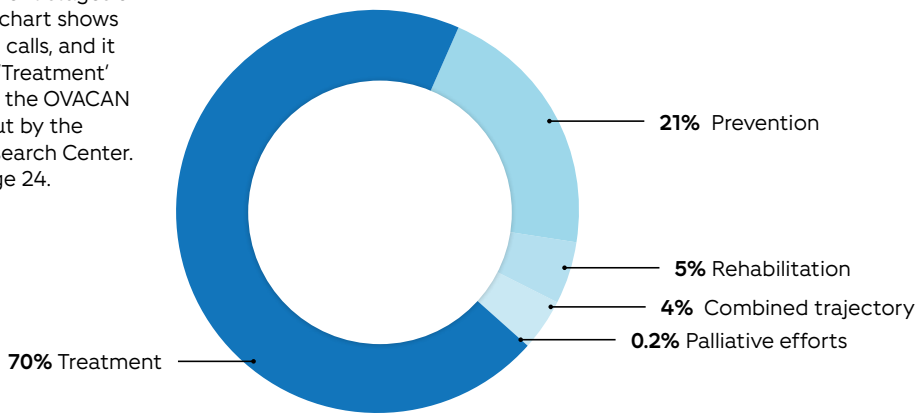
Areas of research

Funds granted to the Danish Cancer Society Research Center in 2021 were allocated to the following areas of research. The chart shows funds allocated after open calls, and it includes external funding.
In previous annual research impact reports, 'Basic biological research' was termed 'basic research'.



Cancer trajectory focus

The funding granted to the Danish Cancer Society Research Center in 2021 went to research into different stages of the cancer trajectory. The chart shows funds allocated after open calls, and it includes external funding. 'Treatment' includes DKK 14 million for the OVACAN research project carried out by the Danish Cancer Society Research Center. Read more about it on page 24.



RESULT FROM 2021

New PhD: Screening and cervical cancer vaccine can save lives – but immigrants are lagging behind

In 2021, Rasmus Hertzum-Larsen completed his PhD at the Danish Cancer Society Research Center. He has researched immigrant acceptance of the HPV vaccine and cervical cancer screening.

Approximately 370 Danish women develop cervical cancer annually, and some 100 die of the disease. Screening and the HPV vaccine can reduce the risk of women dying of the disease, but not everybody signs up. In his PhD, Rasmus Hertzum-Larsen researched the acceptance among women immigrants in Denmark.

Among Danish women, the acceptance of cervical cancer screening and the HPV vaccine is socially and economically imbalanced. Women with short educations or loose association with the labour market are less likely to accept.

The same turned out to be true for immigrants. Even disregarding socio-economic and social conditions, immigrants' acceptance was slightly lower than Danish women's.

While 84 % of Danish women accepted having their children vaccinated against HPV, the percentage was 74 for women immigrants. Some 71 % of Danish women accepted cervical cancer screening, whereas the percentage was 61 for women immigrants. As regards the acceptance of follow-up after screening – which is typically offered, when screening reveals cell change – the difference between the two groups was less than 5 percentage points.

The study does not explain the reasons for the differences, but Rasmus Hertzum-Larsen has a theory:

– Immigrants must learn a new language, find new friends, discover how the country works, and set up a new home. Perhaps you focus more on this for a number of years than on navigating your new country's health system and accepting screening, vaccine, etc. The theory is supported by the fact that the acceptance improves, the longer immigrants have lived in Denmark, says Rasmus Hertzum-Larsen.

Scan the QR code with your smartphone's camera to watch a video about Rasmus Hertzum-Larsen (in Danish).

The Danish Cancer Society Research Center produced a total of 15 PhD graduates in 2021. Visit **www.cancer.dk/research/dcrc-research/phd-defences-2021/** for a full list.

Rasmus Hertzum-Larsen is now continuing his research in the Danish Cancer Society Research Center's Virus, Lifestyle and Genes research group. Photo: Tomas Bertelsen.

In 2021, nine women and six men became PhD graduates at the Danish Cancer Society Research Center.
Photo: Tomas Bertelsen.

Danish Cancer Society Research Center areas of research

Precision medicine, social inequality, survivorship

Childhood Cancer
Jeanette Falck Winther

Translational Cancer Genomics
Zoltan Szallasi

Psychological Aspects of Cancer
Pernille Envold Bidstrup

Survivorship and Inequality in Cancer
Susanne Oksbjerg Dalton

Cancer Invasion and Resistance
Tuula Kallunki

Molecular mechanisms, biomarkers, new treatments

Cell Stress and Survival
Francesco Cecconi

Redox Biology
Giuseppe Filomeni

RNA and Autophagy
Lisa Frankel

Genome Integrity
Jiri Bartek

DNA Replication and Cancer
Apolinar Maya–Mendoza

Nucleolar Stress and Disease
Dorthe Helena Payne-Larsen

Cell Death and Metabolism
Marja Jäättelä

Membrane Integrity
Jesper Nylandsted

Cell Division and Cytoskeleton
Marin Barisic

Cancer Structural Biology
Elena Papaleo

Risk factors, prevention, early diagnosis

Cancer surveillance and Pharmacoepidemiology
Lina Steinrud Mørch

Diet, Genes and Environment
Anne Tjønneland

Nutrition and Biomarkers
Anja Olsen

Molecular Diagnostics
Per Guldberg

Work, Environment and Cancer
Ole Raaschou-Nielsen

Virus, Lifestyle and Genes
Susanne Krüger Kjær

Lifestyle, Reproduction and Cancer
Allan Jensen

Hematology
Henrik Hjalgrim

New blood cancer research group

In 2021, the Danish Cancer Society Research Center welcomed Professor Henrik Hjalgrim, who initiated a new research group specialising in blood cancer. Based on epidemiological cancer research, the group aims to make patients benefit from new research insight quickly.

A new area of research was introduced at the Danish Cancer Society Research Center, when the Hematology – blood cancer – group saw the light of day in March 2021:

– Henrik Hjalgrim and his colleagues have considerable experience in blood disease research, which is a new and valuable focus area for us. Moreover, the group's interest and expertise in the combination of traditional and clinical epidemiology with genetic profiling and biomarker analysis fits very well with the research that is already carried out by our other research groups, Scientific Director Mef Nilbert said, when the new researchers were introduced.

Henrik Hjalgrim and his colleagues research why blood cancer originates and how to treat the diseases in the best possible way. They combine health data from major public registers with genetic analyses, etc., to gain insights that can prevent the diseases and help patients.

One branch of the research focuses on lymphatic cancer of the Hodgkin's lymphoma type. Henrik Hjalgrim's research into the genetics behind the disease has demonstrated that there is an overlap between Hodgkin's lymphoma and multiple sclerosis. Consequently, the two very different diseases somehow have common causes, perhaps via the way in which the immune system reacts to specific infections.

Another example is Henrik Hjalgrim's research into acute lymphocytic leukaemia in children. His results indicate that it might be possible to spot biomarkers in the blood of infants and hence predict their risk of developing leukaemia later in life.

Infections and blood cancer

Another focus area in Henrik Hjalgrim's research is the role of e.g. viral infections, in connection with the development of blood cancer. The scientists have found patterns indicating how patients, who later develop chronic lymphocytic leukaemia, reacted to different infections many years earlier. This has produced knowledge about the role of the immune system in the development of the disease, and this could have interesting prospects:

– The prospects are that we might be able to develop a vaccine against chronic lymphocytic leukaemia, which is the most frequent type of leukaemia in adults, says Henrik Hjalgrim.

Already before the new group was introduced, Henrik Hjalgrim cooperated with scientists from the Danish Cancer Society Research Center, and the group also cooperates closely with physicians and researchers from e.g. Rigshospitalet. His employment with the Danish Cancer Society Research Center allows for extending the combination of register-based and biological research. That is an approach which has already produced promising results in other cases, such as the research into new use of existing drugs:

– The results from the Danish Cancer Society Research Center, which show that antabuse and allergy drugs can improve the effect of chemotherapy, are very interesting. I hope that our collaboration projects can lead to the same exciting new approach to treatment within our field, says Henrik Hjalgrim.

Professor Henrik Hjalgrim is group leader of the Danish Cancer Society Research Center's Hematology research group. Photo: Tomas Bertelsen.

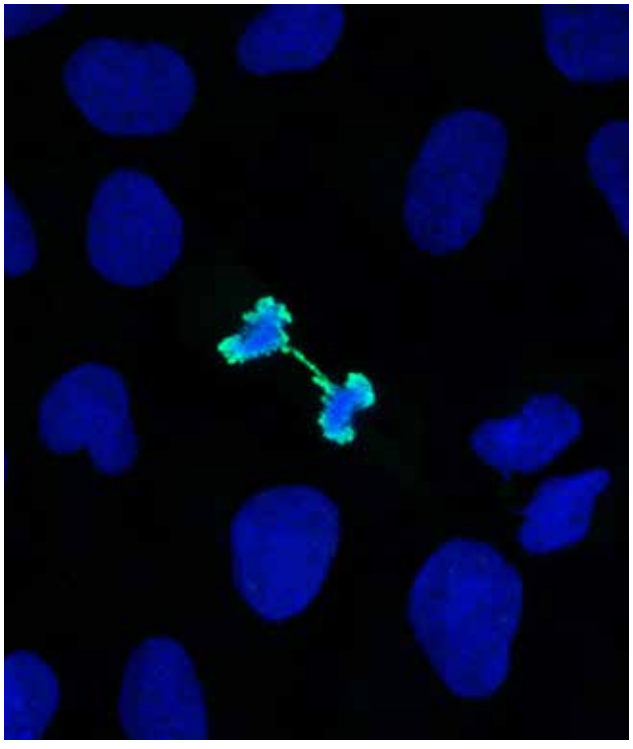
RESULT FROM 2021

Danish and international researchers disclose a key factor in cell division

Most of us do not even know that we have it. Nevertheless, it influences a process that takes place in our bodies thousands of times a day. In 2021, scientists from the Danish Cancer Society Research Center demonstrated that the Ambra1 protein plays a very central role in the division of our cells.

Although cell division is vital, it can also be dangerous. During cell division, our genetic material also divides, and in case of an error involving that the new copy is not identical to the old one, cancer could result.

In 2021, research by the Danish Cancer Society Research Center showed that one of the proteins influencing cell division is Ambra1. The research specifically demonstrated that in healthy cells, Ambra1 makes sure that the level of another protein, cyclin D, remains low. But if the level of Ambra1 is reduced, the level of cyclin D increases, causing faster cell division and increasing risk of genetic errors. Consequently, the risk of cancer also increases. It is already known that too high levels of cyclin D could increase the risk of cancer spreading, reducing patients' chances of surviving cancer. This has been observed in connection with lung cancer, bladder cancer, and breast cancer.



The photo shows cells with too little Ambra1, as observed through a microscope. The blue colour indicates cell nuclei, and the cell at the centre is dividing. However, the division is incorrect: instead of two separate cells, there is a link – a bridge – between the old and the new cell's DNA.
Photo from Maiani et. al., Nature 14 April 2021.

The results are the culmination of many years of research, explains Professor Jiri Bartek from the Genome Integrity research group, who participated in the research:

– Over the past 25 years, we have researched into and obtained much knowledge about how cyclin D works, about cell division control, and about genetic instability in relation to cancer. This has provided us with all the necessary methods and models and formed the basis of the ideas that have now laid the foundations of the exciting new results, says Jiri Bartek.

Even if the results concerning Ambra1 and cyclin D are new, the new knowledge involves great prospects, that could lead to customised treatment of some groups of cancer patients with different diagnoses. Breast cancer drugs already exist, which might also be relevant to other cancer patients, in whom the level of cyclin D is too high due to unusually low levels of Ambra1, explains the head of the study, Professor Francesco Cecconi from the Cell Stress and Survival research group:

– Perhaps, we can measure the levels of Ambra1 in patients' cancer cells in the future and give those with low levels drugs that curb the effect of too much cyclin D. We have studied lung cancer, sarcoma, and brain cancer cells, but Ambra1 probably also influences many other types of cancer cells, Francesco Cecconi says.

The results are published here: Maiani E et al.: AMBRA1 regulates cyclin D to guard S-phase entry and genomic integrity. Nature. 2021, April

Today, cancer survivors stand a good chance of having children, if they wish, thanks to advances in cancer treatment and more focus on preserving fertility during cancer treatment. Photo: Adobe Stock

RESULT FROM 2021

Cancer survivors stand a good chance of having children

Both men with testicular cancer and women who had cancer in their childhood stand very good chances of becoming parents, according to two research projects, which the Danish Cancer Society Research Center carried out and contributed to.

Men with testicular cancer stand much better chances of fathering children after treatment than previously believed. About half of those who have been treated for testicular cancer stand the same statistical chance of becoming fathers as the rest of the male population. The positive development probably has to do with several factors. In Denmark, we are very good at treating testicular cancer with the least interfering methods. Moreover, the possibilities of artificial insemination, IVF treatment, have improved a lot. The research was carried out in cooperation with Rigshospitalet.

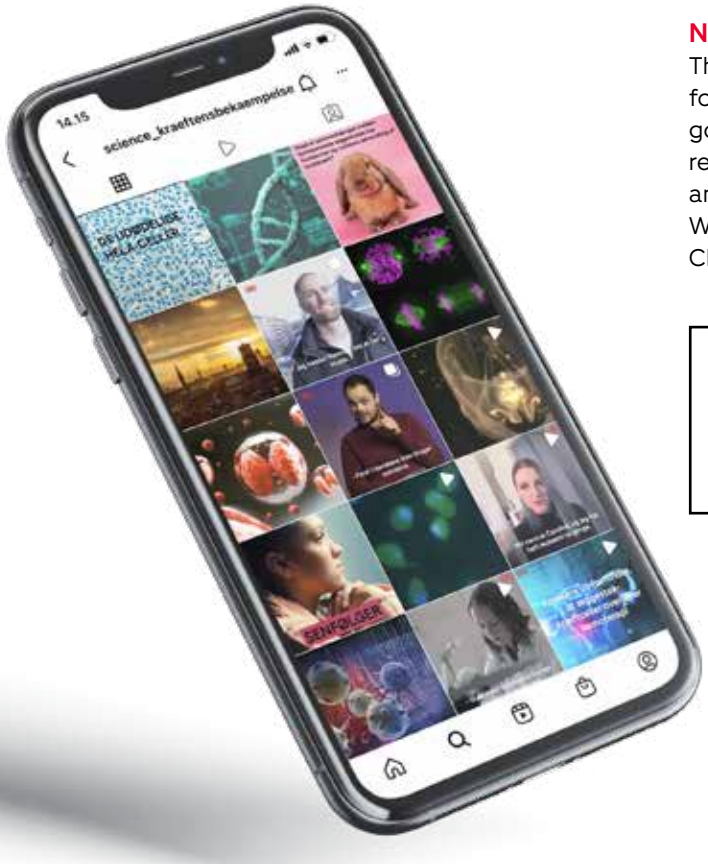
The resultats are published here: Bandak M et al: Paternity After Treatment for Testicular Germ Cell Cancer: A Danish Nationwide Population-Based Cohort Study. JNCI: Journal of the National Cancer Institute. 2021, June 28

Women diagnosed with cancer after 1989 are almost as likely to become the mothers of at least one child as women without cancer, according to the most extensive study in the field so far. That is probably due to gentler cancer treatment and increased focus on preserving fertility in girls with cancer. However, there is still a big difference between the likelihood of the women. Among those with the lowest likelihood of becoming mothers are women who had brain cancer or germ cell cancer.

The results are published here: de Fine Licht S et al.: Temporal changes in the probability of live birth among female survivors of childhood cancer: A Population-Based Adult Life After Childhood Cancer in Scandinavia (ALiCCS) study in five Nordic countries. Cancer. 2021, Jul 23

Scan the QR code with your smartphone's camera to learn more about the research (in Danish).

Photo: Morten Bengtson



New Instagram research profile

The Danish Cancer Society has a new Instagram profile for all of those who would like to be updated on what is going on in the world of cancer research, see the most recent research results, and learn more about cancer and cancer research in general.
We hope that many of you will follow the profile.
Check it out: science_kraeftensbekaempelse

Scan the QR code with your smartphone's camera to find the Danish Cancer Society's research profile on Instagram.

Science

International evalutation of the Danish Cancer Society Research Center

In 2021, the Danish Cancer Society Research Center was visited by the Scientific Advisory Board (SAB), which advices on how to maintain the centre and frequently evaluates its work. In 2021, 11 research groups were evaluated and received individual feedback. The SAB also followed up on the centre's general activities and efforts, which were highly praised in the final report. Here the SAB described the development as very positive and offered recommendations concerning further development such as mentorships for young researhcers, national and international profiling, and advice on how to maintain the high standards of data sharing between the centre and external cooperation partners.

Photo: The Danish Cancer Society

NEW PROJECT FROM 2021

Intestinal miniverse holds secrets about health and disease

In 2021, the freeze-drying of some 22,000 stool samples from Danes who participated in the Danish Cancer Society's cohort study 'Diet, Cancer and Health – Next Generations' began. The effort is to provide us with new insight into the link between our gut microbiome and our health.

Our intestines are full of viruses, bacteria, fungi, parasites, and other microorganisms. Combined, the inhabitants of the intestines are known as the microbiome, and in recent years, scientists have realised that it is very important to our health. The microbiome lives in a symbiotic relationship with the rest of the body and influences our experience of hunger and fullness, how we absorb nutrients, and our immune system. It influences our health, and a series of diseases such as intestinal cancer somehow interact with the inhabitatants of our intestines.

In the years to come, a team of scientists from the Danish Cancer Society and the University of Copenhagen will hence research the microbiome's role in cancer by analysing e.g. DNA from the 22,000 stool samples.

Customised prevention

Colon cancer is one of the first diseases on the scientists' list, according to group leader Anja Olsen from the Danish Cancer Society Research Center. She is the researcher behind 'Diet, Cancer and Health – Next Generations':

– Colon cancer is the type of cancer that is most related to diet and exercise habits. What we know as Western lifestyle, which is characterised by too much meat, too much alcohol, too little exercise, etc., involves an increased risk of developing colon cancer. And some of the factors might very well directly influence the make-up of our intestinal biome, says Anja Olsen.

Moreover, there is every indication that patients with colon cancer have a different bacterial make-up than healthy people, and several of the bacteria that otherwise live in the mouth exist in their intestines. However, we do not know whether the changes result from cancer or if it happens before the cancer and might even influence cancer development. Those are questions that the scientists will take a closer look at.

Apart from the stool samples, the scientists have detailed knowledge about the test subjects' diet and lifestyle plus samples of urine, blood, and saliva. The scientists hope to combine knowledge about the bacterial make-up in the intestines, diet, lifestyle, and bacteria in the mouth. Moreover, the scientists have similar data from the test subjects' grandparents, who participated in the cohort study 'Diet, Cancer and Health'. In combination, the work could provide us with knowledge of how the different factors influence the risk of developing cancer across several generations.

The prospects of the new research are many, but one of them has to do with becoming better at preventing cancer in individual people:

– Perhaps the make-up of our microbiome influences the effect of different preventive efforts. Due to their microbiomes, some people may suffer a bigger risk of colon cancer, and they will benefit particularly from following advice, which can reduce their risk of developing the disease. Others may have a microbiome that increases the risk of other diseases, which should be taken into account in other ways. In short, it would be very valuable, if it turns out that the microbiome and all the other knowledge we have about the human body can also contribute to customising prevention efforts in the future, says Anja Olsen.

Scan the QR code with your smartphone's camera to learn more about the freeze-drying of the 22,000 stool samples (in Danish).

DKK

The Danish Cancer Society supports the research

The 'Diet, Cancer and Health – Next Generations' cohort study received DKK 15 million from the 2012 Knæk Cancer fundraising campaign.

Professor Anja Olsen is the head of the Nutrition and Biomarker research group.
Photo: Tomas Bertelsen

NEW PROJECT FROM 2021

Ovarian cancer research will look into lifestyle factors and new treatments

A team of scientists aims to find out what happens when ovarian cancer cells become resistant to treatment, and whether factors in our lifestyle and diet influence this. The aim is to make more women survive the disease.

The scientists behind the new project (top right): Robert Strauss, Jiri Bartek, Allan Jensen (bottom right): Tuula Kallunki, Susanne Krüger Kjær. Photo: Danish Cancer Society

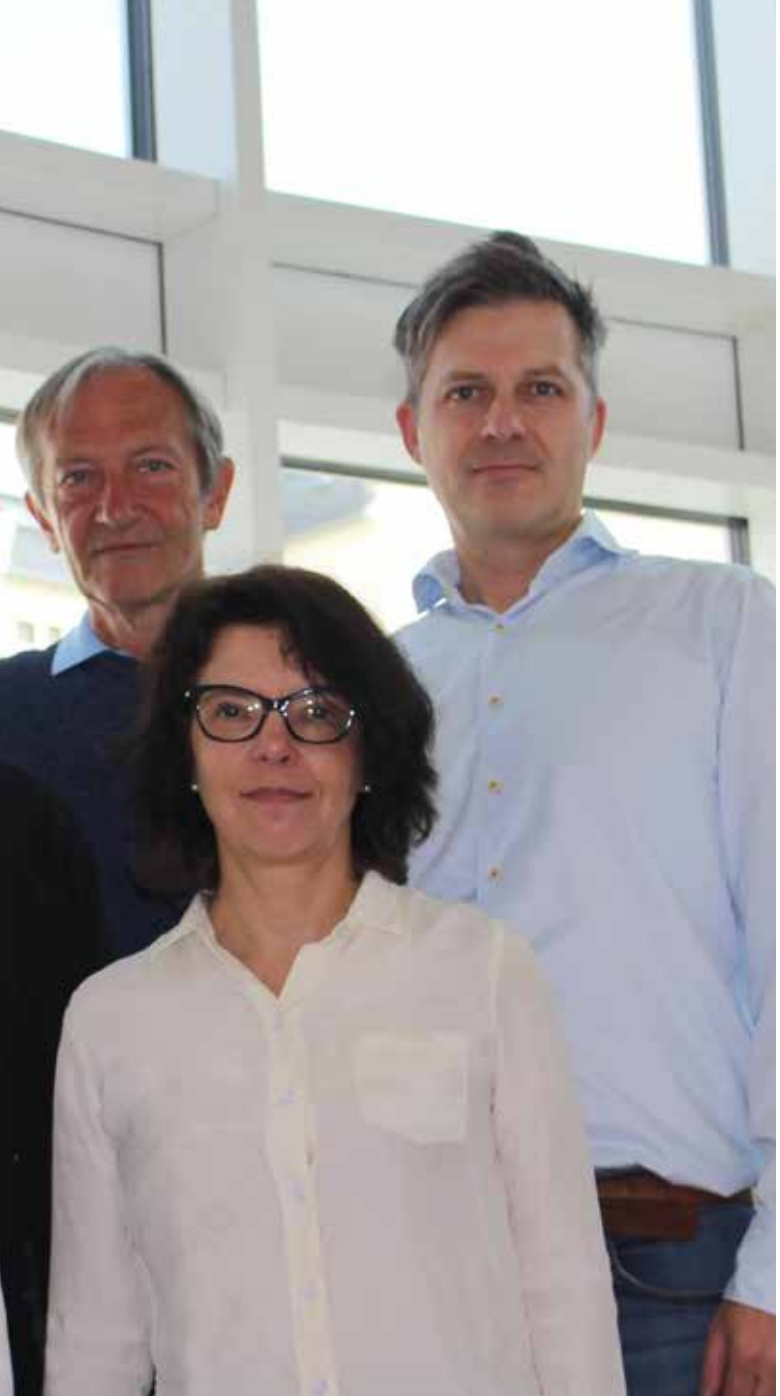
New progress is required to make sure that more of the approximately 550 Danish women who develop ovarian cancer annually survive the disease. Two major challenges exist: in the majority of the cases, the disease is discovered relatively late, and among those who are treated with chemotherapy due to advanced disease, many develop resistance to the chemotherapy. The OVACAN research project, headed by scientists from the Danish Cancer Society Research Center, aims to change this.

The scientists will approach the challenge in different ways. Three of the projects are carried out in the lab, where the scientists will study the changes taking place inside cells, when the cancer becomes resistant to chemotherapy, and look into changes in the system that is responsible for cell division. They will also test new drugs in the treatment of the diehard cancer cells – primarily by researching whether drugs that have already been approved for the treatment of other diseases could be efficient against the resistant cancer cells.

Via questionnaires and register-based studies, other scientists will look into whether lifestyle factors such as diet, alcohol, smoking, physical activity, and the use of different drugs affect the risk of the cancer cells developing resistance to the treatment, so patients do not survive the cancer.

– We would like to discover more cases of ovarian cancer early, involving better surgery prospects. We hope to develop new knowledge that can benefit patients, initially in clinical trials. In the project, we approach the resistance problem from different angles at the same time, and we hope that the combination of biological knowledge and lifestyle factors will allow us to customise the treatment of ovarian cancer in the future, so it becomes as efficient as possible and with the fewest long-term side effects for individual women, says research group leader Tuula Kallunki. Together with her colleagues, Professor Jiri Bartek and Senior Researcher Robert Strauss, she is responsible for lab research in connection with the new project. The register and questionnaire-based research is carried out by group leader Allan Jensen and Professor Susanne Krüger Kjær.

The project has been funded by Fabrikant Chas. Otzen´s Fond.



The lab imitates the body

The scientists use special methods, when they culture ovarian cancer cells in the lab.

– We culture the cancer cells in a gel that allows 3D growth, much like their growth in body tissue. Moreover, we culture cancer tumour sections from patients in a liquid, in which they flow like they would in abdominal cavity liquid. When we subsequently study the cancer cells or treat them with different types of drugs, we get an answer that is as realistic as possible, says Tuula Kallunki.

NEW PROJECT FROM 2021

Major EU effort against ovarian cancer

An international cooperation project is to develop a digital platform allowing physicians to customise the treatment of ovarian cancer for individual patients.

With EU funding from the Horizon 2020 programme of more than DKK 110 million, the Danish Cancer Society Research Center and 13 other organisations from seven European nations will contribute new knowledge about ovarian cancer diagnostics and treatment over the next 5 years. Known as DECIDER, the project is to develop a platform that uses artificial intelligence to analyse data about patients to customise their treatment. The platform will be used in the treatment of the ordinary version of the disease and in cases in which the disease has become resistant to existing treatment.

– The aim is that physicians can use the platform to enter data about individual patients and receive recommendations concerning the best possible treatment of individual patients. In this way, it will be possible to design personalised treatments for women, on whom the present treatment has no effect, explains Tuula Kallunki, who heads the Danish Cancer Society Research Center's research in the field. The digital platform will be free of charge and available to all European hospitals working with ovarian cancer.

Learn more from the EU website:
https://www.deciderproject.eu

Scan the QR code with your smartphone's camera to watch a video presentation of the ovarian cancer research (in Danish).

On behalf of the Danish Cancer Society, we thank everyone whose contribution has made the research possible.

In pursuit of a life without cancer

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