CENTRE
FOR CANCER
BIOMEDICINE

ANNUAL REPORT 2014

CONTENTS

ADVANCING CANCER RESEARCH WITH CCB

PHOTO BY TERJE HEIESTAD

HARALD STENMARK
Director

RAGNHILD A. LOTHE
Co-director

THROUGH AN INTERDISCIPLINARY APPROACH

CCB is continuing to improve our understanding of how cancer arises and to utilize this knowledge for the patient's benefit. The Norwegian Radium Hospital is world-leading in treatment of lymphoma, and CCB's scientists and associate clinicians play a central role in efforts for further optimizing and individualizing the treatments of various lymphoma types. Scientists in Erlend Smeland's group have uncovered gene expression patterns and clonal evolution paths, assessed by DNA copy number changes that can predict development of follicular lymphoma into a more aggressive form. Furthermore this group has uncovered cellular signalling mechanisms that underlie lymphoma development. Such knowledge continues to be translated into novel treatment strategies in close collaboration with the CCB associated oncologist Harald Holte and other clinicians.

CCB also plays a leading role in research on one of the common malignancies with high mortality, colorectal cancer. The groups of Ragnhild A. Lothe and Håvard E. Danielsen have shown the prognostic value of molecular phenotypic subtypes of primary colorectal cancer. Together with clinical partners including the CCB associated surgeon Arild Nesbakken, biomarkers based on nucleic acid molecules or protein expression have been detected for early diagnosis and prognosis of colorectal cancer by researchers in CCB.

Guro E. Lind, junior member of the PI group in 2013 and 2014, has not only identified epigenetic markers for colorectal cancer but recently presented novel markers for detection of the highly aggressive malignancy cholangiocarcinoma by analyses of biliary brush sampling. The 2015 elected junior member of the PI group, Rolf I. Skotheim, has competence in analyses of next generation sequencing data and investigates qualitative and quantitative transcriptome alterations in cancer. They have identified novel fusion genes in colorectal cancer and in prostate cancer, the latter in collaboration with the CCB guest professor Manuel R. Teixeira at University of Porto. Furthermore, a large study is ongoing on heterogeneity issues related to diagnosis and progression of prostate cancer, led by Rolf I. Skotheim together with the CCB associated urologist Karol Axcrona.

Among the cell biological research in CCB, significant progress has recently been made in two areas, cell division and membrane traffic. Work in Harald Stenmark´s group has recently led to the identification and characterization of a mechanism that ensures that chromosomes are equally distributed to the two daughter cells during cell division and halts the final abscission between the two daughter cells if this is not the case. In this way, the occurrence of cells with abnormal chromosome numbers, aneuploidy, is prevented. Stenmark was awarded the King Olav V's Cancer Research Award in 2014.

Kirsten Sandvig´s group has found that a group of membrane-binding proteins called flotillins regulate signalling pathways downstream of the oncogenic ErbB proteins, and as such these proteins are interesting in the context of cancer diagnosis and therapy. The Sandvig group has been very successful in moving part of their research into translational paths during the CCB period, including studies of exosomes in prostate cancer and nano technology based delivery systems. Sandvig obtained the Fridtjof Nansen Prize for Excellent Research in 2014, and she is the first scientist in the field of cancer research to receive this prestigious prize.

The input from CCB´s biostatisticians, headed by Knut Liestøl and Ole Christian Lingjærde, continues to be instrumental to the success of all the CCB´s research programmes. In addition to supporting cell biological and translational research projects by aiding with study design and statistical analyses, CCB´s biostatisticians also develop novel biostatistical tools that can be used for cancer researchers worldwide.

It is important for CCB to train the next generation of cancer researchers, and we would like to congratulate the 11 young CCB scientists who obtained their PhDs during 2014, as well as the 10 students who completed their MSc with supervisors from CCB. These young scientists contributed strongly to CCB´s publication record of 76 papers in 2014, and there is no doubt that Norwegian cancer research has an excellent recruitment base for the future. CCB´s scientists are active in training of young scientists at the University of Oslo and the Norwegian University of Science and Technology. In particular, many of our scientists contribute to the course on Cancer Biology at the Institute for Biosciences led by Guro E. Lind. The efforts of CCB to train young scientists are also illustrated by the fact that CCB sponsors five positions as professor II or associate professor II at the University of Oslo, held by Guro E. Lind, Andreas Brech, Rolf I. Skotheim, June H. Myklebust, and Francesca Micci.

Finally, we would like to thank our host institutions, sponsors and collaboration partners for excellent cooperations in 2014. The Institute of Clinical Medicine at the University of Oslo, headed by Ivar Gladhaug, provides excellent economic and administrative support, and the Division of Cancer Medicine, Transplantation and Surgery at Oslo University Hospital, headed by Sigbjørn Smeland, provides fantastic laboratory facilities that enable top-level research. Special thanks to our main sponsors, the Research Council of Norway, the Norwegian Cancer Society, and the South-Eastern Norway regional health authority, for major contributions to the CCB's running costs and salaries. Our many partners abroad and in Norway are acknowledged for inspiring and productive collaborations that contribute importantly to CCB's progress. CCB's status as a Centre of Excellence certainly makes us attractive as partner in international projects, and this benefits our own research as well as cancer research at large.

From left: Secretary-General of the Norwegian Cancer Society Anne Lise Ryel, HM King Harald V, award winner Harald Stenmark, and Paul Hellandsvik, Chairman of the Norwegian Cancer Society.

PHOTO BY THOMAS BARSTAD ECKHOFF

CONGRATULATION TO PROFESSOR HARALD STENMARK WITH THE KING OLAV V'S CANCER RESEARCH AWARD 2014

CCB DIRECTOR HARALD STENMARK RECEIVED KING OLAV V'S CANCER RESEARCH AWARD 2014 FOR HIS GROUND-BREAKING DISCOVERIES WITHIN CELL BIOLOGY.

King Olav Vs Cancer Research foundation was established in 1992 by the Norwegian Cancer Society, and since then the Cancer Society has awarded this prestigious prize annually to Norway's most outstanding cancer researchers.

Harald Stenmark is particularly known for his research on the development of normal cells into cancer cells. In particular, Stenmark's group has contributed importantly to our understanding of how cellular growth factor signalling is regulated, and how its dysregulation may cause cancer.

In an interview published by the Norwegian Cancer Society, Harald Stenmark emphasizes teamwork, collaboration, a talent for asking the right questions, a bit of luck, and a lot of hard work, as part of the success criteria for excellent research.

The distinguished cancer research prize of 1 MNOK was handed over to Harald Stenmark by his Majesty King Harald V in a ceremony on the 2nd of June in the old ceremonial hall at the University of Oslo.

PHOTO BY ALEXANDER HAGSTADIUS

PROFESSOR KIRSTEN SANDVIG RECEIVES THE FRIDTJOF NANSEN PRIZE FOR EXCELLENT RESEARCH 2014

THE FRIDTJOF NANSEN PRIZE FOR EXCELLENT RESEARCH IN SCIENCE AND MEDICINE 2014 WAS AWARDED TO CCB'S KIRSTEN SANDVIG FOR HER GROUNDBREAKING WORK WITHIN THE FIELDS OF BIOCHEMISTRY AND CELL BIOLOGY.

CCB congratulates Kirsten Sandvig with the Fridtjof Nansen prize for excellent research in science and medicine. Sandvig was awarded the prize for her groundbreaking results within the fields of biochemistry and cell biology. She is the first scientist in the field of cancer research to receive this prestigious prize.

Prize winner Sandvig received a medal, a diploma, and 150,000 NOK at a ceremony on the 5th of May at the Norwegian Academy of Science and Letters. The esteemed prize was handed over by the Chairman of the Nansen Foundation, Øyvind Østerud.

Kirsten Sandvig is Principal Investigator in CCB and Professor at the University of Oslo, Department of Biosciences.

PHOTO BY TERJE HEIESTAD

Prize winner Kirsten Sandvig and Øyvind Østerud, Chairman of the Nansen Foundation.

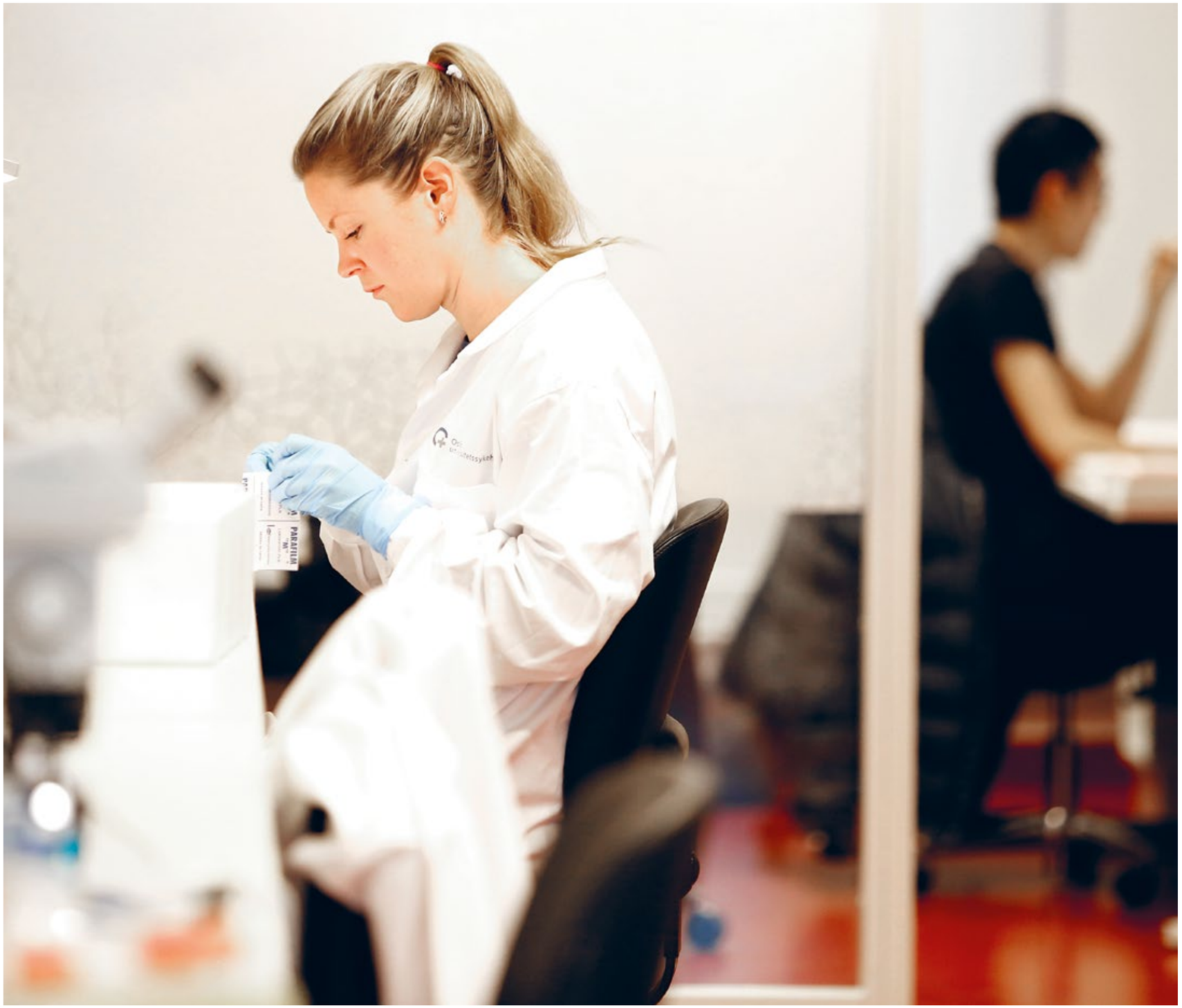
PHOTO BY NORWEGIAN ACADEMY OF SCIENCE AND LETTERS/SCANPIX

MONTH IN REVIEW

2014

JANUARY

PHOTO BY TERJE HEIESTAD



Media coverage

PRESS CONFERENCES ABOUT CANCER NANOMEDICINE

ON THE 31ST OF JANUARY, THE NORWEGIAN CANCER SOCIETY HOSTED A PRESS CONFERENCE ABOUT THE USE OF NANOPARTICLES IN CANCER DIAGNOSIS AND THERAPY.

This event was the Norwegian contribution to the European initiative "Nano World Cancer Day 2014" with similar press conferences arranged simultaneously in 13 European countries.

Collaboration with Oslo Cancer Cluster and SINTEF | The management group of the national competence building project "Biodegradable nanoparticles in cancer diagnosis and therapy" (headed by professor Kirsten Sandvig, CCB) organized the meeting together with Oslo Cancer Cluster and SINTEF. The press conference attracted approximately 40 participants.

Media coverage

PROF. GURO E. LIND APPOINTED SCIENTIST OF THE MONTH BY THE SOUTH-EASTERN NORWAY REGIONAL HEALTH AUTHORITY

The South-Eastern Norway Regional Health Authority (Helse Sør-Øst) aims to profile ongoing excellent research in the region by calling special attention to a "Scientist of the month". For the month of January 2014, this honor goes to CCB's group leader Guro Elisabeth Lind from the Department of Cancer Prevention at the Institute for Cancer Research, the Norwegian Radium Hospital.

The Norwegian news article "Superspennende", a popular scientific presentation of Lind's work, was published on www.helse-sorost.no.

SELECTED PUBLICATIONS

Håvik AB, Lind GE, Honne H, Meling TR, Scheie D, Hall KS, van den Berg E, Mertens F, Picci P, Lothe RA, Heim S, Brandal P. (2014) **Sequencing IDH1/2 glioma mutation hotspots in gliomas and malignant peripheral nerve sheath tumors** Neuro Oncol. 16(2):320-2.

IDH1 and IDH2 in gliomas and MPNST | The gene IDH1 was in 2008 identified as a possible glioblastoma pathogenesis candidate gene. Haavik and colleagues examined the mutational status of IDH1 and IDH2 in a series of 161 Norwegian glioma samples and 93 malignant peripheral nerve sheath tumors (MPNST). The results from this cohort were in agreement with findings in other studies and showed a high frequency of IDH1 mutation in lower-grade gliomas and secondary high-grade gliomas including glioblastomas. In contrast to this, as expected, a low frequency was found in primary high-grade gliomas and MPNST. The study has resulted in a diagnostic IDH1 test performed at the Oslo University Hospital.

SEMINAR JANUARY 29TH

Sigrid Thoresen, PhD student | Department of Biochemistry and CCB, Institute for Cancer Research, The Norwegian Radium Hospital | **ANCHR mediates abscission checkpoint control during cell division**

MASTER DEGREES

IDA SEIM JAKOBSEN
M.Sc. in Molecular Biosciences
Exosome release. Role of PIKfyve and ERM proteins | Faculty of Mathematics and Natural Sciences, University of Oslo, January 2014

FEBRUARY

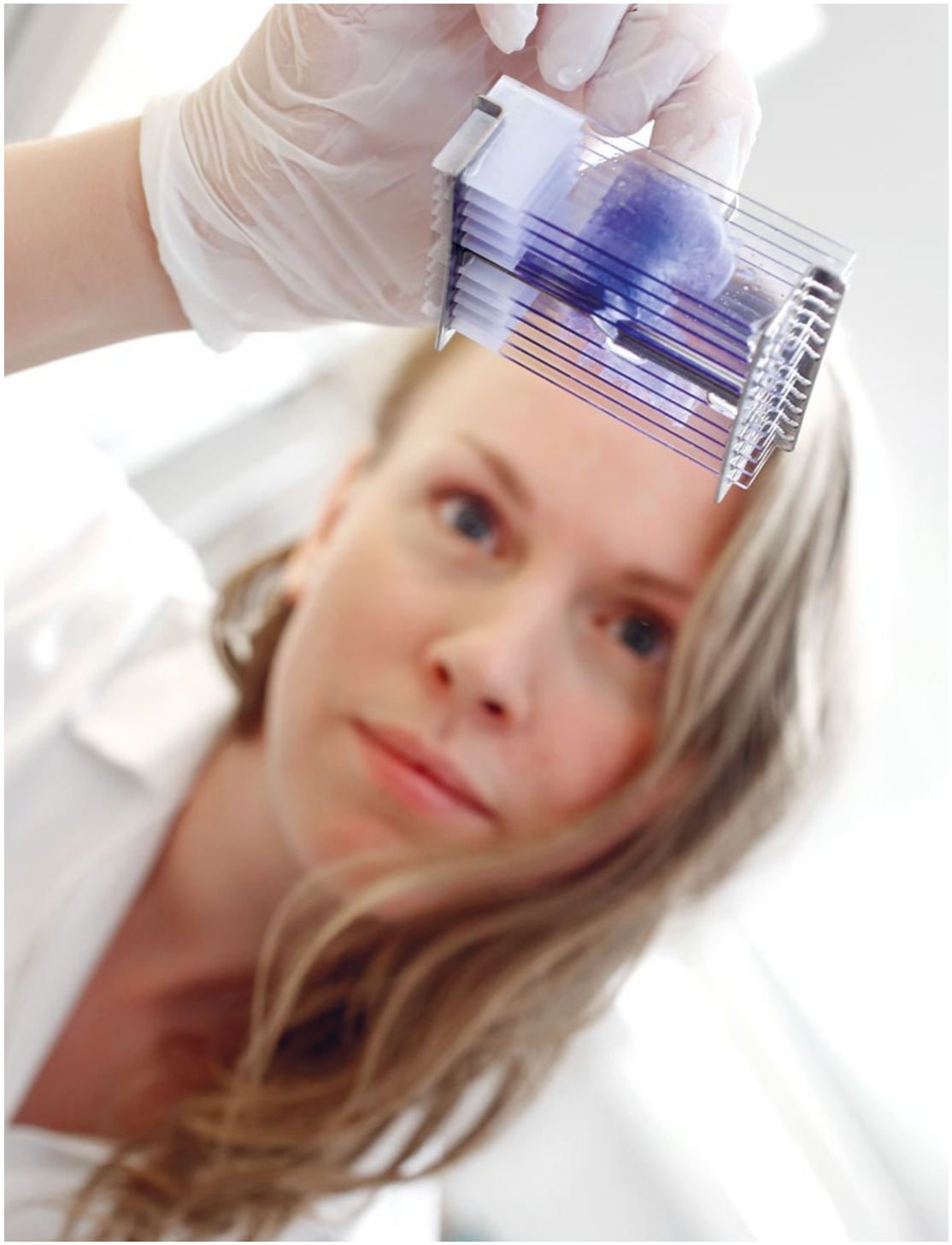


PHOTO BY TERJE HEESTAD

Highlights

PREDICTING AGGRESSIVE LYMPHOMA

EACH YEAR, MORE THAN ONE THOUSAND NORWEGIANS DEVELOP LYMPHOMA. A STATISTICAL GENETIC ANALYSIS CAN DETECT WHEN THE DISEASE WILL BE AGGRESSIVE. THEREBY, TREATMENT CAN BE INITIATED IN TIME.

Results from a collaboration study by CCB researchers, statisticians, and associated clinical researchers have recently been published in Blood, a top-of-the-line journal for haematologists.

Professors Erlend Smeland and Harald Holte are among the country's foremost specialists in B-cell lymphoma. This is the largest group of lymphomas, which affects more than 800 Norwegians each year. Together with Marianne Brodtkorb, who recently completed her PhD degree, and Professor Ole Christian Lingjærde, the researchers have discovered a completely new method that can predict at an early stage of the disease, who will have a recurrence and when the recurrence will appear.

The new statistical method will be able to determine who will need bone marrow transplantation and who can be spared the extreme burden that this excruciating treatment entails. See also Selected Publications on this page (Brodtkorb M et al.)

www.apollon.uio.no | Predicting aggressive lymphoma

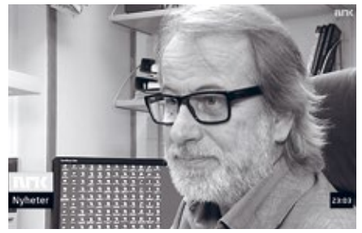
SELECTED PUBLICATIONS

Micci F, Panagopoulos I, Thorsen J, Davidson B, Tropé CG, Heim S. (2014) **Low frequency of ESRRA-C11orf20 fusion gene in ovarian carcinomas** PLoS Biol. 12(2):e1001784.

No ESRRA-C11orf20 fusion gene in carcinomas of the ovary | Micci and colleagues set out to determine the frequency of ESRRA-C11orf20, i.e. the first fusion gene to be described in ovarian carcinomas, in their database of 230 ovarian carcinomas. PCR and high throughput sequencing analyses were used to search for the fusion, no one such transcript was found in their series. They also described possible chromosomal rearrangements that may give rise to the fusion and emphasize the fact that the ESRRA/C11orf20 fusion needs at least three breaks on chromosome arm 11q to occur; no simple deletion or inversion alone could have produced it. From a cytogenetic point of view, it therefore seems that the rearrangement is complicated and therefore is unlikely to occur at high frequencies, indirectly supporting the negative findings.

Brodtkorb M, Lingjærde OC, Huse K, Trøen G, Hystad M, Hilden VI, Myklebust JH, Leich E, Rosenwald A, Delabie J, Holte H, Smeland EB. (2014) **Whole-genome integrative analysis reveals expression signatures predicting transformation in follicular lymphoma** Blood. 123(7):1051-4.

Novel gene signatures predict transformation in follicular lymphoma | Marianne Brodtkorb and colleagues performed a whole-genome study of DNA copy number and gene expression data in serial biopsies from follicular lymphoma. Among the genes with strong association between copy number and gene expression, a strong enrichment for the NFkB pathway was found. For 6 of the 14 NFkB-related genes thus identified, the subset of expression correlated downstream target genes were predictive of transformation, a disease state associated with rapid progression and death. This suggests that genes regulating B-cell survival and activation are involved in transformation, and that the potential to transform can be present long before transformation is observed.



Media coverage

TV INTERVIEW WITH PROF. HÅVARD DANIELSEN ABOUT KREFTLEX ON NRK NEWS

Interview with CCB's Håvard Danielsen in the NRK news broadcast, 3rd of February 2014, in relation to the launch of Kreftlex | 1 out of 3 persons in Norway develop cancer during their life time, and every year almost 30,000 Norwegians are diagnosed with cancer. What treatment to expect, what kind of tests are performed and which procedures one may experience are questions Kreftlex aims to answer. Kreftlex.no is a Norwegian internet encyclopedia on cancer, aimed at patients and their loved ones, developed at the Institute for Cancer Genetics and Informatics, headed by Håvard Danielsen, at Oslo University Hospital.

APPOINTMENTS

Professor Håvard Danielsen was awarded an honorary position as Senior Research Associate at Nuffield division of clinical laboratory sciences at Radcliffe Department of Medicine, University of Oxford, in February 2014.

MASTER DEGREES

MARTE PETERSEN-ØVERLEIR
M.Sc. in Molecular Biosciences
Tools for ESCRT protein studies - Visualising the invisible | Faculty of Mathematics and Natural Sciences, University of Oslo, February 2014

MARCH

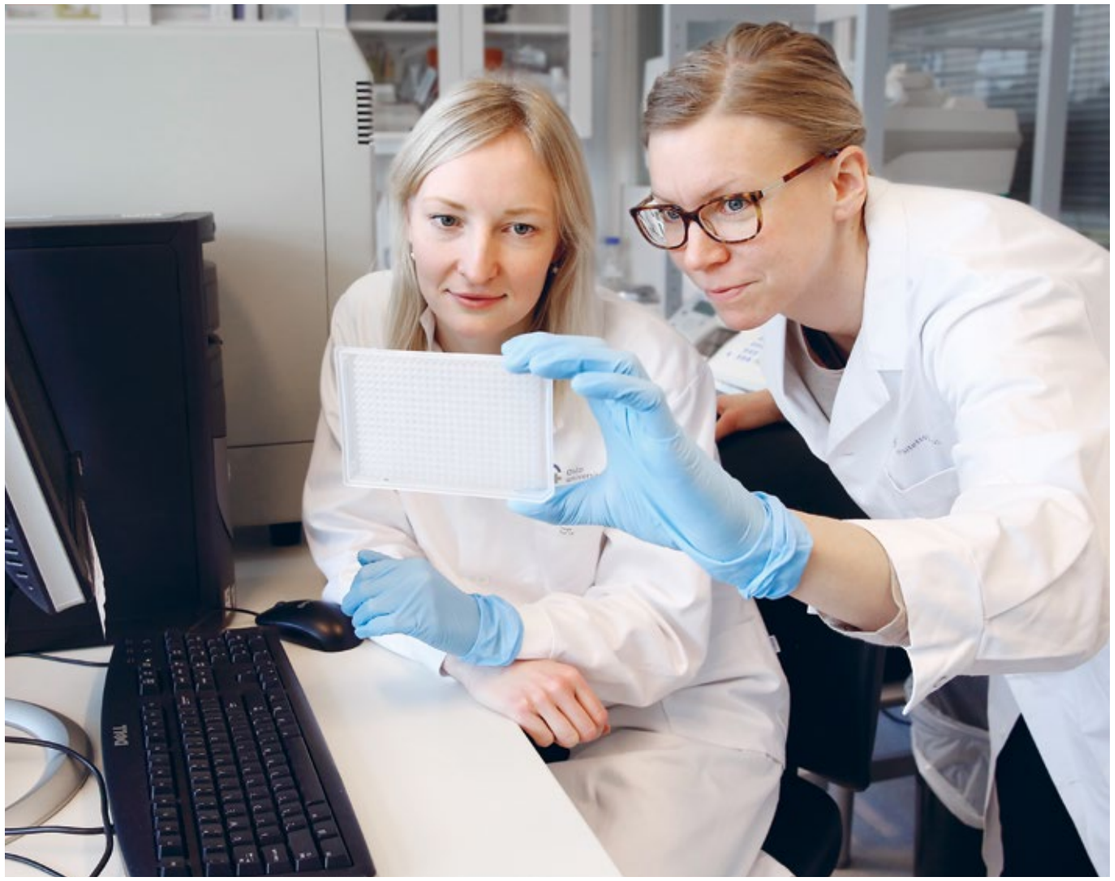


PHOTO BY TERJE HEIESTAD

SELECTED PUBLICATIONS

Vedeld HM, Skotheim RI, Lothe RA, Lind GE. (2014) **The recently suggested intestinal cancer stem cell marker DCLK1 is an epigenetic biomarker for colorectal cancer** Epigenetics. 9(3):346-50.

DCLK1 - a novel colorectal cancer biomarker
Dclk1 expression was recently identified to be an intestinal cancer stem cell specific biomarker in mice, implicating a potential role for targeting the DCLK1-postive cells as a treatment for colorectal cancer. In the present study, methylation of DCLK1 was shown to be a promising novel epigenetic biomarker for colorectal cancer. Furthermore, the progeny of the cancer stem cells, constituting the bulk of the tumor, had reduced DCLK1 expression. This implies that the proposed therapy at best would affect the cancer stem cell population, and that additional treatment would be needed for the bulk of the tumor.
…

Bethge N, Lothe RA, Honne H, Andresen K, Trøen G, Eknæs M, Liestøl K, Holte H, Delabie J, Smeland EB, Lind GE. (2014) **Colorectal cancer DNA methylation marker panel validated with high performance in non-Hodgkin lymphoma** Epigenetics. 9(3):428-36.

Novel epigenetic biomarkers for lymphomas
In a collaborative study between several CCB groups the methylation status of a previously indentified colorectal cancer biomarker panel was analyzed in close to 100 cancer cell lines from 17 different cancer types. Interestingly, the genes were frequently methylated also in hematological cancer. With the exception of a single sample, a correct prediction of non-Hodgkin lymphoma or normal sample was made in a blinded analysis, resulting in a high sensitivity and specificity (98% and 100%). These findings demonstrate that the markers might be suitable for early detection and monitoring of non-Hodgkin lymphoma. One of the biomarkers also held prognostic information.

Media coverage

SUCCESSFUL CANCER GENOMICS CONFERENCE AT LOSBY FOLLOWED UP BY NATIONAL MEDIA - PROF. RAGNHILD A. LOTHE INVITED TO HER OG NÅ, NRK P1

On the 28th of March, Lothe was invited to the radio program "Her og Nå" to talk about cancer genomics, our new everyday life. The interview was done in connection with an important conference about cancer genomics | Oncologists and cancer researchers from all over Norway convened at Losby gods outside Oslo on March 27-28th to participate in the first meeting held in Norway on the subject cancer genomics entitled "Cancer genomics - our new everyday life". The meeting was opened by Minister of Health and Care Services Bent Høie. Talks were held by prominent cancer researchers, many of these from the Division of Cancer Medicine, Surgery and Transplantation at Oslo University Hospital.

The conference, which was organized by professors Ragnhild A. Lothe, Oslo University Hospital, and Per Eystein Lønning, Haukeland University Hospital, through "Norsk kreftsatsing", has attracted attention from the Norwegian media, and several of the participants have been interviewed on national radio.

SEMINAR MARCH 19TH

Associate Professor Jose Carlos Machado
The Institute of Molecular Pathology and Immunology of the University of Porto, Portugal | **Helicobacter pylori infection, chronic inflammation and gastric carcinogenesis. An attempt to put it all together.**

GOING ABROAD

AUDUN S. KVALVAAG
PhD student | Member of the Sandvig group

Spring 2014 I spent 6 months as a visiting PhD student in the Tom Kirchhausen laboratory at Harvard Medical School in Boston. Professor Kirchhausen is globally recognized as one of the foremost experts in the field of clathrin-mediated endocytosis and his lab has implemented cutting edge technology such as CRISPR/Cas genome-editing and advanced fluorescence microscopy. During my stay I used genome-edited cells and various microscopy techniques to study clathrin-mediated endocytosis of a bacterial protein toxin termed Shiga toxin. Among the techniques I learned was labeling of toxin molecules with one fluorophore per toxin and subsequently capturing movies of the binding and uptake of single toxin molecules in living cells. For me, the experience I gained from going abroad has been invaluable, both in terms of learning new techniques and in terms of expanding my scientific perspective. Since returning to Norway, I've established several of the methods I learned here at The Norwegian Radium Hospital and I've continued my collaboration with Tom Kirchhausen and his group.

PHOTO BY TERJE HEIESTAD

DISSERTATIONS

MARTHE LØVF - PHD
Detection of fusion genes and novel RNA variants in cancer
Faculty of Mathematics and Natural Sciences,
University of Oslo, March 2014

APRIL

Media coverage

CCB'S JARLE BRUUN ON COLORECTAL CANCER BIOMARKERS

JARLE BRUUN DEFENDED HIS THESIS "BIOMARKERS WITH FUNCTIONAL AND CLINICAL IMPACT ON COLORECTAL CANCER" THE 24TH OF APRIL. BRUUN'S WORK WAS PRESENTED IN DAGENS MEDISIN THE 24TH OF APRIL AND ON FORSKNING.NO THE 17TH OF MAY.

New findings | His work included detection of aberrant tumor expression pattern of three proteins with normal functions in cell signaling that predicted poor outcome for subgroups of colorectal cancer patients. New functional data between beta-catenin and connexin43 was demonstrated, and mutations in the cell cycle gene RCC2 was functionally validated and shown to have prognostic impact for patients with stage II colorectal cancer tumors with defect mismatch repair. Lack of protein expression of RCC2 was furthermore shown to identify mismatch repair proficient tumors with a poor prognosis.

News articles, in Norwegian, about Jarle Bruun's work:

www.dagensmedisin.no | Biomarkør finner risikopasienter med tarmkreft

www.forskning.no | Fant protein som kan redde tarmkreftpasienter

PHOTO BY TERJE HEIESTAD

MASTER DEGREES

MAX ZACHRISSON TOTLAND
M.Sc. in Molecular Biosciences
Regulation of the gap junction protein connexin 43 by the E3 ubiquitin ligases Smurf1 and -2
Faculty of Mathematics and Natural Sciences, University of Oslo, April 2014

SELECTED PUBLICATIONSW

Hveem T, Merok M, Pretorius M, Novelli M, Bævre M, Sjo O, Clinch N, Liestøl K, Svindland A, Lothe RA, Nesbakken A, Danielsen HE. (2014) **Prognostic impact of genomic instability in colorectal cancer** Br J Cancer. 110(8):2159-64.

Prognostic role of genomic instability in colorectal cancer | A collaboration study including Håvard Danielsen's, Ragnhild Lothe's and Knut Liestøl's groups evaluated the prognostic role of large scale genomic instability in a consecutive series of colorectal cancer patients. Previously published results on microsatellite instability in the same series were included. The authors found a statistically significant association between non-diploid ploidy status and poor outcome. Due to the large number of patients in the study they were able to demonstrate the particularly strong prognostic impact among stage II patients, where non-diploid ploidy status was associated with more than two-fold increased risk of recurrence.
…

Yang Y, Schmitz R, Mitala JJ, Whiting A, Xiao W, Ceribelli M, Wright GW, Zhao H, Yang Y, Xu W, Rosenwald A, Ott G, Gascoyne RD, Connors JM, Rimsza LM, Campo E, Jaffe ES, Delabie J, Smeland EB, Braziel RM, Tubbs RR, Cook JR, Weisenburger DD, Chan WC, Wiestner A, Kruhlak MJ, Iwai K, Bernal F, Staudt LM. (2014) **Essential role of the linear ubiquitin chain assembly complex in lymphoma revealed by rare germline polymorphisms** Cancer Discov. 4(4):480-93.

Excessive activity of the linear ubiquitin chain assembly complex in a subtype of diffuse large B-cell lymphoma | Constitutive activation of NF-κB is a hallmark of the activated B cell–like (ABC) subtype of diffuse large B-cell lymphoma (DLBCL). Polyubiquitination of IκB kinase by the linear ubiquitin chain assembly complex (LUBAC) facilitates NF-κB activation. In this article by the international LLMPP consortium, two germline polymorphisms affecting the LUBAC subunit RNF31 were found to be rare among healthy individuals, but enriched in ABC DLBCL. These polymorphisms increased LUBAC enzymatic activity and NF-κB engagement. A stapled RNF31 α-helical peptide decreased NF-κB activation and killed ABC DLBCL cells. Taken together, these findings identify LUBAC as a therapeutic target in ABC DLBCL and highlight the role of rare germline-encoded protein variants in cancer pathogenesis.

Media coverage

CCB'S GURO E. LIND INTERVIEWED ABOUT EPIGENETICS BY EKKO, NRK P2

Wednesday the 30th of April, Professor Guro E. Lind participated in the radio program Ekko to talk about epigenetics and colorectal cancer. Lind was invited speaker at the Oslo Epigenetics Symposium that took place from the 9th-11th of April. The Ekko program based its news story on this important international conference.

Media coverage

NEW CONTRIBUTIONS TO RESEARCH DISSEMINATION BY CCB'S PHD STUDENT EIKENES

CCB's PhD student Åsmund Husabø Eikenes has contributed with two new articles disseminating his own research field, as well as inspirational thoughts about PhD student life: One article in the Norwegian newspaper Aftenposten about a revolutionizing technique for gene modification. The other one is published on forskning.no about Eikenes' 8 months' stay at the University of California.

www.aftenposten.no/viten:
Frå grunnforsking til designerborn

www.forskning.no:
Hovudet over (PhD)-vatnet

PRIZES/AWARDS

OUS EXCELLENT ARTICLE AWARD TO CCB'S MARIANNE B. EIDE
In April six research prizes were awarded to scientists from Oslo University Hospital. CCB researcher Marianne Brodtkorb Eide was among the prize winners with her Blood article.

Prizes for excellent research articles | The prizes were presented by Tove Strand, vice managing director of Oslo University Hospital, at a ceremony taking place at Rikshospitalet. We are happy to congratulate Marianne Brodtkorb Eide with an Excellent Original Article Award of 50,000 NOK.

DISSERTATIONS

MARIANNE BRODTKORB EIDE – PHD
Integrative genomic and clinical analysis of follicular lymphoma
Faculty of Medicine, University of Oslo, April 2014

JARLE BRUUN - PHD
Biomarkers with functional and clinical impact on colorectal cancer
Faculty of Medicine, University of Oslo, April 2014

MAY

Highlights

NATURE CELL BIOLOGY ARTICLE FROM SIGRID B. THORESEN: ANCHR PREVENTS ANEUPLOIDY

In a recent article in Nature Cell Biology, PhD student Sigrid B. Thoresen and her co-workers in Harald Stenmark's group at the Institute for Cancer Research and Centre for Cancer Biomedicine have uncovered a cellular mechanism that prevents completion of cell division if "lagging" chromosomes are detected in the bridge between the two forming daughter cells. This prevents occurrence of cells with abnormal numbers of chromosomes, aneuploidy. Since aneuploidy is strongly associated with cancer progression, these results open new possibilities for future cancer diagnosis and therapy. See also Selected Publications on this page.

News articles, in Norwegian, about the work of Thoresen et al.:

www.forskning.no | Setter celledelingen på pause for å hindre kreft

www.kreftforeningen.no | Nytt kontrollpunkt for celledeling identifisert

PHOTO BY TERJE HEIESTAD

SELECTED PUBLICATIONS

Thoresen SB, Campsteijn C, Vietri M, Schink KO, Liestøl K, Andersen JS, Raiborg C, Stenmark H. (2014) **ANCHR mediates Aurora-B-dependent abscission checkpoint control through retention of VPS4** Nat Cell Biol. 16(6):550-60.

Mechanism of cell division delay by the abscission checkpoint identified | The abscission checkpoint delays the final step of cell division in the presence of missegregating DNA to avoid cleavage furrow regression and cell binucleation, typical features of cancer cells. However, the mechanisms by which this occurs have been largely elusive. PhD student Sigrid B. Thoresen and co-workers in Harald Stenmark's group have identified a previously uncharacterized protein, ANCHR, which is essential for abscission checkpoint function. ANCHR cooperates with previously identified checkpoint factors to inhibit the action VPS4, an enzyme required for the final membrane scission step, until DNA bridges have been resolved. Importantly, this is the first identified mechanism by which the checkpoint can delay abscission.
…

Phuyal S, Hessvik NP, Skotland T, Sandvig K, Llorente A. (2014) **Regulation of exosome release by glycosphingolipids and flotillins** FEBS J. 281(9):2214-27.

Lipids are important players in exosome release | This is the first authorship of Santosh Phuyal and an important piece of his PhD work. The role of lipids in exosome release is understudied and poorly understood. In this paper Phuyal and coauthors have investigated the role of glycosphingolipids and flotillins, a raft-associated family of proteins, in the release of exosomes. The article includes for the first time results obtained with the recently acquired Nanoparticle Tracking Analysis instrument. The results reveal that alterations in cellular lipids affect the release and/or the composition of exosomes.

SEMINAR MAY 8TH

Dr. Jeremy Carlton | King's College London, UK | **ESCRT-dependent membrane remodeling during mitosis**

SEMINAR MAY 22ND

Professor Paola Dal Cin | Department of Pathology, Brigham and Women's Hospital, Boston, USA | **Cytogenetics of soft tissue tumors: 1984-2014 - An evolution**

DISSERTATIONS

KAJA BEATE NYQUIST - PHD
Gene-level consequences of new cancer-specific chromosomal rearrangements
Faculty of Medicine, University of Oslo, May 2014

MARIANNE AARSTAD MEROK - PHD
Genetic and clinical prognostic markers for colorectal cancer
Faculty of Medicine, University of Oslo, May 2014

PHOTO BY TERJE HEIESTAD

DISSERTATIONS

SIGRID BRATLIE THORESEN - PHD
Novel regulators of the cell division cycle
Faculty of Medicine, University of Oslo, May 2014

FORUMS

THE CCB POSTDOCTORAL FORUM

Since 2009, we have hosted a regular forum for postdoctoral researchers (postdocs, researchers and project leaders) working at the CCB, which includes approximately 60 scientists (60% women) spread over 10 groups. This forum is aimed at improving scientific interactions between scientists and awareness of each other's work and expertise, and by this we hope to facilitate collaborations between the different groups of the CCB. The format of the forum involves two speakers from different departments who succinctly and comprehensibly describe their project with emphasis on aspects where input from the audience is desired.

We expanded the postdoctoral forum in 2014 to include all postdocs, researchers and project leaders at the Institute for Cancer Research (ICR) and the Institute for Cancer Genetics and Informatics (ICGI). This has not only considerably increased the size of the forum and attendance to each meeting, but has also improved the discussions following presentations. Feedback from the speakers has been positive, and several report that they have received valuable input to their project.

In 2014 we have arranged 4 meetings, characterized by excellent presentations and active discussions. We aim to host 4-5 postdoctoral forums in 2015, and hope to initiate more interactions between the scientists of CCB, ICR and ICGI as such, with the overall aim to generate new and fruitful collaborations across research groups.

The CCB Postdoctoral Forum committee *Catherine, Coen, Ellen Margrethe, Jillian, Manohar, Marthe and Tove Irene.*

JUNE

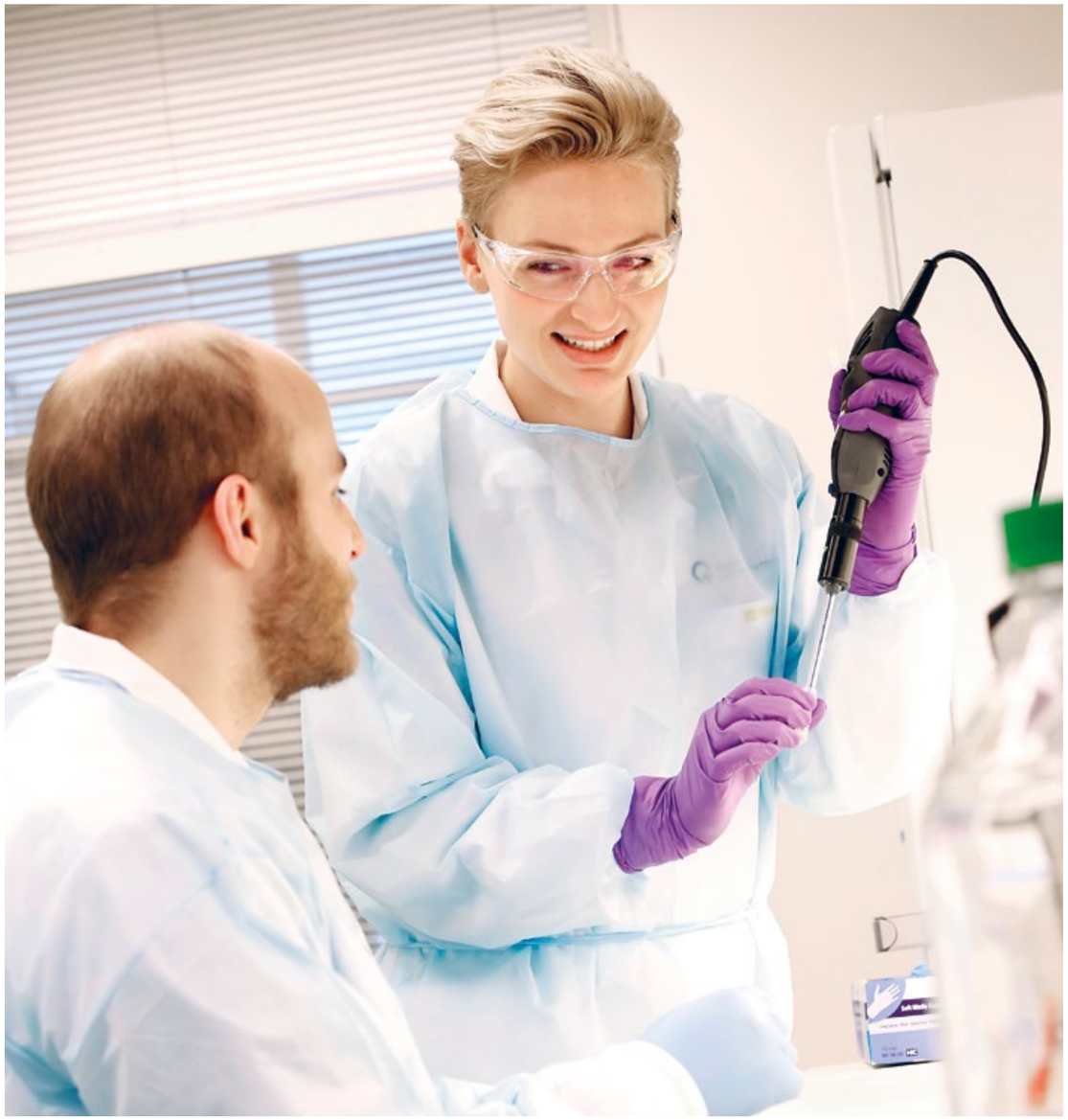


PHOTO BY TERJE HEISTAD

DISSERTATIONS

NICOLE BETHGE – PHD
DNA methylation alterations in B-cell lymphoma
Faculty of Medicine,
University of Oslo, June 2014

TORUNN WENDEL – PHD
Role of intracellular FGF1 interaction partners, and HSP90 as a therapeutic target in FGFR1 driven malignancy
Faculty of Medicine,
University of Oslo, June 2014

SELECTED PUBLICATIONS

Haugsten EM, Brech A, Liestøl K, Norman JC, Wesche J. (2014) **Photoactivation approaches reveal a role for Rab11 in FGFR4 recycling and signaling** Traffic. 15(6):665-83.

Rab11-dependent recycling of FGFR4 | A big challenge in the study of receptor recycling is to precisely determine receptor transport from the cell surface into intracellular structures and, importantly, back to the cell surface again. To do this, Haugsten et al., developed a new recycling assay based on photoactivation of a fusion construct between a photoactivatable green fluorescent protein and FGFR4 (Fibroblast Growth Factor Receptor). Interestingly, FGFR4 has previously been shown to recycle and by using this assay, the authors now identified Rab11 as a mediator of FGFR4 recycling. Depletion of Rab11 led to intracellular accumulation of FGFR4 and altered signalling. The authors conclude that Rab11-mediated recycling of FGFR4 is important for the nature of its signalling output.

GOING ABROAD

VIOLA HELENE LOBERT
Postdoc | Member of the Stenmark group

When I was writing my postdoc fellowship application (to Research Council and to the South-Eastern Norway Regional Health Authority), I decided I wanted to add a new dimension to my work and learn a model organism. I decided on the zebrafish Danio rerio since this model organism has been highlighted as a good model to study cancer, and hasn't been established in our Institute. My fellowship application was based on preliminary results obtained during my PhD, which looked at the role of a tumor suppressor whose expression is lost in colorectal cancer patients. I therefore looked for a group doing research on the zebrafish colon, and got in touch with Associate Professor Joan Heath in Melbourne, Australia at the Walter and Eliza Hall Institute for Medical Research (WEHI). She uses the developing intestine of the zebrafish as a model to study colon cancer. This is based on the principle that genes that regulate embryonic development are reiterated during adult life in cancer, activated or inactivated by somatic mutations. She agreed to host me, so off I went to Melbourne, once I obtained my grant from the South-Eastern Norway Regional Health Authority (spoiler: rarely will a group turn you down if you come with your own funding, so go ahead and start writing an application for the next deadline!). The main goal for the period I spent abroad was to obtain training in zebrafish biology techniques that were relevant to my project. I really want to underline the chance we have of living in a country where making a move abroad with your family is facilitated. Most funding agencies provide a family stipend, which will allow your partner and children to come with you, without the financial pressure for your partner to work. Norway is unique in this way, and this is to encourage you to make the move. Working abroad is an incredible experience, you will be exposed to another work culture, you will be inspired by fantastic researchers, and you will learn techniques that no one in Norway knows. You will come back, and through your international experience, you will enrich the national research environment here at the Institute. I encourage all PhD students and postdocs to take this opportunity and make the plunge – it's worth it.

MASTER DEGREES

LARS MØRLAND KNUDSEN
M.Sc. in Molecular Biosciences
Role of the endolysosomal and autophagosomal pathways in degradation of the gap junction protein connexin 43
Faculty of Mathematics and Natural Sciences, University of Oslo, June 2014

GRO KUMMENEJE PRESTHUS
M.Sc. in Molecular Biosciences
DNA methylation super negatives - identification of a new subgroup of colorectal cancer
Faculty of Mathematics and Natural Sciences, University of Oslo, June 2014

ANE BRENNA
M.Sc. in Molecular Biosciences
Identification of novel epigenetic masterkeys in cancer - with potential diagnostic value
Faculty of Mathematics and Natural Sciences, University of Oslo, June 2014

KARIN SVENSSON
M.Sc. in Molecular Biosciences
The role of evectin-2 and its binding partner PS in toxin transport | Faculty of Mathematics and Natural Sciences, University of Oslo, June 2014

INGER OULIE
M.Sc. in Biomedicine
Transport of biodegradable nanoparticles in cells: Uptake, intracellular transport, degradation and toxicity | Faculty of Health Sciences, Oslo and Akershus University College of Applied Sciences, June 2014

LINN KYMRE
M.Sc. in Molecular Biosciences
Structure-function relationship of Shiga toxins; Role of the A-subunit in complex stability and endocytosis | Faculty of Mathematics and Natural Sciences, University of Oslo, June 2014

INNOVATION

DOFI accepted in June 2014 | **A safe validation of therapeutic T cells** Wälchli S, Myklebust JH. Serial No.: INVEN-14005.

JULY

EDUCATIONAL ACTIVITIES

FAR-8043

Nanomedicine and nanotechnology | Faculty of Health Sciences, University of Tromsø, Autumn 2014 | Lecturer from CCB: Tore Skotland

INF-STK5010

Statistical Bioinformatics - Learning from big data in the life sciences | Faculty of Mathematics and Natural Sciences, University of Oslo, Spring 2014 | Lecturer from CCB: Ole Christian Lingjærde

INF-BIO5121, INF-BIO9121

High Throughput Sequencing Technologies and Bioinformatics Analysis | Faculty of Mathematics and Natural Sciences, University of Oslo, Autumn 2014 | Lecturer from CCB: Rolf Skotheim

MBV1050

Biochemistry I - Structure and Function of Biomolecules | Faculty of Mathematics and Natural Sciences, University of Oslo, Autumn 2014 | Lecturer from CCB: Ieva Ailte Hjelseth

MBV2020

Laboratory course in Biochemistry and Molecular Biology | Faculty of Mathematics and Natural Sciences, University of Oslo, Spring 2014 | Lecturer from CCB: Ieva Ailte Hjelseth

MBV3020

Molecular Genetics and Developmental Biology
Faculty of Mathematics and Natural Sciences, University of Oslo, Autumn 2014 | Course responsible: Francesca Micci | Responsible for Cancer Biology and Cell Cycle section: Ragnhild A. Lothe | Lecturers from CCB: Edward Leithe, Guro E. Lind, Marthe Løvf, Stine A. Danielsen, Tor Erik Rusten, Thale Kristin Olsen, Lene Elisabeth Johannessen

MBV4160/9160

Advanced Cancer Biology | CCB associated course offered to master students at the Department of Biosciences (IBV), The Faculty of Mathematics and Natural Sciences, and to PhD students at the Medical Faculty, University of Oslo, Spring 2014 | Course responsible: Guro E. Lind | Lectures from CCB: Guro E. Lind, Anita Sveen, Arild Nesbakken, Edward Leithe, Jillian Wise, June H. Myklebust, Kai Schink, Karol Axcrona, Marthe Løvf, Mathias Kolberg, Nina Marie Pedersen, Ole Christian Lingjærde, Rolf I. Skotheim, Sharmini Alagaratnam, Stine Aske Danielsen, and Tor Erik Rusten

MBV4240/9240

Biochemical Mechanisms in Intracellular Transport | Faculty of Mathematics and Natural Sciences, University of Oslo, Autumn 2014 | Course responsible: Kirsten Sandvig | Lecturers from CCB: Kirsten Sandvig, Antoni Wiedlocha

MBV4270/9270

Advanced Glycobiology
Faculty of Mathematics and Natural Sciences, University of Oslo, Spring 2014
Lecturer from CCB: Kirsten Sandvig

MF9110BTS

PhD school, Molecular Biology Research Course
Biotechnology Centre of Oslo, University of Oslo, Autumn 2014 | Lecturers from CCB: Rolf Skotheim, June H. Myklebust

MF9120BTS

Molecular Medicine Research Course, NCMM
Faculty of Medicine, University of Oslo, Autumn 2014 | Lecturers from CCB: Guro E. Lind, Anita Sveen

MF9170

Flow cytometry in Medical Research and Diagnostics. | Faculty of Medicine, University of Oslo, Spring and Autumn 2014
Lecturer from CCB: June H. Myklebust

MOL8006

Receptor Signalling and Trafficking | Faculty of Medicine, Norwegian University of Science and Technology, Trondheim, Spring 2014 | Course responsible: Harald Stenmark | Lecturers from CCB: Fergal O'Farrell, Jørgen Wesche

PBL COURSE

2nd semester, Medical Biochemistry | Faculty of Medicine, University of Oslo, Spring and Autumn 2014 | Lecturer from CCB: June H. Myklebust

PBL COURSE

9th semester, Gynecology, Obstetrics, and Pediatrics | Faculty of Medicine, University of Oslo, Spring and Autumn 2014
Lecturer from CCB: Sverre Heim

SELECTED PUBLICATIONS

Danielsen SA, Lind GE, Kolberg M, Høland M, Bjerkehagen B, Sundby Hall K, van den Berg E, Mertens F, Smeland S, Picci P, Lothe RA. (2014) **Methylated RASSF1A in malignant peripheral nerve sheath tumors identifies neurofibromatosis type 1 patients with inferior prognosis** Neuro Oncol. 17(1):63-9

A prognostic biomarker for NF1 patients with MPNST | Methylation analysis of RASSF1A in MPNSTs and benign neurofibromas revealed that 60% of the malignant tumors and none of the benign specimens were methylated, thus strongly indicative of a cancer specific event. More importantly, silencing of the tumor suppressor gene through promoter methylation predicts poor prognosis for patients with the hereditary disorder Neurofibromatosis type 1, independent of clinical risk factors such as tumor size and metastasis at time of diagnosis. These patients will probably benefit from an extended follow-up protocol and adjuvant treatment.

AUGUST

SELECTED PUBLICATIONS

Sveen A, Johannessen B, Teixeira MR, Lothe RA, Skotheim RI. (2014) **Transcriptome instability as a molecular pan-cancer characteristic of carcinomas** BMC Genomics. 15:672.

Transcriptome instability found in multiple cancer types | Anita Sveen and co-workers have previously identified transcriptome instability in colorectal cancer, based on genome-wide analysis of aberrant pre-mRNA splicing (Sveen et al., 2011). Here, the researchers described transcriptome instability as a general characteristic of carcinomas, and identified large variation in amounts of aberrant exon skipping and inclusion among samples in several cancer types. These splicing amounts were strongly correlated with the expression levels of splicing factor genes, suggesting a biological explanation for the splicing variation. In contrast to the tissue-specificity of splicing observed across healthy tissue types, transcriptome instability was a common pattern across the affected cancer types. …

Oppelt A, Haugsten EM, Zech T, Danielsen HE, Sveen A, Lobert VH, Skotheim RI, Wesche J. (2014) **PIKfyve, MTMR3 and their product PtdIns5P regulate cancer cell migration and invasion through activation of Rac1** Biochem J. 461(3):383-90.

The lipid PtdIns5p activates Rac1 during cancer cell migration | Oppelt and colleagues reported earlier that two enzymes (PIKfyve and MTMR3) together produce a lipid (PtdIns5p) that regulates cell migration. In this new study, the authors now reveal that the same molecules also operate in cancer cell migration and invasion. These findings open up new possibilities to control cancer cell migration by inhibiting the druggable enzymes PIKfyve and MTMR3. The authors also report details on the molecular mechanism responsible for the activation of cancer cell migration by showing that PtdIns5p activates Rac1, an important regulator of the cytoskeleton. This study was made possible by a fruitful collaborative between several CCB groups.

PRIZES/AWARDS

CCB SCIENTIST EDWARD LEITHE RECEIVES EARLY CAREER AWARD
Edward Leithe has been recognized with the 2014 Early Career Award from Oslo University Hospital.

Prizes for outstanding research | The award was presented to Leithe for his contributions to the field of connexins and intercellular communication in cancer pathogenesis. The award, established in 2013, is given annually to two early career researchers at Oslo University Hospital and provides 150,000 NOK to support the recipients' research projects. The price was awarded on the 29th of August 2014.

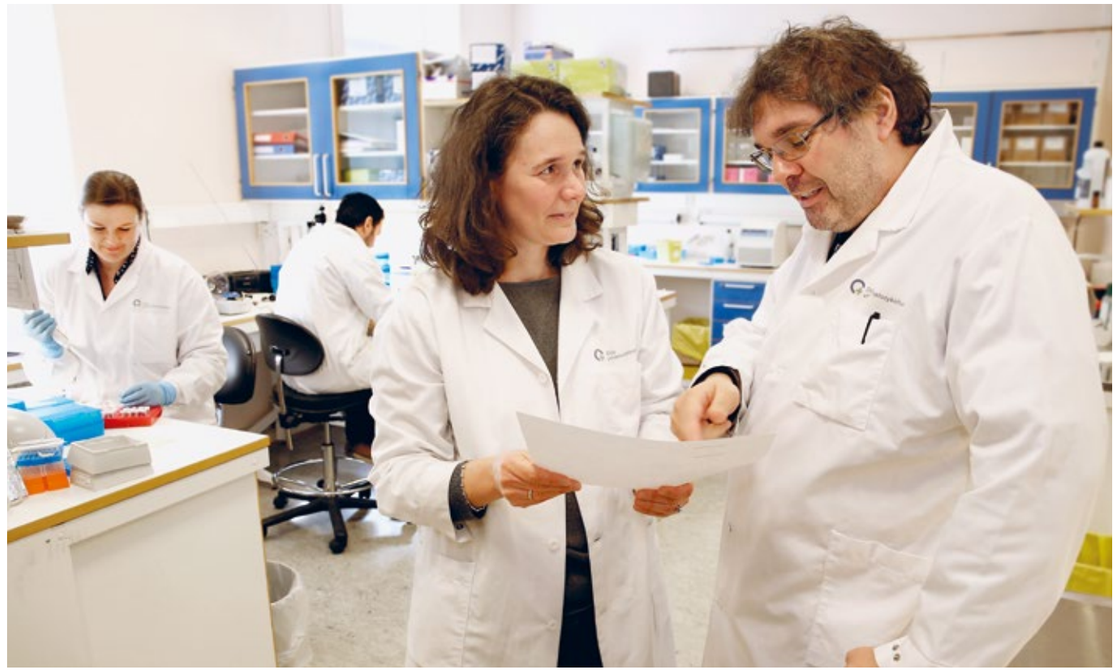


PHOTO BY TERJE HEIESTAD

SEPTEMBER

SELECTED PUBLICATIONS

Asp N, Pust S, Sandvig K. (2014) **Flotillin depletion affects ErbB protein levels in different human breast cancer cells** Biochim Biophys Acta - Molecular Cell Research. 1843(9):1987-96.

Novel function of flotillins in the stabilization of oncogenic ErbB dimers | The tyrosine receptor kinases ErbB2 and ErbB3 are known to be amplified or overexpressed in breast cancer patients and ErbB2-3 dimers are potent activators of oncogenic signaling. Flotillin proteins have been described earlier to regulate ErbB2 levels and downstream signaling in breast cancer cells (Pust et al., 2013, Oncogene). We now demonstrate novel roles of flotillins in the regulation of ErbB3 levels, the stabilization of ErbB2-ErbB3 complexes and the maintenance of signaling processes. Thus, our data indicate flotillins as crucial regulators for oncogenic ErbB function and potential targets for cancer treatment.
…

Bethge N, Honne H, Andresen K, Hilden V, Trøen G, Liestøl K, Holte H, Delabie J, Lind GE, Smeland EB. (2014) **A gene panel, including LRP12, is frequently hypermethylated in major types of B-cell lymphoma** PLoS One. 9(9):e104249.

Identification of genes frequently hypermethylated in lymphoma | Epigenetic modifications are found in most cancer types. In the present study, representing a collaboration between the Smeland and Lind groups, we identified genes frequently methylated in B-cell lymphoma. Genes upregulated after epigenetic drug treatment of cell lines and expressed at a low level in patient samples, were subjected to promoter methylation analyses. We identified a gene panel consisting of 5 genes, which were hypermethylated in major types of B-cell lymphoma. The gene panel could successfully discriminate the vast majority of lymphoma samples from controls and follicular hyperplasia samples. The genes represent promising epigenetic biomarkers which may be suitable for monitoring of B-cell lymphoma.

SEMINAR SEPTEMBER 23RD

Dr. Aled Clayton | Institute of Cancer & Genetics, Cardiff University School of Medicine, UK | **Cancer exosomes mediate changes in prostate stroma**

SEMINAR SEPTEMBER 25TH

Dr. Heinrich Jasper | Buck Institute for Research on Aging, Novato, USA | **Control of stem cell biology by oxidative stress, DNA damage, and immune responses - implications for cancer biology and longevity**

DISSERTATIONS

SANTOSH PHUYAL – PHD
Composition and cellular release of exosomes from cancer cells
Faculty of Mathematics and Natural Sciences, University of Oslo, September 2014

NAGHAM THERES ASP – PHD
Regulation of ErbB2 and ErbB3 growth factor receptors in human breast cancer
Faculty of Mathematics and Natural Sciences, University of Oslo, September 2014

Media coverage

CCB – AN ACTIVE INNOVATOR

A supplement on the topic innovation called "Innovasjon i Helseindustrien" was distributed with the Norwegian newspaper Finansavisen in September 2014 to around 25,000 recepients. CCB participated with the advertisement "Centre of excellence for Cancer Biomedicine (CCB) is one of the most active innovators at Oslo University Hospital/University of Oslo".

SEPTEMBER 18-19TH

The annual CCB seminar 2014 | The annual seminar in CCB was arranged at Hotel Farris Bad in Larvik. Again this year, a record number of CCB members participated in this two day event where scientific presentations and discussions as well as social gathering were the focus of attention. The seminar program included talks on:

_Tailoring of treatments for individual cancer patients using a systems medicine strategy
_Clinical management of colorectal cancer
_New technologies in cancer research
_Molecular mechanisms involved in loss of intercellular junctions during cancer development
_Characterization of new cancer-specific chromosome abnormalities and their gene-level consequences

This CCB gathering is of great importance to our Centre, and it is the perfect way to boost the common CCB spirit.

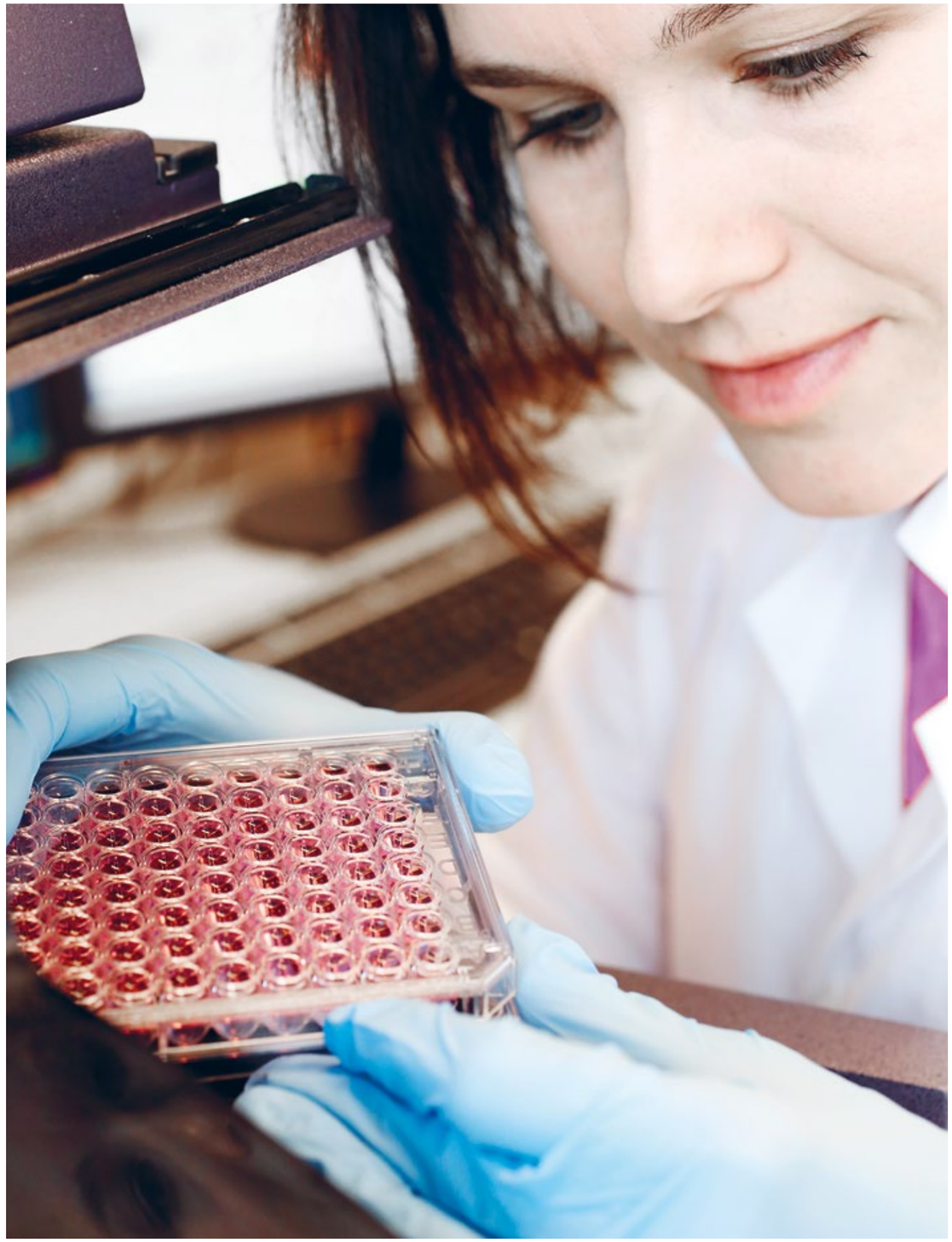


PHOTO BY TERJE HEISTAD

OCTOBER

SELECTED PUBLICATIONS

Nadratowska-Wesolowska B, Haugsten EM, Zakrzewska M, Jakimowicz P, Zhen Y, Pajdzik D, Wesche J, Wiedlocha A. (2014) **RSK2 regulates endocytosis of FGF receptor 1 by phosphorylation on serine 789** Oncogene. 33(40):4823-36.

Regulatory mechanism of fibroblast growth factor receptor signalling identified | Irregularities in FGFR1 (fibroblast growth factor receptor 1) signaling have been implicated in several pathological conditions, including human cancer. In order to discover novel regulators of FGFR1 signaling, postdoc Beata Nadratowska-Wesolowska and co-workers in Antoni Wiedlocha's group performed yeast two-hybrid screens and identified RSK2 (p90 ribosomal S6 kinase 2) as an FGFR1 interaction partner. RSK2 is a serine/threonine kinase and Nadratowska-Wesolowska et al., showed that activated RSK2 can directly phosphorylate FGFR1. Importantly, this phosphorylation was shown to be required for proper endocytosis and ubiqutination of FGFR1 and thus also termination of FGFR1 signaling. The data reveal a novel regulatory mechanism of FGFR1 signaling.

PRIZES/AWARDS

PRIZES FOR BEST SHORT TALK AND BEST POSTER TO PHD STUDENTS FROM CCB
PhD students Nadja Katheder and Tor Espen Torvaldsen from Harald Stenmark's group, were honored with prizes for best short talk and best poster presentation, respectively, at international conferences this autumn. Congratulations!

About the prizes | PhD student Nadja Katheder attended the first joint meeting of the Nordic, French and Spanish Autophagy Networks held in Toulouse, France, from the 15th-18th of September. Nadja Katheder was awarded a prize for the best short talk with the title "Non-cell –autonomous requirement for autophagy in a Drosophila RasV12 cancer model".

PhD student Tor Espen Torvaldsen attended the EMBO Workshop on Wnt Signalling - Stem cells, Development and Disease, held in Broome, Western Australia, from the 6th-9th of October. Tor Espen Torvaldsen received a prize for the best poster with the title "Elucidating the molecular mechanisms and dynamics of G007-LK-induced formation of beta-catenin containing destruction complexes".

INNOVATION

US provisional patent application filed October 2014 **Methods and biomarkers for analyses of colorectal cancer** Lothe RA, Bruun J, Kolberg M, Skotheim RI, Lind GE, Nesbakken A. Serial No.: INVEN-33863/US-1/PRO.

SEMINAR OCTOBER 21ST

Professor Cayetano Gonzalez | Institute for Research in Biomedicine, Barcelona and ICREA-Barcelona, Spain | **Using Drosophila to model malignant growth**

DISSERTATIONS

ANNETTE BENTSEN HÅVIK – PHD
Untangling the web of molecular changes in brain tumors: Molecular characterization of gliomas
Faculty of Medicine, University of Oslo, October 2014

PHOTO BY TERJE HEIESTAD

NOVEMBER

PHOTO BY TERJE HEIESTAD

PRIZES/AWARDS

OUS EXCELLENT ARTICLE AWARD TO CCB'S SIGRID THORESEN

In November six research prizes were awarded to scientists from Oslo University Hospital. CCB postdoc Sigrid Thoresen was among the prize winners with her Nature Cell Biology article.

Prizes for excellent research articles | The prizes were presented by Bjørn Erikstein, managing director of Oslo University Hospital, at a ceremony taking place at Rikshospitalet on the 21st of November. We are happy to congratulate Sigrid Thoresen with an Excellent Original Article Award of 50,000 NOK.

INNOVATION

US Patent Application filed November 2014 **Survival predictor for diffuse large B cell lymphoma** LLMPP consortium, incl. Smeland EB. Serial No.: 14/540,302.

SELECTED PUBLICATIONS

Løvf M, Nome T, Bruun J, Eknaes M, Bakken AC, Mpindi JP, Kilpinen S, Rognum TO, Nesbakken A, Kallioniemi O, Lothe RA, Skotheim RI. (2014) **A novel transcript, VNN1-AB, as a biomarker for colorectal cancer** Int J Cancer. 135(9):2077-84.

A novel transcript as a biomarker for colorectal cancer | Marthe Løvf and co-workers in the Skotheim and Lothe groups have identified a novel transcript with an organ-confined complete specificity for colorectal neoplasia. In this study they combined whole transcriptome sequencing with gene expression outlier analysis to identify colorectal cancer-specific transcripts. A novel transcript of the gene VNN1 was identified and its prevalence was investigated by real-time RT-PCR in 291 samples of miscellaneous origins. The novel transcript was not present in any of the 43 normal colorectal tissue samples investigated, but in 83% (5/6) of the polyps and in 75% (102/136) of the colorectal cancers.

GOING ABROAD

JARLE BRUUN
Postdoc | Member of the Lothe group

I visited the vibrant lab of professor Olli Kallioniemi at the Institute for Molecular Medicine (FIMM) in Helsinki autumn 2014, where I worked with experts in high-throughput drug sensitivity and resistance therapy (DSRT) to identify potent drugs for the orphan disease malignant peripheral nerve sheat tumor (MPNST), guided by biomarkers discovered in professor Ragnhild A. Lothe's lab, CCB. During my stay I got introduced to several new technologies and got the opportunity to initiate a promising collaboration on high-throughput discovery of biomarkers in tissue sections using multiplexed immunohistochemistry and automated image analysis.

I had a wonderful time in Helsinki, and actually, I am heading back this spring for another three months to continue the joint studies and start a new collaboration on DSRT, this time on our main research theme, colorectal cancer. I can highly recommend going abroad for any student or researcher seeking new perspectives, knowledge and partnerships.

DECEMBER

PHOTO BY TERJE HEESTAD

SELECTED PUBLICATIONS

Muppidi JR, Schmitz R, Green JA, Xiao W, Larsen AB, Braun SE, An J, Xu Y, Rosenwald A, Ott G, Gascoyne RD, Rimsza LM, Campo E, Jaffe ES, Delabie J, Smeland EB, Braziel RM, Tubbs RR, Cook JR, Weisenburger DD, Chan WC, Vaidehi N, Staudt LM, Cyster JG. (2014) **Loss of signalling via Gα13 in germinal centre B-cell-derived lymphoma** Nature. 516(7530):254-8.

Novel role of G-protein coupled signaling in diffuse large cell B cell lymphoma | Germinal centre B-cell-like diffuse large B-cell lymphoma (GCB-DLBCL) is a common malignancy, yet the signalling pathways that are deregulated and the factors leading to its systemic dissemination are poorly defined. In this article by the LLMPP consortium, deep sequencing identified frequent function-disrupting mutations in the S1PR2–Gα13–ARHGEF1 signalling in GCB-DLBCL. Moreover, inactivation of this signalling pathway in mice allowed Akt activation and promoted dissemination of germinal centre B cells, consistent with a role in the systemic dissemination of large B-cell lymphoma. These findings identified a Gα13-dependent pathway that exerts dual actions in suppressing growth and blocking dissemination of germinal centre B cells that is frequently disrupted in germinal centre B-cell-derived lymphoma.

Media coverage

NEWS ARTICLE IN DAGSAVISEN: "BLIR HUN EN NY MOSER?"

Interview on the 10th of December with Guro E. Lind in the Norwegian newspaper Dagsavisen in connection with the outcome of the assessment process of the Young Research Talents programme FRIMEDBIO from the Research Council of Norway. See also Funding on this page.

FUNDING

PRESTIGIOUS INDEPENDENT FUNDING TO SIX CCB SCIENTISTS FROM 2015
We congratulate our six colleagues with their prestigious independent funding from 2015:

Guro E. Lind | Professor, Group leader | Young research talents grant from the Research Council of Norway | Proposal title: Methylation supernegative colorectal cancers - a key to unlocking the secrets of the DNA (de)methylation machinery | The grant amounts to NOK 7 million and runs for 4 years.

Tor Erik Rusten | Project leader, Senior scientist | Career grant from the South-Eastern Norway Regional Health Authority | Proposal title: Unveiling mechanisms of carcinogenesis using Drosophila melanogaster and human organoid models | The grant amounts to NOK 8 million and runs for 4 years.

Eva Wenzel | Senior scientist | 4-year researcher grant from the South-Eastern Norway Regional Health Authority Proposal title: The beta-catenin destruction complex in physiology and disease.

Jørgen Wesche | Project leader, Senior scientist | 2-year senior research fellowship from the Norwegian Cancer Society Proposal title: Novel regulators of cancer cell migration.

Fergal O'Farrell | Scientist | 3-year career development research fellowship from the Norwegian Cancer Society | Proposal title: A model for investigating tumor microenvironment interactions in vivo.

Lene Malerød | Scientist | 3-year career development research fellowship from the Norwegian Cancer Society | Proposal title: Centrosome dynamics in cancer.

INNOVATION

DOFI filed in December 2014 **Urinary exosomal protein markers** Llorente A, Skotland T, Sandvig K. Serial No.: INVEN-14257.

Media coverage

YOUTUBE VIDEO ABOUT PROSTATE CANCER REACHES OUT TO 5 MILLION PEOPLE

The online cancer encyclopedia Oncolex.org developed at the Institute for Cancer Genetics and Informatics, headed by Håvard Danielsen, at Oslo University Hospital, has an increasing number of viewers.

A YouTube video from the Oncolex ncyclopedia, explaining essential facts on prostate cancer, was seen by more than 4.9 million people over the last year.

Highlights

GROUP LEADER ROLF I. SKOTHEIM AWARDED ONE-YEAR PI POSITION IN CCB FOR 2015

CCB congratulates Rolf I. Skotheim with a one-year PI position for 2015.

Increased focus on career development of young scientists in CCB | As part of CCBs strategy for supporting career development of young scientists, the PI group decided in 2012 to announce an internal call for a one-year PI position in CCB for a young CCB scientist every year from 2013 to 2017. We congratulate Rolf I. Skotheim with being awarded the 2015 PI stipend.

CCB plans to announce similar one-year PI positions for the years 2016 to 2017 through internal calls in autumn every year.

MASTER DEGREES

HEIDI DIETRICHSON PHARO
M.Sc. in Molecular Biosciences
Quantitative methylation-specific PCR - optimization and application | Faculty of Mathematics and Natural Sciences, University of Oslo, December 2014

RESEARCH GROUPS

AND ASSOCIATED GROUPS

CELLULAR MEMBRANE DYNAMICS

HARALD STENMARK GROUP

CANCER IS a disease characterized by uncontrolled proliferation and migration of specific cell types of the body. Stenmark's research group therefore studies cellular pathways that either prevent or promote conversion of normal cells into cancer cells. Of special interest are pathways that control cellular membrane dynamics such as intracellular traffic, autophagy (cellular self-consumption) and cell division.

The group consists of more than 20 members with research backgrounds in medicine, biology, biochemistry and biotechnology. Researchers in the group are specialists in microscopy, and the group is scientifically responsible for regional core facilities in confocal microscopy, electron and super-resolution microscopy. Most of the research is done with normal and cancerous cells that are grown in tissue culture flasks, but some group members also use the fruit flies as model organisms for studies of tumour suppression and carcinogenesis. The group collaborates extensively with CCB groups that specialize in analyses of human tumour samples.

PHOTO BY TERJE HEIESTAD

GENETICS

RAGNHILD A. LOTHE GROUP

PHOTO BY TERJE HEIESTAD

THE MEMBERS of our group have an interdisciplinary research background and the main activity is translational research of colorectal cancer, which is one of the most common malignancies and one of the major causes of cancer deaths worldwide. We combine patient-oriented and biological studies using human biobanks and in vitro models applying a wide range of state-of-the-art technologies.

Understanding molecular mechanisms underlying human tumour development is essential to improve the diagnosis and treatment of the cancer patient. We study the aetiology of selected solid tumors arising in cells that originate from different germ layers, to gain novel knowledge of molecular paths across malignancies.

Within the Centre we collaborate with most of the other groups and clinical associates. During the first period of the Centre we identified biomarkers for early detection and prognostication. Two licensing agreements were signed with Oxford Gene Technology in 2012 based on biomarkers identified in our group. During the second period, we seek to combine high risk stratification with predictive biomarkers for colorectal cancer. Lothe is one of the key investigators of the Norwegian cancer genomics consortium (www.cancergenomics.no), a national collaboration towards improved personalized cancer medicine.

LYMPHOMA BIOLOGY

ERLEND SMELAND GROUP

PHOTO BY TERJE HEIESTAD

THE GROUP consists of 13 members with research background in medicine, biology, biochemistry and biotechnology. We focus our research on B-cell lymphoma, a malignancy originating from B cells of the immune system. B-cell lymphoma is a heterogeneous group of diseases, and even patients with identical diagnosis can have remarkably variable prognosis. Although new therapeutic approaches have highly improved overall survival for many lymphoma types, some types are still considered incurable. We aim to identify biomarkers for targeted therapy response and to develop novel therapeutic strategies in B-cell lymphoma.

We use advanced flow cytometric analysis to identify abnormal cell signaling in B-lymphoma patient samples. We also perform genetic and immunohistochemical analyses of patient biopsies, and have ongoing exome sequencing project in diffuse large B-cell lymphoma to identify recurrent mutations associated with therapy relapse. We will also use exome sequencing to describe clonal evolution in follicular lymphoma (collaboration with other groups in CCB). The lab has extensive collaboration with the lymphoma program at the hospital, other groups in the CCB and milieus at NCI, Stanford, and Vanderbilt.

INTRACELLULAR TRANSPORT

KIRSTEN SANDVIG GROUP

PHOTO BY TERJE HEIESTAD

SANDVIG'S GROUP, counting 17 members from six different countries, works on mechanisms of endocytosis, intracellular transport and secretion. Uptake of receptors and ligands and correct intracellular sorting are crucial for maintenance of a normal differentiated phenotype. In some of our studies we use protein toxins such as ricin and Shiga toxin, which are well established as markers for studies of membrane traffic, and which can be used as agents in cancer diagnosis and therapy. Our expertise is also applied to investigate uptake of nanoparticles, and in 2013 we obtained a five year grant from the Norwegian Research Council to build national competence in nanomedicine. This project, "Biodegradable nanoparticles in cancer diagnosis and therapy", headed by Sandvig, involves collaboration with ten other Norwegian groups working in academia, research institutes, hospitals and industry. We also characterize exosomes from prostate cancer cells with the goal of detecting lipid and protein biomarkers. Our research spans all the way from basic to translational medicine, including innovation, and the projects aim at increasing our knowledge about intracellular transport and biomarkers in order to provide a rational basis for diagnosis, treatment and prevention of disease. The group has extensive national and international collaboration.

LARGE SCALE GENOMIC INSTABILITY

HÅVARD DANIELSEN GROUP

PHOTO BY TERJE HEIESTAD

CANCER IS a disease characterized by heterogeneity and genomic instability. Danielsen's research group is therefore developing high throughput methods for detection and characterization of large-scale genomic instability (chromatin structure and DNA ploidy), based on high-resolution digital microscopy and advanced image analysis.

The group consists of 15 members with background in medicine, biology, mathematics, and computer science. They are studying archival material at the time of diagnosis from cancer patients with proper clinical follow-up and known prognosis. Several methods; such as IHC, FISH, DNA Ploidy, Tissue Micro Array, as well as original methods developed in the group (Nucleotyping, 3D-reconstruction, ImmunoPath and MicroTracker) are used in an attempt to reveal and understand the 3-dimensional organisation of chromatin, and how this organisation controls gene expression. They are engaged in the search for new diagnostic and prognostic markers among these methods and results, and are running clinical validation studies on large series of colorectal, breast, prostate and gynaecological cancers with a minimum of 5, and up to 20, years of clinical follow-up, with emphasis on disease-free survival. The aim is to improve cancer treatment by the identification of better prediction and prognosis of the outcome among these patients.

EPIGENETICS

GURO E.
LIND
GROUP

PHOTO BY TERJE HEIESTAD

PATHOLOGIC EPIGENETIC SILENCING is an almost universal feature of human malignancies.

In the group of Epigenetics we are focusing our research on DNA methylation alterations in various cancer types, and colorectal cancer in particular. Our aim is to identify epigenetic biomarkers with clinical impact, including markers for early detection and monitoring of cancer. Simultaneously we aim at analyzing and understanding the underlying biology of these aberrations and how they affect the cancer development.

In addition to novel biomarkers in colorectal- (Vedeld et al, Epigenetics) and gastrointestinal-cancer (Vedeld et al, Int J Cancer) we have the last year identified a DNA methylation biomarker panel for early detection of the rare malignancy cholangiocarcinoma (Andresen et al, Hepatology), innovation that can benefit the patients at Oslo University Hospital. In a CCB collaboration we have identified novel biomarkers for Non-Hodgkin lymphomas (Bethge et al, Epigenetics and PLoS One), findings that will be followed up in a newly established international collaboration. Currently we are focusing on an epigenetic subtyping of colorectal cancer patients, which may provide new insights into the inner workings of the DNA methylation machinery.

THE STATISTICAL ANALYSIS UNIT

KNUT LIESTØL GROUP

THE COMPLEXITY of the data sets produced by modern high throughput technologies makes extraction of information a true challenge. Our research unit therefore aims at supporting the activity of other CCB groups by providing data analysis, with a focus on high throughput data. The unit has published together with all the other CCB groups.

The statistical analysis unit at CCB is part of Biomedical Research Group at the Department of Informatics at the University of Oslo. The group's philosophy is to work in close interaction with biomedical research groups and also to obtain own competence in the application areas. Typically, projects initially focus on a concrete biomedical problem, we then try to solve the statistical challenges in a broader context and finally to develop adapted, easy-to-use software tools. Examples of tools include software for copy number estimation, including allele-specific analysis, and for estimating the number of clusters in a data set.

PHOTO BY TERJE HEIESTAD

CYTOGENETICS GROUP

headed by
SVERRE HEIM

PHOTO BY TERJE HEIESTAD

HEIM'S RESEARCH group studies the chromosomal aberrations of cancer cells. The research is done in parallel with diagnostic analyses of leukemias and solid tumors. Of the 16 people involved in research, only seven (five PhD-students, one student, and one technician) do so full-time. The remainder do diagnostic work half of the time.

The research begins by finding specific cytogenetic aberrations in various cancers. Then we take the investigation to the molecular level searching for the corresponding changes of genes and DNA primary structure. We have succeeded in all our three main research areas: 1) Gynecologic tumors; 2) Brain tumors; and 3) Analyses of rare tumor-specific translocations.

Our unique area of expertise is the culturing and chromosome analysis of neoplastic cells. We also have extensive experience with fluorescence in situ-based analyses and the search by molecular means for fusion genes brought about by chromosomal translocations. Our approach by combining the two screening techniques G-band karyotyping and next generation sequencing to this end is novel and has led to the discovery of several cancer-specific fusion genes during the past year.

GENOME BIOLOGY GROUP

headed by
ROLF SKOTHEIM

THE RESEARCH aim for the Genome Biology group is to identify and characterise genes that are critical for development of cancer. Such genes may serve as diagnostic or prognostic biomarkers and also as targets for future molecularly tailored therapy. The projects are mainly focused on prostate, testicular, and colorectal cancers.

The group studies how genomes and transcriptomes are altered in cancer cells by using both computational biology and wet-lab based approaches. Mutation analyses in cancer clearly benefit from knowing which genes and variants that are actually expressed. In this line, the group has particularly specialized in RNA-level analyses. Recent publications from the group have provided evidence of several novel transcripts, including fusion transcripts, which are recurrently expressed by colorectal cancers. An interdisciplinary set of competences is required to perform meaningful genome-scale cancer research. As such, personnel in the group have their basic education across the disciplines of biology, informatics, and medicine.

PHOTO BY TERJE HEIESTAD

PROTEIN INTERNALIZATION AND SIGNALING GROUP

headed by
ANTONI WIEDLOCHA

PHOTO BY TERJE HEIESTAD

MAINTENANCE OF tissue homeostasis depends on complex intercellular growth factor-mediated signaling networks that control basic cell functions. The fibroblast growth factor (FGF) signaling system represents one of the fundamental tools of such cell to cell communication. Dysregulated cell signaling is of critical importance for cancer development and maintaining malignant phenotype, and excessive FGF signaling has been implicated in several forms of cancer.

The goal of Wiedlocha's research group is to elucidate differences in mechanisms of signaling induced by FGF in normal as well as in tumor cells. Members of the group devote a lot of effort studying several aspects of the pathways that lead to i) down-regulation of FGFR signaling, ii) migration and metastasis formation. Currently, the group is also focusing on identifying interaction partners that could be involved in regulation of FGF-induced signaling as well as the internalization and intracellular trafficking of FGF/FGFR signaling complex. Today, the group consists of 8 researchers with extensive experience in biochemistry, cell biology and cellular signaling.

PHOTO BY TERJE HEIESTAD

COLORECTAL CANCER TREATMENT PROGRAMME

ARILD NESBAKKEN
_Professor | MD | Senior Consultant
Department of Gastrointestinal Surgery
Oslo University Hospital

IN 2005 a translational research program on colorectal cancer was initiated together with Profs. Ragnhild A. Lothe and Håvard Danielsen in CCB. Diagnostic, prognostic, predictive and monitoring biomarkers are studied in both primary tumor and metastatic setting. The clinical part of this project implies consecutive inclusion of all admitted patients, registration of comprehensive clinical datasets and high quality biobanking.

The contributions of colorectal and liver surgeons, pathologists, radiologists and oncologists are essential. Clinical and molecular data must be integrated and joint efforts from clinicians and molecular biologists are necessary in the interpretation and presentation of the results and when preparing for application of these in clinical practice.

We now have TMA from 1500+ and fresh frozen tumor samples from 700 primary tumors and 150 samples from colorectal liver metastases. Many promising results have been published or are in the pipeline. We have expanded from research on the primary tumor to a focus on tumor heterogeneity and liver metastases, and have set up collaborations with the aim to implement our research in clinical practice. The cooperation with CCB and the other members of this multidisciplinary team is excellent.

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LYMPHOMA TREATMENT PROGRAMME

HARALD HOLTE
_MD | PhD | Senior Consultant | Department of Medical Oncology and Radiotherapy | Oslo University Hospital | Head of Lymphoma Treatment Programme and Lymphoma Research Group

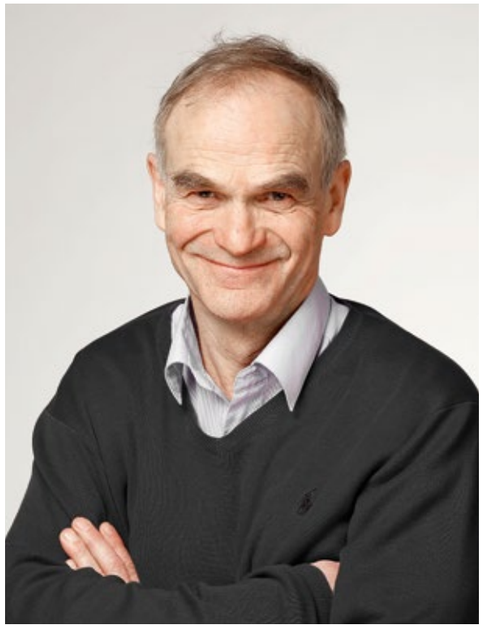

PHOTO BY TERJE HEIESTAD

THE LYMPHOMA Research Group is one of many research groups at Clinic for Cancer, Surgery and Transplantation. The core members of the group consists of lymphoma dedicated clinicians while there is a number of associated members who are all important for the function of the team. These associated members are pathologists, surgeons and radiologists at the clinic, colleagues at the National Resource Centre for long effects after cancer and researchers at the Institute for Cancer Research, most of them at Dept of Immunology. My connection to CCB is mainly through the fruitful collaboration with researchers at Dept of Immunology. Presently, we have joint projects through Post Docs and PhD students studying tumor microenvironment and tumor genetic aberrations with impact on patient outcome. We have access to tumor material from researcher initiated prospective clinical studies, and the idea is to improve future protocols through our findings. One such study will be initiated later this year.

As lymphoma is one of the prioritized tumours of the National Cancer Genomics Consortium leadership, we are presently performing exome sequencing on lymphomas. The projects involve sequencing of a number of samples of a new entity of T-cell lymphomas for further characterization of typical genetic aberrations and sequencing of serial biopsies from B-cell lymphomas. These studies will hopefully lead to better treatment of the T-cell lymphoma entity and better understanding of why some B-lymphomas – and not others - become therapy resistant.

I appreciate the opportunity given to me to be involved in the CCB. It is the hope that I, together with the other two clinical associates, can contribute with our clinical background to further strengthen the translational aspects of the excellent research performed by CCB.

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PHOTO BY TERJE HEIESTAD

PROSTATE CANCER TREATMENT PROGRAMME

KAROL AXCRONA
_MD | PhD | Professor of Urology | Institute for Cancer Research and Molecular Medicine
The Norwegian University for Science and Technology (NTNU) | Trondheim

PROSTATE CANCER is the most diagnosed cancer in Norway accounting for 4876 new cases in 2013. Every fifth cancer death amongst men is prostate cancer. Especially patients with high-risk disease are threatened to develop lethal disease that over a number of years gives a poor quality of life in addition.

We believe that molecular biological approaches will be necessary to deepen understanding of biological behavior and development of prostate cancer. Furthermore, we believe that deepened molecular biological understanding of prostate cancer will give us ideas of how tailored cancer treatment can be delivered to the patients in need.

The CCB has the crucial tools for bringing molecular biology and molecular biological thinking into the clinics. Urologists also do believe that much of the future treatment of our patients will be dependent on prevention, and optimal treatment stratification of patients, i.e. based on gained knowledge from the lab. Our key partner in the translational genomics collaboration within the CCB is Prof. Ragnhild A. Lothe and Dr. Rolf Skotheim.

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PHOTO BY TERJE HEIESTAD

TOTAL NUMBER OF CCB PUBLICATIONS IN 2014

76 PUBLICATIONS

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NUMBER OF PUBLICATIONS IN HIGH IMPACT JOURNALS [IMPACT FACTOR > 9]

9 PUBLICATIONS

[12%]

…

NUMBER OF PUBLICATIONS WITH CCB SCIENTISTS AS CORRESPONDING AUTHOR

48 PUBLICATIONS

[63%]

…

NUMBER OF COLLABORATION PUBLICATIONS WITH CLINICIANS AND PATHOLOGISTS

42 PUBLICATIONS

[55%]

…

NUMBER OF PUBLICATIONS WITH INTERNATIONAL PARTNERS

38 PUBLICATIONS

[50%]

PUBLICATIONS 2014

Almeida M, Costa VL, Costa NR, Ramalho-Carvalho J, Baptista T, Ribeiro FR, Paulo P, Teixeira MR, Oliveira J, Lothe RA, Lind GE, Henrique R, Jerónimo C. (2014) **Epigenetic regulation of EFEMP1 in prostate cancer: biological relevance and clinical potential** J Cell Mol Med. 18(11):2287-97.

Asp N, Pust S, Sandvig K. (2014) **Flotillin depletion affects ErbB protein levels in different human breast cancer cells** Biochim Biophys Acta. 1843(9):1987-96.

Bergan J, Skotland T, Lingelem AB, Simm R, Spilsberg B, Lindbäck T, Sylvänne T, Simolin H, Ekroos K, Sandvig K. (2014) **The ether lipid precursor hexadecylglycerol protects against Shiga toxins** Cell Mol Life Sci. 71(21):4285-300.

Bethge N, Honne H, Andresen K, Hilden V, Trøen G, Liestøl K, Holte H, Delabie J, Lind GE, Smeland EB. (2014) **A gene panel, including LRP12, is frequently hypermethylated in major types of B-cell lymphoma** PLoS One. 9(9):e104249.

Bethge N, Lothe RA, Honne H, Andresen K, Trøen G, Eknæs M, Liestøl K, Holte H, Delabie J, Smeland EB, Lind GE. (2014) **Colorectal cancer DNA methylation marker panel validated with high performance in non-Hodgkin lymphoma** Epigenetics. 9(3):428-36.

Blaker YN, Eide MB, Liestøl K, Lauritzsen GF, Kolstad A, Fosså A, Smeland EB, Holte H. (2014) **High dose chemotherapy with autologous stem cell transplantation for patients with transformed B-cell non-Hodgkin lymphoma in the rituximab era** Leuk Lymphoma. 55(10):2319-27.

Brodtkorb M, Lingjærde OC, Huse K, Trøen G, Hystad M, Hilden VI, Myklebust JH, Leich E, Rosenwald A, Delabie J, Holte H, Smeland EB. (2014) **Whole-genome integrative analysis reveals expression signatures predicting transformation in follicular lymphoma** Blood. 123(7):1051-4.

Bruun J, Kolberg M, Nesland JM, Svindland A, Nesbakken A, Lothe RA. (2014) **Prognostic significance of β-catenin, E-cadherin, and SOX9 in colorectal cancer: Results from a large population-representative series** Front Oncol. 4:118.

Bull-Hansen B, Cao Y, Berg K, Skarpen E, Rosenblum MG, Weyergang A. (2014) **Photochemical activation of the recombinant HER2-targeted fusion toxin MH3-B1/rGel; Impact of HER2 expression on treatment outcome** J Control Release. 182:58-66.

Cordara G, Winter HC, Goldstein IJ, Krengel U, Sandvig K. (2014) **The fungal chimerolectin MOA inhibits protein and DNA synthesis in NIH/3T3 cells and may induce BAX-mediated apoptosis** Biochem Biophys Res Commun. 447(4):586-9.

Demarco RS, Eikenes ÅH, Haglund K, Leanne Jones D. (2014) **Investigating spermatogenesis in Drosophila melanogaster** Methods. 68(1):218-27.

Fiskvik I, Beiske K, Delabie J, Yri O, Spetalen S, Karjalainen-Lindsberg ML, Leppä S, Liestøl K, Smeland EB, Holte H. (2014) **Combining MYC, BCL2 and TP53 gene and protein expression alterations improves risk stratification in diffuse large B-cell lymphoma** Leuk Lymphoma. 19:1-8.

Haugsten EM, Brech A, Liestøl K, Norman JC, Wesche J. (2014) **Photoactivation approaches reveal a role for Rab11 in FGFR4 recycling and signaling** Traffic. 15(6):665-83.

Haugvik SP, Gorunova L, Haugom L, Eibak AM, Gladhaug IP, Heim S, Micci F. (2014) **Loss of 11p11 is a frequent and early event in sporadic nonfunctioning pancreatic neuroendocrine neoplasms** Oncol Rep. 32(3):906-12.

Heim S. (2014) **Boveri at 100: Boveri, chromosomes and cancer** J Pathol. 234(2):138-41.

Holland P, Torgersen ML, Sandvig K, Simonsen A. (2014) **LYST affects lysosome size and quantity, but not trafficking or degradation through autophagy or endocytosis** Traffic. 15(12):1390-405.

Hveem T, Merok M, Pretorius M, Novelli M, Bævre M, Sjo O, Clinch N, Liestøl K, Svindland A, Lothe RA, Nesbakken A, Danielsen HE. (2014) **Prognostic impact of genomic instability in colorectal cancer** Br J Cancer. 110(8):2159-64.

Håvik AB, Lind GE, Honne H, Meling TR, Scheie D, Hall KS, van den Berg E, Mertens F, Picci P, Lothe RA, Heim S, Brandal P. (2014) **Sequencing IDH1/2 glioma mutation hotspots in gliomas and malignant peripheral nerve sheath tumors** Neuro Oncol. 16(2):320-2.

Kavaliauskiene S, Nymark CM, Bergan J, Simm R, Sylvänne T, Simolin H, Ekroos K, Skotland T, Sandvig K. (2014) **Cell density-induced changes in lipid composition and intracellular trafficking** Cell Mol Life Sci. 71(6):1097-116.

Kjersem JB, Ikdahl T, Lingjaerde OC, Guren T, Tveit KM, Kure EH. (2014) **Plasma microRNAs predicting clinical outcome in metastatic colorectal cancer patients receiving first-line oxaliplatin-based treatment** Mol Oncol. 8(1):59-67.

Kostaras E, Pedersen NM, Stenmark H, Fotsis T, Murphy C. (2014) **SARA and RNF11 at the crossroads of EGFR signaling and trafficking** Methods Enzymol. 535:225-47.

Kristensen VN, Lingjærde OC, Russnes HG, Vollan HK, Frigessi A, Børresen-Dale AL. (2014) **Principles and methods of integrative genomic analyses in cancer** Nat Rev Cancer. 14(5):299-313.

Kvalvaag AS, Pust S, Sandvig K. (2014) **Vps11, a subunit of the tethering complexes HOPS and CORVET, is involved in regulation of glycolipid degradation and retrograde toxin transport** Commun Integr Biol. 7(1):e28129.

Lund K, Bostad M, Skarpen E, Braunagel M, Kiprijanov S, Krauss S, Duncan A, Høgset A, Selbo PK. (2014) **The novel EpCAM-targeting monoclonal antibody 3-17I linked to saporin is highly cytotoxic after photochemical internalization in breast, pancreas and colon cancer cell lines** MAbs. 6(4):1038-50.

Lundin C, Forestier E, Klarskov Andersen M, Autio K, Barbany G, Cavelier L, Golovleva I, Heim S, Heinonen K, Hovland R, Johannsson JH, Kjeldsen E, Nordgren A, Palmqvist L, Johansson B. (2014) **Clinical and genetic features of pediatric acute lymphoblastic leukemia in Down syndrome in the Nordic countries** J Hematol Oncol. 7(1):32.

Løvf M, Nome T, Bruun J, Eknaes M, Bakken AC, Mpindi JP, Kilpinen S, Rognum TO, Nesbakken A, Kallioniemi O, Lothe RA, Skotheim RI. (2014) **A novel transcript, VNN1-AB, as a biomarker for colorectal cancer** Int J Cancer. 135(9): 2077-84.

Micci F, Gorunova L, Gatius S, Matias-Guiu X, Davidson B, Heim S, Panagopoulos I. (2014) **MEAF6/PHF1 is a recurrent gene fusion in endometrial stromal sarcoma** Cancer Lett. 347(1):75-8.

Micci F, Haugom L, Abeler VM, Davidson B, Tropé CG, Heim S. (2014) **Genomic profile of ovarian carcinomas** BMC Cancer. 14:315.

Micci F, Panagopoulos I, Thorsen J, Davidson B, Tropé CG, Heim S. (2014) **Low frequency of ESRRA-C11orf20 fusion gene in ovarian carcinomas** PLoS Biol. 12(2):e1001784.

Morelli E, Ginefra P, Mastrodonato V, Beznoussenko GV, Rusten TE, Bilder D, Stenmark H, Mironov AA, Vaccari T. (2014) **Multiple functions of the SNARE protein Snap29 in autophagy, endocytic, and exocytic trafficking during epithelial formation in Drosophila** Autophagy. 10(12):2251-2268.

Muppidi JR, Schmitz R, Green JA, Xiao W, Larsen AB, Braun SE, An J, Xu Y, Rosenwald A, Ott G, Gascoyne RD, Rimsza LM, Campo E, Jaffe ES, Delabie J, Smeland EB, Braziel RM, Tubbs RR, Cook JR, Weisenburger DD, Chan WC, Vaidehi N, Staudt LM, Cyster JG. (2014) **Loss of signalling via Gα13 in germinal centre B-cell-derived lymphoma** Nature. 516(7530):254-8.

Nadratowska-Wesolowska B, Haugsten EM, Zakrzewska M, Jakimowicz P, Zhen Y, Pajdzik D, Wesche J, Wiedlocha A. (2014) **RSK2 regulates endocytosis of FGF receptor 1 by phosphorylation on serine 789** Oncogene. 33(40):4823-36.

Nome T, Hoff AM, Bakken AC, Rognum TO, Nesbakken A, Skotheim RI. (2014) **High frequency of fusion transcripts involving TCF7L2 in colorectal cancer: Novel fusion partner and splice variants** PLoS One. 9(3):e91264.

Oksvold MP, Kullmann A, Forfang L, Kierulf B, Li M, Brech A, Vlassov AV, Smeland EB, Neurauter A, Pedersen KW. (2014) **Expression of B-cell surface antigens in subpopulations of exosomes released from B-cell lymphoma cells** Clin Ther. 36(6):847-862.e1.

Olsen TK, Gorunova L, Meling TR, Micci F, Scheie D, Due-Tønnessen B, Heim S, Brandal P. (2014) **Genomic characterization of ependymomas reveals 6q loss as the most common aberration** Oncol Rep. 32(2):483-90.

Oppelt A, Haugsten EM, Zech T, Danielsen HE, Sveen A, Lobert VH, Skotheim RI, Wesche J. (2014) **PIKfyve, MTMR3 and their product PtdIns5P regulate cancer cell migration and invasion through activation of Rac1** Biochem J. 461(3): 383-90.

Palibrk V, Lång E, Lång A, Schink KO, Rowe AD, Bøe SO. (2014) **Promyelocytic leukemia bodies tether to early endosomes during mitosis** Cell Cycle.13(11):1749-55.

Panagopoulos I, Bjerkehagen B, Gorunova L, Berner JM, Boye K, Heim S. (2014) **Several fusion genes identified by whole transcriptome sequencing in a spindle cell sarcoma with rearrangements of chromosome arm 12q and MDM2 amplification** Int J Oncol. 45(5):1829-36.

Panagopoulos I, Brandal P, Gorunova L, Bjerkehagen B, Heim S. (2014) **Novel CSF1-S100A10 fusion gene and CSF1 transcript identified by RNA sequencing in tenosynovial giant cell tumors** Int J Oncol. 44(5):1425-32.

Panagopoulos I, Gorunova L, Bjerkehagen B, Boye K, Heim S. (2014) **Chromosome aberrations and HEY1-NCOA2 fusion gene in a mesenchymal chondrosarcoma** Oncol Rep. 32(1):40-4.

Panagopoulos I, Gorunova L, Bjerkehagen B, Heim S. (2014) **The "grep" command but not FusionMap, FusionFinder or ChimeraScan captures the CIC-DUX4 fusion gene from whole transcriptome sequencing data on a small round cell tumor with t(4;19)(q35;q13)** PLoS One. 9(6):e99439.

Panagopoulos I, Gorunova L, Taksdal I, Bjerkehagen B, Heim S. (2014) **Recurrent 12q13-15 chromosomal aberrations, high frequency of IDH1 mutations, and absence of HMGA2 expression in periosteal chondromas** Oncology Letters. Int J Oncol. 45(5):1829-36.

Panagopoulos I, Thorsen J, Gorunova L, Micci F, Heim S. (2014) **Sequential combination of karyotyping and RNA-sequencing in the search for cancer-specific fusion genes** Int J Biochem Cell Biol. 53:462-5.

Panagopoulos I, Torkildsen S, Gorunova L, Tierens A, Tjønnfjord GE, Heim S. (2014) **Comparison between karyotyping-FISH-reverse transcription PCR and RNA-sequencing-fusion gene identification programs in the detection of KAT6A-CREBBP in acute myeloid leukemia** PLoS One. 9(5):e96570.

Phuyal S, Hessvik NP, Skotland T, Sandvig K, Llorente A. (2014) **Regulation of exosome release by glycosphingolipids and flotillins** FEBS J. 281(9):2214-27.

Reidick C, El Magraoui F, Meyer HE, Stenmark H, Platta HW. (2014) **Regulation of the tumor-suppressor function of the class III phosphatidylinositol 3-kinase complex by ubiquitin and SUMO** Cancers (Basel). 7(1):1-29.

Russnes HG, Lønning PE, Børresen-Dale AL, Lingjærde OC. (2014) **The multitude of molecular analyses in cancer: the opening of Pandora's box** Genome Biol. 15(9):447.

Sagona AP, Nezis IP, Stenmark H. (2014) **Association of CHMP4B and autophagy with micronuclei: Implications for cataract formation** Biomed Res Int. 2014:974393.

Salvi M, Raiborg C, Hanson PI, Campsteijn C, Stenmark H, Pinna LA. (2014) **CK2 involvement in ESCRT-III complex phosphorylation** Arch Biochem Biophys. 545C:83-91.

Sandhu V, Bowitz Lothe IM, Labori KJ, Lingjærde OC, Buanes T, Dalsgaard AM, Skrede ML, Hamfjord J, Haaland T, Eide TJ, Børresen-Dale AL, Ikdahl T, Kure EH. (2014) **Molecular signatures of mRNAs and miRNAs as prognostic biomarkers in pancreatobiliary and intestinal types of periampullary adenocarcinomas** Mol Oncol. S1574-7891(14)00287-7.

Sandvig K, Bergan J, Kavaliauskiene S, Skotland T. (2014) **Lipid requirements for entry of protein toxins into cells** Prog Lipid Res. 54C:1-13.

Schneikert J, Ruppert JG, Behrens J, Wenzel EM. (2014) **Different roles for the axin interactions with the SAMP versus the second twenty amino acid repeat of adenomatous polyposis coli** PLoS One. 9(4):e94413.

Scott DW, Wright GW, Williams PM, Lih CJ, Walsh W, Jaffe ES, Rosenwald A, Campo E, Chan WC, Connors JM, Smeland EB, Mottok A, Braziel RM, Ott G, Delabie J, Tubbs RR, Cook JR, Weisenburger DD, Greiner TC, Glinsmann-Gibson BJ, Fu K, Staudt LM, Gascoyne RD, Rimsza LM. (2014) **Determining cell-of-origin subtypes of diffuse large B-cell lymphoma using gene expression in formalin-fixed paraffin-embedded tissue** Blood. 123(8):1214-7.

Skotland T, Iversen TG, Sandvig K. (2014) **Development of nanoparticles for clinical use** Nanomedicine (Lond). 9(9):1295-9.

Skårn M, Noordhuis P, Wang MY, Veuger M, Kresse SH, Egeland EV, Micci F, Namløs HM, Håkelien AM, Olafsrud SM, Lorenz S, Haraldsen G, Kvalheim G, Meza-Zepeda LA, Myklebost O. (2014) **Generation and characterization of an immortalized human mesenchymal stromal cell line** Stem Cells Dev. 23(19):2377-89.

Sletten T, Kostas M, Bober J, Sorensen V, Yadollahi M, Olsnes S, Tomala J, Otlewski J, Zakrzewska M, Wiedlocha A. (2014) **Nucleolin regulates phosphorylation and nuclear export of fibroblast growth factor 1 (FGF1)** PLoS One. 9(3):e90687.

Słomińska-Wojewódzka M, Pawlik A, Sokołowska I, Antoniewicz J, Węgrzyn G, Sandvig K. (2014) **The role of EDEM2 versus EDEM1 in ricin transport from the endoplasmic reticulum to the cytosol** Biochem J. 457(3):485-96.

Smebye ML, Sveen A, Haugom L, Davidson B, Tropé CG, Lothe RA, Heim S, Skotheim RI, Micci F. (2014) **Chromosome 19 rearrangements in ovarian carcinomas: Zinc finger genes are particularly targeted** Genes Chromosomes Cancer. 53(7):558-67.

Solhaug A, Torgersen ML, Holme JA, Lagadic-Gossmann D, Eriksen GS. (2014) **Autophagy and senescence, stress responses induced by the DNA-damaging mycotoxin alternariol** Toxicology. 326C:119-129.

Stiebler AC, Freitag J, Schink KO, Stehlik T, Tillmann BA, Ast J, Bölker M. (2014) **Ribosomal readthrough at a short UGA stop codon context triggers dual localization of metabolic enzymes in Fungi and animals** PLoS Genet, 10 (10), e1004685.

Sveen A, Johannessen B, Teixeira MR, Lothe RA, Skotheim RI. (2014) **Transcriptome instability as a molecular pan-cancer characteristic of carcinomas** BMC Genomics. 15:672.

Sørlie T, Johnsen H, Vu P, Lind GE, Lothe R, Børresen-Dale AL. (2014) **Mutation screening of the TP53 gene by temporal temperature gel electrophoresis (TTGE)** Methods Mol Biol. 1105:315-24.

Thoresen SB, Campsteijn C, Vietri M, Schink KO, Liestøl K, Andersen JS, Raiborg C, Stenmark H. (2014) **ANCHR mediates Aurora-B-dependent abscission checkpoint control through retention of VPS4** Nat Cell Biol. 16(6):550-60.

Vedeld HM, Skotheim RI, Lothe RA, Lind GE. (2014) **The recently suggested intestinal cancer stem cell marker DCLK1 is an epigenetic biomarker for colorectal cancer** Epigenetics. 9(3):346-50.

Wahlin BE, Sundström C, Sander B, Christensson B, Jeppsson-Ahlberg A, Hjalmarsson E, Holte H, Ostenstad B, Brown PD, Smeland EB, Kimby E. (2014) **Higher World Health Organization grades of follicular lymphoma correlate with better outcome in two Nordic Lymphoma Group trials of rituximab without chemotherapy** Leuk Lymphoma. 55(2):288-95.

Wang L, Wenners A, Hilpert F, Fredrik R, Micci F, Onkes W, Caliebe A, Maass N, Weimer J, Arnold N. (2014) **Frequent translocations of 11q13.2 and 19p13.2 in ovarian cancer** Genes Chromosomes Cancer. 53(6):447-53.

Wegner CS, Schink KO, Stenmark H, Brech A. (2014) **Monitoring phosphatidylinositol 3-phosphate in multivesicular endosome biogenesis** Methods Enzymol. 534:3-23.

Wæhre H, Vlatkovic L, Cvancarova M, Paus E, Fosså SD, Danielsen HE. (2014) **Fifteen-year mortality after radical prostatectomy: Which factors are available for patient counselling?** Scand J Urol. 48(2):123-30.

Yang Y, Schmitz R, Mitala JJ, Whiting A, Xiao W, Ceribelli M, Wright GW, Zhao H, Yang Y, Xu W, Rosenwald A, Ott G, Gascoyne RD, Connors JM, Rimsza LM, Campo E, Jaffe ES, Delabie J, Smeland EB, Braziel RM, Tubbs RR, Cook JR, Weisenburger DD, Chan WC, Wiestner A, Kruhlak MJ, Iwai K, Bernal F, Staudt LM. (2014) **Essential role of the linear ubiquitin chain assembly complex in lymphoma revealed by rare germline polymorphisms** Cancer Discov. 4(4):480-93.

Yermakova A, Klokk TI, Cole R, Sandvig K, Mantis NJ. (2014) **Antibody-mediated inhibition of ricin toxin retrograde transport** MBio. 5(2):e00995.

Zhao X, Rødland EA, Sørlie T, Vollan HK, Russnes HG, Kristensen VN, Lingjærde OC, Børresen-Dale AL. (2014) **Systematic assessment of prognostic gene signatures for breast cancer shows distinct influence of time and ER status** BMC Cancer. 14:211.

PUBLICATIONS 2015

Brabrand S, Johannessen B, Axcrona U, Kraggerud SM, Berg KG, Bakken AC, Bruun J, Fosså SD, Lothe RA, Lehne G, Skotheim RI. (2015) **Exome sequencing of bilateral testicular germ cell tumors suggests independent development lineages** Neoplasia, 17 (2), 167-74.

Danielsen SA, Lind GE, Kolberg M, Høland M, Bjerkehagen B, Sundby Hall K, van den Berg E, Mertens F, Smeland S, Picci P, Lothe RA. (2015) **Methylated RASSF1A in malignant peripheral nerve sheath tumors identifies neurofibromatosis type 1 patients with inferior prognosis** Neuro Oncol. 17(1):63-9.

Eikenes ÅH, Malerød L, Christensen AL, Steen CB, Mathieu J, Nezis IP, Liestøl K, Huynh JR, Stenmark H, Haglund K. (2015) **ALIX and ESCRT-III coordinately control cytokinetic abscission during germline stem cell division in vivo** PLoS Genet. 11(1):e1004904.

Oksvold MP, Neurauter A, Pedersen KW. (2015) **Magnetic bead-based isolation of exosomes** Methods Mol Biol. 1218:465-81.

Raiborg C, Stenmark H. (2015) **An ER clamp for endosome fission** EMBO J. 34(2):136-7.

Panagopoulos I, Gorunova L, Bjerkehagen B, Heim S. (2015) **Novel KAT6B-KANSL1 fusion gene identified by RNA sequencing in retroperitoneal leiomyoma with t(10;17)(q22;q21)** PLoS One. 10(1):e0117010.

Panagopoulos I, Gorunova L, Davidson B, Heim S. (2015) **Novel TNS3-MAP3K3 and ZFPM2-ELF5 fusion genes identified by RNA sequencing in multicystic mesothelioma with t(7;17)(p12;q23) and t(8;11)(q23;p13)** Cancer Lett. 357 (2), 502-9.

Phuyal S, Skotland T, Hessvik NP, Simolin H, Overbye A, Brech A, Parton RG, Ekroos K, Sandvig K, Llorente A. (2015) **The ether lipid precursor hexadecylglycerol stimulates the release and changes the composition of exosomes derived from PC-3 cells** J Biol Chem. 290(7):4225-37.

Riihijärvi S, Fiskvik I, Taskinen M, Vajavaara H, Tikkala M, Yri O, Karjalainen-Lindsberg ML, Delabie J, Smeland E, Holte H, Leppa S. (2015) **Prognostic influence of macrophages in patients with diffuse large B-cell lymphoma: a correlative study from a Nordic phase II trial** Haematologica. 100(2):238-45.

Sokołowska I, Piłka ES, Sandvig K, Węgrzyn G, Słomińska-Wojewódzka M. (2015) **Hydrophobicity of protein determinants influences the recognition of substrates by EDEM1 and EDEM2 in human cells** BMC Cell Biol. 16(1):1.

Vedeld HM, Andresen K, Andrassy Eilertsen I, Nesbakken A, Seruca R, Gladhaug IP, Thiis-Evensen E, Rognum TO, Muri Boberg K, Lind GE. (2015) **The novel colorectal cancer biomarkers CDO1, ZSCAN18 and ZNF331 are frequently methylated across gastrointestinal cancers** Int J Cancer. 136(4):844-53.

Vollan HK, Rueda OM, Chin SF, Curtis C, Turashvili G, Shah S, Lingjærde OC, Yuan Y, Ng CK, Dunning MJ, Dicks E, Provenzano E, Sammut S, McKinney S, Ellis IO, Pinder S, Purushotham A, Murphy LC, Kristensen VN; METABRIC Group, Brenton JD, Pharoah PD, Børresen-Dale AL, Aparicio S, Caldas C. (2015) **A tumor DNA complex aberration index is an independent predictor of survival in breast and ovarian cancer** Mol Oncol. 9(1):115-27.

PUBLICATIONS IN PRESS

Andresen K, Boberg KM, Vedeld HM, Honne H, Jebsen P, Hektoen M, Wadsworth CA, Clausen OP, Lundin KE, Paulsen V, Foss A, Mathisen Ø, Aabakken L, Schrumpf E, Lothe RA, Lind GE. (2015) **Four DNA methylation biomarkers in biliary brush samples accurately identify the presence of cholangiocarcinoma** Hepatology. 2015 Jan 16. [Epub ahead of print].

Bassarova A, Trøen G, Spetalen S, Micci F, Tierens A, Delabie J. (2015) **Lymphoplasmacytic lymphoma and marginal zone lymphoma in the bone marrow: paratrabecular involvement as an important distinguishing feature** American Journal of Clinical Pathology, in press.

Blaker YN, Brodtkorb M, Maddison J, Hveem TS, Nesheim JA, Mohn HM, Kolstad A, Geisler CH, Liestøl K, Smeland EB, Holte H, Delabie J, Danielsen H. (2014) **Computerized image analysis of the Ki-67 proliferation index in mantle cell lymphoma** Histopathology. 2014 Nov 27. [Epub ahead of print].

Mesquita D, Barros-Silva JD, Santos J, Skotheim RI, Lothe RA, Paulo P, Teixeira MR. (2014) **Specific and redundant activities of ETV1 and ETV4 in prostate cancer aggressiveness revealed by co-overexpression cellular contexts** Oncotarget. 2014 Dec 29. [Epub ahead of print].

Nielsen B, Hveem TS, Kildal W, Abeler VM, Kristensen GB, Albregtsen F, Danielsen HE. (2014) **Entropy-based adaptive nuclear texture features are independent prognostic markers in a total population of uterine sarcomas** Cytometry A. 2014 Dec 5. [Epub ahead of print].

Oksvold MP, Duyvestyn JM, Dagger SA, Taylor SJ, Forfang L, Myklebust JH, Smeland EB, Langdon WY. (2015) **The targeting of human and mouse B lymphocytes by dasatinib** Exp Hematol. 2015 Jan 29. [Epub ahead of print].

Rørtveit R, Reiten MR, Lingaas F, Sveri SB, Brech A, Espenes A, Jansen JH (2014) **Glomerular collagen V codeposition and hepatic perisinusoidal collagen III accumulation in canine collagen type III glomerulopathy** Vet Pathol 2014 Dec 8. [Epub ahead of print].

Sirnes S, Lind GE, Bruun J, Fykerud TA, Mesnil M, Lothe RA, Rivedal E, Kolberg M, Leithe E. (2014) **Connexins in colorectal cancer pathogenesis** Int J Cancer. 2014 Apr 18. [Epub ahead of print].

Øvrebø JI, Campsteijn C, Kourtesis I, Hausen H, Raasholm M, Thompson EM. (2015) **Functional specialization of chordate CDK1 paralogs during oogenic meiosis** Cell Cycle. 2015 Feb 25. [Epub ahead of print].

ABOUT CCB

PHOTO BY TERJE HEESTAD

ANETTE SØRENSEN
Administrative coordinator

The CCB board (from left):
Karl-Erik Giercksky, Ole M. Sejersted,
Hilde Irene Nebb, Svein Stølen

PHOTO BY TERJE HEESTAD

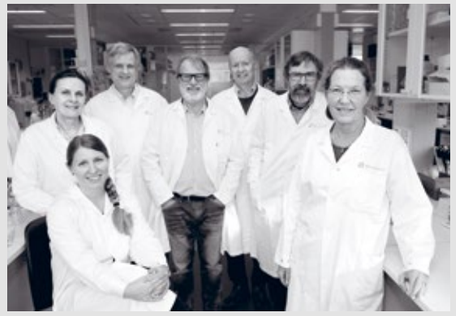


PHOTO BY TERJE HEESTAD

The CCB Principal Investigators
(from left): Guro E. Lind, Ragnhild A. Lothe, Erlend Smeland, Håvard Danielsen,
Harald Stenmark, Knut Liestøl, Kirsten Sandvig

CENTRE FOR CANCER BIOMEDICINE was established in September 2007 as a Centre of Excellence appointed by the Research Council of Norway with the University of Oslo as host institution. Our Centre is located at the Norwegian Radium Hospital, Oslo University Hospital. A consortium agreement regulates cooperation between the University of Oslo and Oslo University Hospital with the intention to make conditions favourable for fulfilling the scientific aims and strategic plans of CCB.

The Research Groups | CCB consists of seven research groups and three associated groups embracing an average of approx. 150 people in 2014.

As part of CCBs strategy for supporting career development of young scientists, the PI group decided in 2012 to announce an internal call for a one-year PI position in CCB for a young scientist every year from 2013 to 2017. For 2014, we again congratulate Guro E. Lind with being awarded the PI stipend, and we welcome her as the seventh member of the PI group for the second time.

CCB plans to announce similar one-year PI positions for the years 2015 to 2017 through internal calls in autumn every year.

The seven research groups are headed by Prof. Harald Stenmark, Prof. Ragnhild A. Lothe, Prof. Kirsten Sandvig, Prof. Erlend Smeland, Prof. Håvard Danielsen, Prof. Knut Liestøl, and Prof. Guro E. Lind.

Three independent groups are associated with CCB. These are the groups of Antoni Wiedlocha PhD, Ass. Prof. Rolf Skotheim, and Prof. Sverre Heim.

Management | The day-to-day management of CCB is performed by Director Harald Stenmark, Co-director Ragnhild A. Lothe, and Administrative coordinator Anette Sørensen. The Centre management reports to the CCB board.

The Board | The CCB board has two members from the University of Oslo as well as two members from Oslo University Hospital.

The board members are:
_Prof. Hilde Irene Nebb | Chairperson, Dean of Research, Faculty of Medicine, University of Oslo

_Prof. Svein Stølen | Dean of Research, Faculty of Mathematics and Natural Sciences, University of Oslo

_Prof. Karl-Erik Giercksky | Department of Gastrointestinal & Paediatric Surgery, Division of Cancer Medicine, Surgery and Transplantation, Oslo University Hospital

_Prof. Ole M. Sejersted | Head of Institute for Experimental Medical Research, Oslo University Hospital

Chairperson Hilde Irene Nebb about CCB: *The Faculty of Medicine, University of Oslo is proud of hosting CCB in close collaboration with Oslo University Hospital. By good leadership, a clear scientific vision and focus, CCB delivers also in 2014 research results of top class, combined with excellent research training and international research exchanges. In addition, the Centre's scientists have made several innovations that are getting close to entering the clinic. To achieve this, CCB takes advantage of unique biobanks and specialists within cell biology, translational cancer research and computational biology to address crucial topics of cancer biomedicine with the ultimate goal to improve the life of the cancer patient.*

I have been the chairman of CCB the last four years and it has been inspiring to witness the progress during CCB's lifetime so far. Due to the highly multidisciplinary environment in this Centre, researchers of CCB are given the opportunity to pursue new ideas towards understanding basic biological processes in addition to those with immediate clinical impact. This provides an optimal setting for frontline research that further fosters excellence in science and development of young research talents.

Scientific Advisory Board | The Scientific Advisory Board supports our Centre with valuable input on strategy and science which helps us achieve our goal of becoming one of Europe's leading centres for cancer research.

The SAB members are:
_Professor Manuel Sobrinho-Simões Head of Department of Pathology, Medical Faculty of Porto & Director, Institute of Molecular Pathology and Immunology of the University of Porto (IPATIMUP), Portugal

_Professor Marja Jäättelä | Head of research unit Cell Death and Metabolism, Danish Cancer Society Research Center, Copenhagen, Denmark

_Professor Olli Kallioniemi | Director, Institute for Molecular Medicine Finland (FIMM), Nordic EMBL Partnership for Molecular Medicine, University of Helsinki & Director, Academy of Finland Centre of Excellence in Translational Genome-Scale Biology, Helsinki, Finland.

_Professor David J. Kerr | Professor of Cancer Medicine, Nuffield Department of Clinical and Laboratory Sciences, University of Oxford, UK

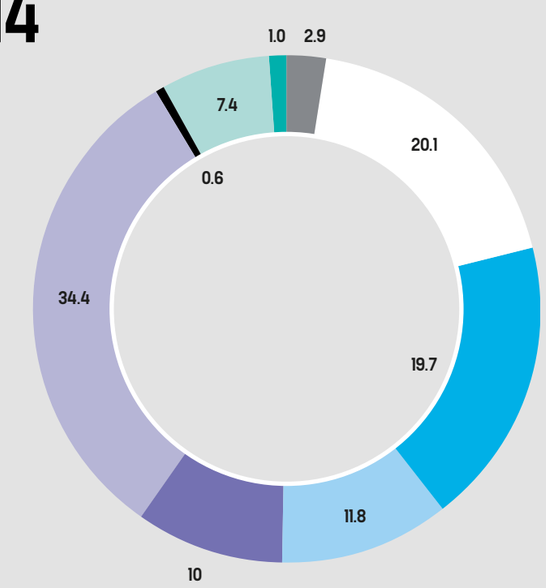
Visiting Professors | CCB has three professors associated to the Centre.

_Professor Manuel Teixeira | Portuguese Oncology Institute, Porto, Portugal

_Professor Marco Novelli | University College London Hospitals, UK

_Professor Jan Delabie | University Health Network, Toronto, Canada

FACTS AND FIGURES 2014



FUNDING IN MNOK

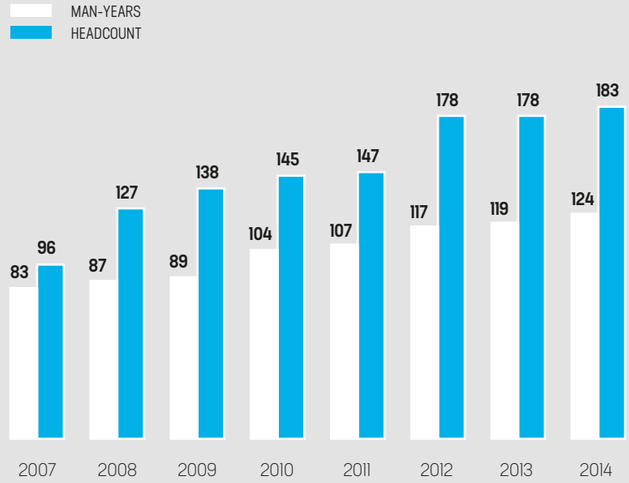
THE TOTAL FUNDING for 2014 is 107.9 MNOK excluding in-kind contributions from our two host institutions. The funding situation for CCB is stable and the centre has been obtaining sufficient financial resources to implement all its planned activities.
In 2014, funding from the Norwegian Cancer Society is showing a remarkable increase from 15.9 MNOK in 2013 to 20.1 MNOK.

This year CCB's Centre of Excellence funding includes Gender Equality funding from the Research Council of Norway amounting to 1 MNOK.

CCB's international funding includes an ERC Advanced Grant, as well as a Polish-Norwegian Research Fund grant.

Private funds include financial support from The Radium Hospital Legacy Foundation and The Norwegian Radium Hospital Research Foundation.

- THE RESEARCH COUNCIL OF NORWAY
- THE NORWEGIAN CANCER SOCIETY
- SOUTH-EASTERN NORWAY REGIONAL HEALTH AUTHORITY
- CENTRE OF EXCELLENCE
- UNIVERSITY OF OSLO
- OSLO UNIVERSITY HOSPITAL
- PRIVATE FUNDS
- INTERNATIONAL
- VESTFOLD HOSPITAL TRUST



CCB STAFF – DEVELOPMENT IN MAN-YEARS/HEADCOUNT

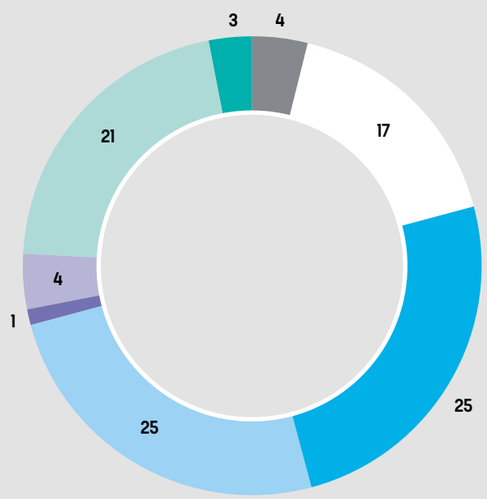
THE TOTAL NUMBER of people registered in the centre in 2014:

Man-years, excluding students: 124
Headcount, including students: 183

CCB currently houses 23 different nationalities.

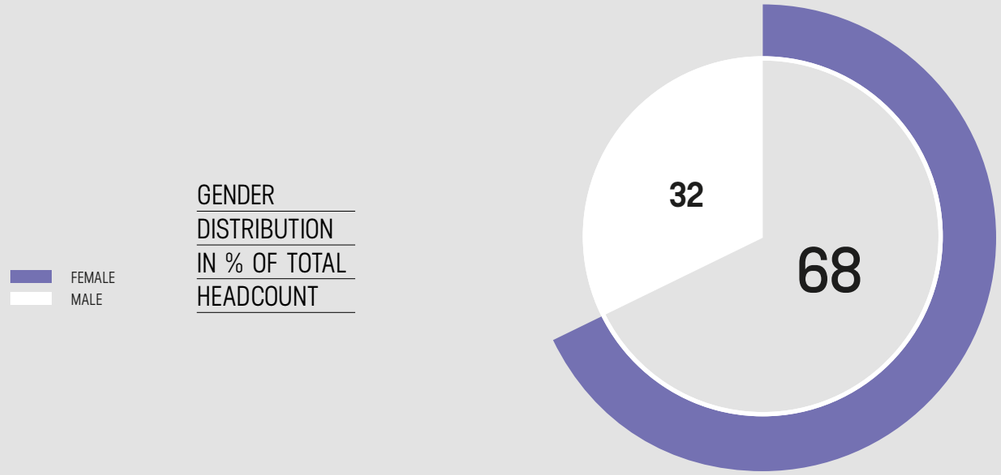
CCB STAFF CATEGORIZED BY POSITION IN % OF TOTAL MAN-YEARS

CCB STAFF equals 124 man-years in 2014. The pie chart shows the categorization of our staff by position. In addition 10 master students were hosted by CCB in 2014.



- PRINCIPAL INVESTIGATORS
- PROFESSORS AND SCIENTISTS
- POSTDOCS
- PHD STUDENTS
- GUEST RESEARCHERS
- RESEARCH FELLOWS
- TECHNICAL STAFF
- ADMINISTRATIVE STAFF

GENDER DISTRIBUTION IN % OF TOTAL HEADCOUNT



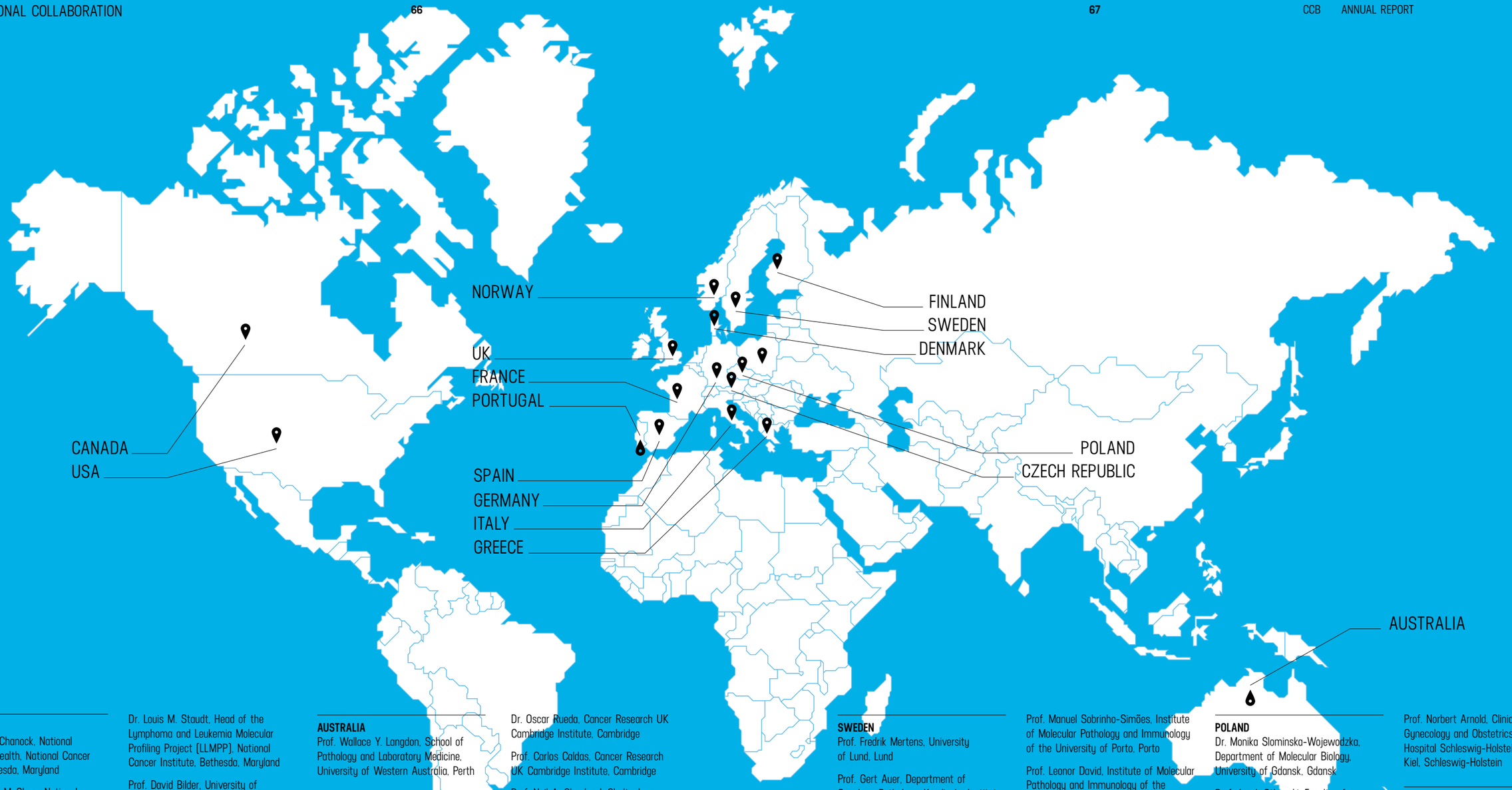
THE GENDER BALANCE in CCB is 68% women and 32% men among our total staff. The same percentages account for the postdoc category as well as for the PhD student category. However, for the highest scientific categories (principal investigators as well as professors and scientists) the figures shift around, and here our male colleagues constitute approx. 60%.

CCB actively supports the promotion of talented female scientists through various means where the overall strategy is to create predictability and continuity, and thereby motivating women to stay in their current career path.

CCB's focus on gender equality is in line with the gender equality policy of our host institution, the University of Oslo.

Diversity with respect to gender representation, age and educational background is a plus for any environment devoted to innovative work.

Gender equality actions | Working with gender equality is a strategic matter for CCB. Our Centre has obtained a grant earmarked gender equality actions from the Research Council of Norway (RCN) totaling 3.1 MNOK for 2013-2016. Based on CCB's application to the RCN, an internal call for a transition grant for 1 female scientist was announced during autumn 2014. This grant will enable the grant holder to improve her foundation for independent funding. The transition grant runs for one year. Furthermore, CCB finances 2 assistant professor positions of 3 years' duration with support from the mentioned RCN grant.



USA
Prof. Stephen Chanock, National Institutes of Health, National Cancer Institute, Bethesda, Maryland

Prof. Katherine McGlynn, National Institutes of Health, National Cancer Institute, Bethesda, Maryland

Prof. Katherine Nathanson, University of Pennsylvania, Philadelphia

Ass. Prof. Ash A. Alizadeh, Division of Oncology, Stanford University School of Medicine, California

Prof. Ronald Levy, Division of Oncology, Stanford University School of Medicine, California

Ass. Prof. Jonathan M. Irish, Department of Cancer Biology, Vanderbilt University, Nashville, Tennessee

Ass. Prof. Joshua Brody, Director of Lymphoma Immunotherapy Program, Mount Sinai School of Medicine, New York

Ass. Prof. Holbrook Kohrt, Division of Oncology, Stanford University School of Medicine, California

Dr. Louis M. Staudt, Head of the Lymphoma and Leukemia Molecular Profiling Project [LLMPP], National Cancer Institute, Bethesda, Maryland

Prof. David Bilder, University of California, Berkeley, California

Prof. Tom Kirchhausen, Department of Cell Biology, Harvard Medical School, Boston

Dr. Nicholas J. Mantis, Wadsworth Center, New York State Department of Health, Albany, New York state

Prof. Laising Yen, Duncan Cancer Center, Baylor College of Medicine, Houston, Texas

Ass. Prof. Winston Timp, Johns Hopkins University, Baltimore

CANADA
Prof. Jan Delabie, Department of Medicine, Laboratory Medicine & Pathobiology, University of Toronto, Ontario

AUSTRALIA
Prof. Wallace Y. Langdon, School of Pathology and Laboratory Medicine, University of Western Australia, Perth

UK
Prof. Peter Andrews, University of Sheffield, Sheffield

Prof. Jim Norman, The Beatson Institute for Cancer Research, Glasgow

Dr. Jason Dunn, St Thomas' Hospital, London

Dr. Jude Fitzgibbon, Barts Cancer Institute, Barts, and The London School of Medicine and Dentistry, London

Prof. Marco Novelli, University College London, London

Dr. Peter Van Loo, Cancer Genome Project, Wellcome Trust Sanger Institute, Cambridge

Dr. David C. Wedge, Cancer Genome Project, Wellcome Trust Sanger Institute, Cambridge

Dr. Oscar Rueda, Cancer Research UK Cambridge Institute, Cambridge

Prof. Carlos Caldas, Cancer Research UK Cambridge Institute, Cambridge

Prof. Neil A. Shepherd, Cheltenham General Hospital, Cheltenham

Prof. David Kerr, Nuffield Division of Clinical Laboratory Sciences, University of Oxford, Oxford

Prof. Ian Tomlinson, The Wellcome Trust Centre for Human Genetics, Nuffield Department of Medicine, University of Oxford, Oxford

Prof. Edward W. Odell, St Thomas' Hospital, London

FINLAND
Dr. Kim Ekroos, Zora Biosciences Oy, Espoo

Prof. Ilpo Vattulainen, Department of Physics, Tampere University of Finland, Tampere

Prof. Olli Kallioniemi, Finnish Institute of Molecular Medicine, Helsinki

SWEDEN
Prof. Fredrik Mertens, University of Lund, Lund

Prof. Gert Auer, Department of Oncology-Pathology, Karolinska Institute, Stockholm

Prof. Eva Kimby, Department of Hematology, Karolinska Institute at Huddinge University Hospital, Stockholm

Prof. Christos Samakovlis, Department of Molecular Biosciences, University of Stockholm, Stockholm

DENMARK
Prof. Ewa Rajpert-De Meyts, Rigshospitalet, Copenhagen

Prof. Jens S. Andersen, University of Southern Denmark, Odense

PORTUGAL
Prof. Paula Soares, Institute of Molecular Pathology and Immunology of the University of Porto, Porto

Prof. Manuel Sobrinho-Simões, Institute of Molecular Pathology and Immunology of the University of Porto, Porto

Prof. Leonor David, Institute of Molecular Pathology and Immunology of the University of Porto, Porto

Prof. Manuel R. Teixeira, Portuguese Oncology Institute, Porto

Dr. Carmen Jeronimo, Portuguese Oncology Institute, Porto

ITALY
Prof., Director Piero Picci, Lab Experimental Oncology, Rizzoli Ortopedic Institute, Bologna

Ass. Prof. Mauro Salvi, University of Padova, Padova

Prof. Cecilia Bucci, University of Salento, Lecce

Dr. Thomas Vaccari, IFOM, Milan

FRANCE
Dr. Graça Raposo-Benedetti, Curie Institute, Paris

POLAND
Dr. Monika Slominska-Wojewodzka, Department of Molecular Biology, University of Gdansk, Gdansk

Prof. Jacek Otlewski, Faculty of Biotechnology, University of Wroclaw, Wroclaw

GERMANY
Prof. Dr. Torsten Steinmetzer, Inst. of Pharmaceutical Chemistry, Phillips University, Marburg

Dr. Philos. Jörg Weimer, Department of Gynecology and Obstetrics, University Medical Center RWTH, Aachen

Prof. Norbert Arnold, Department of Gynecology and Obstetrics, University Medical Center RWTH, Aachen

Dr. Harald W. Platta, Ruhr-University of Bochum, Bochum

Dr. Jörg Weimer, Clinic of Gynecology and Obstetrics, University Hospital Schleswig-Holstein Campus Kiel, Schleswig-Holstein

Prof. Norbert Arnold, Clinic of Gynecology and Obstetrics, University Hospital Schleswig-Holstein Campus Kiel, Schleswig-Holstein

CZECH REPUBLIC
Dr. Pavel Krejci, Institute of Experimental Biology, Masaryk University, Brno

Dr. Libor Macurek, Institute of Molecular Genetics of the ASCR, Prague

GREECE
Dr. Philos. Nikos Pandis, Department of Genetics, Saint Savvas Hospital, Athens

Dr. Carol Murphy, University of Ioannina Medical School, Ioannina

SPAIN
Dr. Dolores Pérez-Sala, Centre for Biological Studies, Madrid

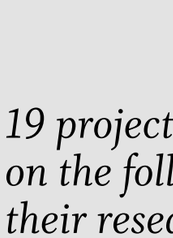
19 project leaders and scientists are in the spotlight on the following pages presenting themselves and their research interests.

RESEARCH INTERESTS

MATTHIAS KOLBERG

_Senior scientist
Member of the Lothe group
GENETICS

Biomarker discovery and medical biostatistics in cancer research with special interest in malignant peripheral nerve sheath tumors and colorectal cancer. Drug discovery and functional studies in cancer models.



JØRGEN WESCHE

_Project leader | Senior scientist
Member of the Wiedlocha group
PROTEIN INTERNALISATION AND SIGNALING

The project group studies novel regulators of cancer cell migration identified through different screening methods. A deeper understanding of the process of cancer cell migration will pave the way for new targets for drug intervention in metastatic cancers.

TOR ERIK RUSTEN

_Project leader | Senior scientist
Member of the Stenmark group
CELLULAR MEMBRANE DYNAMICS

To explore the cell biological basis of disease, our group studies the functions of the oncogenic Receptor Tyrosine Kinase, RET (Rearranged during transfection) and the Phosphatidylinositol 3-kinases that act both as oncogenes and tumor suppressors. Our favorite experimental models are the fruit fly and human 3D-organoid cell culture.

FRANCESCA MICCI

_Project leader | Vice head of the section
Member of the Heim group
CANCER CYTOGENETICS

Chromosomes: these entities have attracted many microscopists not only because these sausage-like bodies represent vehicle of genetic material but also because they are hypnotically beautiful objects.

ALICIA LLORENTE

_Project leader | Senior scientist
Member of the Sandvig group
INTRACELLULAR TRANSPORT

Cells release different types of vesicles to the extracellular environment. These vesicles have been implicated in cancer. The principal objective of this project is to obtain new knowledge about the vesicles released by prostate cancer cells that can help us to better understand prostate carcinogenesis and to diagnose the disease.

IOANNIS PANAGOPOULOS

_Senior scientist
Member of the Heim group
CANCER CYTOGENETICS

Identification of fusion genes in hematologic malignancies and solid tumors. Fusion genes play a key role for the accurate diagnosis and sub-classification of neoplasias, have prognostic significance and they can be the targets of molecular therapy. Thus, fusion genes are excellent biomarkers for the neoplasms.

CAMILLA RAIBORG

_Project leader | Senior scientist
Member of the Stenmark group
CELLULAR MEMBRANE DYNAMICS

Endomembranes from different cellular compartments can make direct contact mediated by protein complexes. Our focus is the contact sites that form between endosomes and the endoplasmic reticulum. We are studying how such contact sites influence cell migration and the dynamic behavior of the plasma membrane and how they regulate tumor suppressor pathways like endosomal trafficking and autophagy.

SIGRID MARIE KRAGGERUD

_Senior scientist
Member of the Lothe group
GENETICS

RESEARCH INTERESTS

The developmental biology and molecular characteristics of germ cell tumors of the testis and ovary. Genetic risk assessment for disease (genome-wide association studies) and long term side effects after chemotherapy with focus on DNA repair genes.

BIRGITTE NIELSEN

_Project leader | Scientist
Member of the Danielsen group
LARGE SCALE GENOMIC INSTABILITY

My research is focused on medical image analysis. The aim is to further develop: high resolution, high-throughput nuclear texture analysis (Nucleotyping) as a prognostic marker in human cancer, methods for automatic segmentation of cell nuclei in histological sections, and methods for quantitative evaluation of segmentation results.

KAISA HAGLUND

_Project leader | Senior scientist
Member of the Stenmark group
CELLULAR MEMBRANE DYNAMICS

The aim of our research is to gain novel insight into molecular mechanisms of cell division and cytokinesis and whether and how alterations of these processes may contribute to carcinogenesis *in vivo*. We have a particular interest in stem cell division and use *Drosophila melanogaster* as a model organism.

JUNE HELEN MYKLEBUST

_Senior scientist | Assistant professor
Member of the Smeland group
LYMPHOMA BIOLOGY

We are studying activation of intracellular signaling pathways in primary lymphoma patient samples, using phosphoFlow cytometry and CyTOF. We also investigate how the presence of mutated kinases in tumor cells affects their responsiveness to kinase inhibitors. The goal is to identify druggable targets and to tailor anti-cancer therapy to individual patients.

SASCHA PUST

_Scientist
Member of the Sandvig group
INTRACELLULAR TRANSPORT

The general research interest is the study and analysis of the regulatory mechanisms of membrane dynamics and trafficking processes. In particular, the role of membrane organizing proteins in the regulation of growth factor receptor function in cancer cells and tissues is a main focus of our work.

LINA CEKAITE

_Senior scientist
Member of the Lothe group
GENETICS

Medical bioinformatics in cancer research with in depth knowledge of gene expression analyses. My current main field of interest is the regulation and function of miRNAs and their potential as biomarkers for cancer with particular focus on colorectal cancer.

TORE GEIR IVERSEN

_Project leader | Senior scientist
Member of the Sandvig group
INTRACELLULAR TRANSPORT

RESEARCH INTERESTS

Addressing questions concerning the cellular fate of biodegradable nanoparticles (NPs) that need to be answered in connection with their use both in cell biological studies and certainly before applying them as nanomedicines in humans: To which extent are they internalized? Can they be recycled or degraded by the cells? To which extent do the NPs disturb intracellular trafficking, and do they have a cytotoxic effect?

EDWARD LEITHE

_Project leader | Senior scientist
Member of the Lothe group
GENETICS

Post-translational mechanisms involved in regulation of tumor suppressor proteins, with emphasis on the role of the ubiquitin system, and how aberrant regulation of these processes contributes to cancer pathogenesis.

TORSTEIN TENGS

_Scientist
Member of the Lothe group
GENETICS

I have a broad background in molecular biology, mostly working on projects combining genetic data with bioinformatics. The majority of my previous projects have focused on evolutionary biology and development of molecular detection assays and I am currently working on the identification of molecular markers using next-generation DNA sequence data from colorectal cancer patients.

LENE MALERØD

_Scientist
Member of the Stenmark group
CELLULAR MEMBRANE DYNAMICS

Centrosomes are essential organelles for cell migration, correct mitotic spindle formation during mitosis and assembly of primary cilia in quiescent cells. We focus to characterize the molecular mechanisms associated to centrosomes in these diverse cellular processes *in vivo* by using *Drosophila melanogaster*. Determining their potential influence for human cancer development is of particular interest.

EVA MARIA WENZEL

_Senior scientist
Member of the Stenmark group
CELLULAR MEMBRANE DYNAMICS

The tumour suppressor APC (adenomatous polyposis coli) is mutated in more than 80 % of colon cancers, typically leading to a truncation of the protein.
I'm studying the molecular functions of APC and truncated APC to understand their role in cancer development.

FERGAL O'FARRELL

_Scientist
Member of the Stenmark group
CELLULAR MEMBRANE DYNAMICS

Interactions between tumor cells and the surrounding microenvironment are a crucial aspect of cancer progression. We will evaluate the extent to which specific cellular processes within the non-transformed cell population of the microenvironment restrict/support tumor cell growth.

NAME	POSITION	GROUP	NATIONALITY	EMPLOYER	ACADEMIC TITLE
Ager-Wick, Eirill Catrine	Postdoc	Lind	Norway	Oslo University Hospital	PhD
Agostini, Antonio	Research fellow	Heim	Italy	Oslo University Hospital	
Alagaratnam, Sharmini	Scientist	Lothe	Malaysia	Oslo University Hospital	PhD
Al-kayassi, Aya	Laboratory assistant	Stenmark	Norway	Oslo University Hospital	
Andersen, Hege Kilen	Technician	Heim	Norway	Oslo University Hospital	
Andersen, Kristine	Technician	Heim	Norway	Oslo University Hospital	
Andresen, Kim	Postdoc	Lind	Norway	Oslo University Hospital	PhD
Askautrud, Hanne	Technician	Danielsen	Norway	Oslo University Hospital	
Askevold, Kaja	PhD student	Wiedlocha	Norway	Oslo University Hospital	MSc
Asp, Nagham	PhD student	Sandvig	Sweden	Oslo University Hospital	MSc
Bai, Baoyan	Postdoc	Smeland	China	University of Oslo	PhD
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