Annual Report 2022

Department of Haematology

AALBORG UNIVERSITY
DENMARK

AALBORG UNIVERSITY HOSPITAL

CONTENT

1 Research strategy

The Haematology Research Section is an integrated division of Department of Haematology at Aalborg University Hospital. In accordance with the overall research strategy and the Danish Health Act, the clinical practice is based on evidence and development in relation to new diagnostics, therapy and follow up.

Mission

Our mission at Department of Haematology, Aalborg University Hospital, is to ensure optimal diagnostics, treatment, and care for patients with haematological diseases in the North Denmark Region and furthermore to create a good working environment making Department of Haematology an attractive and inspiring place to work.

Vision and goals

We aim to

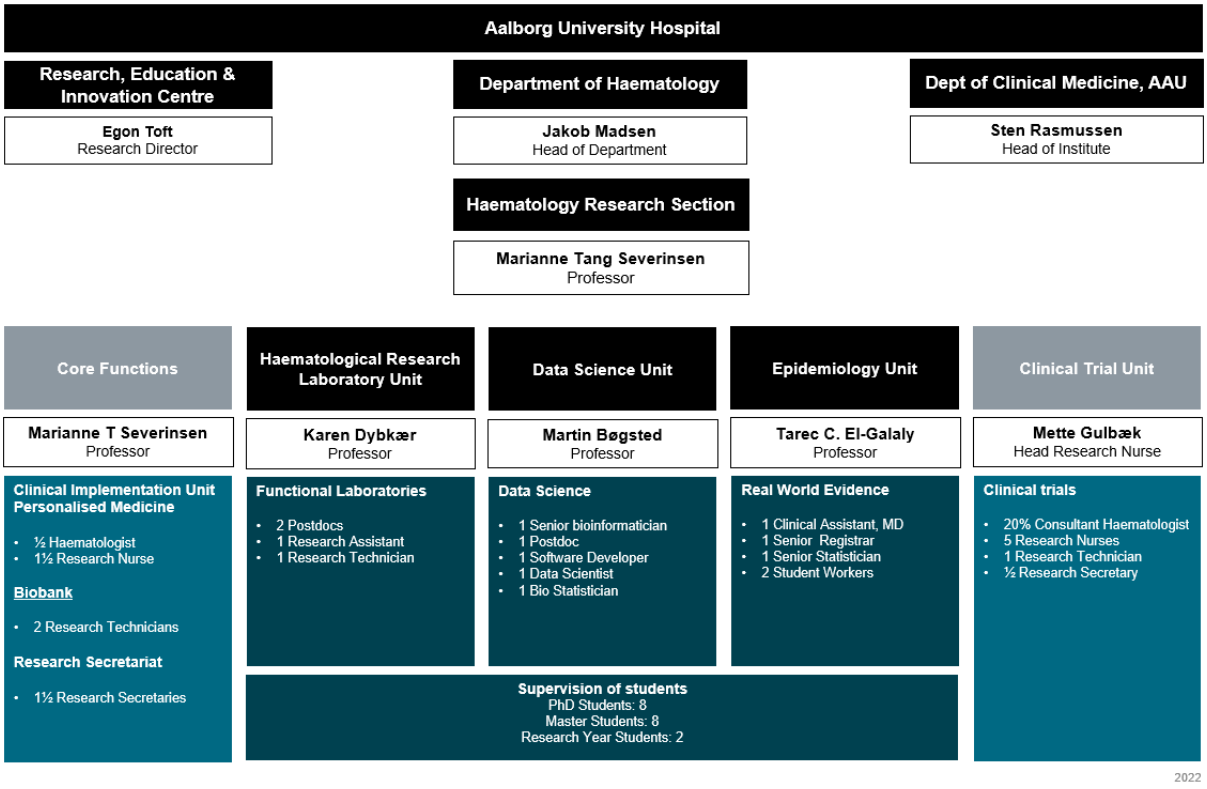
- Understand the mechanisms behind disease pathogenesis and resistance of blood diseases (personalised medicine and tumour cell biology)
- Develop preclinical models, methods, and tools for assignment of individual drug resistance of haematological cancer (personalised medicine and tumour cell biology)
- Generate clinical evidence by relevant end points, before implementation and prospective validation of new diagnostics
- Develop biostatistical models and bioinformatic tools to explain haematological diseases and their course of treatment
- Understand the relation between venous thromboses and cancer diseases and develop algorithms to identify patients at risk (thrombosis prophylaxis)
- Monitor the development in diagnostics, treatment, and survival of haematological diseases and their complications by means of cancer epidemiological research methods
- Explore the spatial distribution of haematological cancers in Denmark to identify hotspots for further studies on environmental risk factors
- Develop new and less resource demanding methods for follow-up of patients treated for blood diseases (nurse-led research)
- Be an attractive partner for the pharmaceutical industry regarding industry-initiated clinical trials to develop and offer new and experimental treatments for patients with haematological diseases
- Implement and run investigator-initiated clinical trials
- Attract researchers and clinicians from other regions and universities
- Inspire and attract students and young scientists to research in haematology

2 Research infrastructures

Organisation

The research section at Department of Haematology, Aalborg University Hospital, was established in 2005, now including clinical research, epidemiology, laboratories, data science, and a secretariat.

Figure 1 | Organisation plan for 2022



Professorship responsibilities

Chair professor Marianne Tang Severinsen

We will attain our mission by bridging research and clinical work which is the overarching goal of the Department of Haematology, Aalborg University Hospital. The research section is organised as a unit within the Department of Haematology. The professor and head of research holds a chair at the faculty/Department of Clinical Medicine and works parttime as a consultant haematologist at the clinical department. Furthermore, the professorship involves being responsible for the education of medical students in the field of haematology. The aim is to engage medical doctors and students to do research, but also to give researchers in other fields an insight into the “real world” seen from a patient-doctor perspective.

Core functions

Professor Marianne Tang Severinsen

Clinical Implementation & PM Unit

Clinical Implementation Unit – specialised in personalised medicine (PM) and prospective trials.

The Clinical Implementation Unit handles screening, information, and inclusion of trial subjects, obtains informed consent, creates clinical databases, and registers clinical data in the REDCap databases created for the individual projects. In addition, the Clinical Implementation Unit has had a coordinating role in relation to collecting biological material, including tissue, blood, and bone marrow samples as well as collecting saliva samples, mouth scrapes and punch biopsies used as normal reference in a personal medicine trial.

The Clinical Implementation Unit collaborates with Department of Molecular Diagnostics and Department of Oncology, Aalborg University Hospital, on personalised medicine as an operational function at Aalborg University Hospital

As for personalised medicine, results from the completed molecular genetic studies are evaluated by specialists and placed in a clinical and literature context, whereafter the results are presented and discussed at local tumour conferences for doctors employed at the Department of Haematology, Aalborg University Hospital.

The Clinical Implementation Unit also runs projects including the collection and registering of patient-reported outcome data (PRO data).

Haematological Biobank

Bone marrow and peripheral blood samples are registered in the Haematological Biobank under Bio and Genome Bank Denmark (RGBG). The Haematological Biobank collects and stores vital frozen single cell suspensions of mononuclear cells, plasma and serum from patients included in current clinical prospective protocols and health science projects and from patients suitable for future research projects.

For current clinical prospective protocols and health science projects approved by a regional or national committee on health research ethics, a project-specific research biobank has been set up for the individual projects. For personalised medicine the Haematological Biobank usually also collects, handles, and registers biological tissue in the form of a saliva sample, mouth scrape or skin punch biopsy. For sample handling and processing, detailed standard operating procedures have been developed, ensuring fast and reproducible logistics and freezing.

Biological material from patients with haematological diagnoses is collected and stored in the haematological biobank if informed consent is given by the patient. The sample material can be used if a future course of treatment requires additional investigations for the individual patient. Sample material can also be used in future research projects if accepted by a committee on health research ethics, given an opportunity for improving diagnostics and treatment methods for future patients is present.

Research Secretariat

The research secretariat at the Haematology Research Section coordinates and provides secretarial and administrative assistance to professors, researchers, and students at the research laboratory, data science and epidemiology units as well as the clinical trial unit, biobank, and the clinical implementation & PM unit.

The research secretariat performs research-related administrative tasks including

- preparation, coordination, translation, and editing of project descriptions, scientific papers, reports, and strategies
- submission of manuscripts for publication, funding proposals and applications for regulatory authorities
- administration of research accounts and preparation of budgets and financial reports
- coordination of travel itineraries, conferences, and meetings
- maintenance of office filing systems and web pages

Haematological Research Laboratory Unit

Professor Karen Dybkær

The Haematological Research Laboratory Unit has focus on molecular analyses of haematological cancers and how to use these in combination with clinical information to identify new determinants and mechanisms that affect disease development, sensitivity to therapeutic drugs as well as disease classifications. Based on genome editing with CRISPR-Cas9 technology spanning over genome analyses, functional analyses, biobanking, and participation in prospective clinical trials, we strive towards better treatment and risk stratification of cancer patients. Their projects are all based on interdisciplinarity and collaboration with local, national, and international partners. The unit is primarily externally funded, and results are published in high-impact peer-reviewed scientific journals. The group works in an innovative and inspiring research environment from which many PhD, master and bachelor students have already graduated.

Data Science Unit

Professor Martin Bøgsted

The Data Science Unit focuses on research in machine learning for data driven personalised medicine. We are an interdisciplinary team of statisticians, engineers, and doctors finding solutions together for data infrastructure, unsupervised learning for unravelling new disease taxonomies, and supervised learning for dynamic risk prediction.

Based on real world health data and molecular biomarkers, the focus is currently on establishing scalable, national decision support tools for personalised medicine in cancer treatment, chronic diseases, and health economics benefit. The research group takes part in the Danish National Research Foundation's Centre for Molecular Prediction of Inflammatory Bowels Disease (PREDICT), the Danish Comprehensive Cancer Centre's Research Centre for Precision Medicine in blood cancer, and the Novo Nordisk Foundation-supported National Health Data Science Sandbox.

The Data Science Unit has grown through the years, and skills from the unit are highly demanded from several partners outside the Department of Haematology. During 2022 an initiative was taken to generate a Data Science Section, separate from Department of Haematology. Consequently, Center for Clinical Data Science (CLINDA), led by Professor Martin Bøgsted, was established in January 2023 at Department of Clinical Medicine, Aalborg University, and Research, Education and Innovation, Aalborg University Hospital. The research section at Department of Haematololgy and CLINDA will continue their collaboration on research projects.

Epidemiology & Real-World Evidence Unit

Professor Tarec C El-Galaly

The Epidemiology & Real-World Evidence Unit has focus on conducting high-quality and practice-changing studies in haematology using local, nationwide, or international real-world data. Strong international collaborations and core functions in national and international studies characterise this group. The group is highly experienced in conducting clinical research and implementation of results. The areas of strength, all documented by high impact publications and international collaborations, are dynamic prognostic model development, implementation of decision support tools, survival statistics, real-world effectiveness of treatment interventions, efficient diagnostic work-up and disease surveillance in haematology and late toxicities. The group is multi-disciplinary with physicians and statisticians working closely together on research with clinical impact.

Clinical Trial Unit

Manager, Head Research Nurse Mette Gulbæk & Consultant Haematologist Henrik Gregersen

The Clinical Trial Unit is a part of Department of Haematology and aims to support clinical research activity in the department. The unit continuously participates in clinical trials within the large haematological diseases and thereby contribute to gather new knowledge and to improve the quality of patient treatment. A large part of the activity concerns industry-initiated trials and the unit has experience in a large portfolio of studies spanning phase 1A studies to phase 4 studies.

In February 2022 the first patient was included in the phase 1A study which demonstrated the unit's ability to handle the special conditions in this type of studies e.g., extended PK-sampling, cooperation with the intensive care unit, and close oversight from the sponsor.

Our general activities include screening of patients for inclusion in clinical protocols, administration of study drugs, ensuring high data quality, registering data in project databases, and securing compliance with protocols and legislation.

Another important function of the Clinical Trial Unit is participation in investigator-initiated studies, partly studies initiated from other departments and researchers in Denmark, but also local investigator-initiated studies. Consequently, Clinical Trial Unit has in recent years built up experience as sponsor, conducting clinical trials locally, nationally, and internationally with preparation of study protocols, applications to regulatory authorities, designing case report forms (CRFs) for registering study data, and other sponsor responsibilities. Additionally, the unit facilitates the conduct of other types of studies such as questionnaire studies, register studies as well as collection of biological samples, thus supporting studies originating from other units of the haematology research section.

3 Major events in 2022

Best in Denmark at treatment of acute leukaemia

In February 2022, Department of Haematology Aalborg UH was elected best at treatment of acute leukemia by the media *Dagens Medicin.*

PhD defence by Charles Vesteghem

On Friday 25 March 2022 MSc Charles Vesteghem defended his PhD thesis with the title: “30-day mortality of patients with advanced cancer: monitoring and machine learning models using extensive health data”

Martin Bøgsted, Deirdre Cronin Fenton, Henrik Bøggild, Charles Vesteghem, Rasmus Froberg Brøndum (private photo)

Supervisors: Professor Martin Bøgsted (main), Clinical Professor Ursula Falkmer, Associate Professor Rasmus Froberg Brøndum, Professor Karen Dybkær, Department of Clinical Medicine, Aalborg University, Denmark

Assessment committee: Associate Professor Deirdre Cronin Fenton, Department of Clinical Epidemiology, Aarhus University, Denmark; Professor Anita Burgun, Department of Biomedical Informatics, Paris University, France; Associate Professor Henrik Bøggild (chair), Department of Health Science Technology, Aalborg University, Denmark

Professor Dr Karin Ekström Smedby appointed Honorary Doctor

In connection with her appointment as an Honorary Doctor, Professor Dr Karin Ekström Smedby held a guest lecture on 8 April 2022 with the title “Clinical and register-based lymphoma research in the Nordic countries – recent developments”.

Dr Karin Ekström Smedby is a professor of haematology-oncology at Karolinska Institutet, Stockholm, and her focus is on lymphoma epidemiology and real-world evidence. She has led multiple national and international studies published in high-impact journals and with a direct impact on patient care. Professor Smedby is a practicing oncologist and treats lymphoma patients in Stockholm, and she is a close collaborator of Department of Haematololgy, Aalborg University Hospital and Department of Clinical Medicine, Aalborg University.

New chairpersons of Health Research Ethics Committees

Professor Karen Dybkær PhD is appointed chair of the North Denmark Region Committee on Health Research Ethics by the Regional Council. Members are appointed for four years following the election period of the Regional Council. As of 13 March 2022, the committee consists of 11 members: six laypersons and five researchers. The committee assesses health science research projects that do not include drug trials or medical devises.

Professor Tarec Christoffer El-Galaly DM MSc is appointed chair of one of three new Danish Medical Research Ethics Committees whose primary task, together with the Danish Medicines Agency, is to assess applications concerning clinical trials of medicines and medical devices.

Inaugural lectures

Professors Marianne Tang Severinsen and Tarec Christoffer El-Galaly held their inaugural lectures on 22 April 2022 at Medicinerhuset, Aalborg University Hospital.

Tarec Christoffer El-Galaly was appointed professor in January 2021. His talk focused on “*Optimering af prognostiske modeller, udredning, behandling og opfølgning af lymfekræft gennem analyse af real-world data”*.

Marianne Tang Severinsen was appointed professor in haematology at Department of Clinical Medicine in June 2021. Her talk focused on *“Livsstilsfaktorer og genetiks betydning for prognose og behandling: Veneblodpropper, leukæmi og andre myeloide former for blodkræft”.*

PhD Fellow at Danish Data Science Academy

One of the first 10 talented young data scientists to be awarded a three-year PhD Fellowship from Danish Data Science Academy (DDSA) was Ida Burchardt Egendal, PhD Fellow at Department of Clinical Medicine, Clinical Data Science Group, Aalborg University and Department of Haematology, Aalborg UH. The DDSA PhD Fellowship is a fixed individual research grant aiming to attract and support visionary data science students who want to develop their own PhD project in collaboration with a strong hosting environment at a Danish research institution.

Best project award at OvaCure Innovation Challenge

At the OvaCure Innovation Challenge 2022 which was held on 19-20 September 2022 in Copenhagen, Professor Martin Bøgsted presented a project that was elected as one of two top projects. The concept was to gather scientists leading in their field to participate in a “hackaton” where they cooperate to develop ideas for new research projects.

The project GIANTS - Targeting Giants in Ovarian Cancer was awarded 150,000 €

GIANTS Group, Martin Bøgsted 3rd from the left (private photo)

Junior Researcher Award

In September 2022 Senior Statistician, PhD Lasse Hjort Jakobsen was awarded the prestigious Junior Researcher Award by the Danish Cancer Society, which included a research grant of 100,000 DKK. Later the same year he received funding for a two-year research project, entitled "A new online platform for prognostication of patients with lymphoma," receiving 1,495,000 DKK from the Danish Cancer Society's *Knæk Cancer* funds under the Young Talented Cancer Researchers’ programme.

New research project grants

Is it possible to diagnose pulmonary mold infections by analysis of exhaled breath?

Postdoc, MD Inger Lise Gade is lead of a project with the research question “Is it possible to diagnose pulmonary mold infections by analysis of exhaled breath?” and was supported with a 2 million DKK grant by the Independent Research Fund Denmark Thematic Research under the Inge Lehmann Programme. The project will pave the way for a new method for diagnosing mold infections in patients with a weakened immune system or chronic lung disease.

Risk factors for acute leukaemia and multiple myeloma in Denmark

Professor Marianne Tang Severinsen and collaborators were awarded a grant of 5.24 million DKK from *Sygeforsikringen “danmark”* to a project investigating whether PFAS in drinking water, background radiation from radon, and occupational exposure can explain a more frequent occurrence of patients diagnosed with acute leukaemia and multiple myeloma in certain parts of Denmark than in the country as a whole.

Artificial intelligence for detection of frequent complication following chemotherapy

Sygeforsikringen “danmark” has also allocated a 6 million DKK research grant for a five-year study to develop a decision support tool as a method to better assess early risk of febrile neutropenia in patients treated with chemotherapy. Febrile neutropenia is a frequent complication following chemotherapy that can ultimately lead to sepsis, a potentially life-threatening systemic reaction of the immune system, and the clinicians want to develop a tool based on artificial intelligence and observational data that can help them identify patients at risk. The project is led by Professor Tarec C. El-Galaly in a collaboration between the departments of haematology and microbiology at Aalborg UH, *Rigshospitalet*, Copenhagen, and Aalborg University.

Easier detection of hereditary blood disease

Professor Tarec C. El-Galaly is also partner in a three-year research project supported by the Novo Nordisk Foundation entitled “Development of an artificial intelligence-based methodology for hemoglobinopathy screening in low-income countries (AI-HEMO)”. This project is led by Professor Izabela Nielsen, Aalborg University.

ForskningsKUBEN REPAIR

Professor Inge Søkilde Pedersen, Professor Karen Dybkær and Professor Martin Bøgsted are the initiators of *ForskningsKUBEN* REPAIR, and in collaboration with several departments at Aalborg University Hospital they aim to improve the identification and biological understanding of DNA damage repair (DDR) deficiency in tumours of selected groups of cancer patients, in order to optimise diagnostics, prognostics, and treatment decisions. In depth molecular profiling of tumour cells by next generation sequencing (NGS) identifies somatic genetic alterations directly affecting genes involved in DDR but also the global genomic footprint of DDR deficiency. Large publicly available genomic NGS data sets paired with clinical information for selected cancer entities will be used to develop advanced bioinformatics tools to capture DDR deficient footprints. Their significance will be validated in clinical cohorts diagnosed and treated at Aalborg UH, and their biological impact will be challenged in functional analysis. Once their diagnostic potential has been clarified, they will be incorporated into clinical decision support tools, and lay the ground for new clinical protocols.

4 Research projects

Clinical studies

Investigator-initiated clinical studies conducted by the clinical implementation unit or as part of PhD projects are listed below in alphabetical order. Apart from the studies listed below, the clinical trial unit conducts many industry-initiated clinical trials.

AmbuFlex

Research Ethics Committee Approval number: Not applicable; quality control project

Title: *AmbuFlex – individualised patient follow-up*

PI: Jakob Madsen, MD, Head of Department of Haematology, Aalborg UH

BosuPeg

Research Ethics Committee Approval number: S-20190041

Title: *A study of efficacy and safety of long-acting low dose ropeginterferon in patients with chronic myeloid leukemia treated with bosutinib from diagnosis: a randomized prospective trial*

PI (coordinating): Henrik Hjorth-Hansen, Department of Haematology, St. Olav's Hospital Trondheim, Norway. National PI DK: Andreja Dimitrijevic, Department of Haematology Odense University Hospital, Odense

PI (local): Rie Sander Bech, Senior Registrar, Department of Haematology, Aalborg University Hospital

CircRNA

Research Ethics Committee Approval number: 1-10-72-170-21 (Central Denmark Region)

Title: *Identifikation af molekylære mekanismer under udvikling af resistens mod Revlimid i myelomatose*

PI (coordinating): Lasse Sommer Kristensen, Associate Professor, Institut for biomedicin, Aarhus University

PI (local): Karen Dybkær, Professor PhD and Henrik Gregersen Professor, MD, PhD, Department of Haematology, Aalborg University Hospital

DELPHI

Research Ethics Committee Approval number: H-20077410 02-06-2021

Title: *Danish Elderly Lymphoma Patient Hematopoietic Investigation*

PI (coordinating): Kirsten Grønbæk, Professor, MD, DMSc, Department of Haematology, Rigshospitalet, Copenhagen.

PI (local): Tarec C. El-Galaly, Professor, MD, DMSc, Department of Haematology, Aalborg UH

EVI-3

Research Ethics Committee Approval number: H-18040929

Title: *A multicenter, randomized, parallel-group, placebo-controlled phase II study of the efficacy and safety of oral vitamin C supplement in combination with azacitidine in higher-risk MDS, CMML, and low blast-count AML*

PI (coordinating): Kirsten Grønbæk, Professor, MD, DMSc, Department of Haematology, Rigshospitalet, Copenhagen.

PI (local): Marianne Tang Severinsen, Professor, MD, PhD, Department of Haematology, Aalborg UH

GC-MDS-AML

Research Ethics Committee Approval number: N-20210017

Title: *Gastrointestinal complication in Patients with Myelodysplastic Syndrome or Acute Myeloid Leukemia undergoing Treatment with 5-Azacitidin - A clinical follow-up study of Patients with haematological malignancies treated with 5-Azacitidin.*

Sponsor: Christina Brock, Professor, DVM, PhD, Mech-Sense, Aalborg UH

PI: Marianne Tang Severinsen, Professor, MD, PhD, Department of Haematology, Aalborg UH

GenKabCell

Research Ethics Committee Approval number: S-20160069

Title: *Genetic characterisation of B-cell neoplasia*

PI (coordinating): Charlotte G. Nyvold, Professor, MSc, PhD, Department of Haematology, Odense University Hospital

PI (local): Karen Dybkær, professor, MSc, PhD, and Marianne Tang Severinsen, Professor, MD, PhD, Department of Haematology, Aalborg UH

hMN

Research Ethics Committee Approval number: 2104062 (NVK)

Title: *Identifikation og funktionel betydning af medfødte genetiske varianter der prædisponerer til myeloid neoplasi hos voksne i Danmark*

PI (coordinating): Kirsten Grønbæk, Professor, MD, DMSc, Department of Haematology, Rigshospitalet, Copenhagen.

PI (local): Marianne Tang Severinsen, Professor, MD, PhD, Department of Haematology, Aalborg UH

LD-VenEx

EudraCT No.: 2020-005461-14

Title: *Phase II Study of Azacitidine in Combination with Low Dose Intensity Venetoclax in Patients with Acute Myeloid Leukemia With integration of Explorative Multi-Omics and ex vivo Drug Screening Data*

PI (coordinating): Kim Theilgaard-Mönch, MD, DMSc, Department of Haematology, Rigshospitalet, University of Copenhagen

PI (local): Marianne Tang Severinsen, Professor, MD, PhD, Department of Haematology, Aalborg UH

MICRO

Research Ethics Committee Approval number: S-20170101

Title: *MethylphenIdat, doubleblind, placebo-controlled CROss-over trial*

PI (coordinating): Henrik Frederiksen, Consultant, MD, PhD, Odense University Hospital
PI (local): Henrik Gregersen, Consultant, MD, PhD, Department of Haematology, Aalborg UH

NIPA

Research Ethics Committee Approval number: N-20190070

Title: *Non-invasive Diagnosis of Invasive Pulmonary Aspergillosis by use of Biomarkers in Exhaled Breath Condensate*

PI: Inger Lise Gade, MD, PhD, Registrar, Department of Haematology, Aalborg University Hospital, Department of Haematology, Aarhus University Hospital

NOVIT-1

Research Ethics Committee Approval number: N-20190068

Title: *Early detection and prevention of Neuropathy and Cognitive Impairment following treatment for Haematological Malignancies (the NOVIT study)*

PI: Marianne Tang Severinsen, Professor, MD, PhD, Department of Haematology, Aalborg UH

PE-EBC

Research Ethics Committee Approval number: N-20180086

Title: *Non-invasive Diagnosis of Pulmonary Embolism by use of Biomarkers in Exhaled Breath Condensate*

PI: Inger Lise Gade, MD, PhD, Registrar, Department of Haematology, Aalborg University Hospital, Department of Haematology, Aarhus University Hospital

POLAR BEAR

Research Ethics Committee Approval number: H-20028621

Title: *R-MINI-CHOP versus R-MINI-CHP in combination with polatuzumab-vedotin, as primary treatment for patients with diffuse large B-cell lymphoma, ≥80 years, or frail ≥75 years – an open label randomized Nordic Lymphoma Group phase III trial - NLG-LBC7 (POLAR BEAR)*

Sponsor: Nordic Lymphoma Group. PI (coordinating): Mats Jerkeman, Lund University Hospital, Lund, Sweden.

PI (local): Jakob Madsen, Department Medical Director, Department of Haematology, Aalborg University Hospital.

PRO-B-HMA

Research Ethics Committee Approval number: H-20032246

Title: *Quality-of-life and treatment effect associated with the use of DNA hypomethylating drugs in the treatment of myelodysplastic syndrome, chronic myelomonocytic leukaemia and acute myeloid leukaemia – a Danish nationwide study*

PI: Project initiator, DMSc, PhD, MD Christen Lykkegaard Andersen and Professor, DMSc, Chief Consultant, Haematologist Kirsten Grønbæk

PI (local): Marianne Tang Severinsen, Professor, MD, PhD, Department of Haematology, Aalborg UH

ProSeq Cancer (Haematology)

Research Ethics Committee Approval number: N-20200018

Title: *En prospektiv undersøgelse af omfattende genomiske analyser hos patienter med uhelbredelig kræft, med henblik på målrettet behandling*

PI (coordinating): Morten Ladekarl, Professor, MD, Phd, Department of Oncology, Aalborg UH

PI (local): Marianne Tang Severinsen, Professor, MD, PhD, Department of Haematology, Aalborg UH

PTH

Research Ethics Committee Approval number: 1705391 (NVK)

Title: *Targeted treatment of patients with haematological diseases*

PI (coordinating): Kirsten Grønbæk, Professor, MD, DMSc, Department of Haematology, Rigshospitalet, Copenhagen.

Local partners: Anne Roug, Clinical Associate Professor, MD, PhD, Department of Clinical Medicine, Aalborg University; Karen Dybkær, Professor, MSc, PhD, Department of Haematology, Aalborg UH; Martin Bøgsted, Professor, MSc, PhD, Department of Haematology, Aalborg UH

RetroGen

Research Ethics Committee Approval number: N-20140099

Title: *Retrospektiv analyse af kemoterapi-specifik molekylær resistens ved hæmatologiske kræftsygdomme - multiparametriske undersøgelser af arkiveret væv og blod registreret i klinisk biobankdatabase 1990-2022*

PI: Karen Dybkær, Professor, MSc, PhD, Department of Haematology, Aalborg UH

RetroSeq

Research Ethics Committee Approval number: 1706295 (NVK)

Title: *Retrospektiv gensekventering og personlig medicin - Afprøvning af ny in vitro gendiagnostik omfattende gensekventering af humant væv med henblik på klinisk validering af personlig medicin-konceptet.*

PI: Karen Dybkær, Professor, MSc, PhD, Department of Haematology, Aalborg UH

SABLe

EudraCT No.: 2020-006060-89

Title: *Selinexor with alternating bortezomib or lenalidomide plus dexamethasone in transplant ineligible newly diagnosed multiple myeloma patients (SABLe)*

Sponsor/PI (coordinating): Odense University Hospital, Department of Haematology represented by MD Ida Bruun Kristensen on behalf of Nordic Myeloma Study Group

PI (local): Henrik Gregersen, Consultant, MD, PhD, Department of Haematology, Aalborg UH

Vertebroplasty

Research Ethics Committee Approval number: S-20200075

Title: *Palliative treatment of multiple myeloma patients with painful vertebral lesions. A multicenter randomized controlled trial of vertebroplasty in addition to usual treatment*

Sponsor/PI (coordinating): Professor Niels Abildgaard, Head of Research, Hematology Pathology Research Laboratory, Department of Hematology, Odense University Hospital.

PI (local): Henrik Gregersen, Consultant, MD, PhD, Department of Haematology, Aalborg UH

VTE-Covid-19

Research Ethics Committee Approval number: N-20200069

Title: *Non-invasive Prognostication of COVID-19 patients by use of Biomarkers in Exhaled Breath Condensate*

PI: Inger Lise Gade, MD, PhD, Registrar, Department of Hematology, Aalborg University Hospital, Department of Hematology, Aarhus University Hospital, Skejby

Supervision and student projects

PhD projects

Defence in 2022

Charles Vesteghem, MSc PhD, Department of Haematology

Title: *Decision Support Tools for Precision Oncology*

PhD defence: 25 March 2022.

Supervisor: Martin Bøgsted. Co-supervisors: Ursula Falkmer (Department of Oncology), Rasmus Froberg Brøndum, Karen Dybkær

Ongoing projects

Eva Futtrup Maksten, MD, Department of Haematology

Title: *Long-term complications following treatment for haematological malignancies: Neuropathy and Cognitive Impairment*

Enrolment: 1 January 2020

Supervisor: Marianne Tang Severinsen. Co-supervisors: Lasse Hjort Jakobsen, Tarec C. El-Galaly, Kristian Hay Kragholm (Department of Cardiology)

Staff at Department of Haematology, December 2022

Joachim Bæch, MD, Department of Haematology

Title: *Late toxicities of steroid-including immunochemotherapy regimens for patients with lymphoma*

Enrolment: 1 May 2020

Supervisor: Tarec C. El-Galaly. Co-supervisors: Lasse Hjort Jakobsen, Henrik Frederiksen (Department of Haematology OUH), Marianne Tang Severinsen

Issa Ismail Issa, MSc in Biomedicine, Department of Clinical Medicine, Aalborg University

Title: *Targeting multidrug resistance mechanisms in Diffuse Large B-cell Lymphoma*

Enrolment 1 October 2020

Supervisor: Karen Dybkær. Co-supervisor**:** Martin Bøgsted

Lars Børty Nielsen, MSc in Economics, Department of Haematology

Title: *Application of individual-based registrations of systemic anti-cancer therapy for monitoring expenditures and access to treatment*

Enrolment: 1 January 2021

Supervisor: Rasmus Brøndum. Co-supervisors: Martin Bøgsted, Marianne Tang Severinsen

Ahmed Ludvigsen Al-Mashhadi, MD, Department of Haematology

Title: *Outcomes of rare lymphomas*

Enrolment: 1 September 2021

Supervisor: Tarec C. El-Galaly. Co-supervisor: Lasse Hjort Jakobsen, Thomas Stauffer Larsen (Syddansk Universitet)

Daniel Kristensen, MD, Department of Haematology

Title: *REFORM-AML: A nationwide retrospective study of population-based acute myeloid leukemia tumor genetic data*

Enrolment: 1 October 2021

Supervisor: Anne Stidsholt Roug. Co-supervisors: Martin Bøgsted, Marianne Tang Severinsen, Rasmus Froberg Brøndum

Rasmus Rask Kragh Jørgensen, MSc in Operations Research, Department of Haematology

Title: *Advanced statistical methods for studies of lymphoma prognosis and treatment outcomes in a real-world setting*

Enrolment: 15 November 2021

Supervisor: Lasse Hjort Jakobsen. Co-supervisors: Tarec Christoffer El-Galaly, Andreas Kiesbye Øvlisen, Marianne Tang Severinsen, Sandra Eloranta (Karolinska Institutet)

Maja Zimmer Jakobsen, MSc in Health Science and Technology, BSc in nursing, Department of Haematology

Title: *Multidisciplinary investigation of proteasome inhibitor response in multiple myeloma*

Enrolment: 1 November 2022

Supervisor: Karen Dybkær. Co-supervisors: Henrik Gregersen, Rasmus Froberg Brøndum

Master student and research year student projects

Hulda Haraldsdóttir, MSc, Department of Haematology

Title: *The molecular and proteome effects of Cisplatin on DNA damage response in diffuse large B-cell lymphoma*

Supervisors: Karen Dybkær, Linnéa Schmidt, Issa Ismail Issa, Hanne Due Rasmussen, Allan Stensballe and Christopher Aboo (Department of Health Science and Technology, Aalborg University)

Maja Zimmer Jakobsen, MSc in Health Science and Technology, BSc in nursing, Department of Haematology

Title: *Prognostic and predictive biomarkers of response to proteasome inhibitors in multiple myeloma*

Supervisor: Karen Dybkær

Julie Haugaard Vandtved, MD, Department of Haematology

Title: *Bleomycin-induced pulmonary toxicity in Hodgkin lymphoma*

Supervisor: Tarec C. El-Galaly

Mathilde Selmar Pedersen, MD, Department of Haematology

Title: *Work disability and return to work after adult acute lymphoblastic leukaemia: a Danish nationwide cohort study*

Supervisor: Marianne Tang Severinsen

Josephine Galsklint, Medical Student, Department of Haematology

Title: *Blood type, obesity, and venous thromboembolism after major orthopedic surgery of lower extremity*

Supervisor: Marianne Tang Severinsen

Trine Louise Jåtun, Medical Student, Department of Haematology

Title: *Temporal changes in survival among adult patients with acute lymphoblastic leukemia in the period 1998-2020: a Danish nationwide population-based study*

Supervisor: Marianne Tang Severinsen

Trine Trab, Medical Student, Department of Haematology

Title: *Secondary malignancies following high-dose chemotherapy (HDT) with autologous stem cell transplantation in patients with lymphoma*

Supervisor: Tarec C. El-Galaly. Daily supervisor: Joachim Bæch. Co-supervisors: Marianne Tang Severinsen, Andreas Kiesbye Øvlisen, Lasse Hjort Jakobsen

Lise Dueholm Bertelsen, Medical Student, Department of Haematology

Title: *Geografisk fordeling af hæmatologiske kræftsygdomme samt risikofaktorer i miljøet - et dansk nationalt kohorte-studie: MGUS og myelomatose*

Supervisor: Marianne Tang Severinsen. Co-supervisors: Lars Børty Nielsen, Henrik Gregersen, Heidi Søgaard Christensen, Martin Bøgsted.

Christian Teglgaard, Medical Student, Department of Haematology

Title: *Geographical distribution of myelodysplastic syndrome (MDS) and acute myeloid leukemia (AML) in Denmark: a national cross-sectional study*

Supervisor: Marianne Tang Severinsen. Co-supervisor: Martin Bøgsted.

Asta Brogaard Christensen, BSc, Master Student

Title: *Applying the CRISPR activation system for functional studies of treatment resistance in diffuse large B-cell lymphoma*

Supervisor**:** Karen Dybkær. Co-supervisors: Hanne Due, Issa Ismail Issa

Cathrine Sylvester, BSc, Master Student

Title: *Unravelling the role of the UBE2A gene, identified in genome-wide CRISPR screens, on treatment response in DLBCL*

Supervisor: Karen Dybkær. Co-supervisors: Maja Zimmer Jacobsen, Hulda Haraldsdóttir

Freja Tang Severinsen, DARE Research Fellow and Medical Student, Stanford Blood and Marrow Transplantation Division, San Francisco, CA, USA

Title: *Infektioner efter transplantation og cellulære terapier*

Supervisor: Tarec C. El-Galaly

5 Research grants and awards

External funding 2022

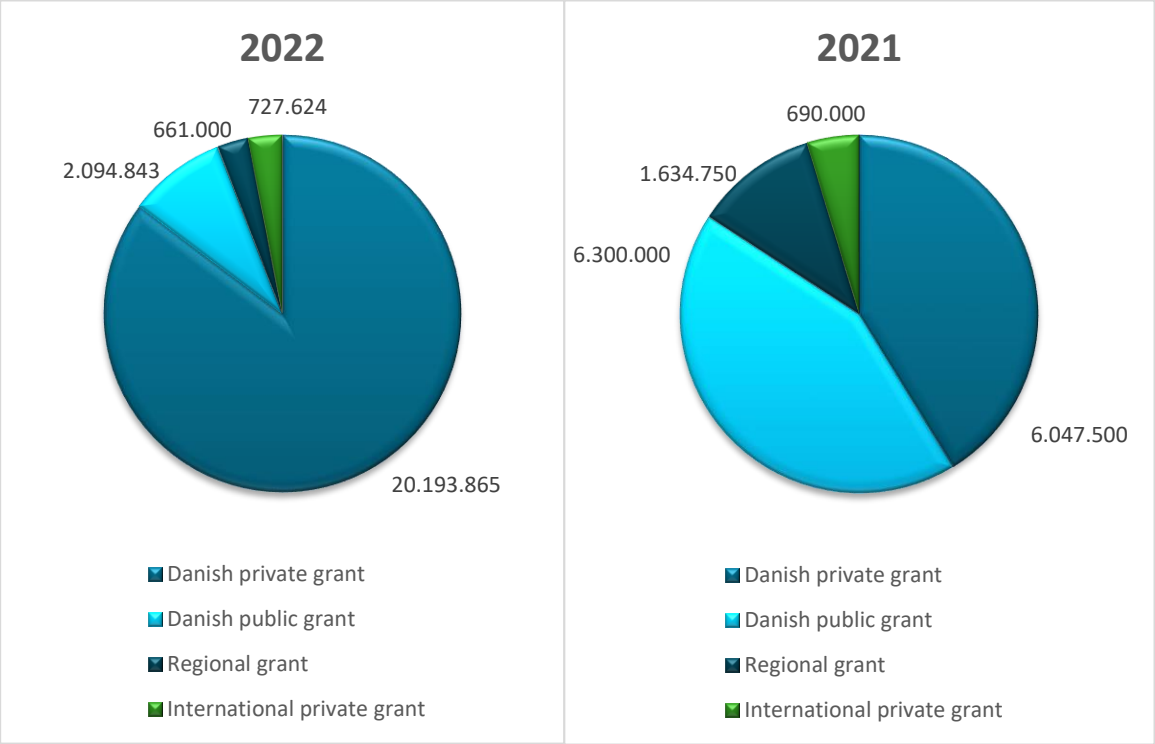
In 2022 the Research Section of Department of Haematology at Aalborg University Hospital sent 72 funding applications resulting in 30 grants amounting to 23.7 million DKK from Danish and international private and public foundations. In 2021, secured funding amounted to 14.7 million DKK. Below is an overview of funders and the projects receiving grants in 2022.

Table 1 | Funding secured in 2022

Funder	Project	Recipient	Type	Duration
A.P. Møller Fonden til Lægevidenskabens Fremme	CDCA2	Hanne Due	Danish private grant	2022-2023
A.P. Møller Fonden til Lægevidenskabens Fremme	PhD: Card-HDT	Joachim Bæch	Danish private grant	2022
Agnes & Poul Friis' Fond	PhD: SMZL	Ahmed L. Al-Mashhadi	Danish private grant	2023-
Clinic for Surgery and Oncology – Research Pool	LAHS	Mads Okkels	Regional grant	2022-2025
Clinic for Surgery and Oncology – Research Pool	PhD: SMZL	Ahmed L. Al-Mashhadi	Regional grant	2022
Clinic for Surgery and Oncology – Research Pool	PhD: REFORM-AML	Daniel Kristensen	Regional grant	2022
Danish Cancer Society's Junior Researcher Award (nominated by Tarec C. El-Galaly et al.)	Researcher Award	Lasse H.K. Jakobsen	Danish private grant	2022-2023
Danish Cancer Society - KBVU-MS Project	PhD: REFORM-AML	Anne S. Roug Daniel Kristensen	Danish private grant	2023-2024
Danish Cancer Society - Stay Abroad	Travel Grant	Eva Futtrup Maksten	Danish private grant	2023
Danish Cancer Society - Young Talented Researchers (Knæk Cancer)	HL prognosis	Lasse H.K. Jakobsen	Danish private grant	2023-2024
Danish Data Science Academy (DDSA) small event	DLG workshop	Lasse H.K. Jakobsen	Danish private grant	2023
EHA Research Mobility Grant	PhD Travel Grant	Ahmed L. Al-Mashhadi	International private grant	2022-2023
Independent Research Fund Denmark The Inge Lehmann Program	EBC	Inger Lise Gade	Danish public grant	2023-2026
Incyte Nordic Grant for Hematological Research	LAHS	Tarec C. El-Galaly Mads Okkels	International private grant	2024-2027
Inge & Jørgen Larsen's Memorial Grant	PhD: REFORM-AML	Daniel Kristensen	Danish private grant	2022-2024
Knud Højgaard's Foundation	Travel Grant	Issa Ismail Issa	Danish private grant	2022
Nordic Cancer Union Research Grant	RWD Lymphoma	Tarec C. El-Galaly	International private grant	2023

Novo Nordisk Foundation - Exploratory Interdisciplinary Synergy Programme 2022	AI-HEMO	Tarec C. El-Galaly (co-applicant)	Danish private grant	2023-2026
Novo Nordisk Foundation Research Year Scholarship	Scholarship	Marianne T. Severinsen Christian Teglgaard	Danish private grant	2022-2023
Novo Nordisk Foundation Research Year Scholarship	Scholarship	Tarec C. El-Galaly Julie V. Haugaard	Danish private grant	2022
Region Nordjyllands Sundhedsvidenskabelige Forskningsfond	PhD	Rasmus R.K. Jørgensen	Regional grant	2023
Region Nordjyllands Sundhedsvidenskabelige Forskningsfond	PhD	Sander Boisen Valentin	Regional grant	2023
Region Nordjyllands Sundhedsvidenskabelige Forskningsfond	PhD	Maren P. Jørgensen	Regional grant	2023
Region Nordjyllands Sundhedsvidenskabelige Forskningsfond	PhD	Maja Zimmer Jakobsen	Regional grant	2023
Reservelægefonden	Travel Grant (ASH)	Andreas Kiesby Øvlisen	Regional grant	2022
Reservelægefonden	Travel Grant (ASH)	Ahmed L. Al-Mashhadi	Regional grant	2022
Savværksejer Jeppe Juhl og Hustru Ovita Juhls Mindelegat	MPAL	Marianne T. Severinsen	Danish private grant	2022-2025
Sygeforsikringen "danmark" donation	AL-MM-risk	Marianne T. Severinsen	Danish private grant	2023-2027
Sygeforsikringen "danmark" donation	AI-neutropeni	Tarec C. El-Galaly	Danish private grant	2023-2027
Aalborg University	Travel Grant (PhD)	Issa Ismail Issa	Danish public grant	2022
Aalborg University - Research Student Grant	work-ALL	Mathilde S. Pedersen	Danish public grant	2022
Aalborg University - Research Student Grant	temp-ALL	Trine Jåtun	Danish public grant	2022
Aalborg University - Research Student Grant	lunge-HL	Julie H. Vandtved	Danish public grant	2022

Figure 1.1, 1.2 | Breakdown of types of research grants awarded in 2021 and 2022



6 Dissemination of scientific output

Conference contributions

Hagedorn prize for best oral presentation

Private photo

Postdoc, Registrar, PhD Inger Lise Gade was awarded the Hagedorn prize for best oral presentation at the yearly Hagedorn Meeting in March 2022 held by Danish Society for Internal Medicine. The presentation “Exhaled Breath Condensate and Pulmonary Embolism” was about diagnosing pulmonary embolism by analysis of exhaled breath condensate.

Apart from the honour, Inger Lise received 10,000 DKK

Research stays abroad

Freja Tang Severinsen

Research fellow (pre-graduate scholarship) at Stanford Blood and Marrow Transplantation Division, San Francisco, California, USA, as part of the Lundbeck Foundation Danish American Research Exchange (DARE). Project: Immune function in lymphoma patients. American mentor: Surbhi Sidana. Danish Mentor: Tarec C. El-Galaly. August 2021 – July 2022.

Joachim Bæch

MD and PhD student at Aalborg University Hospital. In 2022 he stayed at Karolinska Institutet in Stockholm for a two-month research exchange with the focus on investigating treatment-related cardiotoxicities for Swedish patients with Hodgkin lymphoma. He is supervised by Professor Tarec Christoffer El-Galaly.

Issa Ismail Issa

PhD student at Aalborg University. He had a research stay at the University of Nebraska Medical Center in Omaha in the USA for two months during the summer of 2022, working on projects related to drug resistance in lymphomas both in the laboratory and using molecular data from lymphoma patients' tumor samples. Issa is supervisor by Professor Karen Dybkær.

Guest researchers and students from abroad

Dr. Joshua Entrop is PhD student at Karolinska. He visited Aalborg two times during 2022 to work on fertility in lymphoma. He is co-supervised by Professor Tarec Christoffer El-Galaly

Paul Guillot is a student of biotechnologies and engineering from Mines Paris - PSL. He was here as a research intern for six months in 2022, supervised by Professor Martin Bøgsted and Program Manager Charles Vesteghem.

Collaborations

Mayo Clinic, Rochester, Minnesota, USA

Stanford University, California, USA

Karolinska Universitetet, Stockholm, Sweden

Oslo University, Oslo, Norway

The University of Western Australia, Perth, Western Australia, Australia

The University of British Columbia, Vancouver, British Columbia, Canada

Duke University, Durham, North Carolina, USA

Universitetet i Tromsø, Norges Arktiske Universitet, Tromsø, Norway

University of Nebraska Medical Center, Omaha, Nebraska, USA

National and international society memberships and chairs

Dansk Hæmatologisk Selskab (DHS)

Danish Lymphoma Group (DLG)

Acute Leukemia Group (ALG)

Danish Myeloma Study Group (DMSG)

Danish Study Group for Chronic Myeloid Diseases (DSKMS)

Danish National Genome Center (NGC) Research and Infrastructure Committee

Nordic Lymphoma Group (NLG)

Nordic MDS Group (NMDSG)

Nordic AML Group (NAML)

Medical Research Council UK (MRC)

Nordic Myeloma Study Group (NMSG)

European Myeloma Network (EMN)

Scandinavian Thrombosis and Cancer group (STAC)

7 Scientific output

Bibliometrics

Table 2 | H-index of research leaders. Indexed publications, citations, and H-index.

		Publications		Citations		H-index	
Title	Name	Scopus	WoS	Scopus	WoS	Scopus	WoS
Professor	Marianne Tang Severinsen	95	145	2068	1875	22	22
Professor	Karen Dybkær	134	198	4429	4316	35	36
Professor	Martin Bøgsted	170	215	2321	2171	25	24
Professor	Tarec Christoffer El-Galaly	124	209	1971	1910	25	26

Data derived from Scopus and Web of Science (WoS).

Not all publications are indexed in Scopus or Web of Science

Figure 2 | Number of publications in subcategories in the past 10 years (2013-2022)

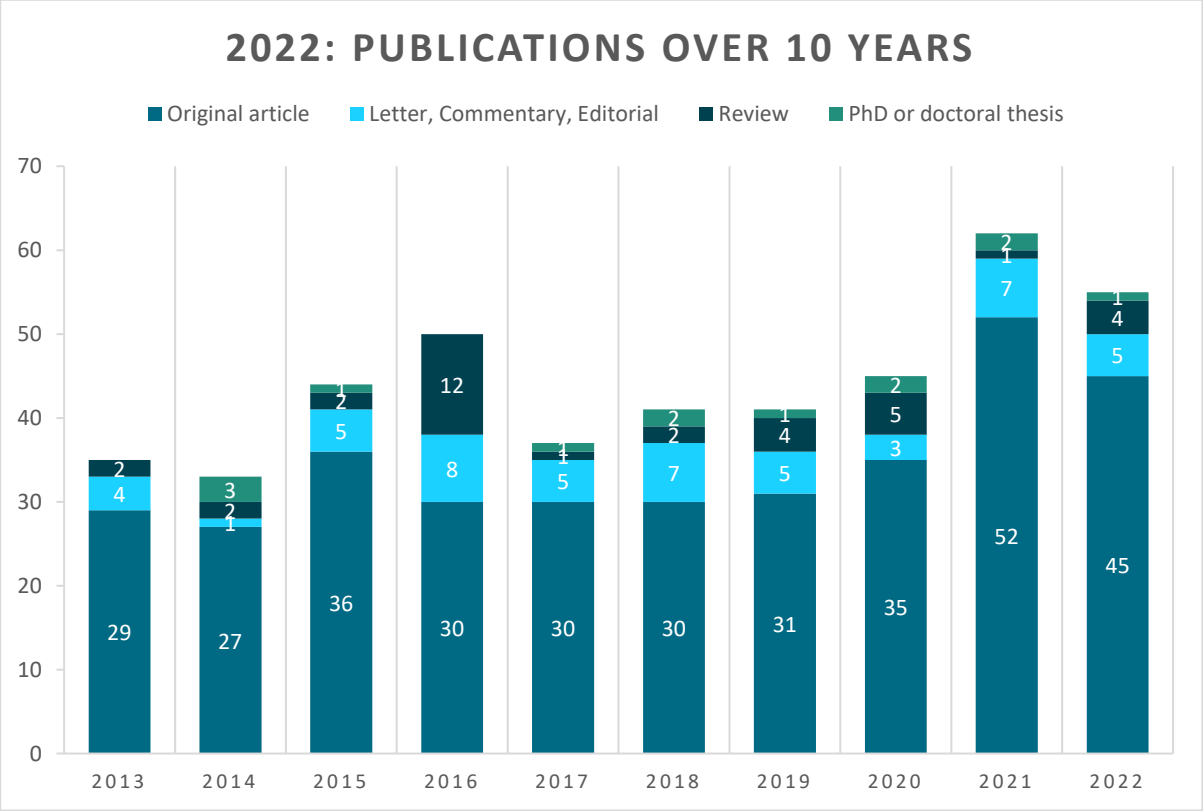
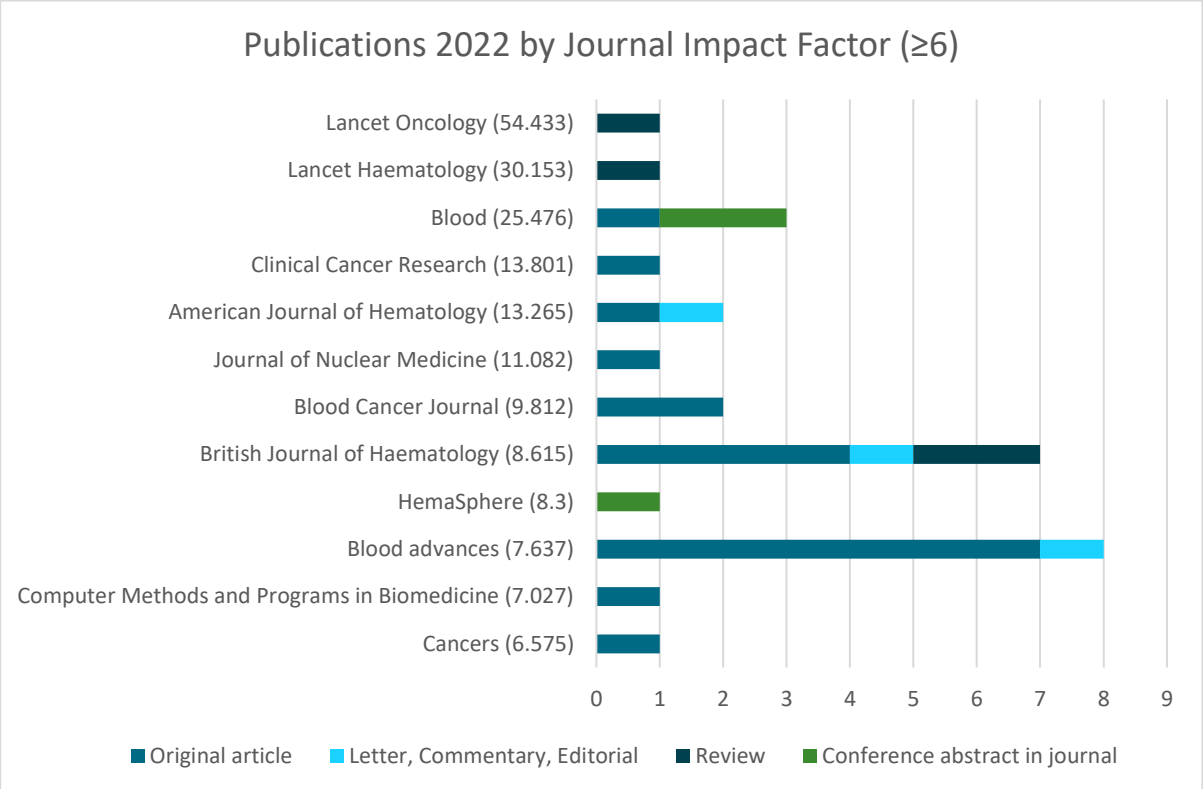


Figure 3 | Papers published in journals with impact factor (IF) >6 (IF given in brackets) 2021



8 Publication list

Publications in 2022

Impact factor >10

1. Eyre, TA, Savage, KJ, Cheah, CY, **El-Galaly, TC**, Lewis, KL, McKay, P, Wilson, MR, Evens, AM, Bobillo, S, Villa, D, Maurer, MJ, Cwynarski, K & Ferreri, AJM 2022, 'CNS prophylaxis for diffuse large B-cell lymphoma', *The Lancet Oncology*, bind 23, nr. 9, s. e416-e426. (IF 54.433)

2. Thanarajasingam, G, Minasian, LM, Bhatnagar, V, Cavalli, F, De Claro, RA, Dueck, AC**, El-Galaly, TC**, Everest, N, Geissler, J, Gisselbrecht, C, Gormley, N, Gribben, J, Horowitz, M, Ivy, SP, Jacobson, CA, Keating, A, Kluetz, PG, Kwong, YL, Little, RF, Matasar, MJ, Mateos, M-V, McCullough, K, Miller, RS, Mohty, M, Moreau, P, Morton, LM, Nagai, S, Nair, A, Nastoupil, L, Robertson, K, Sidana, S, Smedby, KE, Sonneveld, P, Tzogani, K, van Leeuwen, FE, Velikova, G, Villa, D, Wingard, JR, Seymour, JF & Habermann, TM 2022, 'Reaching beyond maximum grade: progress and future directions for modernising the assessment and reporting of adverse events in haematological malignancies', *The Lancet. Haematology*, bind 9, nr. 5, s. e374-e384. (IF 30.153)

3. Wilson, MR, Eyre, TA, Kirkwood, AA, Wong Doo, N, Soussain, C, Choquet, S, Martinez-Calle, N, Preston, G, Ahearne, MJ, Schorb, E, Moles-Moreau, M-P, Ku, M, Rusconi, C, Khwaja, J, Narkhede, M, Lewis, KL, Calimeri, T, Durot, E, Renaud, L, **Øvlisen, AK,** Mcilroy, G, Ebsworth, TJ, Elliot, J, Santarsieri, A, Ricard, L, Shah, N, Liu, Q, Zayac, AS, Vassallo, F, Lebras, L, Roulin, L, Lombion, N, Manos, K, Fernandez, R, Hamad, N, Lopez-Garcia, A, O'Mahony, D, Gounder, P, Forgeard, N, Lees, C, Agbetiafa, K, Strüessmann, T, Htut, TW, Clavert, A, Scott, H, Guidetti, A, Barlow, BR, Tchernonog, E, Smith, J, Miall, F, Fox, CP, Cheah, CY, **El Galaly, TC,** Ferreri, AJM, Cwynarski, K & McKay, P 2022, 'Timing of high dose methotrexate CNS prophylaxis in DLBCL: a multicenter international analysis of 1,384 patients', *Blood*, bind 139, nr. 16, s. 2499-2511. (IF 25.476)

4. Xu-Monette, ZY, Wei, L, Fang, X, Au, Q, Nunns, H, Nagy, M, Tzankov, A, Zhu, F, Visco, C, Bhagat, G, **Dybkaer, K,** Chiu, A, Tam, W, Zu, Y, Hsi, ED, Hagemeister, FB, Sun, X, Han, X, Go, H, Ponzoni, M, Ferreri, AJM, Møller, MB, Parsons, BM, van Krieken, JH, Piris, MA, Winter, JN, Li, Y, Xu, B, Albitar, M, You, H & Young, KH 2022, 'Genetic subtyping and phenotypic characterization of the immune microenvironment and MYC/BCL2 double expression reveal heterogeneity in diffuse large B-cell lymphoma', *Clinical Cancer Research*, bind 28, nr. 5, s. 972-983. (IF 13.801)

5. **Øvlisen, AK, Jakobsen, LH,** Kragholm, KH, Nielsen, RE, de Nully Brown, P, Dahl-Sørensen, RB, Frederiksen, H, Mannering, N, Josefsson, PL, **Ludvigsen Al-Mashhadi, A,** Jørgensen, JM, Dessau-Arp, A, Clausen, MR, Pedersen, RS, Torp-Pedersen, C, **Severinsen, MT & El-Galaly, TC** 2022, 'Mental Health Among Patients with non-Hodgkin Lymphoma: a Danish Nationwide Study of Psychotropic Drug Use in 8,750Patients and 43,750 Matched Comparators', *American Journal of Hematology*, bind 97, nr. 6, s. 749-761. (IF 13.265)

6. Szabo, AG, Thorsen, J, Iversen, KF, Levring, MB, Preiss, B, Helleberg, C, Breinholt, MF, Hermansen, E, Gjerdrum, LMR, Bønløkke, ST, Nielsen, K, Kjeldsen, E, **Teodorescu, EM**, Dokhi, M, Kurt, E, Strandholdt, CN, Andersen, MK & Vangsted, AJ 2022, 'The clinical course and life expectancy of patients with multiple myeloma who discontinue their first daratumumab-containing line of therapy', *American Journal of Hematology*, bind 97, nr. 3, s. E117-E120. (IF 13.265)

7. Barrington, SF, Mir, F, **El-Galaly, TC**, Knapp, A, Nielsen, TG, Sahin, D, Wenger, M, Kostakoglu, L, Trotman, J & Meignan, M 2022, 'Follicular lymphoma treated with first-line immunochemotherapy: A Review of PET/CT in Patients Who Did Not Achieve a Complete Metabolic Response in the GALLIUM Study', *Journal of Nuclear Medicine*, bind 63, nr. 8, s. 1149-1154. (IF 11.082)

Impact factor 6-9

8. Albitar, M, Zhang, H, Goy, A, Xu-Monette, ZY, Bhagat, G, Visco, C, Tzankov, A, Fang, X, Zhu, F, **Dybkaer, K,** Chiu, A, Tam, W, Zu, Y, Hsi, ED, Hagemeister, FB, Huh, J, Ponzoni, M, Ferreri, AJM, Møller, MB, Parsons, BM, van Krieken, JH, Piris, MA, Winter, JN, Li, Y, Xu, B & Young, KH 2022, 'Determining clinical course of diffuse large B-cell lymphoma using targeted transcriptome and machine learning algorithms', *Blood Cancer Journal*, bind 12, nr. 2, 25. (IF 9.812)

9. **Jakobsen, LH, Øvlisen, AK, Severinsen, MT, Bæch, J,** Kragholm, KH, Glimelius, I, Gang, AO, Jørgensen, JM, Frederiksen, H, Poulsen, CB, Clausen, MR, Pedersen, PT, Pedersen, RS, Torp-Pedersen, C, Eloranta, S & **El-Galaly, TC** 2022, 'Patients in complete remission after R-CHOP(-like) therapy for diffuse large B-cell lymphoma have limited excess use of health care services in Denmark', *Blood Cancer Journal*, bind 12, nr. 1, 16. (IF 9.812)

10. Eyre, TA, **Jensen, P**, Booth, S & **El-Galaly, TC** 2022, 'Bone health and glucocorticoid-containing lymphoma therapy - a review of risk factors and preventative measures', *British Journal of Haematology*, bind 198, nr. 3, s. 431-442. (IF 8.615)

11. **Kristensen, DT, Nielsen, LB, Jakobsen, LHK, Kristensen, T-CC,** Jepsen, LØ, Schöllkopf, C, Theilgaard-Mönch, K, **El-Galaly, TC, Roug, AS & Severinsen, MT** 2022, 'Effects of chemotherapy dose reductions in overweight patients with acute myeloid leukaemia: A Danish nationwide cohort study', *British Journal of Haematology*, bind 199, nr. 4, s. 539-548. (IF 8.615)

12. Petersen, MA, Rosenberg, CA, **Brøndum, RF,** Aggerholm, A, Kjeldsen, E, Rahbek, O, Ludvigsen, M, Hasle, H, **Roug, AS** & Bill, M 2022, 'Immunophenotypically defined stem cell subsets in paediatric AML are highly heterogeneous and demonstrate differences in BCL-2 expression by cytogenetic subgroups', *British Journal of Haematology*, bind 197, nr. 4, s. 452-466. (IF 8.615)

13. Andersen, MD, Hamilton-Dutoit, S, Modvig, L, Vase, M, **Christiansen, I,** Christensen, JH, Dahl-Sørensen, RB, Stoltenberg, D, Kamper, P & d'Amore, F 2022, 'Late recurrence of lymphoid malignancies after initial treatment for Hodgkin lymphoma - A study from the Danish Lymphoma Registry', *British Journal of Haematology*, bind 198, nr. 1, s. 50-61. (IF 8.615)

    El-Galaly, TC & Glimelius, I 2022, 'Late relapses in Hodgkin lymphoma - should we search for the needle in the haystack?', *British Journal of Haematology*, bind 198, nr. 1, s. 11-13. (IF 8.615)

14. Harrysson, S, Eloranta, S, Ekberg, S, Enblad, G, **El-Galaly, TC,** Sander, B, Sonnevi, K, Andersson, P-O, Jerkeman, M & Smedby, KE 2022, 'Outcomes of relapsed/refractory diffuse large B-cell lymphoma and influence of chimaeric antigen

receptor T trial eligibility criteria in second line-A population-based study of 736 patients', *British Journal of Haematology*, bind 198, nr. 2, s. 267-277. (IF 8.615)

15. **El-Galaly, TC**, Villa, D, Cheah, CY & Gormsen, LC 2022, 'Pre-treatment total metabolic tumour volumes in lymphoma: Does quantity matter?', *British Journal of Haematology*, bind 197, nr. 2, s. 139-155. (IF 8.615)

16. Træden, D, Tulstrup, M, Cowland, JB, Sjö, LD, **Bøgsted, M**, Grønbæk, K, Andersen, MK & Hansen, JW 2022, 'A predictive model for bone marrow disease in cytopenia based on noninvasive procedures', *Blood advances*, bind 6, nr. 11, s. 3541-3550. (IF 7.637)

17. **Jensen, P, Hjort Jakobsen, L, Bøgsted, M, Baech, J,** Lykkeboe, S, **Severinsen, MT,** Vestergaard, P & **El-Galaly, TC** 2022, 'A randomized trial of alendronate as prophylaxis against loss in bone mineral density following lymphoma treatment', *Blood advances*, bind 6, nr. 8, s. 2549-2556. (IF 7.637)

18. Li, Y, Xu-Monette, ZY, Abramson, J, Sohani, A, Bhagat, G, Tzankov, A, Visco, C, Zhang, S, **Dybkaer, K**, Pan, Z, Xu, M, Tam, W, Zu, Y, Hsi, ED, Hagemeister, FB, Go, H, van Krieken, JH, Winter, JN, Ponzoni, M, Ferreri, AJM, Møller, MB, Piris, MA, Wang, Y, Zhang, M & Young, KH 2022, 'EBV-positive DLBCL frequently harbors somatic mutations associated with clonal hematopoiesis of indeterminate potential', *Blood advances*. (IF 7.637)

19. Knudsen, TA, Skov, V, Stevenson, KE, Werner, L, Duke, W, Laurore, C, Gibson, CJ, Nag, A, Thorner, AR, Wollison, B, Hansen, DL, Ellervik, C, El Fassi, D, de Stricker, K, Ocias, LF, Brabrand, M, Bjerrum, OW, Overgaard, UM, Frederiksen, M, Kristensen, TK, Kruse, TA, Thomassen, M, Mourits-Andersen, T, **Severinsen, MT,** Stentoft, J, Starklint, J, Neuberg, DS, Kjaer, L, Larsen, TS, Hasselbalch, HC, Lindsley, RC & Mullally, A 2022, 'Genomic Profiling of a Randomized Trial of Interferon-α versus Hydroxyurea in MPN Reveals Mutation-Specific Responses', *Blood advances*, bind 6, nr. 7, s. 2107–2119. (IF 7.637)

20. Joelsson, JK, Wästerlid, T, Rosenquist, R, **Jakobsen, LH, El-Galaly, TC,** Ekström Smedby, K & Eloranta, S 2022, 'Incidence and time trends of second primary malignancies after non-Hodgkin lymphoma: a Swedish population-based study', *Blood advances*, bind 6, nr. 8, s. 2657-2666. (IF 7.637)

21. **Baech, J, Severinsen, MT, Øvlisen, AK,** Frederiksen, H, Vestergaard, P, Torp-Pedersen, C, Jørgensen, JM, Clausen, MR, Poulsen, CB, Brown, P, Gang, AO, Pedersen, R, Ekström Smedby, K, Eloranta, S, **Hjort Jakobsen, L & El Galaly, TC** 2022, 'Risk of diabetes and the impact on preexisting diabetes in patients with lymphoma treated with steroid-containing immunochemotherapy', *Blood advances*, bind 6, nr. 15, s. 4427-4435. (IF 7.637)

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Overvad, TF, Ording, AG, Nielsen, PB, Skjøth, F, Albertsen, IE, Noble, S, Krog Vistisen, A, **Gade, IL, Severinsen, MT**, Piazza, G & Larsen, TB 2022, 'Validation of the Khorana score for predicting venous thromboembolism in 40 218 patients with cancer initiating chemotherapy', *Blood advances*, bind 6, nr. 10, s. 2967-2976. (IF 7.637)

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cure models in R using the packages cuRe and rstpm2', *Computer Methods and Programs in Biomedicine*, bind 226, 107125. (IF 7.027)

24. Wysocki, O, Zhou, C, Rogado, J, Huddar, P, Shotton, R, Tivey, A, Albiges, L, Angelakas, A, Arnold, D, Aung, T, Banfill, K, Baxter, M, Barlesi, F, Bayle, A, Besse, B, Bhogal, T, Boyce, H, Britton, F, Calles, A, Castelo-Branco, L, Copson, E, Croitoru, A, Dani, SS, Dickens, E, Eastlake, L, Fitzpatrick, P, Foulon, S, Frederiksen, H, Ganatra, S, Gennatas, S, Glenthøj, A, Gomes, F, Graham, DM, Hague, C, Harrington, K, Harrison, M, Horsley, L, Hoskins, R, Hudson, Z, **Jakobsen, LH,** Joharatnam-Hogan, N, Khan, S, Khan, UT, Khan, K, Lewis, A, Massard, C, Maynard, A, McKenzie, H, Michielin, O, Mosenthal, AC, Obispo, B, Palmieri, C, Patel, R, Pentheroudakis, G, Peters, S, Rieger-Christ, K, Robinson, T, Romano, E, Rowe, M, Sekacheva, M, Sheehan, R, Stockdale, A, Thomas, A, Turtle, L, Viñal, D, Weaver, J, Williams, S, Wilson, C, Dive, C, Landers, D, Cooksley, T, Freitas, A, Armstrong, AC, Lee, RJ, On Behalf Of The Esmo Co-Care & ESMO Co-Care 2022, 'An International Comparison of Presentation, Outcomes and CORONET Predictive Score Performance in Patients with Cancer Presenting with COVID-19 across Different Pandemic Waves', *Cancers*, bind 14, nr. 16, 3931. (IF 6.675)

Impact factor <6

25. **Jensen, O, Øvlisen, AK, Jakobsen, LH, Roug, AS,** Nielsen, RE, Marcher, CW, Ebbesen, LH, Theilgaard-Mönch, K, Møller, P, Schöllkopf, C, Torp-Pedersen, C, **El-Galaly, TC & Severinsen, MT** 2022, 'Psychotropic Drug Use in Acute Myeloid Leukaemia (AML) and Myelodysplastic Syndrome (MDS): A Danish Nationwide Matched Cohort Study of 2404 AML and 1307 MDS Patients', *Clinical Epidemiology*, bind 14, s. 225-237. (IF 5.814)

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