

Research and Teaching

The Medical Faculty of the
University of Duisburg-Essen



FACULTY OF MEDICINE
UNIVERSITY OF DUISBURG-ESSEN

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Preface

Dear readers,

We are pleased to present this report, the first comprehensive overview of the scientific accomplishments achieved by the Medical Faculty of the University of Duisburg-Essen!

Although research, teaching, and health care are closely interlinked at the Essen University Hospital campus, this publication specifically highlights our outstanding achievements in research and teaching, both currently and over the past five years.

We present our analysis of the overall status quo; at the same time, we share our view of the research situation from the perspective of each of the hospital's departments and other units, and we are especially proud to present these special insights.

For this reason, we specifically thank all of the department and institute heads who so actively supported us by presenting their units' focuses and profiles. Their sharing of the intricate details of their activities in research and teaching were an important contribution to our achieving this goal.





From left to right: Dr. Alexander Hanspach (Managing Director), Prof. Dr. Joachim Fandrey (Academic Vice Dean), Prof. Dr. Jan Buer (Dean), Prof. Dr. Sigrid Elsenbruch (Vice Dean for Early Career Support and Diversity), Prof. Dr. Peter Hoyer (Vice Dean for Planning and Finances), and Prof. Dr. Michael Forsting (Vice Dean for Research).

As a medical school, we may be relatively small and, at the tender age of 53, still quite young, but we can nevertheless be proud of our accomplishments. And despite our size, we can hold our own against other medical schools both in North Rhine-Westphalia and the rest of Germany.

To support our research excellence, we have made a point of investing in the expansion of our science infrastructure and core facilities. For example, in recent years, we have established a central imaging facility with state-of-the-art imaging techniques and a central biobank for storing liquid and solid biological samples.

But we do not plan to rest on our laurels. These successes motivate us and make us committed to continuing this path in the future to promote innovation and to further advance research and teaching at our medical school.

Sincerely,

Prof. Dr. med. Jan Buer
Dean

1.

Executive Summary

The Medical Faculty of the University of Duisburg-Essen was founded in 1963. Employing approximately 95 professors and more than 1,500 researchers, it offers outstanding training opportunities for some 1,875 students. It is one of Germany's youngest and smallest medical schools.

At the same time, the research and teaching in Essen can compete with those of other institutions. In recent years in particular, the medical school has seen rapid development, in part because of a strategic appointment policy.

The Medical Faculty began sharpening its research profile early on, explicitly focusing on the research areas of cardiovascular medicine, oncology, and transplantation, along with the interdisciplinary focuses of genetic medicine, immunology, and infectious diseases. In recent years, the close links between basic and clinical research have yielded a wide range of new methods of diagnosis and treatment, leading to optimized health care procedures.

The basic concept provides for comprehensive networking among the individual departments, and such networking is explicitly supported. All institutes and departments are active in at least one research focus. At the same time, networks involving other national and international institutions also play a key role.

For instance, Essen coordinated the first joint Collaborative Research Center (Sino-German Transregional Collaborative Research Center, Transregio 60, SFB/TRR 60) with partners in China in 2009. The Medical Faculty is also responsible for various DFG-funded Research Units and Research Training Groups. The faculty's researchers also participate in important studies, such as the German National Cohort, and are part of important networks, including the German Cancer Consortium (DKTK).

It goes without saying that providing training for our students is a top priority. We have consistently invested in this training, for instance by upgrading infrastructure such as the Medical Faculty's state-of-the-art teaching and learning center, which opened in 2014.



At the same time, we have systematically refined our curriculum, which meets all of the requirements for modern, comprehensive medical training. For example, the Medical Faculty has operated a cutting-edge Skills Laboratory for 11 years and has used a dedicated simulated patient program to foster practical hands-on training for students for 12 years. This is a key area of teaching for which Essen serves as the base for coordinating collaboration among all medical schools in North Rhine-Westphalia.

The Essen University Hospital Medical Faculty is one of the few medical schools in Germany to award a share of the available student placements on the basis of personal selection interviews that complement candidates' academic credentials. Special mentoring programs, the targeted use of e-learning tools, and the awarding of scholarships ensure our high standards for excellent training. A particular focus is also placed on conscious promotion of early career support, particularly for women, for achieving academic milestones such as habilitations and professorships.

Our scientific success can be measured by the various output parameters in Germany's largest university ranking, the CHE University Ranking (2015/2016 report). An ever increasing number of publications and the continuously growing acquisition of external funding play a key role in this area. One example is SEVRIT, an important EU project with a substantial project volume, acquired in early 2016. This funding means that our research is also very successful in comparison to that of the other medical schools in North Rhine-Westphalia and throughout Germany, as evidenced by the Medical Faculty's leading position in the area of research in the current CHE report. This is an overall positive development that is set to continue in the coming years.

2.

Structure and Development of the Medical Faculty

Origins and Developments to the Present

Today's University of Duisburg-Essen (UDE) Medical Faculty looks back on a 53-year history. Initially founded in 1963 as a second medical school of Münster University, the medical faculty became part of the University of Bochum in 1967. The year 1972 marked the assignment of the Medical Faculty to the newly created Comprehensive University of Essen. In 2003, the University of Essen merged with the Gerhard-Mercator University Duisburg to form today's University of Duisburg-Essen.

With the reestablishment of the Comprehensive University of Essen, in 1973 the federal state of North Rhine-Westphalia assumed the sponsorship of Essen University Hospital (UK Essen), which has been independent as a public-law institution since 2001.

The teaching program of the Medical Faculty was launched in the 1963/1964 winter term with only 70 students. By the following summer term, this number had swelled to 176, and by the 1964/1965 winter term the enrollment figure stood at 240. Because a number of students had begun their medical studies at other institutions, it wasn't long before the first PhD dissertations and state medical examinations were completed and passed. In 2015, the first "golden doctoral anniversaries" were celebrated.



The Medical Faculty today

Today, the Medical Faculty is a modern medical school featuring first-class international science and research and offering outstanding training for future medical doctors. The governing bodies of the Medical Faculty are the Dean's Office and the Faculty Council.

Dean's Office

The Dean's Office is the governing body of the Medical Faculty and is responsible for all affairs of the Medical Faculty for which no other body is explicitly designated responsible by the Higher Education Act (HG) or the law directive decreed in accordance with Section 31a of the Higher Education Act (HG).

Members of the Dean's Office (last updated October 2016)

- Prof. Dr. Jan Buer, Dean

- Prof. Dr. Joachim Fandrey, Academic Vice Dean

- Prof. Dr. Michael Forsting, Vice Dean for Research

- Prof. Dr. Peter Hoyer, Vice Dean for Planning and Finances

- Prof. Dr. Sigrid Elsenbruch, Vice Dean for Early Career Support and Diversity

- Dr. Alexander Hanspach, Managing Director

- Prof. Dr. Jochen A. Werner (advisory capacity), Medical Director

- Thorsten Kaatze (advisory capacity), Commercial Director

The duties of the Dean's Office include the disbursement and use of subsidies granted by the federal state and by the Teaching and Research Fund. It also regulates the allocation of the envisaged positions and funds for research and teaching at the Medical Faculty. The Dean's Office provides the Faculty Council with an annual report on its areas of operation.

Faculty Council

The Faculty Council of the Medical Faculty consists of the following members:

- the Dean as the chair in an advisory capacity
- the other members of the Dean's Office in an advisory capacity
- seven representatives of the group of university professors
- seven representatives of the group of academic staff members
- three representatives of the student body

The Faculty Council issues recommendations and statements about the Medical Faculty's development plan, about the principles for the disbursement and use of federal state funds, including the criteria for merit-based disbursement of funds, and about other fundamentally important affairs of the Medical Faculty. The Faculty Council is also responsible for decision-making in matters related to appointment procedures incumbent on the Medical Faculty; for the awarding of the title "Supernumerary Professor" ("Apl. Professor") and "Honorary Professor"; and for habilitations and honorary doctorates. One meeting each of the Faculty Council is specifically dedicated to the topics of teaching and research. The term of office of the voting members from the student body is one year; the representatives of the other groups serve two-year terms.

Committees

To advise and prepare the resolutions of the Dean's Office and the Faculty Council, the Faculty Council forms the following standing faculty committees:

- Departmental Committee for Research and Early Career Support; Chair, Prof. Dr. Michael Forsting and Prof. Dr. Sigrid Elsenbruch
- Faculty Committee for Planning and Finances; Chair, Prof. Dr. Peter Hoyer
- Study Advisory Council and Committee for Quality Improvement in Teaching as a joint committee; Chair, Prof. Dr. Joachim Fandrey

Ethics Committee

The Ethics Committee is charged with the ethical and legal assessment of research projects involving humans (including those who are deceased) and material of human origin that has been removed, as well as epidemiological research projects with person-related data that are to be performed at the Medical Faculty of the University of Duisburg-Essen or one of its facilities and with responsible advisors.

In addition to three physicians with experience in clinical medicine, members of the Ethics Committee include at least one member of the legal profession qualified to exercise the functions of a judge, at least one person with scientific or professional experience in the area of ethics, and at least one person from the area of patient advocacy. To perform its important duties, the Ethics Committee has a dedicated office.

Chair: Prof. Dr. Werner Havers

Commissioners

The Medical Faculty appoints commissioners for key areas. The commissioners are responsible for all activities in the area for which they have been appointed. They serve as points of contact for the particular topic and represent the Medical Faculty both internally and externally. They are generally elected by the Faculty Council for a two-year term.

At present, there are commissioners for the following topics (last updated April 2016):

International Affairs Commissioner of the Medical Faculty, Prof. Dr. Stephan Lang

BAföG (needs-based student loans and funding) Commissioner of the Medical Faculty, Prof. Dr. Manfred Schedlowski; after October 2016, Prof. Dr. Sven Benson

China Commissioner of the Medical Faculty, Prof. Dr. Ulf Dittmer

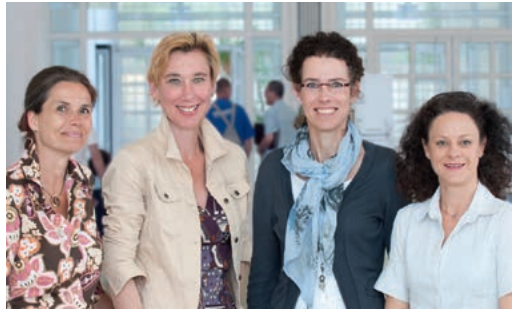
Erasmus Commissioner of the Medical Faculty, Prof. Dr. Eric Metzen

Japan Commissioner of the Medical Faculty, Prof. Dr. Wolfgang Sauerwein

Capability Commissioner of the Medical Faculty Prof. Dr. Joachim Fandrey (Part 1 of medical studies program) and Prof. Dr. Joachim Esser (Part 2 of medical studies program)

Russia Commissioner of the Medical Faculty, Dr. Wilfried E. E. Eberhardt and Dr. Kurt Trübner

*From left to right: PD Dr. Diana Arweiler-Harbeck,
Prof. Dr. Ulrike Schara, PD Dr. Stefanie Flohé,
Prof. Dr. Sigrid Elsenbruch*



Equal Opportunity Commissioner

The Equal Opportunity Commissioner and her deputies are nominated by the female faculty members and elected by the Faculty Council in accordance with Section 7 of the constitution in conjunction with Section 22a of the election regulations of the University of Duisburg-Essen.

Prof. Dr. Ulrike Schara is the Equal Opportunity Commissioner. PD Dr. Diana Arweiler-Harbeck, Prof. Dr. Sigrid Elsenbruch, and PD Dr. Stefanie Flohé are deputy Equal Opportunity Commissioners (last updated April 2016).

Collaboration with the University Hospital and the Board

The Medical Faculty performs its duties in close collaboration with the University Hospital. Decisions in appointment proceedings and other matters related to research, teaching, and studies are made in agreement with Essen University Hospital insofar as patient care and the public health system are concerned. The agreement in appointment proceedings may be disregarded only if there are justified doubts about the suitability of the proposed appointee for the duties to be performed at the University Hospital.

By virtue of his or her office, the Dean is a voting member of the Essen University Hospital Board.

Medical institutions outside the university

Appropriate medical institutions outside the university may be used for the purposes of research and teaching in accordance with their contractual agreements with the sponsors with whom they are affiliated. With the agreement of the Ministry of Innovation, Science, and Research of the State of North Rhine-Westphalia, the university is entitled to grant this type of institution the right to designate itself as a university institution if it meets the research and teaching requirements for a university institution. The following institutions have been granted University Hospital status: Ruhrlandklinik, Department of Psychiatry and Psychotherapy, Department of Psychosomatic Medicine and Psychotherapy; LVR Hospital, Department of Pediatric and Adolescent Psychiatry and Psychotherapy; and Essen-Mitte Hospitals, Department of Maxillofacial Surgery.

If an institution outside the university serves only to provide practical training in line with the Medical Licensure Act, the university may grant it a suitable designation. In the case of a hospital, it may grant the designation "Academic Teaching Hospital." The Medical Faculty maintains agreements with 19 academic teaching hospitals.

Core facilities

The Medical Faculty provides core facilities that are at the disposal of all researchers and scientists.



Centre for Clinical Trials Essen (ZKSE)

The Centre for Clinical Trials Essen (ZKSE) is a facility of the Medical Faculty at the University of Duisburg-Essen. The ZKSE is charged with supporting clinical trials in a practical and quality-oriented manner in line with actual practice, and with refining clinical research in a scientific setting. It serves to develop efficient structures for clinical trials research and to support participating institutions in planning and conducting trials. The facility also aims to develop a research profile complementing existing institutions and to establish binding quality standards and quality assurance measures. The ZKSE assists researchers in raising external funding for conducting clinical trials and in acquiring their own external funding. In addition, it provides capability development through training and further-qualification measures.

The ZKSE's service portfolio also includes the performance of scientifically relevant contract research and the creation of transparency with respect to the funding of research and care.

West German Biobank Essen (WBE)

The West German Biobank Essen (WBE), a central service facility of the Medical Faculty, is what makes the investigation of etiology and, in turn, the improvement of diagnosis and therapy possible in the first place. Donated specimens, along with the associated pseudonymized data of patients treated at Essen University Hospital and its subsidiary hospitals, are stored here under high quality standards and are available for medical research. Blood (and derivatives), urine, and formalin-fixed paraffin-embedded (FFPE) and fresh tissue materials are stored at the WBE. At present, as many as 130,000 specimens are available for research projects to researchers at Essen University Hospital and other German and international institutions. Thanks to the approval of a DFG-reviewed proposal for large-scale devices and accessories (€2.68 million) in 2015, the processing and storage of the specimens are being continually improved. The WBE is currently involved in 127 research projects and is actively listed in the German Cancer Aid's Comprehensive Cancer Center working group for tissue banks, in the working group "Biomaterial banks" of the TMF-registered association in the DKTK network, and in the German Biobank Registry.

Central Laboratory

The Medical Faculty's Central Laboratory, in close cooperation with the Central Laboratory for Routine Diagnostics, offers a service facility for the entire range of laboratory analysis in the context of clinical and experimental scientific studies. The facility is equipped with state-of-the-art infrastructure in the area of clinical chemistry, special analysis for hormones, and metabolic medicine. Comprehensive advice is offered for planning trials. A further core task involves conducting and setting up special assays, as well as analysis and liquid biobanking in the context of large-scale cohort studies. The Central Laboratory's involvement in teaching consists of lectures and practical courses in clinical chemistry and supervision of Bachelor's, Master's, and PhD theses. Trainees enrolled in the Essen University Hospital's medical technical laboratory assistant (MTLA) school also complete their required practical laboratory courses here. The Central Laboratory is DIN EN ISO 15189–certified.

Medical Library

The Medical Library is one of six subject-specific libraries of the University of Duisburg-Essen's University Library (UB). The textbooks in the Medical Library's extensive collection can be used both as hard copies and online. The e-book collection encompasses nearly the entire Springer Verlag portfolio and selected publications by Thieme and Elsevier. The library has 180 carrels and two rooms for group work and is used by students as a place to study Mondays through Fridays from 8:00 am to 8:00 pm. Researchers and physicians tend to use the online resources. The collection comprises approximately 3,700 online journals and the most important medical databases. Publications that are not directly available on site can be ordered for pick-up within 24 hours. The Medical Library's information services and training courses include an introduction to medical database searches and to using the EndNote reference management program and bibliometric analyses.

Central Animal Laboratory (ZTL)

The specialized animal laboratories of the Central Animal Laboratory (ZTL) feature cutting-edge equipment meeting the latest animal protection and hygiene standards. All laboratory animals are kept in strict compliance with the provisions of the German Animal Welfare Act. The ZTL provides trained animal-protection officers who inspect and supervise research projects involving animal experiments. At the ZTL's four core facilities (laboratory unit, surgical unit, transgenic unit, and behavioral unit), the laboratory animals can be studied scientifically. The ZTL also offers a certified 40-hour course on laboratory animal science and on experimental methods; researchers must complete this course before they conduct experiments with laboratory animals. The ZTL also offers scientific advice and assistance with laboratory animal procedures, such as injections, blood sampling, anesthesia, and surgical procedures.

Imaging Center Essen (IMCES)

The Imaging Center Essen (IMCES) features state-of-the-art equipment and expertise in light and electron microscopy, in vivo and intravital imaging, and image analysis. These services are available to all researchers. The IMCES laboratories and microscopy rooms are authorized to work at the S1 and S2 biological safety levels.

Media Center

The Media Center performs all tasks required for preparing digital image and graphic data for all facilities of the Medical Faculty and Essen University Hospital, particularly for the presentation of research and medicine.

Dean's Office Administration

The Dean's Office Administration has recently been strategically expanded and structurally refined. New areas have been created to cover important spheres of responsibility.

The Dean's Office Administration is composed of the following areas (last updated October 2016):





The offices have also been remodeled to meet the new requirements. The Dean's Office Administration has expanded its ground-floor premises to include offices on the first floor. This expansion has permitted the integration of staff members who had previously been working from more remote locations, along with the offices of the external funding services, thus enhancing communication and shortening distances to the Office of Research and Structure and making it more accessible to all professors and scientists.

Gender Equality Plan

The Medical Faculty's Gender Equality Plan in accordance with the state equality act of November 20, 1999, was adopted by the senate of the University of Duisburg-Essen in February 2014 and is valid until February 2017. It provides for the introduction of application procedures for student assistant positions for women pursuing habilitations who are caring for children (see Chapter 3, Research, Promoting Early Career Scientists). In addition to increasing the percentage of women pursuing habilitations, equal opportunity measures at the Medical Faculty cover the scientific staff, gender issues as an element of research and teaching, anti-sexual discrimination and violence measures, the participation of women in academic self-administration, and the encouragement of women to pursue professional and academic careers.

The Medical Faculty implements measures defined in the Gender Equality Plan, evaluates their effectiveness, and works with the University Hospital to improve the compatibility of family and career. The Dean also calls on the chairs of the faculty search committees to actively encourage suitable women to apply for positions.



Appointments from 2011 – 2016

The following professors were appointed to the Medical Faculty in 2011:

- Prof. Dr. med. Karl Sebastian Lang to the W3 professorship for Immunology
- Prof. Yang Zhang, Ph.D., to the junior professorship for Molecular Medicine (new)
- Prof. Dr. med. Marcus Jäger to the W3 professorship for Orthopedics
- Prof. Dr. med. Jörg Timm to the W2 professorship for Virology
- Prof. Dr. med. Johannes H. Schulte to the junior professorship for Pediatric Oncological Research
- Prof. Dr. med. Dr. rer. nat. Dagmar Führer to the W3 professorship for Internal Medicine, with a focus on Endocrinology
- Prof. Dr. rer. nat. Sven Rahmann to the new W3 professorship for Genome Informatics (new)
- Prof. Dr. rer. nat. Matthias Gunzer to the W3 professorship for In Vivo Imaging (new)
- Prof. Dr. med. Georg Täger to the W2 professorship for Orthopedics/Trauma Surgery with a focus on Sarcoma Surgery (new)

2011

The following professors were appointed to the Medical Faculty in 2012:

- Prof. Dr. med. Ulrike Schara to the W2 professorship for Neuromuscular Disorders of Childhood (new)
- Prof. Dr. med. Markus Kamler to the W3 professorship for Thoracic Transplantation (new)
- Prof. Dr. rer. nat. Astrid Maria Westendorf to the W3 professorship for Infection and Immunity (new)
- Prof. Dr. rer. nat. Mirko Trilling to the junior professorship for Virology
- Prof. Dr. rer. nat. Susanne Moebus to the W2 professorship for Urban Epidemiology (new)
- Prof. Dr. rer. nat. Anke Hinney to the W2 professorship for Molecular Genetics of Obesity and Eating Disorders (new)
- Prof. Dr. med. Dobromir Dobrev to the W3 professorship for Pharmacology and Toxicology

2012

The following professors were appointed to the Medical Faculty in 2013:

- Prof. Dr. rer. nat. Wiebke Hansen to the W2 professorship for Molecular Infection and Immunity (new)
- Prof. Dr. med. Gunther Wennemuth to the W3 professorship for Anatomy
- Prof. Dr. med. Beate Timmermann to the W3 professorship for Radiation Therapy with a focus on Particle Therapy (new)
- Prof. Dr. med. Andreas Paul to the W3 professorship for Transplantation Surgery (new)
- Prof. Dr. med. Ulrike Bingel to the W3 professorship for Functional Imaging (new)
- Prof. Dr. med. Katharina Fleischhauer to the W3 professorship for Cell Therapy Research (new)

2013

2014

The following professors were appointed to the Medical Faculty in 2014:

- Prof. Dr. rer. medic. Harald Quick to the W3 professorship for Experimental Hybrid Imaging (new)
- Prof. Dr. med. Alexander Rösch to the W2 professorship for Dermatocology (new)
- Prof. Dr. rer. nat. Daniel Robert Engel to the W2 professorship for Immunodynamics (new)
- Prof. Dr. rer. nat. David Hoogewijs to the junior professorship for Physiology
- Prof. Dr. med. Dirk Reinhardt to the W3 professorship for Pediatrics
- Prof. Dr. med. Andreas Stang to the W3 professorship for Cardiovascular Epidemiology or Neuroepidemiology (new)
- Prof. Dr. med. Jürgen Becker to the W3 professorship for Translational Oncology with a focus on Skin Cancer Research (new)

2015

The following professors were appointed to the Medical Faculty in 2015:

- Prof. Dr. med. Hendrik Streeck to the W3 professorship for Medical Biology (new)
- Prof. Dr. med. Tienush Rassaf to the W3 professorship for Internal Medicine with a focus on Cardiology
- Prof. Dr. med. Sebastian Bauer to the W3 professorship for Translational Oncology with a focus on Individualized Tumor Therapy (new)
- Prof. Dr. med. Thomas Minor to the W2 professorship for Surgical Research (new)
- Prof. Dr. rer. nat. Nils von Neuhoff to the W2 professorship for Molecular Genetics in Pediatric Hematology and Oncology (new)

2016

The following professors were appointed to the Medical Faculty in 2016 (last updated October 2016):

- Prof. Dr. med. Clemens Aigner to the W3 professorship for Thoracic Surgery (Ruhrländklinik) (new)
- Prof. Dr. med. Marcel Dudda to the W2 professorship for Special Trauma Surgery (new)
- Prof. Dr. rer. nat. Kristina Lorenz to the W3 professorship for Mechanisms of Cardiovascular Diseases (new)
- Prof. Dr. med. Björn Scheffler to the W3 professorship for Translational Oncology with a focus on Neurooncology (new)
- Prof. Dr. med. Benjamin Wilde to the W2 professorship for Physiology or Biochemistry of Acute Kidney Failure associated with Transplantation (new)
- Prof. Dr. med. Jens Siveke to the W3 professorship for Translational Oncology with a focus on Thoracic and Visceral Oncology (new)
- Prof. Dr. med. Sandra Ciesek to the W2 professorship for Virology
- Prof. Dr. med. Christoph Kleinschnitz to the W3 professorship for Neurology
- Prof. Dr. med. Richard Dodel to the W3 professorship for Geriatrics (new)
- Prof. Dr. med. Ken Herrmann to the W3 professorship for Nuclear Medicine
- Prof. Dr. med. Jennifer Caroline Landsberg to the W2 professorship for Immunodermatology (new)

Professors of the Medical Faculty of the University of Duisburg-Essen
(last updated June 2016)



Prof. Dr. med. Clemens Aigner

Prof. Dr. med. Hideo Baba

Prof. Dr. med. Thomas Bajanowski

Prof. Dr. med. Sebastian Bauer

Prof. Dr. med. Jürgen C. Becker

Prof. Dr. med. Dietrich W. Beelen

Prof. Dr. med. Ulrike Bingel

Prof. Dr. med. Norbert Bornfeld

Prof. Dr. sc. hum. Wolfgang Brandau

Prof. Dr. med. Jan Buer

Prof. Dr. med. Sandra Ciesek

Prof. Dr. rer. nat. Ulf Dittmer

Prof. Dr. med. Gustav J. Dobos

Prof. Dr. med. Dobromir Dobrev

Prof. Dr. med. Richard Dodel

Prof. Dr. med. Marcel Dudda

Prof. Dr. med. Ulrich Dührsen

Prof. Dr. rer. nat. Nicole Dünker

Prof. Dr. phil. Sigrid Elsenbruch

Prof. Dr. rer. nat. Daniel Engel

Prof. Dr. med. Joachim Fandrey

Prof. Dr. med. Ursula Felderhoff-Müser

Prof. Dr. med. Katharina Fleischhauer

Prof. Dr. med. Michael Forsting

Prof. Dr. med. Dr. rer. nat. Dagmar Führer

Prof. Dr. med. Guido Gerken

Prof. Dr. med. Stefan Gesenhues

Prof. Dr. rer. nat. Erich Gulbins

Prof. Dr. rer. nat. Matthias Gunzer

Prof. Dr. rer. nat. Wiebke Hansen

Prof. Dr. med. Cornelia Hardt

Prof. Dr. med. Johannes Hebebrand

Prof. Dr. med. Dirk Hermann

Prof. Dr. med. Ken Herrmann

Prof. Dr. med. Dr. h.c. Gerd Heusch

Prof. Dr. rer. nat. Anke Hinney

Prof. Dr. rer. nat. David Hoogewijs

Prof. Dr. med. Peter A. Horn

Prof. Dr. rer. nat. Bernhard Horsthemke

Prof. Dr. med. Peter Hoyer

Prof. Dr. phil. nat. George Iliakis

Prof. Dr. med. Marcus Jäger

Prof. Dr. med. Heinz Günther Jakob

Prof. Dr. rer. nat. Verena Jendrossek

Prof. Dr. rer. nat. Karl-Heinz Jöckel

Prof. Dr. med. Markus Kamler

Prof. Dr. med. Kathy Keyvani

Prof. Dr. med. Rainer Kimmig

Prof. Dr. rer. nat. Carsten Kirschning

Prof. Dr. med. Christoph Kleinschnitz

Prof. Dr. med. Andreas Kribben

Prof. Dr. rer. nat. Ralf Küppers

Prof. Dr. sc. techn. Mark E. Ladd

Prof. Dr. med. Jennifer Caroline Landsberg

Prof. Dr. med. Karl Sebastian Lang

Prof. Dr. med. Stephan Lang

Prof. Dr. med. Bodo Levkau

Prof. Dr. med. Norbert Leygraf

Prof. Dr. med. Dietmar Lohmann

Prof. Dr. rer. nat. Kristina Lorenz

Prof. Dr. med. Eric Metzen

Prof. Dr. med. Thomas Minor

Prof. Dr. rer. nat. Susanne Moebus

Prof. Dr. med. Dr. med. dent. Christopher Mohr

Prof. Dr. rer. nat. David G. Norris

Prof. Dr. med. Andreas Paul

Prof. Dr. med. Jürgen Peters

Prof. Dr. rer. medic. Harald H. Quick

Prof. Dr. rer. nat. Sven Rahmann

Prof. Dr. med. Tienush Rassaf

Prof. Dr. med. Ursula Rauen

Prof. Dr. med. Dirk Reinhardt

Prof. Dr. med. Alexander Rösch

Prof. Dr. med. Dr. h.c. Herbert Rübben

Prof. Dr. med. Dirk Schadendorf

Prof. Dr. med. Ulrike Schara

Prof. Dr. rer. biol. hum. Manfred Schedlowski

Prof. Dr. med. Björn Scheffler

Prof. Dr. med. Norbert Scherbaum

Prof. Dr. med. Kurt Werner Schmid

Prof. Dr. med. Martin Schuler

Prof. Dr. med. Winfried Siffert

Prof. Dr. med. Jens Siveke

Prof. Dr. med. Andreas Stang

Prof. Dr. med. Klaus-Peter Steuhl

Prof. Dr. med. Hendrik Streeck

Prof. Dr. med. Martin Stuschke

Prof. Dr. med. Ulrich Sure

Prof. Dr. med. Georg Taeger

Prof. Dr. med. Helmut Teschler

Prof. Dr. med. Dagmar Timmann-Braun

Prof. Dr. med. Beate Timmermann

Prof. Dr. rer. nat. Mirko Trilling

Prof. Dr. rer. nat. Nils von Neuhoff

Prof. Dr. med. Isabel Wanke

Prof. Dr. med. Gunther Wennemuth

Prof. Dr. rer. nat. Astrid Westendorf

Prof. Dr. med. Benjamin Wilde

Number of appointments from 2011 – 2016 (last updated June 2016)

	2011	2012	2013	2014	2015	2016
m	8	3	2	7	5	8
f	1	4	4	0	0	3
Total	9	7	6	7	5	(11)

	2011	2012	2013	2014	2015	2016
W3	5	3	5	5	3	7
W2	2	3	1	1	2	4
W1	2	1	0	1	0	0
Total	9	7	6	7	5	(11)

The number of appointments continues at a high level. In recent years, a particularly high number of appointments were made to newly established professorships. The expansion has taken place in particular in the research focuses, for example, in oncology, where new professorships have been established in the context of support by the German Cancer Consortium (DKTK).

In the first six months of 2016, eleven appointments have already been made – with three of the positions filled by women and eight positions filled in newly established professorships – that serve the research focuses in particular and have served to fill two DKTK professorships.

Despite intensive efforts, it has become increasingly apparent during appointment proceedings that the number of female applicants for the advertised professorships is very low, especially at the W3 level, and that for several of the professorships there were no female applicants at all. Despite the intensive efforts of the search committees, no potential female applicants or only very few suitable female applicants were identified. Nevertheless, the Medical Faculty was able to appoint several female candidates to positions in 2012 and 2013 and again in 2016.

Gender professorships

In 2015, two applications by the Medical Faculty to retrospectively expand of existing professorships to include a gender denomination were successful. The professorships of Prof. Dr. Sigrid Elsenbruch, “Experimental Psychobiology with a Focus on Gender-specific Aspects,” and of Prof. Dr. Anke Hinney, “Molecular Genetics of Obesity and Eating Disorders with a Focus on Gender-specific Aspects,” have been supported by the federal state of North Rhine-Westphalia since January 2016, with funding of €75,000 per year for three years. The Medical Faculty and the University Board of the University of Duisburg-Essen have expressly supported the applications and have pledged to designate the professorships as gender professorships for at least six years.

For the Medical Faculty, these are not only the first gender professorships: the extended focus of the two professorships also serves as an important unique feature in the area of neuroscientific, medical, psychological, and molecular genetic research.

The Medical Faculty specifically promotes the integration of gender-specific issues in the teaching and research content of its departments and for many years has cooperated very successfully in this area with the Essen College of Gender Research (EKfG). The two scientists promoted are active members of the college.



AluMedEs

AluMedEs is the Medical Faculty's alumni network. For many years, it has served as the common denominator for all graduates who have completed their medical studies or a postgraduate course of studies in Essen, have earned a doctorate or completed a habilitation at the Medical Faculty, or have become a medical specialist or been part of the teaching staff. In 2015, AluMedEs became a registered association.

Chair and Alumni Officer:
Prof. Dr. Horst Sack



B.

Research

Top-ranking International Science and Research

New diagnostic and treatment methods and, ultimately, optimized approaches to patient care are always the product of in-depth research. The basic and clinical research conducted at the University of Duisburg-Essen's Medical Faculty has an excellent international reputation. Numerous Essen-based scientists from a range of disciplines are active members of national and international research networks.

Research focuses

The Medical Faculty explicitly focuses on the research areas of cardiovascular medicine, oncology, and transplantation, along with the interdisciplinary areas of genetic medicine, immunology, and infectious diseases. These core topics have been established thanks to the interdisciplinary nature of basic research and clinically oriented science in numerous research alliances. In fact, all departments and all institutes are active in at least one research focus. Setting this focus and pooling resources help make research institutions competitive in the long term, including at the international level.

B.1.1

Research Focus: Cardiovascular Medicine

Spokespersons:

Prof. Dr. Dr. h.c. Gerd Heusch
Prof. Dr. Tienush Rassaf

Research profile

The founding of the West German Heart and Vascular Center Essen (WHGZ) in 2015 served to expand our cardiovascular research group and take it to the next level of cutting-edge science. As an umbrella for all of the Essen University Hospital's facilities involved in research, diagnostics, and treatment of cardiovascular diseases, the WHGZ endeavors to promote interdisciplinary collaboration in these fields while providing a structure that will support us well in the future. This approach will bring medical research to the bedside more quickly, allowing patients to benefit from our efforts in less time.

All of the institutions that are part of the cardiovascular research group address pathological remodeling processes and their treatment, namely in the following areas:

-
- 1 the blood vessels**
(atherosclerosis, Prof. Dr. Levkau)

 - 2 the atrium**
(atrial fibrillation, Prof. Dr. Dobrev)

 - 3 the heart muscle**
(myocardial infarction and cardioprotection, Prof. Dr. Dr. h.c. Heusch & Prof. Dr. Rassaf)

 - 4 the heart valves**
(Prof. Dr. Jakob & Prof. Dr. Rassaf)

 - 5 advanced heart failure**
(Prof. Dr. Baba, Prof. Dr. Kamler and Prof. Dr. Rassaf)
-

Our research profile has a strong translational focus. Numerous joint publications attest to our extensive, well-established collaboration efforts. A large-scale epidemiological clinical cohort study (Heinz Nixdorf Recall Study) has been initiated to identify risk factors for heart disease; this study complements our basic research activities.

The cardiovascular focus group actively participates in the German Competence Network for Heart Failure.

Developments and ongoing activities over the past five years:

Several new professors have strengthened and rejuvenated the cardiovascular research group over the past five years.

A long-standing collaboration with the Medical Faculty of the Heinrich Heine University Düsseldorf is reflected in some of these new assignments: Professors Heusch, Peters, and Rassaf were originally on the Heinrich Heine University Düsseldorf Medical Faculty before their appoint-

ments to the Medical Faculty, Essen. Professor Fischer served on the Düsseldorf Medical Faculty, spent a period on the Medical Faculty in Essen, and subsequently returned to Düsseldorf, where he is now a full professor. Professor Heusch leads a subproject in the DFG-funded, Düsseldorf-based Collaborative Research Centre (SFB) 1116.

Currently, nine DFG-funded projects are active in the cardiovascular research group as part of SFBs 656 (Levkau: A6, C6), 688 (Lorenz: A17), 1116 (Heusch/Kleinbongard: B8), and Research Training Group 2098 (Levkau: 9, 11, Keul: 10), and as individual research grants (Heusch: He 1320/18-3; Rassaf: RA 969/4-2).

Professor Dobrev currently supervises three projects at the German Center for Cardiovascular Disease (DZHK), funded by the German Federal Ministry of Education and Research (BMBF): project

numbers 81X2800108, 81X2800136, and PENDING). Professor Lorenz is involved in a project at the Comprehensive Heart Failure Center Würzburg (98519102).

Strategic outlook

The clinical area of electrophysiology has been enhanced by the appointment of a W2 professor. Future plans call for a reorganization of the Cardiac Surgery Department, including the Huttrop Cardiac Center, a 100% subsidiary of Essen University Hospital. In the Vascular Medicine Department, further expansion of the Angiology Department and the establishment of a department for vascular surgery and endovascular treatment are planned. In addition, a W3 professor is to be appointed for molecular cardiology.

Ground-breaking appointment

Professor Tienush Rassaf was appointed as a professor of cardiology in 2015 and is the new head of the Cardiology Department. He studied medicine at Heinrich Heine University, Düsseldorf, and at the Texas Heart Institute, Houston, Texas, USA. Professor Rassaf held a DFG-funded postdoctoral position at the Louisiana State University Health Sciences Center, New Orleans, Louisiana, USA, with DFG funding, and another postdoctoral position at the University Hospital Düsseldorf, funded by the German Society for Cardiology. At Aachen University Hospital (Uniklinik RWTH Aachen) he was first a resident and later a senior physician. In 2009, he returned to Düsseldorf, where he headed facilities including the cardiac catheterization laboratory, the interdisciplinary internal medicine intensive care unit, and the immediate care ward for treating acute coronary syndrome. He also founded the Chest Pain Unit and established programs for the interventional treatment of heart valve disease. Professor Rassaf was the acting department head from 2013 to 2015.

Selected publications from the past five years

1. Thielmann M, Kottenberg E, Kleinbongard P, Wendt D, Gedik N, Pasa S, Price V, Tsagakis K, Neuhäuser M, Peters J, Jakob H, Heusch G (2013) Cardioprotective and prognostic effects of remote ischaemic preconditioning in patients undergoing coronary artery bypass surgery: a single-centre randomised, double-blind, controlled trial. *Lancet* 382: 597-604.
2. Rassaf T, Totzeck M, Hendgen-Cotta UB, Shiva S, Heusch G, Kelm M (2014) Circulating nitrite contributes to cardioprotection by remote ischemic preconditioning. *Circ Res* 114: 1601-1610.
3. Voigt N, Heijman J, Wang Q, Chiang DY, Li N, Karck M, Wehrens XHT, Nattel S, Dobrev D (2014) Cellular and molecular mechanisms of atrial arrhythmogenesis in patients With paroxysmal atrial fibrillation. *Circulation*: 129:145-156.
4. Skyschally A, Gent S, Amanakis G, Schulte C, Kleinbongard P, Heusch G (2015) Specific myocardial signal transduction by reperfusion injury salvage kinase and survival activating factor enhancer pathways. *Circ Res* 117: 279-288.
5. Sattler K, Gräler M, Keul P, Weske S, Reimann CM, Jindrová H, Kleinbongard P, Sabbadini R, Bröcker-Preuss M, Erbel R, Heusch G, Levkau B (2015) Defects of high-density lipoproteins in coronary artery disease caused by low sphingosine-1-phosphate content: correction by sphingosine-1-phosphate-loading. *J Am Coll Cardiol* 66:1470-1485.

B.1.2

Research focus: Oncology

Spokespersons:

Prof. Dr. Dirk Schadendorf
Prof. Dr. Ralf Küppers

Research profile

The West German Cancer Center Essen (WTZ) builds the framework for the facilities at Essen University Hospital focusing on research, diagnosis, and treatment of cancer. The departments and institutes involved in the WTZ perform basic, translational, and clinical research and are organized into 14 multidisciplinary treatment programs and 10 research core facilities. The interdisciplinary cooperation with the Faculties of Biology and Chemistry at the University of Duisburg-Essen via the Centre for Medical Biotechnology (ZMB) provides a foundation for basic research. Professional expertise and resources for translational research are pooled in the five research programs: Exploitation of Oncogenetic Mechanisms; Molecular Diagnostics, Early Detection and Biomarker Development; Molecularly Targeted Therapy; Cancer Immunotherapy; and Radiation Oncology & Imaging.

The WTZ contributes its competencies to working and study groups collaborating both in Germany and internationally. The high number of patients with complex diseases allows the development and evaluation of new technologies and permits research on translational questions.

The following research areas are priorities of the work:

-
- Radiation oncology, with the West German Proton Therapy Centre Essen (WPE), and innovative imaging and treatment options

 - Surgical oncology, with specialized research programs and surgical techniques

 - Personalized cancer treatment, with a unique study portfolio on phase 1 single agents and combination therapy and biomarker development programs

 - Transplantation program, with a link to immunological research

Developments and current activities over the past five years:

The WTZ was again recertified as an Oncology Center of Excellence by the German Cancer Aid (Deutsche Krebshilfe) in 2016. Together with the Heinrich Heine University Düsseldorf, Essen is one of seven German facilities in the German Cancer Consortium (DKTK).

Whenever possible, studies are conducted in close association with translational research programs. The WTZ also actively cooperates with various working groups of the German Cancer Society (DKG).

Research activities in the area of epidemiology are conducted by the Institute of Medical Informatics, Biometrics and Epidemiology (IMIBE), in most cases in cooperation with other departments. Essen University Hospital's collaboration as a German National Cohort site plays an important role in this area.

In 2013, a DFG-funded Research Training Group for the investigation of radiation biology and oncology, GRK1739 (Coordinator: Prof. V. Jendrossek), was established and received funding for an additional 4.5 years in 2016.

Strategic outlook

The goal is to acquire an SFB, a comparable initiative, or both in the next five years and to intensify the link to basic research fields. A particular focus is placed on the development of the Sarcoma Centre into Europe's largest such center for the treatment of patients of all ages. In this context, in 2014 the Sarcoma Surgery Section was established in the Department of General Surgery, with access to clinical trials.

Ground-breaking appointment

In 2014, Prof. Dr. med. Dr. rer. nat. Jürgen Christian Becker accepted the first of three professorships established by the German Cancer Consortium (DKTK) at UK Essen. He heads the Department of Translational Oncology with a focus on skin cancer research. Becker studied medicine in Hanover, Germany, and subsequently qualified as a dermatologist at the Würzburg University Hospital Department of Dermatology. He worked at The Scripps Research Institute (TSRI) in La Jolla, California, USA, for four years and earned his PhD from the Danish Cancer Society Research Center in Copenhagen. In 2010, he was appointed to the Medical University of Graz, Austria, as a professor. Since his days as a medical student, Becker's scientific work has addressed topics in tumor biology and tumor immunology that are relevant to various types of skin cancer.

Selected publications from the past five years

1. TERT promoter mutations in familial and sporadic melanoma. Horn S, Figl A, Rachakonda PS, Fischer C, Sucker A, Gast A, Kadel S, Moll I, Nagore E, Hemminki K, Schadendorf D *Science* - 2013; 339: 959-61. * shared
2. Exome sequencing identifies recurrent somatic mutations in EIF1AX and SF3B1 in uveal melanoma with disomy 3. Martin M, Maßhöfer L, Temming P, Rahmann S, Metz C, Bornfeld N, van de Nes J, Klein-Hitpass L, Hinnebusch AG, Horsthemke B, Lohmann DR, Zeschnick M *Nature Genetics* - 2013 Aug;45(8):933-6.
3. Cellular origin and pathophysiology of chronic lymphocytic leukemia Seifert M, Sellmann L, Bloehdorn J, Wein F, Stilgenbauer S, Dürig J, Küppers R. *J Exp Med* - 209:2183-2198 2012.
4. Improved Overall Survival in Melanoma with Combined Dabrafenib and Trametinib. Robert C, Karaszewska B, Schachter J, Rutkowski P, Mackiewicz A, Stroiakovski D, Lichinitser M, Dummer R, Grange F, Mortier L, Chiarion-Sileni V, Drucis K, Krajsova I, Hauschild A, Lorigan P, Wolter P, Long GV, Flaherty K, Nathan P, Ribas A, Martin AM, Sun P, Crist W, Legos J, Rubin SD, Little SM, Schadendorf D. *The New England Journal of Medicine* - 2015; 372: 30-9.
5. Phase III study of afatinib or cisplatin/pemetrexed in metastatic lung adenocarcinoma patients with epidermal growth factor receptor mutations. Sequist LV, Yang JCH, Yamamoto N, O'Byrne K, Hirsh V, Mok T, Geater SL, Orlov S, Tsai CM, Boyer M, Su WC, Bennouna J, Kato T, Gorbunova V, Lee KH, Shah R, Massay D, Zazulina V, Shahidi M and Schuler M *Journal of Clinical Oncology* - 31:3327-3334 (2013).

B.1.3

Research Focus: Transplantation Medicine

Spokespersons:

Prof. Dr. Peter Horn
Prof. Dr. Andreas Paul

Research profile

Transplantation medicine has been systematically expanded into a clinical and scientific research focus. The research focus is consolidated in the West German Organ Transplant Centre (WZO). The WZO comprises all departments and institutes at UK Essen involved in research, diagnosis and treatment in the area of transplantation medicine.

The WZO's objectives are to meet the complex challenges of transplantation medicine as a university facility and to develop the discipline in an innovative manner. The departments and institutes involved in caring for and treating transplant patients participate in basic and clinical research.

The following topics are represented:



Improving pretransplant diagnostics and Tx-monitoring, such as the evaluation of new detection methods for HLA antibodies in the area of organ and stem-cell transplants



New organ conservation methods, including KFO 117 – Optimization of Living Related Liver Transplantation, Prof. Gerken/Prof. Rauen, funded by DFG from 2004 to 2011



Organ revitalization of donor organs, e.g., clinical evaluation of retrograde oxygen persufflation revitalization of hypothermically stored donor livers with ischemic damage, Prof. Minor/Prof. Paul (DFG)



Experimental approaches to organ protection, e.g., the multicenter COPE WP2 study, EU 7th Framework Programme



Mechanisms of the learned immunosuppressive placebo response, e.g., FOR 1328, Subproject: Neurobehavioral mechanisms of learned immunosuppressive placebo responses: from basics toward clinical application, Prof. Schedlowski/Prof. Witzke (DFG)

Developments and ongoing activities over the past five years:

- Participation of three Essen-based researchers (Prof. Dr. Paul, Prof. Dr. Minor, and Prof. Dr. Rauen) in the program committee for a proposal to establish a DFG Priority Programme in the area of organ conservation and conditioning (From preservation to improvement and evaluation of organ function: molecular mechanisms and innovative pretransplant strategies to overcome graft failure [ORGAN PRIME]; currently under review)
- Developing, improving, and applying new methods in liver pretransplant diagnostics for the determination of fatty liver. At present, a study that quantifies fat determination with the NMR technique is nearing completion (as of 2016).
- Hosting and organization of the 2016 annual meeting of the German Transplantation Society (DTG) in Essen

Strategic outlook

The WZO is an important structure for the strategic development of the excellent interaction already in place between the participating areas.

Ground-breaking appointments

Prof. Dr. med. Thomas Minor was appointed to the surgical research professorship at the Medical Faculty of the University of Duisburg-Essen (UDE) and heads the surgical research division of Essen University Hospital's Department of General, Visceral and Transplantation Surgery. He studied medicine at the Universities of Aachen, Cologne, and Clermont-Ferrand, France (1980 to 1986); conducted research at the University of Cologne until 1997; and spent a year at the University of Kyoto, Japan, in 1993. Before his appointment at UDE, he headed the Surgical Research Division of the University Clinic of Surgery at University Hospital Bonn. Professor Minor plans to establish UK Essen as a leading international expert center for organ preservation and reconditioning. He is also focused on opening new sources for organ transplants.

Selected publications from the past five years

1. Controlled Oxygenated Rewarming of Cold Stored Livers Prior to Transplantation: First Clinical Application of a New Concept. Hoyer DP, Mathé Z, Gallinat A, Canbay AC, Treckmann JW, Rauen U, Paul A, Minor T. *Transplantation*. 2016; 100(1): 147-52.
2. Pharmacodynamic monitoring of mammalian target of rapamycin inhibition by phosphoflow cytometric determination of p70S6 kinase activity. Hoerning A, Wilde B, Wang J, Tebbe B, Jing L, Wang X, Jian F, Zhu J, Dolff S, Kribben A, Hoyer PF, Witzke O. *Transplantation*. 2015; 99(1): 210-9.
3. Five-year outcomes in kidney transplant patients converted from cyclosporine to everolimus: the randomized ZEUS study. Budde K, Lehner F, Sommerer C, Reinke P, Arns W, Eisenberger U, Wüthrich RP, Mühlfeld A, Heller K, Porstner M, Veit J, Paulus EM, Witzke O. *Am J Transplant*. 2015 Jan;15(1):119-28.
4. Influence of oxygen concentration during hypothermic machine perfusion on porcine kidneys from donation after circulatory death. Hoyer DP, Gallinat A, Swoboda S, Wohlschlaeger J, Rauen U, Paul A, Minor T. *Transplantation*. 2014; 98(9): 944-50.
5. Shift of HIV tropism in stemcell transplantation with CCR5 Delta32 mutation. Kordelas L, Verheyen J, Beelen DW, Horn PA, Heinold A, Kaiser R, Trenschele R, Schadendorf D, Dittmer U, Esser S. *N Engl J Med*. 2014; 371(9): 880-2.

B.1.4

Research Focus: Immunology and Infectious Diseases

Spokespersons:

Prof. Dr. Astrid Westendorf
Prof. Dr. Ulf Dittmer

Research profile

The West German Centre for Infectious Diseases (WTI) builds the framework for the Essen University Hospital institutes and departments focusing on research, prevention, diagnosis, and treatment of infectious diseases. The WTI also covers the area of clinical hygiene and all intensive care units, as well as the Antibiotics Consultancy Service. Practice-related topics in the area of infectious diseases and immunity and related disciplines are investigated in the context of large-scale collaborative research projects.

Infections can cause severe illnesses, and persons with congenital or acquired immunodeficiency are particularly vulnerable. Preventing or treating infectious diseases requires broad, in-depth expertise. In the newly established infectious diseases outpatient department and the infectious diseases ward, physicians and scientists collaborate closely, thus facilitating patient care based on cutting-edge scientific research.

The scientific focus of the research group encompasses the following areas:

- Regulation of pathogenic-specific immune responses (innate and adaptive immunity)
- Chronic viral infections
- Mucosal immunity
- Nanoparticle-based systems for modulating immune responses in vivo
- Pseudomonas infections
- Sepsis and opportunistic fungal infections

Developments and ongoing activities over the past five years:

- Second funding period of the Sino-German Transregional Collaborative Research Center TRR 60; Spokesperson, Prof. Dr. Ulf Dittmer, www.uni-due.de/trr60/
- Establishment of two new DFG Research Training Groups
 - » GRK1949, Spokesperson Prof. Dr. Astrid Westendorf, www.uni-due.de/grk1949/
 - » GRK2098, Spokesperson Prof. Dr. Erich Gulbins, www.uni-due.de/grk2098/

Strategic outlook

Plans call for the extension of important research projects and initiatives.

- Extension of SFB Transregio 60 in 2017 and of GRK1949 in 2018.
- SFB initiative “Infection and Tumor”; Coordinator, Prof. Dr. Matthias Gunzer. The following questions are investigated as part of this initiative: Why are many tumor patients more susceptible to infections? How are tumor-infiltrating immune cells reprogrammed so that they promote tumor growth instead of fighting it? How do chronic inflammatory processes lead to immune defense failure and ultimately permit tumor growth?
- SFB initiative “Effector mechanisms of cellular immunity and virulence strategies of intracellular pathogens” with colleagues from Heinrich Heine University Düsseldorf; Coordinator, Prof. Dr. Klaus Pfeffer (Düsseldorf). This SFB initiative aims to identify immunological effector mechanisms against intracellular pathogens. It will also investigate the virulence factors and strategies used by intracellular pathogens to manifest themselves in the host.

Ground-breaking appointment

Prof. Dr. med. Karl Sebastian Lang was appointed to the professorship for Immunology at the Medical Faculty in 2011 and now heads the Department of Immunology at UK Essen. Lang studied medicine at the Universities of Innsbruck and Tübingen, as well as at Kings College Hospital London and at Yale. After earning his doctorate in 2003, he conducted postdoctoral research in the laboratory of Nobel laureate Rolf Zinkernagel in Zurich, where he completed his habilitation in 2007. Lang then performed research at the Campbell Family Cancer Institute at Princess Margaret Cancer Centre in Toronto, Ontario, Canada. In 2008, he received the Sofja Kovalevskaja Award, with which the German Federal Ministry of Education and Research (BMBF) promotes top-rank junior researchers. With this €1.45 million award, Lang established his own Humboldt Research Group on the immunology of hepatitis in the Department of Gastroenterology, Hepatology and Infectious Diseases of University Hospital Düsseldorf. Lang is continuing this work at our Medical Faculty.

Selected publications from the past five years

1. Dietze KK, Zelinsky G, Gibbert K, Schimmer S, Francois S, Myers L, Sparwasser T, Hasenkrug KJ, Dittmer U. Transient depletion of regulatory T cells in transgenic mice reactivates virus-specific CD8+ T cells and reduces chronic retroviral set points. *Proc Natl Acad Sci U S A*. 2011.
2. Oldenburg M, Krüger A, Ferstl R, Kaufmann A, Nees G, Sigmund A, Bathke B, Lauterbach H, Suter M, Dreher S, Koedel U, Akira S, Kawai T, Buer J, Wagner H, Bauer S, Hochrein H, Kirschning CJ. TLR13 recognizes bacterial 23S rRNA devoid of erythromycin resistance-forming modification. *Science*. 2012 Aug 31;337(6098):1111-5.
3. Hansen W, Hutzler M, Abel S, Alter C, Stockmann C, Cliche S, Albert J, Sparwasser T, Sakaguchi S, Westendorf AM, Schadendorf D, Buer J, Helfrich I. Neuropilin 1 deficiency on CD4+Foxp3+ regulatory T cells impairs mouse melanoma growth. *J Exp Med*. 2012 Oct 22;209(11):2001-16.
4. Khairnar V, Duhan V, Maney SK, Honke N, Shaabani N, Pandya AA, Seifert M, Pozdeev V, Xu HC, Sharma P, Baldin F, Marquardsen F, Merches K, Lang E, Kirschning C, Westendorf AM, Häussinger D, Lang F, Dittmer U, Küppers R, Recher M, Hardt C, Scheffrahn I, Beauchemin N, Göthert JR, Singer BB, Lang PA, Lang KS. CEACAM1 induces B-cell survival and is essential for protective antiviral antibody production. *Nat Commun*. 2015 Feb 18;6:6217.
5. Hasenberg A, Hasenberg M, Männ L, Neumann F, Borkenstein L, Stecher M, Kraus A, Engel DR, Klingberg A, Seddigh P, Abdullah Z, Klebow S, Engelmann S, Reinhold A, Brandau S, Seeling M, Waisman A, Schraven B, Göthert JR, Nimmerjahn F, Gunzer M. Catchup: a mouse model for imaging-based tracking and modulation of neutrophil granulocytes. *Nat Methods*. 2015 May;12(5):445-52.

B.1.5

Research Focus: Genetic Medicine

Spokespersons:

Prof. Dr. Bernhard Horsthemke
Prof. Dr. Johannes Hebebrand

Research profile

The Genetic Medicine research focus builds the framework for the facilities of the Essen University Hospital and the LVR Hospital that are concerned with genetic and epigenetic knowledge. Nearly all of the theoretical and clinical departments contribute to and benefit from the interdisciplinary research focus. The research focus deepens the cooperation between the research areas of cardiovascular medicine, oncology, transplantation and immunology, and infectious diseases and is supported through the use of joint infrastructure. There is close collaboration with the Centre for Medical Biotechnology (ZMB) and the Faculty of Biology.

Today, the diagnosis of various diseases is based on genetic findings. In the past two decades, genetic research has substantially deepened our understanding of the etiology and pathogenesis of complex diseases. This progress is due to the development of DNA chips that allow more than one million genotypes to be identified per person. Modern DNA sequencing machines enable the identification of the complete DNA sequence (next-generation sequencing).

Molecular epigenetics, a young research subdiscipline of genetics, is concerned with heritable changes in gene activity and explains why certain environmental impacts change a person's developmental pathways.

The following departments operate technical platforms, contribute their expertise to genetic medicine projects, or both:

- DNA Sequencing Services (Institute of Human Genetics)
- BioChip Laboratory (Institute of Cell Biology)
- Genome sequencing (Institutes of Human Genetics and Cell Biology)
- Genome informatics (Chair of Genome Informatics, Institute of Human Genetics)
- DNA methylation analysis (Institute of Human Genetics; Genome Informatics)
- Genotyping of pharmacogenetically relevant sequence variants (Institute of Pharmacogenetics)
- Molecular genetic analyses of weight regulation and in child and adolescent psychiatric disorders (Department of Child and Adolescent Psychiatry, Psychotherapy, and Psychosomatics)
- Genetic epidemiology (Institute of Medical Informatics, Biometrics and Epidemiology)
- Transgenic animals (Central Animal Laboratory, ZTL)

Developments and ongoing activities over the past five years:

The most important developments are the establishment of next-generation sequencing and the founding of the Essen Center for Rare Diseases (EZSE). The following departments are currently or were previously involved in international and national research alliances:

- International Human Epigenome Consortium (IHEC, BLUEPRINT, DEEP)
- International Cancer Genome Consortium (ICGC)
- Research alliances for rare diseases (muscular dystrophy, FACE, CraniRare, Imprinting)
- German National Genome Research Network (NGFN)
- German-French program “Genomics and Physiopathology of Cardiovascular and Metabolic Diseases”

- European Sequencing and Genotyping Infrastructure (ESGI)
- German National Cohort
- DFG-funded coordinated programs include the following: GRK1431, “Transcription, chromatin structure and DNA repair,” and SFB876, “Providing Information by Resource-Constrained Data Analysis” in Ashburn, Virginia, USA.

Strategic outlook

The objective is to achieve further integration of the various genome activities within the Medical Faculty.

Ground-breaking appointment

Prof. Dr. rer. nat. Sven Rahmann was appointed to the Medical Faculty as a professor for Genome Informatics in 2011. He studied mathematics and computer science at the University of Göttingen, the University of California Santa Cruz, California, USA, and the University of Heidelberg. Rahmann wrote his doctoral thesis at the Max Planck Institute for Molecular Genetics in Berlin. He was an independent Junior Research Group leader at Bielefeld University. In October 2007, he accepted an appointment as a professor at the Technical University of Dortmund. He also performed research at the Janelia Research Campus of the Howard Hughes Medical Institute in Ashburn, Virginia, USA. In his research and teaching, he maintains a strong collaboration with the Department of Computer Science at the Technical University of Dortmund, where he leads a project within DFG Collaborative Research Center SFB 876, “Providing Information by Resource-Constrained Data Analysis.”

Selected publications from the past five years

1. Dauwerse JG, Dixon J, Seland S, Ruivenkamp CA, van Haeringen A, Hoefsloot LH, Peters DJ, Boers AC, Daumer-Haas C, Maiwald R, Zweier C, Kerr B, Cobo AM, Toral JF, Hoogeboom AJ, Lohmann DR, Hehr U, Dixon MJ, Breuning MH, Wiczorek D. (2011) Mutations in genes encoding subunits of RNA polymerases I and III cause Treacher Collins syndrome. *Nat Genet.* 43:20-2.
2. Martin M, Maßhöfer L, Temming P, Rahmann S, Metz C, Bornfeld N, van de Nes J, Klein-Hitpass L, Hinnebusch AG, Horsthemke B, Lohmann DR, Zeschneigk M (2013) Exome sequencing identifies recurrent somatic mutations in EIF1AX and SF3B1 in uveal melanoma with disomy 3. *Nat Genet.* 45(8):933-6.
3. Horn S, Figl A, Rachakonda PS, Fischer C, Sucker A, Gast A, Kadel S, Moll I, Nagore E, Hemminki K, Schadendorf D, Kumar R. (2013) TERT promoter mutations in familial and sporadic melanoma. *Science.* 339:959-61.
4. Jarick I, Volckmar AL, Pütter C, Pechlivanis S, Nguyen TT, Dauvermann MR, Beck S, Albayrak Ö, Scherag S, Gilsbach S, Cichon S, Hoffmann P, Degenhardt F, Nöthen MM, Schreiber S, Wichmann HE, Jöckel KH, Heinrich J, Tiesler CM, Faraone SV, Walitza S, Sinzig J, Freitag C, Meyer J, Herpertz-Dahlmann B, Lehmkuhl G, Renner TJ, Warnke A, Romanos M, Lesch KP, Reif A, Schimmelmann BG, Hebebrand J, Scherag A, Hinney A. Genome-wide analysis of rare copy number variations reveals PARK2 as a candidate gene for attention-deficit/hyperactivity disorder. *Mol Psychiatry.* 2014;19:115-21.
5. Schramm A, Köster J, Assenov Y, Althoff K, Peifer M, Mahlow E, Odersky A, Beisser D, Ernst C, Henssen AG, Stephan H, Schröder C, Heukamp L, Engesser A, Kahlert Y, Theissen J, Hero B, Roels F, Altmüller J, Nürnberg P, Astrahantseff K, Gloeckner C, De Preter K, Plass C, Lee S, Lode HN, Henrich KO, Gartlgruber M, Speleman F, Schmezer P, Westermann F, Rahmann S, Fischer M, Eggert A, Schulte JH. (2015) Mutational dynamics between primary and relapse neuroblastomas. *Nat Genet.* 47:872-7.

Research programs

Medical Faculty scientists are involved in numerous collaborative projects with national and international partners.



DFG Collaborative Research Centres (SFBs)

As defined by the German Research Council (DFG), Collaborative Research Centres (SFBs) are long-term university-based research institutions in which researchers work together within a multidisciplinary research program. They allow researchers to tackle innovative, challenging, complex, long-term research undertakings through the coordination and concentration of researchers and resources within the applicant universities. They therefore enable the development of institutional priority areas and structure. Collaboration with non-university research institutions is expressly encouraged.

Collaborative Research Centres consist of a large number of projects. The number and scope of these projects depend on the research program. Individual projects are led by one researcher or jointly by several researchers.

SFBs and SFB subprojects at the Medical Faculty:

DFG Collaborative Research Centre (SFB) / Transregio (TRR) 60

More than 500 million persons worldwide are chronically infected with hepatitis B or C or with HIV. After years, the infections lead to diseases such as severe liver inflammation or AIDS. In 2009, scientists in Germany and China joined efforts in Collaborative Research Centre (SFB) Transregio (TRR) 60 to investigate how viruses manage to survive in the host's body and escape the immune system's defense capabilities. The SFB is led by scientists from the Medical Faculty of the University of Duisburg-Essen in cooperation with the Ruhr-Universität Bochum (RUB) and universities in Wuhan and Shanghai, China. This is the only German-Chinese Collaborative Research Centre (SFB) in medicine funded by the DFG.

The scientific developments were so promising that in 2013, the DFG and the National Natural Science Foundation of China (NSFC) decided to fund the project for another three-and-a-half years. The DFG funds 11 subprojects in Essen and Bochum with a total volume of €5.5 million, and the NSFC funds 7 projects in China with around €2 million. For Essen alone, this means continued funding of personnel and equipment amounting to more than €5 million.

More than 100 scientific publications in the past years prominently attest to the excellent foundational work achieved by the international Research Unit, which now aims to specifically develop new strategies for immunotherapy and immunization against chronic viral infections. SFB/TRR 60 puts the Medical Faculty of the University of Duisburg-Essen in an excellent position as a strong center for infectious diseases research, both in Germany and internationally. The joint objective of all participating institutes now entails developing drugs and vaccines that can overcome the immune system's "braking systems" and, in so doing, stop chronic viral infections.

Spokesperson: Prof. Dr. Ulf Dittmer

Participation in Collaborative Research Centre (SFB) 656

Sphingosine-1 phosphate (S1P) plays an important role in cardiovascular, immunological, and neurological disorders. The participating scientists have synthesized and patented a new class of S1P analogues with strong immunosuppressive properties. They have demonstrated that the analogues' Ω -fluorinated derivatives are biologically active in vivo, and thus are promising candidates for positive emission tomography (PET) imaging. The next funding period will entail the synthesis of ^{18}F fluorescence and double-labelled samples and PET and fMRI imaging of S1P1 and S1P3 receptors in mouse models of cardiovascular diseases.

The subproject on imaging of sphingolipid receptors in cardiovascular disease is led by Prof. Dr. Bodo Levkau of the Medical Faculty of the University of Duisburg-Essen and Prof. Dr. Michael Schäfers and Prof. Dr. Günter Haufe of the University of Münster. Total funding at UK Essen is approximately €370,000 for the period from 2013 to 2017.



Participation in Collaborative Research Centre (SFB) 876

"Feature selection in high dimensional data for risk prognosis in oncology" is the topic of a subproject of the computer science Collaborative Research Centre (SFB) 876 ("Providing information by resource-constrained data analysis") of the Technical University of Dortmund (Spokesperson, Prof. Dr. Katharina Morik). This subproject was established in 2011 and was extended for four years in 2015. The aim of the Collaborative Research Centre is to investigate methods of analyzing very high-dimensional data volumes on relatively small devices (e.g., smartphones, standard computers) while using limited resources. One example of such methods is the use of genome data of the neuroblastoma in various stages of tumor progression, whose analysis can provide new insights into the mutation process during tumor formation and development and can demonstrate new treatment options.

The subproject is co-led by Prof. Dr. Alexander Schramm and Prof. Dr. Sven Rahmann at the Medical Faculty of the University Duisburg-Essen and Dr. Sangkyun Lee of the Technical University of Dortmund. Total funding at UK Essen is approximately €425,000 for the period from 2015 to 2018.

Participation in Collaborative Research Centre (SFB) 974

Liver diseases have a high prevalence and are therefore highly relevant, both clinically and socioeconomically. Most liver diseases become chronic, thereby affecting the entire organism. Impaired liver function and the consequences of altered hepatic hemodynamics progressively hamper the function of other organ systems. Often the clinical presentation and prognosis of liver diseases are determined by the impaired function of other organ systems.

Within the framework of SFB 974, conducted at Heinrich Heine University Düsseldorf with Prof. Dieter Häussinger as the spokesperson, cellular and molecular mechanisms of liver damage and regeneration are investigated. In addition to University Hospital Düsseldorf's Department of Gastroenterology, Hepatology and Infectious Diseases and other departments there, the University of Duisburg-Essen's Department of Immunology is involved in the subproject. In this subproject, Prof. Dr. Karl Sebastian Lang and his brother, Prof. Dr. Philipp Lang of University Hospital Düsseldorf's Department of Molecular Medicine, collaborate in the investigation of congenital immune cell populations in viral-induced liver injury.

Participation in Collaborative Research Centre (SFB) 1116

How can you protect the heart from myocardial infarction? A subproject at Essen's Medical Faculty is addressing this question as part of the Collaborative Research Centre (SFB) 1116 launched in 2015. The DFG subproject entitled "Master switches in cardiac ischemia" is based at Heinrich Heine University Düsseldorf. Total funding for the subproject at Essen University Hospital amounts to €665,000.

Today, nearly half of the deaths in Germany result from cardiovascular disease originating in the vascular system or the heart, most frequently from an acute myocardial infarction (AMI). The new SFB intends to use experimental, preclinical, and clinical studies to analyze the phase after an AMI. The goal is to identify mechanisms that determine the future course and to find starting points for new treatments. In addition to Heinrich Heine University Düsseldorf as the spokesperson university and the UDE Medical Faculty, the German Diabetes Center Düsseldorf and the Leibniz Research Institute for Environmental Medicine are involved in the SFB. In Essen, Prof. Dr. Dr. h.c. Gerd Heusch and PD Dr. Petra Kleinbongard lead the project entitled "Cardiac protection by remote ischemic conditioning during and post myocardial infarction."



Participation in Collaborative Research Centre (SFB) 1093

The “ischemic bowel” is the topic of the Medical Faculty’s subproject in Collaborative Research Centre (SFB) 1093 “Supramolecular Chemistry on Proteins,” set up by the DFG in 2014 at the University of Duisburg-Essen’s Institute for Organic Chemistry (Spokesperson, Prof. Dr. Thomas Schrader).

The goal of the Collaborative Research Centre (SFB) is to apply new findings and methods from supramolecular chemistry to biological and medical questions. The subproject “Supramolecular specific inhibitors of intestinal proteases against ischemia/reperfusion injury,” led by Prof. Dr. Dr. Herbert de Groot, investigates the mechanisms of damage to the intestines in association with circulatory disorders (ischemic injury of the intestines). In addition, in collaboration with researchers from the Chemistry Department, the SFB is seeking new medical approaches for treating this rare but extremely serious disease, which carries a mortality rate of more than 50%. Total funding for the subproject amounts to €360,000.




DFG Priority Programmes (SPPs)

The Priority Programmes (SPPs) aim to give clear impetus to the advancement of science and the humanities through coordinated multi-location funding for important new topics: A particular feature of a Priority Programme is the nationwide collaboration between its participating researchers. As a rule, Priority Programmes receive funding for a period of six years. If researchers are interested in collaborating on a Priority Programme, the DFG invites them to submit the corresponding applications for research grants by a certain deadline.

SPPs and SPP subprojects at the Medical Faculty:

DFG Priority Programme 1629

Thyroid disorders are among the main disorders in Germany, affecting approximately one-third of the German population. The primary focus of the DFG Priority Programme THYROID TRANS ACT, Translation of Thyroid Hormone Actions beyond Classical Concepts (SPP1629), launched in 2012, involves understanding the differences between healthy and pathological thyroid function in the organism and identifying ways of detecting thyroid diseases earlier in the future and offering better treatment. New studies have shown that the diagnostic methods used to date provide inadequate information on thyroid health. In addition, for many patients taking thyroid hormones, symptoms do not completely improve. Furthermore, the pathogenesis and course of many health disorders such as obesity, diabetes, osteoporosis, cardiovascular disease and cancer are influenced by thyroid hormones.



To better diagnose and treat these widespread thyroid disorders, the DFG has extended the Priority Programme at UK Essen and 13 other locations in Germany by three years (2015–2018). The projects funded in Essen are led by Prof. Dr. Dagmar Führer, PD Dr. Lars Moeller and Dr. Denise Zwanziger and investigate the effect of thyroid hormone with respect to age and sex, cardiac function, and the hepatobiliary system; the non-genomic effects of thyroid hormones; and new systemic markers of hyperthyroidism and hypothyroidism. The Medical Faculty of the University of Duisburg-Essen, Jacobs University, Bremen, and Charité – Universitätsmedizin Berlin coordinate SPP1629. Funding for this second three-year funding period amounts to more than €7 million, with total funding for this Priority Programme amounting to €14 million.

Spokesperson: Prof. Dr. Dr. Dagmar Führer

DFG Priority Programme 1267

Until the early 1990s, sphingolipids were considered to be primarily structural elements of the cell membrane. However, between 1990 and 1995, a paradigm shift took place. Researchers demonstrated that sphingolipids such as ceramide, sphingosine, and sphingosine-1-phosphate are central biological mediators regulating cellular function, such as cell death, cell differentiation, migration, and angiogenesis and embryogenesis. A pathophysiological role of sphingolipids has already been demonstrated in neurodegenerative disorders, such as Alzheimer's disease; ischemic tissue damage such as myocardial infarction or stroke; atherosclerosis; bacterial, viral, and

parasitic infection; sepsis; cystic fibrosis; tumor disorders; psoriasis; glomerulosclerosis; and autoimmune disorders. The discovery of FTY720 as a pharmacological agent that influences the function of sphingosine-1 phosphate demonstrates that the modification of sphingolipid metabolism opens brand new alternatives for immunosuppression during organ transplants and for severe autoaggressive diseases such as multiple sclerosis or rheumatoid arthritis.

The Priority Programme investigates neurobiological, cardiovascular, and pulmonological aspects of sphingolipids. The DFG Priority Programme SPP1267, "Sphingolipids – Signal and Disease," was completed in 2014. The Research Unit FOR2123, "Sphingolipid Dynamics in Infection Control," builds on the SPP.

Spokesperson: Prof. Dr. Erich Gulbins

Subproject in DFG Priority Programme 1468

SPP1468 addresses the topic "Osteoimmunology – IMMUNOBONE – A Program to Unravel the Mutual Interactions between the Immune System and Bone." The subproject focuses on the role of CCR2 ligands for neutrophil mobilization from the bone marrow to peripheral sites and for the structure of the blood vessel system in bone.

Spokesperson: Prof. Dr. Matthias Gunzer

DFG Research Units

The DFG supports the establishment of Research Units to provide outstanding researchers the opportunity to carry out close cooperation in a special research project. The purpose is to help researchers achieve far-reaching results that extend well beyond those achieved within the scope of the individual grants program.

Research Units may have a modular structure. Modules are selected according to subject-related aspects and can therefore vary depending on the particular research interest, the research areas included, and the desired structural aspect.

The Medical Faculty is currently involved in four DFG Research Units:


- “Expectation and conditioning as basic processes of the placebo and nocebo response: From neurobiology to clinical application” (FOR1328)
- “Extinction learning: Behavioural, neural and clinical mechanisms” (FOR1581)
- “Mature T-cell lymphomas – mechanisms of perturbed clonal T-cell homeostasis” (FOR1961)
- “Sphingolipid dynamics in infection control” (FOR2123)



EU projects and research funding

The European Union also supports projects, with the aim of establishing a European Research Area. The long-term objective is to create uniform conditions for research and innovation in Europe and to overcome the fragmentation of the European research landscape of the past. The European Union has funded research since 1984 in the form of multiannual “work programs.” Since 2014, the Horizon 2020 program has been the EU’s primary funding instrument for research, technological development, and innovation. The program continues the previous 7th Framework Programme for Research (FP7) and also integrates the important parts of the previous Competitiveness and Innovation Framework Programme (CIP) and, for the first time, the European Institute of Innovation & Technology (EIT). Horizon 2020 covers a wide range of topics ranging from basic research to market-oriented innovation measures.

Current projects funded by the Horizon 2020 program at the Medical Faculty are presented in the following:



MELGEN – Melanoma genetics: Understanding and biomarking the genetic and immunological determinants of melanoma development and patient survival

Investigating melanoma genetics: Involving 17 doctoral candidates at 7 European universities and 5 collaborating academic and commercial partners, the project aims to tailor melanoma treatment more specifically to individual patients and, in so doing, to substantially enhance success. The disciplines of genetics, immunology, bioinformatics, and statistics work in cooperation to improve their understanding of the interactions between tumor and healthy tissue and to discover biomarkers that allow conclusions to be drawn about treatment success.

Participating institution: Department of Dermatology

RADIATE – DNA damage response, DNA repair and cancer: From molecules to treatment

Radiotherapy is 1 of 3 standard treatment options for cancer patients. However, treatment success is hampered by 2 factors. On the one hand, tumor tissue can be highly resistant to irradiation, whereas the healthy tissue of some organs is very sensitive. On the other hand, the tumor microenvironment can cause increased resistance to the irradiation effect. The EU's RADIATE project aims to investigate the underlying mechanisms and to develop new treatment approaches with the support of 14 doctoral candidates at 7 leading radiotherapy research facilities.

Participating institution: Institute of Cell Biology (Cancer Research)

MULTIMOT Collaborative Project

Cell migration is an essential process in every phase of immune response, ranging from the recruitment of immune cells in infected tissue to the migration of B cells in bone marrow for antibody production. Live-cell imaging is the gold standard of migration analysis. Performing video microscopic analysis of the motility of immune cells and comparing healthy volunteers with chronically or acutely ill patients open up new dimensions in the diagnosis and prognosis of disease. The Institute of Experimental Immunology and Imaging, with its Imaging Center Essen core facility, is therefore an important partner in the MULTIMOT Collaborative Project. The project researchers aim to use metaanalyses of the data obtained by the participating institutions to achieve a standardized processing method of using imaging methods to expand the possibilities of individualized medicine.

Participating institution: Institute of Experimental Immunology and Imaging with its core facility, the Imaging Center Essen

Since 2015, the Dean's Office Administration of the Medical Faculty has assisted researchers in applying for EU funding via the newly established EU Project Office.

The following projects at the Medical Faculty are funded within the EU Framework Programmes:

Project manager	Department/ Institute	Project title	Acronym and GA no.	Framework program	Funding program	Term
Prof. Küppers	Cell biology (Tumor research)	A BLUEPRINT of Haematopoietic Epigenomes	Blueprint	FP-7	Health	Oct. 1, 2011 – Mar. 31, 2016
Prof. Ladd	Diagnostic and Interventional Radiology and Neuroradiology	Ultra-High Field Magnetic Resonance Imaging	HiMR GA	FP-7	Marie Skłodowska Curie ITN	Nov. 1, 2012 – Oct. 31, 2016
Prof. Paul	General, Visceral and Transplantation Surgery	Consortium on Organ Preservation in Europe	COPE	FP-7	Health	Jan. 1, 2013 – June 30, 2017
Prof. Gunzer	Experimental Immunology and Imaging	New Molecular-Functional Imaging Technologies and Therapeutic Strategies for Theranostic of Invasive Aspergillosis	MATHIAS	FP-7	Health	Oct. 1, 2013 – Sept. 30, 2018
Prof. Scherbaum	Psychiatry and Psychotherapy Department for Addiction Medicine and Addictive Behavior LVR Hospital Essen	European-wide, Monitoring, Analysis and knowledge Dissemination on Novel/Emerging pSychoactiveS	MADNESS	JUST	DPIP	Apr. 1, 2014 – Mar. 31, 2016
Prof. Eckstein	Diseases of the Anterior Segments of the Eyes	Investigation of Novel biomarkers and Definition of the role of the microbiome In Graves' Orbitopathy	INDIGO	FP-7	Marie Curie Action: Industry-Academia Partnerships and Pathways	May. 1, 2014 – Apr. 30, 2018
Prof. Gunzer	Experimental Immunology and Imaging	Capture, Dissemination, and Analysis of Multiscale Cell Migration Data for Biological and Clinical Applications	MULTIMOT	Horizon 2020	Health	Aug 1, 2015 – July 31, 2018
Prof. Brandau	Ear, Nose, and Throat Clinic	European Network of Investigators Triggering Exploratory Research on Myeloid Regulatory Cells (Myc-EUNITER)	Cost Action BM 1404	FP-7 und Horizon 2020	Cost-Action	Dec. 1, 2014 – Apr. 30, 2016
Prof. Schadendorf Prof. Becker	Dermatology	IMMune MODulating strategies for treatment of MErkel cell Carcinoma	IMMOMEc	FP-7	Health	Jan. 1, 2012 – Dec. 31, 2015
Prof. Jendrossek	Cell Biology (Tumor Research)	Radiation Innovations for Therapy and Education	RADIATE	Horizon 2020	Marie Skłodowska Curie ITN	Mar. 1, 2015 – Feb. 28, 2019
Prof. Schadendorf	Dermatology	MELanoma GENetics – understanding and biomarking the genetic and immunological determinants of melanoma survival	MELGEN	Horizon 2020	Marie Skłodowska Curie ITN	June 1, 2015 – May 31, 2019

German Cancer Aid–certified Interdisciplinary Oncology Center of Excellence

WTZ is one of 13 Oncology Centers of Excellence in Germany and is the country's oldest Comprehensive Cancer Center (CCC*). Before an institution can qualify for the German Cancer Aid (Deutsche Krebshilfe) designation, it must offer functional structures comparable to those required for the US CCC designation on which it is modeled. One primary aspect is the interdisciplinary development of strategies in the following areas: optimization and standardization of cancer treatment, compatible documentation systems, cancer registry and epidemiology, tumor tissue banks, clinical trials and trial structures, and training and translational research.

Since its designation in 2009, its subsequent funding in 2013, and its recertification in 2016, the WTZ has pooled the skills and experience of physicians and scientists from more than 20 departments and 16 institutes for early detection, diagnosis, and treatment of cancer. This goal is based on interdisciplinary cooperation, close coordination of inpatient and outpatient treatment in tumor-centered research and treatment programs, and top-level quality management.

The Director of the WTZ is
Prof. Dr. Dirk Schadendorf.

German Cancer Consortium (DKTK)

UK Essen's WTZ, in cooperation with partners from University Hospital Düsseldorf, represents the federal state of North Rhine-Westphalia (NRW) in the German Cancer Consortium (DKTK), one of the German Health Research Centres established by the German Ministry of Research (BMBF) and the federal states. In the DKTK, seven excellent university hospitals work together with the German Cancer Research Center (DKFZ) to translate the latest findings from basic research into medical application to patients. The DKTK focuses on interdisciplinary approaches and innovative clinical trials that aim to improve early detection and diagnosis and to develop individualized treatments.

The BMBF and the participating states currently support the consortium with some €28 million annually. In association with the DKTK, three W3 professorships for Translational Oncology were established at the Medical Faculty together with the DKFZ, and professors were appointed to the positions.

Prof. Dr. Martin Schuler is the spokesperson of the DKTK Essen/Düsseldorf partner site and is a member of the DKTK steering committee.



* Based on the US National Cancer Institute's
Comprehensive Cancer Center designation concept





German National Cohort (NAKO)

Since 2014, the Medical Faculty has been a study center of the German National Cohort, Germany's largest health study. The National Cohort Study includes 200,000 participants between the ages of 20 and 69 who undergo medical examinations and answer questions about their living conditions. The National Cohort Study, the first large-scale research project of its kind, aims at improved prevention and early detection and treatment of serious diseases such as cancer, diabetes, and dementia.

The study involves 25 research institutions throughout Germany with a network of 18 study centers. The German government, the state governments, and the Helmholtz Association are funding the study with €210 million.

The study center in Essen offers two special features. It is one of only five MRI centers set up for the study throughout Germany, enabling the performance of total-body MRI scans of 6,000 cohort members in Essen alone.

In addition, Essen is the base of the Chair of the Board of Directors of the NAKO, Prof. Karl-Heinz Jöckel (see also Chapter 5, Infrastructure, Study Center for Imaging).

Heinz Nixdorf Recall Study and Heinz Nixdorf Recall Multigeneration Study

Cardiovascular diseases continue to be the most common cause of death in the Western industrialized countries. Although relevant progress has been made in the treatment of acute or impending heart attack, today approximately 50 percent of patients with acute myocardial infarction do not reach the hospital alive. Developing specific diagnostic methods for the early diagnosis of cardiovascular diseases is therefore a high priority. The goal of the successive studies is to analyze selected examination methods with regard to their suitability for early detection of myocardial infarction and cardiac death in the population of the Ruhr region of northwestern Germany.

The studies are led by Prof. Dr. Karl-Heinz Jöckel and Prof. Dr. Susanne Moebus. Prof. Dr. em. Raimund Erbel, Prof. Dr. Stefan Möhlenkamp (Moers), and Prof. Nico Dragano (Düsseldorf) are co-project leaders.

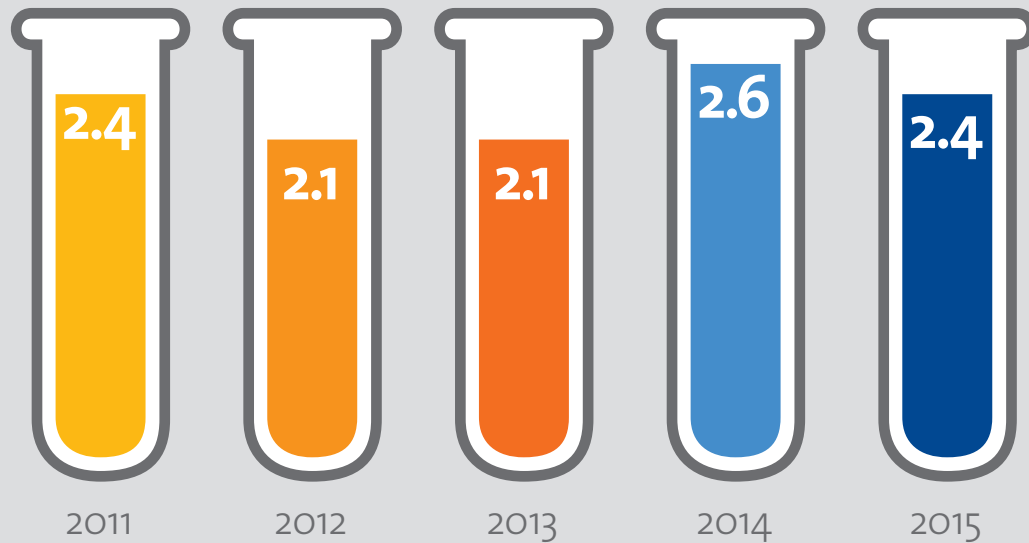
Research funding and early career support

At the Medical Faculty, Early Career Support is accorded high priority. A wide range of interconnected programs and funding opportunities is offered.

IFORES – Program for Internal Research Funding Essen

Future-oriented research funding calls for targeted, performance-based distribution of available funds. For this purpose, the Medical Faculty set up the Program for Internal Research Funding Essen (IFORES) back in 1995. IFORES is a pool fed from part of the finances for research and teaching.

Funding amount per year (in million euros)



The IFORES program comprises the following funding instruments:

Bonus system

This funding measure rewards the acquisition of external funding from ministries, the EU, and reviewed foundations. For external funding from various institutions (DFG, BMBF, EU, and peer-reviewed foundations), a financial bonus is provided. Funding acquired through a non-scientifically reviewed appraisal process, such as from industry or donations, is not rewarded.

Project funding (since 2014)

Researchers whose DFG grant proposals were not approved but who have good prospects for approval if they are resubmitted can use this funding to finance the required preliminary work.

Internal research grants for clinicians

Hospital-based physicians are provided the opportunity to work on projects in an experimental research working group by being released from their medical care duties. Each year, as many as five one-year grants are awarded with the option of a one-year extension. This funding measure also serves to establish long-term links between clinical and theoretical departments.

Funding for returnees

Scientists who return to a position at Essen University Hospital after completing a research stay funded by the DFG or the US National Institutes of Health (NIH) can apply for return funding. The measure serves to establish methods that have been learned or to set up an operational laboratory structure, and provides a funding stopgap while applications for external funding are prepared.

Support for Collaborative Projects

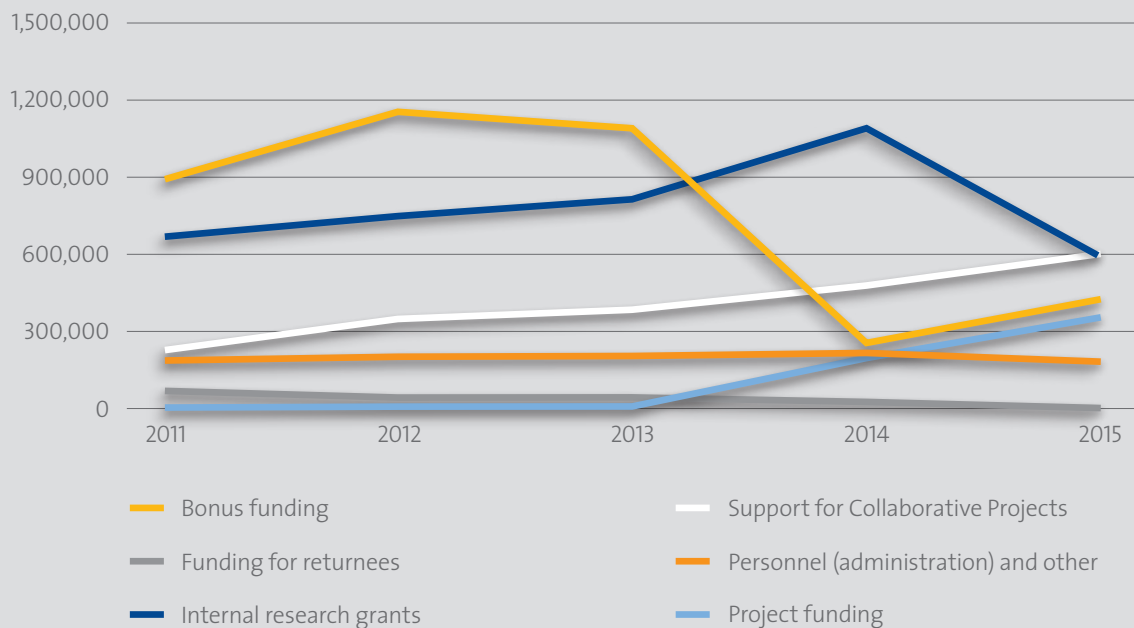
Collaborative Projects are larger-scale research projects jointly implemented by several partners in an alliance. Examples of Collaborative Projects are Collaborative Research Centres (SFBs) and Research Training Groups. Researchers may apply for funding from the IFORES program for support of Collaborative Projects.

BIOME – BIOME Postdoctoral Excellence Programme

BIOME PEP aims to tie outstanding biomedical science doctoral candidates actively involved in the BIOME graduate school to the Medical Faculty while they are still in the final stages of their doctoral studies. Every year, as many as three researchers (salary group TV-L E13) can receive funding for a two-year term (in exceptional cases, for up to two-and-one-half years) in a laboratory of a Medical Faculty department or institute of their choice, headed by a full-time experimental researcher. This funding instrument was introduced for the first time in 2016.



Development of IFORES funding since 2011 in euros



Since the 2014 winter term, the amount of external funding spent is used to calculate the bonus funding rather than the amount of external money acquired, as had been the case in previous years. The shift in phases occurring as a result is reflected by the decrease in bonus funding distributed despite the increase in external funding acquired.

DFG Research Training Groups

Research Training Groups are established by universities to promote young researchers. They are funded by the DFG for a period of up to nine years.

Their key emphasis is on the qualification of doctoral researchers within the framework of a focused research program and a structured training strategy. Research Training Groups with an interdisciplinary approach are warmly welcomed. The aim is to prepare doctoral researchers for the complexities of the job market in science and academics and simultaneously to encourage early scientific independence.

At the Medical Faculty there are currently three Research Training Groups:

Research Training Group 1739

Radiotherapy is one of the three main pillars of cancer treatment. However, for the treatment of tumor types with high locoregional recurrence rates and for tumors located in high-risk organs, therapy optimization is urgently needed. By setting up the Research Training Group GRK1739, “Molecular determinants of the cellular radiation response and their potential for response modulation,” in 2012, the DFG supports one of only two Research Training Groups in radiation biology research in Germany. The scientific experiments focus on advancing our mechanistic understanding of molecules and pathway-regulating cellular sensitivity to ionizing radiation and on investigating new opportunities for effective radiation response modulation. Early career scientists from the areas of biology and medicine benefit from a unique environment combining excellence in radiation biology, experimental and clinical (radiation-) oncology, and expertise in complementary research areas directly related to radiation research. The participants also have access to cutting-edge technologies such as proton therapy (WPE).

The integration of the clinical departments in the DKTK and the WTZ creates excellent conditions for translational research approaches. The innovative research and training program offers students a host of opportunities for developing their scientific, professional, and social skills and establishing national and international networks. This support offers them ideal preparation for a future career in radiation biology, oncology, and biomedicine in both academic and nonacademic settings. In 2016 the Research Training Group GRK1739 received funding for an additional 4.5 years.

Spokesperson: Prof. Dr. Verena Jendrossek

Research Training Group 1949

Previously, very few experts conducted research on the interaction between innate and acquired immunity in association with infectious diseases. To fill this research gap, in 2014 the DFG established Research Training Group 1949, entitled “Immune Response in Infectious Diseases – Regulation between Innate and Adaptive Immunity.” The Research Training Group comprises 14 projects based at Heinrich Heine University Düsseldorf, Ruhr-Universität Bochum (RUB), and the University of Duisburg-Essen, as the university providing the spokesperson. It will receive funding amounting to €4.5 million in the first four-and-one-half years. Highly qualified scientists from a range of areas related to infectious diseases and immunity and vaccine development collaborate here to investigate the interaction between innate and acquired immune response. As part of the Research Training Group, outstanding early career scientists receive training in the area of infectious diseases research and immunology. To this end, the Research Training Group coordinates a three-year doctoral program for natural scientists and physician-scientists and a one-year structured training program for medical students. The training aims to consolidate the long-term advances in this important research area in the Rhine-Ruhr region of Germany. The program will initially run until 2018.

Spokesperson: Prof. Dr. Astrid Westendorf

Research Training Group 2098

For a long time, biomedical research assumed that sphingolipids were primarily structural elements of the cell membrane. We now know that they play an important role in a whole range of biological processes. New therapeutic approaches based on targeted manipulation of sphingolipids are currently being tested for treating multiple sclerosis, malignant tumors, and neurodegenerative diseases. The Research Training Group entitled “Biomedicine of the acid sphingomyelinase/acid ceramidase system” was established by the DFG in October 2015. It conducts in-depth analysis of the role and function of the sphingolipids in inflammatory, cardiovascular, and malignant diseases. The second step calls for the implementation of new findings in preclinical and clinical studies. The project aims to train young scientists in the area of the biomedicine of sphingolipids. The research projects are conducted in close cooperation with Cornell University, Memorial-Sloan Kettering Cancer Center, and Mount Sinai Hospital, New York City.

Spokesperson: Prof. Dr. Erich Gulbins

BIOME Graduate School

BIOME was founded in 2010 by the Medical Faculty and the Faculty of Biology of the University of Duisburg-Essen. Its aim is to offer doctoral candidates in the natural sciences and medicine highly qualified scientific training and a platform for periodic scientific debate. All of the doctoral candidates are assigned to a thematic focus in line with their research project. Regular scientific presentations and lectures by international guests, project presentations by the BIOME members, and literature seminars are held on the ten BIOME cores (BIOME Module). The teaching is conducted in English. The BIOME Graduate School also offers various events on the acquisition of basic scientific skills for the nearly 200 participating doctoral students and hosts annual meetings. In 2015, the BIOME Graduate School launched a clinically oriented program to complement its basic research focuses.

Spokespersons: Prof. Dr. Sven Brandau and Prof. Dr. Ulf Dittmer



ELAN Doctoral School

Since 2012, particularly high-achieving medical students have had the opportunity to apply for the ELAN Doctoral School. The “Essen Laboratory and Science Training Program for Up-and-Coming Physicians” offers as many as 13 talented students per year the chance to take time off from their regular course of study and enter the world of research. The program provides grants to subsidize the research period. The students spend two terms learning laboratory and analytical techniques, along with the rules of sound scientific practice. They perform experimental work in an evaluated project of their choice in various theoretical and clinical areas and learn to present themselves and their projects at meetings and to publish their results in scientific journals. Some of the ELAN participants also have the opportunity to spend several weeks at a leading laboratory outside Germany as part of the program. The ELAN Doctoral School thus paves the way for outstanding students to pursue a career in academic medicine and research. The first set of students completed their experimental block in 2015. Several of the participants have already received distinctions at national and international meetings.

In 2016, the Else Kröner-Fresenius Foundation (EKFS) pledged as much as €750,000 in funding for the ELAN Doctoral School for another three years. ELAN is one of six doctoral schools supported by the EKFS.

Heads of ELAN:

Prof. Dr. Ursula Rauen, Prof. Dr. Andreas Paul, and Prof. Dr. Peter Horn

MediMent Mentoring Program

The MediMent Mentoring Program was one of the first programs of its kind to be established for university medicine. It was launched in 2005. The program aims to specifically promote career development of female scientists in university medicine and to counteract the underrepresentation of female scientists in leadership positions. The evaluation of the MediMent programs in 2015 testifies to the extensive benefits of the seminar programs, the dissemination of knowledge by experienced mentors, and the active networking within the peer groups. By providing individual support with career planning and sharing of strategies and rules of the game necessary for pursuing an academic career, the program enables candidates to make career decisions in a more targeted manner and helps them to more quickly attain subsequent training levels in their professional career.

The MediMent mentoring program concept was expanded in 2009. Since then, two formats have been offered on a biyearly basis: a one-to-one program for young women scientists, and a small-group peer-mentoring program for women and men. Participants in these programs have the opportunity to invite faculty members to attend their meetings as mentors. Each program offers seminars and networking activities.

Over a ten-year period, a total of 140 postdoctoral candidates, among them 107 women and 33 men, from the areas of medicine, biology, biochemistry, chemistry, pharmacy, clinical psychology, nutrition science, physics, biostatistics, and business administration have completed the MediMent program, supported by 59 mentors (last updated 2015). The sixth MediMent 1:1 program started in late January 2016.

Research and study grants

Candidates can also apply for research or study grants from the Medical Faculty. For students and visiting scientists from partner universities, these grants are financed by Medical Faculty funding for collaboration with foreign institutions. Grant recipients from all institutions are financed by funding resources provided by the host institute or department.

Academic proceedings

A key Medical Faculty remit involves training for early career scientists.

A doctoral degree is evidence of the candidate's ability to perform independent scientific work that exceeds the general objectives of the study. The Medical Faculty awards a doctoral degree to candidates who have successfully completed a doctoral program.

The academic degrees Doctor of Medicine (Dr. med.), Doctor of Medical Science (Dr. rer. medic.), and Doctor of Dentistry (Dr. med. dent.) can be earned from the University of Duisburg-Essen's Medical Faculty. The Medical Faculty can also award an honorary doctorate in medicine (Dr. med. h.c.) for outstanding scientific achievements or particular achievements in the area of medicine.



Doctorates, Dr. med.

	Total	Male	Female
2011	148	75	73
2012	136	63	73
2013	125	55	70
2014	132	51	81
2015	115	44	71

Doctorates, Dr. rer. medic.

	Total	Male	Female
2011	25	7	18
2012	40	19	21
2013	25	7	18
2014	21	6	15
2015	25	11	14

Doctorates, Dr. med. dent.

	Total	Male	Female
2011	1	1	–
2012	1	–	1
2013	–	–	–
2014	2	2	–
2015	1	–	1

In 2015, 115 “Dr. med.” degrees, 25 “Dr. rer. medic.” Degrees, and 1 “Dr. med. dent.” degree were awarded.

Honorary doctorates at the Medical Faculty

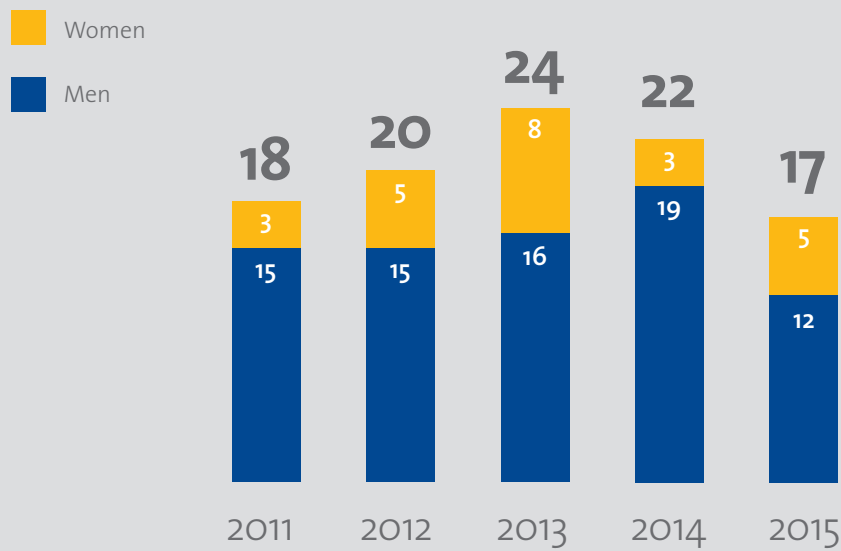
- 1970 – Dr. phil. Hans Littmann,
Carl-Zeiss-Werke, Oberkochen
- 1971 – Prof. Dr. med. Wilhelm Flaskamp,
Protestant Hospital Oberhausen
- 1988 – Prof. Dr. Mitsuyuki Abe,
University of Kyoto, Japan
- 1988 – Prof. Dr. med. Hans-Jürgen Bretschneider,
University of Göttingen
- 1988 – Prof. Dr. PhD. Johannes Joseph van Rood,
University of Leiden, Netherlands
- 1990 – Prof. Dr. med. Hans Robert Willenegger,
University of Basel, Switzerland
- 1993 – Prof. Dr., Ph.D. Dr. sci. h.c. Richard B. Setlow,
Brookhaven National Laboratory, Upton, New York, USA
- 1997 – Prof. Dr. med. Wolfgang Bircks,
Heinrich Heine University Düsseldorf
- 1997 – Prof. Dr. med. Franz Loogen,
Heinrich Heine University Düsseldorf
- 2000 – Prof. James Lafayette German III, M.D.,
New York Blood Center, New York, NY, USA
- 2006 – Prof. Dr. Wu Zhongbi,
Tongji Medical College of Huazhong University
of Science and Technology, Wuhan, China
- 2008 – Dr. rer. pol. Jochen Melchior,
Essen
- 2008 – Dr. Ronald Nutt,
University of Tennessee, Knoxville, Tennessee, USA
- 2009 – Prof. Dr. Yu-Mei Wen Fudan,
Shanghai Medical College, Fudan University, Shanghai,
China
- 2012 – Prof. h.c. Dr. med. Dr. h.c. Heinz-Horst Deichmann,
Essen
- 2014 – Prof. Dr. phil. Jan Beckmann,
Hagen

A habilitation, taking into account the assessment of external reviewers, serves as the formal determination of the ability to independently and responsibly represent a scientific discipline in research and teaching.

Upon completing a habilitation, the candidate obtains a teaching license (*venia legendi*) in the subject area for which the teaching qualification has been pronounced and is entitled to use the designation “Privatdozentin” or “Privatdozent.”

In 2015, 12 men and 5 women completed habilitations at the University of Duisburg-Essen’s Medical Faculty.

Habilitations



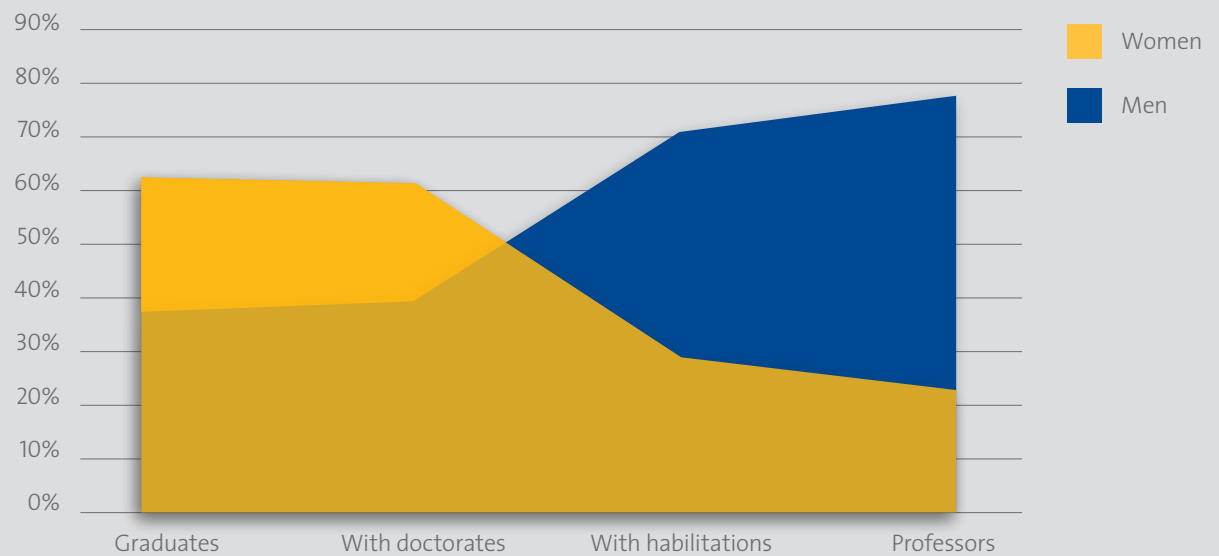
Support program for female habilitation candidates

A habilitation is an important step on the way to becoming a professor. However, when it comes to taking this step, far more men than women choose to do so. To prevent the attrition of highly qualified and motivated women on the path to habilitation, the Medical Faculty has established a special concept, the support program for female habilitation candidates. The Medical Faculty launched the program in 2014 with the aim of specifically promoting female scientists. The program was extended in 2016. To allow participating scientists with children to focus on

their research tasks, the scientists are assigned a student assistant. The underlying motivation for this support is obvious. Supporting female habilitation candidates is an investment in the future that equally benefits research and teaching in the long term.

The program was initiated by the Medical Faculty's Equal Opportunity Commissioner Prof. Dr. Ulrika Schara, along with her deputies, PD Dr. Diana Arweiler-Harbeck, Prof. Dr. Sigrid Elsenbruch, and PD Dr. Stefanie Flohé.

Percentage of women and men at various career levels



Central events

To promote exchange and networking among scientists, the Medical Faculty regularly holds science- and medicine-related events.

Research Day

In 2015, the Medical Faculty hosted its 14th Research Day. At the event, doctoral candidates present their doctoral projects to the public. Outstanding participants are awarded poster and presentation prizes. Research Day is the product of hard work and energy behind the scenes and is a high-profile Medical Faculty event. First conducted in 2002, it provides young researchers the opportunity to gather valuable input for their work and to establish contact with their colleagues.

MFZ Research Day

The Medical Research Center's (MRZ) first Research Day took place in 2014. At the event, 24 working group leaders presented their work in short talks. Individual projects were showcased in 56 posters. With some 120 participants, the MFZ Research Day was a complete success, impressively presenting the diversity and high quality of the research conducted at the MFZ.

Scientific Seminar ("Tuesday Seminar")

For many years, the Medical Faculty has offered a Scientific Seminar, a lecture series in which leading external experts from a range of disciplines are invited to Essen to share their insights. During the term, lectures are offered on a central topic or on one of the Medical Faculty's focuses on cardiovascular, oncology, transplantation, immunology/infectious diseases, or genetic medicine research. The "Tuesday Seminar" is certified by the medical association as a continuing professional education event.

Winter Seminar

Every spring, the Medical Faculty hosts a three-day seminar in Austria. The event, which is open to members of the Medical Faculty, serves to foster communication between early career scientists and the heads of the departments and institutes, and promotes scientific exchange among the various Research Units. The Winter Seminar is also certified as a continuing professional education event.

Publications

Scientific publications are recognized evidence of achievement for evaluating research performance in medicine.

Since 2006, the EVALunaBiblio program has been used to record and evaluate the publication data of all medical schools in North Rhine-Westphalia. For the awarding of performance-based funding (LOM), only publications meeting defined criteria are taken into account. For example, a publication must be listed in the Web of Science, must list

a valid affiliation with the Medical Faculty, and must constitute one of the following publication types: article, editorial, letter, new item, or review.

The table presents the development of the Medical Faculty's publication output between 2009 and 2014. Each publication was recorded only once, even if more than one Medical Faculty author contributed. The data for 2015 are not yet available, because the EVALunaBiblio final evaluation has not yet been completed.

Publications between 2009 and 2014

	2009	2010	2011	2012	2013	2014*
Total publications	958	984	1.014	963	1.069	987
Total impact factor (IF)	3,732	4,275	4,814	5,087	5,049	5,410
Mean impact factor (mIF)	3.896	4.344	4.748	5.282	4.723	5.481

* preliminary

In relation to the number of its professors, the Medical Faculty can claim an outstanding position among the state's university hospitals.

Medical Faculty professors have published the results of their scientific work in international top-caliber scientific journals, including *Science*, *Nature Genetics*, *Journal of Experimental Medicine*, *Journal of the American Medical Association*, *Lancet*, *Lancet Neurology*, and the *New England Journal of Medicine*. The list also includes publications to which Essen-based researchers contribute as coauthors, such as *Nature* and *Nature Cell Biology*.



Patents

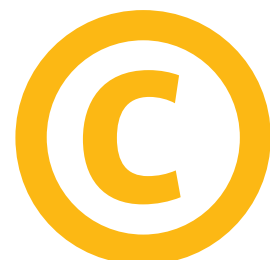
The Medical Faculty not only conducts excellent research but also has the structures necessary to exploit this research effectively. In addition to publishing research findings in scientific journals, results can also be used to develop patented inventions.

A patent is a set of exclusive rights granted by a sovereign state for a technical invention for which the patentee is granted the sole right to use his or her achievement for a certain time. Patentability per se is defined by the achievement of certain criteria. In accordance with German law, patents can be granted for technical inventions that are new, involve an inventive step, and can be used for industrial application. Between January 2010 and December 2015, Medical Faculty employees submitted a total of 58 invention disclosures to the Patent Office of the University of Duisburg-Essen's Science Support Centre. Among these submissions, 27 inventions were claimed by the university on the basis of their promising patentability and marketability, and 31 inventions were released to the inventor because of their poor prospects for patentability and marketability. The scientists submitting the latter patent disclosures can themselves register the inventions for a patent, using their own names and at their own expense.

For the inventions claimed by the university, the university pledges to submit an application giving rise to a right of priority for a patent. Among these patent applications, from 2010 to 2015 the rights to three patent applications were transferred to external institutions or companies on the basis of contractual obligations and in consultation with the inventors, and six applications had already been abandoned before the patent was granted.

From 2010 to 2015, 17 inventions for which a patent application was filed could be successfully exploited. This means that the rights to the inventions in the form of licenses or patent sales to third parties were granted in exchange for normal market remuneration.

Two patent exploitation agreements are especially noteworthy. Both were entered with companies founded by the inventors on the basis of their own patent submissions. One of the two companies is coramaze GmbH, which was founded by Prof. Dr. Till Neumann (formerly in the Department of Cardiology) in 2014. The company is developing a minimally invasive procedure for treating mitral regurgitation with an implantable device without the need for a conventional surgical procedure. The other



company is Heidelberg ImmunoTherapeutics GmbH, founded in 2015 by Dr. Michaela Arndt and PD Dr. Jürgen Krauss (formerly in the Department of Internal Medicine, Tumor Research), the most recent patent sale to lead to a start-up. An antibody that can be used to therapeutically and prophylactically target the human herpes simplex virus (HSV) is the first active ingredient to be clinically developed by the young company in the context of a phase I/IIa trial.

Number of patent applications and patents granted in the period from 2010 to February 2016

	Applications submitted	Patents granted
2010	7	0
2011	3	2
2012	7	2
2013	3	1
2014	4	3
2015	3	5
02/2016	0	2

27

15

4.

Teaching Activities

Educating Tomorrow's Physicians

At the University of Duisburg-Essen's Medical Faculty, a total of 1,875 students – roughly 225 per academic year – are equipped to act as self-reliant, independent medical professionals. The quality of teaching at the University of Duisburg-Essen's Medical Faculty is excellent, thanks to a wide range of subjects, including foundational scientific and medical studies, clinical subjects, and disciplines in psychology and sociology. In addition to the medical course, the Medical Faculty also offers a Master's degree in Pharmaceutical Medicine. The Medical Faculty also has excellent connections with the other disciplines within the University of Duisburg-Essen, in particular with the Faculties of Chemistry, Biology, and Economics, and the Chair of Healthcare Management.

Our future physicians benefit particularly from a targeted combination of academic and practical teaching. At all times, theoretical and practical approaches complement each other to achieve a bidirectional translation of knowledge. Even when fundamental knowledge about the structures and functions of the human body is

imparted, this information is linked with clinical content to highlight the practical relevance of acquired theoretical knowledge. Dealing with patients on a direct and personal level is just as much a part of medical training as is the integration of theoretical and practical knowledge. During the clinical part of the study course later on, the basic subjects are referred to again and again.

In the main clinical subjects, intensive instruction is offered in small-group settings. Instead of the usual large number of individual tests, central end-of-term examinations are administered between terms 1 and 3 of the clinical stage of studies. In scope and nature, these examinations closely approximate final examinations.

The Skills Laboratory, with its highly modern equipment, and the simulated patient program in the new Teaching & Learning Center are part of the modern teaching facilities. The Practical Year can be completed at the Essen University Hospital or at one of 19 academic teaching hospitals.

The Medical Faculty focuses on promoting early career researchers. In addition to its Program for Internal Research Funding Essen IFORES, the mentoring program MediMent, the BIOME Graduate School of Biomedical Science, and the ELAN Doctoral School (“Essen Laboratory and Science Training Program for Up-and-coming Physicians”) are examples of this research-friendly environment.

Regulations governing the course of study of medicine

The regulations dated March 17, 2004, which govern the course of study of medicine at the University of Duisburg-Essen, culminating in the Examination in Medicine (“Staatsexamen”), were most recently amended by the 18th amendment, dated March 15, 2016. This amendment was developed in close collaboration with the students and was published in Verkündungsblatt, Vol. 14, 2015, p. 223, no. 31. The amendment went into effect on September 24, 2015.

Other courses of study

The Medical Faculty also participates in a Master’s program in “Medical Management” (jointly with the Faculty of Business Administration and Economics), in a Bachelor’s and Master’s program in “Medical Biology” (jointly with the Faculty of Biology), in a program in “Medical and Biological Chemistry,” which forms one track of the Master’s program in Chemistry (jointly with the Faculty of Chemistry), and in a Bachelor’s and Master’s program in Medical Engineering (jointly with the Faculty of Engineering). Additionally, since the 2012/2013 winter term the Medical Faculty has been offering a joint program in “Medical Computer Science” with the Dortmund University of Applied Sciences and Arts.

The postgraduate Master’s program “Pharmaceutical Medicine,” established in 2005, was successfully reaccredited in 2010. It is managed in collaboration with the Institute for Education in Pharmaceutical Medicine GmbH in a “franchise process” according to Art. 66 (5) of the North Rhine-Westphalia Higher Education Act (HG).



Students

Term	Total	Men	Women	Percentage of Women
Winter 2010/11	1,572	607	965	61.4%
Summer 2011	1,481	567	914	61.7%
Winter 2011/12	1,630	612	1,018	62.5%
Summer 2012	1,625	598	1,027	63.2%
Winter 2012/13	1,775	641	1,134	63.9%
Summer 2013	1,664	602	1,062	63.8%
Winter 2013/14	1,809	655	1,154	63.8%
Summer 2014	1,706	622	1,084	63.5%
Winter 2014/15	1,821	672	1,149	63.1%
Summer 2015	1,781	671	1,110	62.3%
Winter 2015/16	1,875	715	1,160	61.9%

Students in the 1st Medical term = 1st preclinical term

Term	Total	Men	Women	Percentage of Women
Winter 2010/11	168	71	97	57.7%
Winter 2011/12	203	66	137	67.5%
Winter 2012/13	225	78	147	65.3%
Winter 2013/14	226	84	142	62.8%
Winter 2014/15	226	84	142	62.8%
Winter 2015/16	226	90	136	60.2%

International students

Term	Total	With foreign high school certificates*	Percentage of students	in 1 st Term**	Percentage
Winter 2010/11	1,572	154	9.8%	174	11.1%
Summer 2011	1,481	144	9.7%	7	0.5%
Winter 2011/12	1,630	154	9.4%	178	10.9%
Summer 2012	1,625	154	9.5%		
Winter 2012/13	1,775	144	8.1%	188	10.6%
Summer 2013	1,664	132	7.9%	3	0.2%
Winter 2013/14	1,809	140	7.7%	204	11.3%
Summer 2014	1,706	125	7.3%		
Winter 2014/15	1,821	133	7.3%	191	10.5%
Summer 2015	1,781	140	7.9%	6	0.3%
Winter 2015/16	1,875	137	7.3%	183	9.8%

* Any secondary school completion examination obtained outside Germany and qualifying the student for higher education

** 1st Term, i.e., enrolled for the first time at a German university; may have been previously enrolled abroad

Average duration of course of study

Winter 2010/11	13.36
Summer 2011	13.96
Winter 2011/12	13.60
Summer 2012	14.05
Winter 2012/13	13.76
Summer 2013	13.82
Winter 2013/14	13.69
Summer 2014	14.74
Winter 2014/15	13.15
Summer 2015	14.26
Winter 2015/16	13.72



Graduates

	Total	Men	Women	Percentage of Women
2010	255	102	153	60.0%
2011	214	86	128	59.8%
2012	215	72	143	66.5%
2013	209	82	127	60.8%
2014	202	59	143	70.8%
2015	251	95	156	62.2%
	1,346	496	850	63.2%

University admissions

From 1986 until 1997, and then again since 2000, the Medical Faculty has taken advantage of the opportunity to conduct interviews as part of the admissions process. The statutes regarding the admissions process were amended accordingly on the basis of a decision by the faculty representative committee, dated January 20, 2005. Of the total of 225 slots available annually, 60 percent are given to applicants who are chosen for an interview, on the basis of their high school grade point average and university preference, and who successfully complete this interview. The remaining 40 percent are assigned to those applicants with the best secondary school grades and to those with the longest waiting time, as is customary in Germany. Of the 35 medical schools in Germany, only 7 use such an admissions process. Thus, the University of Duisburg-Essen's Medical Faculty is leading the country in this respect, along with the Technische Universität Dresden, the Hannover Medical School, and the medical faculties of the universities in Hamburg, Lübeck, and Rostock (universities using admissions interviews, as of 2014, according to hochschulstart.de). The preselection procedure for this time-consuming but constructive process is

conducted via the German national electronic university admissions portal hochschulstart.de. For applicants with good grades who opt for Essen as their top choice for place of study, chances are good that they will be among those 350 candidates invited to be tested by an admissions committee in a face-to-face interview. During the interview, they will be asked about the highlights of their school careers; any formal knowledge attained to date; their interests, activities, and employment background; and their general motivation for pursuing the study of medicine.

Other factors taken into consideration are the candidates' notions about the medical profession and their understanding of the German health care system and health care policy. This portion of the interview is aimed at ensuring that these future physicians do not come to the profession with unrealistic expectations. In addition to their overall impressions of the applicants, the committee members will also consider the applicants' conduct during the interview and their ability to express themselves and support their position.

Teaching & Learning Center

Since the 2014 summer term, as many as 700 of the total of 1,800 medical students at the Medical Faculty have used the Teaching & Learning Center's (LLZ's) modern infrastructure daily. In the center the students benefit from realistic, state-of-the-art conditions for learning, because this new building at the southern end of the campus features several innovative approaches to teaching and studying. One of these is the study management system: Cameras installed in the classrooms allow audiovisual recording of all lectures and exercises, thereby providing not only documentation but also

the opportunity to review and analyze these activities.

Also available is the "SimArena," which provides authentic learning experiences, complementing the high level of theoretical study at the Medical Faculty. It provides a 270° projection across a total of more than 20 square meters, simulating practical scenarios for physicians by using real-time conditions. This arena allows, for example, the simulation of a bicycle accident at a busy intersection, or the medical first response to a lumberjack's accident.





In addition to the main lecture hall, which seats up to 300 students, the LLZ also provides 18 small-group instruction rooms of various sizes. The center is equipped for state-of-the-art teaching methods: for example, it has six classrooms connected via one-way mirrors to form three double rooms, giving students and teachers the opportunity to observe examination and treatment situations with simulated patients and allowing these situations to be conducted in an undisturbed, almost authentic environment. Rooms not otherwise in use can be booked by students for their own study groups.

The technical infrastructure is complemented by a computer pool containing 20 modern computer workstations and a lecturer's computer with a projector and sound system. All of these computers are part of the university's information technology (IT) network and can be administered locally. On the ground floor, the LLZ's study café not only supports discussion and exchange among students but also provides space for group work.

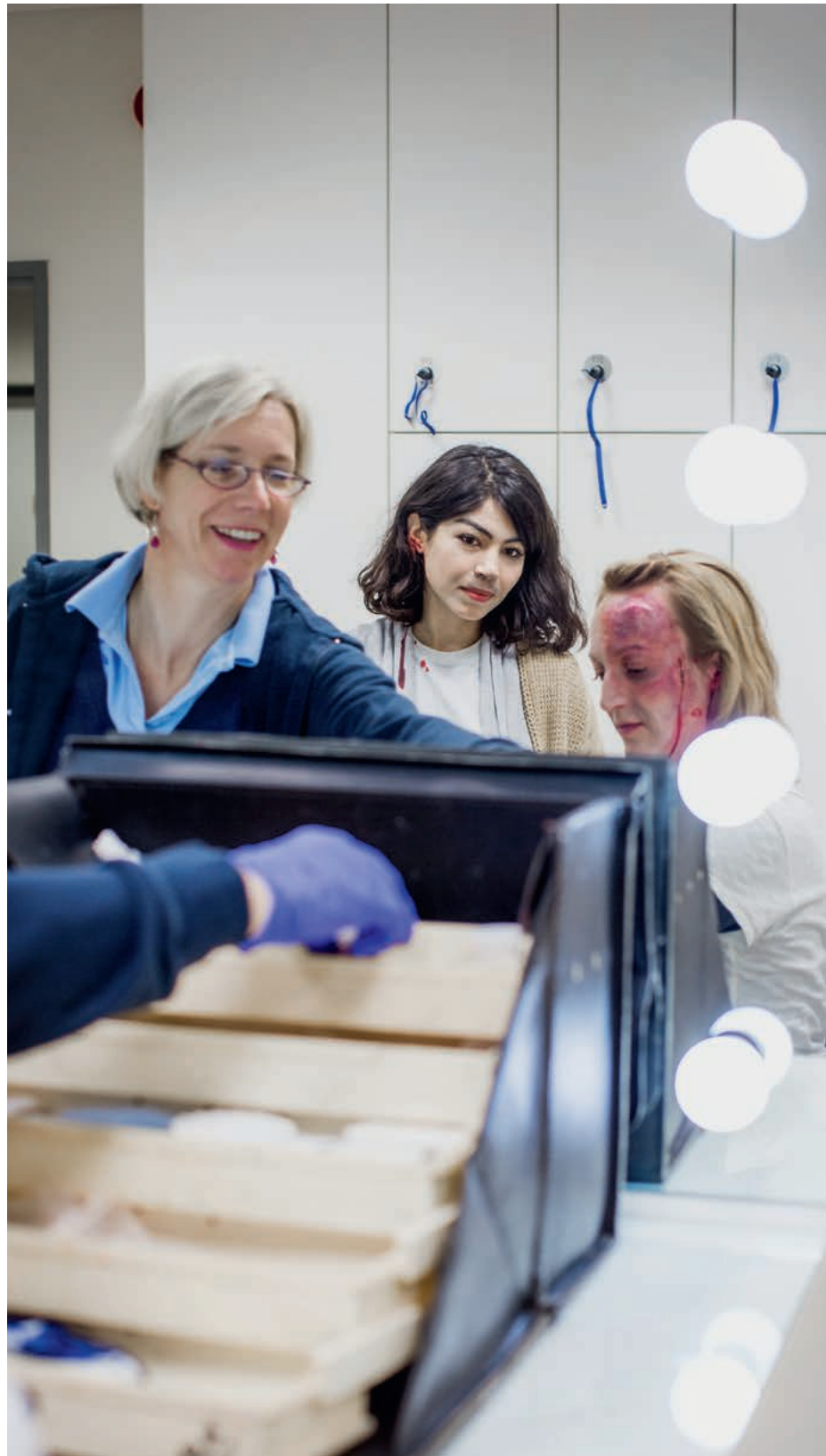
In 2014, the Teaching & Learning Center won the prestigious architectural award "Auszeichnung guter Bauten" (Good Buildings Prize) presented by the German Association of Architects (BDA), Essen chapter.



Simulated Patient Program (SPP)

The University of Duisburg-Essen's Medical Faculty is committed to preparing young physicians for the responsible and independent practice of medicine. This practice requires skilled and empathic physician-patient communication. Since 2005, the teaching of such communication skills has been enhanced by the use of simulated patients in both mandatory and elective classes. The simulated patients are actors, including acting students and graduates of the theater classes at Folkwang University of the Arts, as well as lay actors, all of whom have been trained to present various disorders and diseases, including all of the associated complaints and symptoms, in a standardized and authentic manner. The actors are also trained to provide structured feedback to the medical students. Training sessions take into account age- and gender-specific aspects as well as language, culture, and religion. The simulated patient program (SPP) is located inside the LLZ and is equipped with a professional make-up facility.

The Medical Faculty is also home to the SPP Network Center of the Simulated Patient Program of North Rhine-Westphalia, which coordinates the exchange between simulated patient programs of all medical schools in the state.



(Left) Dr. Stefanie Merse, Medical Director of the simulated patient program



Skills Laboratory

Since 2005, the Medical Faculty has also had its own Skills Laboratory, which is used both in mandatory classes and in electives. Its usefulness is evident: In everyday hospital routine, medical students have little or no opportunity to practice certain skills, because some diseases are rare or because patient safety concerns prohibit their participation. In the Skills Laboratory, however, training situations can be practiced in a standardized and sophisticated manner. Objective Structured Clinical Examinations (OSCEs) are conducted in the Skills Laboratory, where they serve to test students' mastery of the typical skills expected of physicians, with and without the participation of simulated patients.

Since 2005, the Skills Laboratory has also provided students with an opportunity to participate in an Emergency Medicine Summer School once a year, during which various medical emergency situations are taught in theory and practice. The summer school activities always culminate in a large-scale exercise simulating a mass casualty incident and involving the police and fire departments, as well as the German Federal Agency for Technical Relief. Since 2015, the Skills Laboratory has conducted Skills Laboratory Nightshift exercises, in which students participating in their clinical training terms learn about the specific challenges associated with emergency room nightshifts. The Skills Laboratory is located inside the LLZ.

Participation in the joint federal and state program on “Educational Equity in the Spotlight”

In 2011, the Medical Faculty together with the University of Duisburg-Essen applied for participation in the joint federal and state program on “Educational Equity in the Spotlight,” which aims to promote better conditions and higher quality in higher education. For the first funding period, lasting until 2016, the Medical Faculty received almost €800,000. The program in general covers such concepts as integrated student counseling and supervision, assistance in finding their place in university life at the beginning of their studies, and projects for discovering and supporting individual talent. The program also offers measures for quality assurance and for expanding the range of feedback instruments. The Medical Faculty has used the allocated funds to hire staff for mentoring (counseling and supervision), for specialized tutorials (supporting talent), and for conducting the Progress Test in Medicine as a benchmarking (feedback) instrument. The Faculty has also participated in a successful application for extending this funding (which will begin in October 2016).



Use of e-learning tools

At the Medical Faculty, e-learning has become a regular component of teaching activities. The central tool used is the Moodle learning platform, a system for creating and administering web-based study, teaching, and learning environments. E-learning activities are a meaningful addition to in-classroom teaching, enabling targeted preparation and revision of class content. Moodle is a password-protected platform that can be accessed by students and professors or by lecturers only. For every class or lecture, a “Moodle class” can be set up to offer selected content such as lecture slides, lecture summaries, audio-visual recordings of lectures, or even teaching videos to facilitate targeted class preparation and revision by students. It is always the instructor who decides on the content to be presented on this platform and who will be allowed to access it. Students are also able to access a huge selection of electronic textbooks from home via the online library of the Medical Library. In addition, the Faculty pays for free student access to electronic study platforms provided by large medical textbook publishers.

In 2010, the position of an E-Learning Officer was created in the Dean’s Office Administration to strategically develop and implement this important aspect of teaching.

Career support

Targeted offerings supporting students during their course of study and the furthering of scientific careers are a high priority at the Medical Faculty (see also Chapter 3, Research funding and early career support).

MentiZin mentoring program

MentiZin is the Medical Faculty's mentoring program for beginning medical students. It has been open to all students enrolled in this program since the end of 2011. This mentoring program comprises two components: For first-term students, MentiZin provides regularly offered tutorial sessions that allow the exchange of views and experiences and also make it easier for students to get off to a good start at the university. The mentoring activities are not limited to the first term, however; they can also be continued individually. For each mentoring tutor, a maximum of ten students are included in a tutoring group. This mentoring program has proved useful since the 2011/2012 winter term and is currently being continued.

MentiZin², on the other hand, provides all medical students with additional information and comprehensive assistance contributing to successful completion of their studies. These measures include tips about optimally preparing for examinations, writing a doctoral thesis, or applying for grants and scholarships. This mentoring concept has been continually developed and scientifically evaluated since the 2013 summer term. Participation in the mentoring programs is voluntary.

Introductory week for the "Practical Year" internship

This week-long introductory event was initiated in 2016 and aims to efficiently prepare students for their mandatory internship, the "Practical Year." During this event, participants accompany a (fictitious) patient from her admission to the emergency room through in-patient treatment and, finally, her discharge. This exercise serves to prepare students for their new roles and also helps them refresh their most important theoretical and practical skills in an interdisciplinary setting involving cross-professional collaboration with the nursing staff. This week-long program is intended for students who will complete the first part of their three-part Practical Year at UK Essen. Since 2015, the Skills and Simulation Training during the Practical Year has used five case-based simulations in small groups, video feedback, and subsequent skills training in surgery and internal medicine to prepare participants for the oral and practical examinations and for their future work as physicians.

Counseling center

During the course of study, many opportunities for personal development present themselves, in some cases leading to special challenges. When a student's own efforts to cope with these challenges are not sufficient, the counseling center can provide assistance. Since 2008, the center has been available free of charge to all medical students who seek counseling there. All discussions and personal information are kept confidential.



Deutschlandstipendium scholarships

The Medical Faculty is expressly committed to supporting and retaining young medical talent. To this end, high-achieving students are supported with a *Deutschlandstipendium* scholarship. In 2016, a total of 28 of these scholarships were awarded with funding totaling more than €100,000. Selection criteria include high achievement in coursework and certain extracurricular activities, such as volunteer work. A *Deutschlandstipendium* scholarship provides a student with €300 per month for one year. Of this amount, €150 is provided by sponsors, donors, or the *Stiftung Universitätsmedizin* foundation, which provides a total of 15 scholarships. The other €150 is provided by the German government. The idea behind this financial support is to enable scholarship recipients to focus even more strongly on their studies. At the same time, being awarded a scholarship is an important distinction for laying a foundation for a successful career.

Ever since the *Deutschlandstipendium* was initiated by the German government in 2011, the Medical Faculty has participated in this scholarship program, as it did in the predecessor program, the state-based NRW-Stipendium.

Evaluations

The Medical Faculty continually evaluates the quality of its teaching by using strategically complementary tools.

EVALuna

The online evaluation system EVALuna is a tool for the anonymous evaluation of teaching activities. In addition, it allows students to enter into an anonymous dialogue with professors and lecturers, during which they can discuss in free-form comments those teaching activities from which they benefited and those for which there is room for improvement.

Based on the EVALuna evaluation results, the Medical Faculty awards prizes for teaching activities, namely for the activities in the first and second part of the study course that received the best evaluations. In addition, recognition is given to activities that have improved most since the previous term. Currently, a prize of €1,000 is granted to supplement the teaching of the award winners. These awards are among the most prestigious prizes given by the Medical Faculty.

Best Instructor award

In the 2015/2016 winter term, the nomination of the best instructor was introduced as an additional category for evaluation. This €200 award is intended to recognize professors and lecturers who have shown outstanding commitment and have presented outstanding teaching activities. Winners are selected by student votes in an anonymous online survey conducted via the EVALuna web site.



ANSTOSS INNOVATIONSPREIS LEHRE



Der Medizinischen Fakultät
der Universität Duisburg-Essen

ANSTOSS, An award for innovation in teaching

“ANSTOSS” (Kick-off) is a tool created in 2016 that serves to make accessible to all students of the Medical Faculty the suggestions for improvement and creative ideas submitted by students. A new award for innovation in teaching will be given every other year during the fall or winter, beginning in 2016. All students in the Medical Faculty are invited to participate by submitting suggestions for new developments, innovations, or additional activities in the realm of teaching. All suggestions are attributed by name, and up to €10,000 will be available per project realized. Implementation of the winning projects will be supported and supervised by the Office of Academic Affairs.

The potential benefits of this award are obvious: On the one hand, it promotes the students’ motivation and constructive criticism of teaching activities and also allows instructors to revise and improve the activities they offer. On the other hand, this award will have a publicity effect that will be enhanced by its support of marketing measures.

Wir suchen
EURE IDEEN!
DEADLINE
15.09.2015

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AN DER MEDIZINISCHEN
FAKULTÄT NOCH BESSER!

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**ANSTOSS
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Progress Test in Medicine

The Progress Test in Medicine is a written examination that tests knowledge that should be representative of the knowledge required by a newly minted physician on her or his first day in practice. It presents students and the Office of Academic Affairs with a regular assessment of teaching and learning successes. The test comprises 200 questions that must be answered within, on average, 54 seconds each. The test is given once each term during the first week of lectures. Students are explicitly not expected to prepare for the test because it is intended to assess the knowledge spontaneously available to them. In this way, the students are also presented with detailed feedback regarding their individual strengths and weaknesses in terms of their current medical knowledge.

The Progress Test in Medicine was developed at Maastricht University and was first used there in 1977. It was first used in Germany in Berlin as the German Progress Test during the 1999/2000 winter term and has been given every term since. Since 2000, the Charité – Universitätsmedizin Berlin and Witten/Herdecke University have collaborated on the test. Numerous additional medical schools have since joined this collaboration, including the Medical Faculty of the University of Duisburg-Essen.

ERASMUS program

During the 2013/2014 academic year, 10 UK Essen Medical Faculty students spent a term abroad at one of the universities that collaborate with the Medical Faculty in the EU's educational exchange program ERASMUS SMS. These universities are located in Alicante, Spain; Lille, Paris, and Strasbourg, France; Aarhus, Denmark; Bialystok, Poland; Prague, Czech Republic; Kosice and Bratislava, Slovakia; and Siena, Italy. Also, 32 students spent one part of their Practical Year at these universities as part of the ERASMUS SMP program. At the same time, 8 students and 15 interns came to the UK Essen Medical Faculty. During the 2014/2015 academic year, 5 students spent a semester abroad as part of the ERASMUS SMS program at one of the eligible universities or academic teaching hospitals located in Alicante, Barcelona, Madrid, and Valencia, Spain; Porto, Portugal; Athens and Thessaloniki, Greece; Adana and Erzurum, Turkey; Verona, Italy; Vienna, Austria; Lille, Paris, and French West Indies and Guiana, France; Stockholm, Sweden; Prague, Czech Republic; Kosice, Slovakia; Bialystok, Warsaw, Cracow, and Wroclaw, Poland; and Budapest, Hungary. Also, 14 students spent one part of their Practical Year at these universities as part of the ERASMUS SMP program.

During this period, 10 students and 15 interns came to the UK Essen Medical Faculty.

5.

Building Infrastructure

Research, Teaching, and Health Care at a Single Location

The University of Duisburg-Essen's Medical Faculty is located on the campus of Essen University Hospital. On the 218,000 square meter grounds are 58 buildings used for teaching, research, and patient care. The research and teaching premises alone comprise 34,255 square meters (last updated, 2014). In addition, space is available for use by the faculty's administration and by support infrastructure.

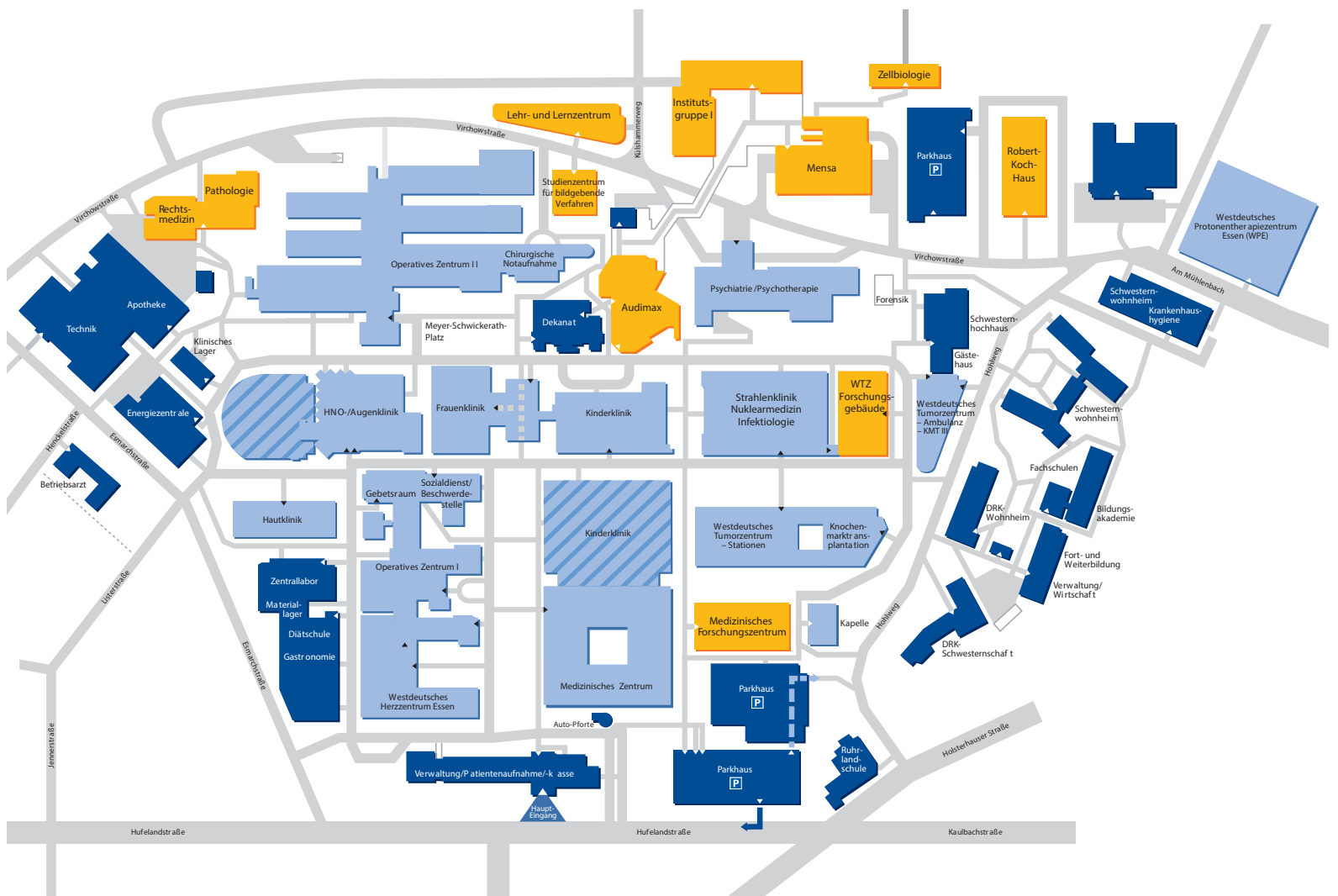
The close proximity of research, teaching, and patient care is very helpful, because the Medical Faculty's research activities are very much inter-linked, with many departments and institutes participating in one or more research focus areas.

Additionally, this setup enhances the rapid and systematic transfer of new translational research results from bench to bedside. Teaching activities have also benefited from this supportive infrastructure, because it means that students and instructors do not need to cover long distances. On the other hand, this shared campus also comes with challenges: Space is limited, both on the grounds and within the Essen city limits.

However, creative solutions make optimum use of the space available (see also New buildings).

On the map, buildings have been shaded according to their main uses:

- Institutes/institutions of teaching and research
- Inpatient and outpatient care centers
- Other buildings
- Buildings under construction



Space for research

Research at the Medical Faculty can be classified as either patient- and clinic-related research or basic research as conducted by the institutes. Clinical research activities are mainly found in the area between Virchowstrasse and Hufelandstrasse. Thus, scientists working in a clinical setting are close to patients, can avoid long travel times, and have access to clinical infrastructure. This is true in particular for the buildings designed for this type of research:

- WTZ Research Building (WTZ-FG)
- Medical Research Center (MFZ)
- Robert Koch Building (RKH)
(partially used for research)

The institutes and nonclinical research areas, on the other hand, are located on the other side of Virchowstrasse in the following buildings:

- Institutional Group 1 (IG1)
- Institute of Cell Biology (IFZ)

In addition, located all across campus are numerous small laboratories that serve only one department or clinic because of their isolated location. Whenever possible, solutions for needs-based allocations have been developed.

In addition to the space used by the Medical Faculty directly on the UK Essen campus, external areas have been leased, providing a total of approximately 23,800 square meters of usable space for research.

Space for teaching

The teaching resources at the Medical Faculty provide a total of 1,962 seats (last updated in 2014) in lecture halls and classrooms, most of them located in the Audimax Building and inside the Teaching & Learning Center (LLZ), which was financed with funds provided by the state

of North Rhine-Westphalia, UK Essen, and the Medical Faculty. Fees paid during the era of mandatory tuition and a generous donation by Prof. Dr. mult. Heinz-Horst Deichmann also helped to fund the first-rate facilities of this building. Additional classrooms are located in Institutional Group 1 (IG1) and in the Surgical Center II.

Teaching & Learning Center – Facts and Figures

Building area	1,275 square meters
Floor space, gross	4,500 square meters
Floor space, net	3,900 square meters
Levels	4 (incl. underground level)
Classrooms	18, 6 of them connected by one-way mirrors
Skills Laboratories	6
Simulation Arena	1 (including make-up area)
Deichmann Auditorium	seating 300 max.
Study café	1
Computer Lab (CIP Pool)	1
Administrative rooms	3
Total cost of building (incl. start-up equipment)	€16 million

Audimax Building – Facts and Figures

Audimax total	
incl. library/ administration etc.	2,114 square meters of usable space
Library, alone	1,567 square meters of usable space
Audimax lecture hall alone	350 seats
Classroom	75 seats

New buildings for research and teaching

Over the past years, important new buildings for research and teaching activities have been constructed or remodeled to adapt to the changing needs of the various departments:

2007

New building: Robert Koch Building (RKH)

This building, housing nearly 100 laboratories, is an open and communicative research venue focusing on immunology and infectious diseases. It also plays a role in patient care. The Institutes of Virology, Transfusion Medicine, and Medical Microbiology use this building to avail themselves of four highly specialized biosafety level 3 laboratories on the fourth floor. The RKH replaced the previous laboratory building at the end of its useful life.

Usable space total: 9,011 square meters

Construction cost: €27.63 million

Original equipment and furnishings: €3.1 million

2011

New building: Medical Research Center (MFZ)

The state of North Rhine-Westphalia provided €30 million to support the construction of the new Medical Research Center, making available urgently needed facilities for basic and clinical research at the Medical Faculty. The state-of-the-art research building, with 3,527 square meters of space, was erected in the immediate vicinity of clinical buildings such as the Medical Hospital, the Pediatric Hospital, and the West German Heart and Vascular Center Essen. Its location enables and supports close collaboration between research and patient care facilities. On five floors, it offers scientists access to modern research laboratories, including cardiovascular, isotope, genetic engineering, cell culture, and animal research laboratories, as well as classrooms and separate study rooms.



The new Teaching & Learning Center

2014

New building: Teaching & Learning Center (LLZ)

Before the LLZ was built, there were no central teaching and learning facilities on campus. Since April 2014, the classrooms and teaching laboratories that were previously scattered across the grounds have been consolidated in the new building. The facilities of the new LLZ fulfill all of the requirements of modern medical education. Because it is situated in the immediate vicinity of the preclinical Institutional Group 1 (IG 1), the distances between buildings are manageable for students and teachers.

2014

New building: Study Center for Imaging

In July 2014, the new Study Center for Imaging of the University of Duisburg-Essen's Medical Faculty, financed with funding provided by the state of North Rhine-Westphalia, was opened on the UK Essen campus. It houses one of only five magnetic resonance imaging (MRI) scanners in Germany used for studies conducted for the German National Cohort. With support from the Deutsche Forschungsgemeinschaft (DFG), a computed tomography (CT) scanner was installed during a further extension step in the fall of 2014. This scanner is used for the Heinz Nixdorf Recall Multigeneration Study. Both of these large instruments are exclusively used for research purposes.

Usable space: 241 square meters

Construction cost: €3.3 million

Remodeling and restructuring of existing buildings

2002

Remodeling and refurbishing of the Audimax Building

The Audimax Building, erected in 1972, was completely overhauled within a period of two years. Over three distinct construction phases, individual solutions for lighting, media technology, and acoustics were developed. The renovations also accommodate the users' desire for bright, friendly materials.

Ongoing – Needs-based refurbishing of the Institutional Group 1

Over the past few years, the building has been successively remodeled, refurbished, and functionally improved while in continued use. These improvements allowed for the integration of the Institute of Pharmacology in 2013. The total usable area of the building is 19,625 square meters.

Refurbishment of the WTZ Research Building

Since 2011 this building has undergone gradual conversion into a laboratory building purely dedicated to research, while continuing research operations. The objective: Research space for oncology is to be allocated in a concentrated and needs-based manner. The total usable area of the building is 4,157 square meters.

2011



2015

The Medical Library inside the Audimax Building – Opening of the new reading room

In fall 2015, the renovation of the reading room of the library inside the Audimax Building was completed. The windows and all of the interior furnishings of this building, which is listed on the historical register, were replaced and modernized. Now, 94 carrels, 2 rooms for group work, and a lounge are available for students and professors alike. The new Medical Library also satisfies the often voiced requests for more quiet zones, free WiFi service, and a sufficient number of electrical outlets.

6.

Financial Structure

Funding – an Important Factor for Success

The funding of the Medical Faculty and its facilities mainly rests on two pillars:

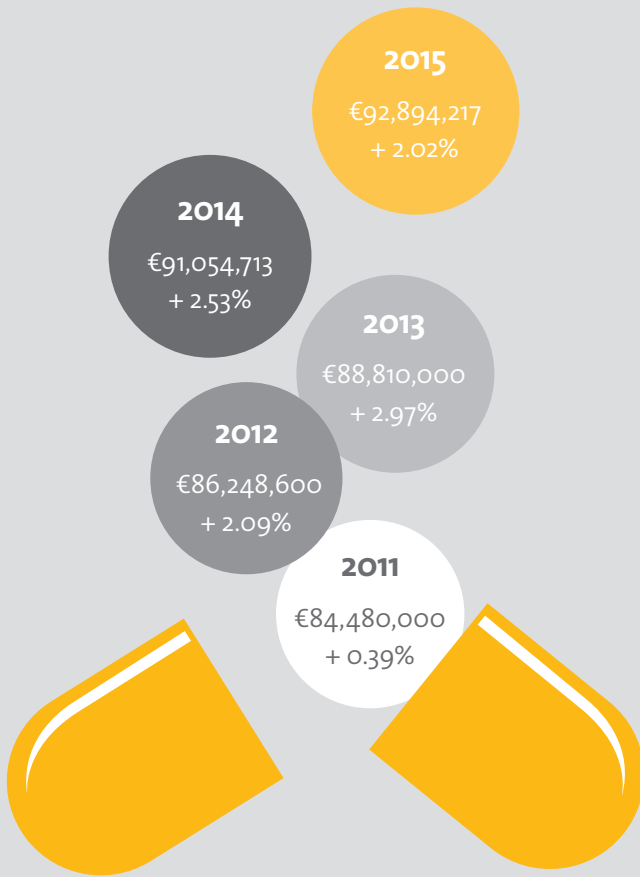
Its basis is the annual appropriation by the state of North Rhine-Westphalia. This amount is distributed by the Medical Faculty to its departments and institutes on the basis of their performance.

In addition, external funding has been provided by public and private sponsors. It is the responsibility of researchers and research units of the hospital departments and institutes to procure and allocate this external funding for promoting science and development.

The amount of state appropriation and its development since 2011

Each year, the Medical Faculty receives an appropriation from the Ministry of Innovation, Science, and Research of the State of North Rhine-Westphalia to fund its teaching and research activities. In 2015, this appropriation totaled €94,394,217, including a €1.5-million subsidy for setting up research and teaching activities for the West German Proton Therapy Centre Essen (WPE), which was granted for the first time in 2014.

Development of the appropriation amount
from 2011 to 2015
Medical Faculty revenues (without WPE)



The continuous increase in the appropriation amount that has occurred in recent years is due almost exclusively to compensation of payroll cost increases based on collective bargaining.

Performance-based allocation of the state appropriation to the various medical schools in North Rhine-Westphalia

Twenty percent (€141 million in 2015) of the total appropriation allocated to all medical faculties in the state by the Ministry of Innovation, Science, and Research of the State of North Rhine-Westphalia is divided among the state's seven medical schools (at the Universities of Aachen, Bochum, Bonn, Düsseldorf, Essen, Cologne, and Münster) according to set performance criteria. In times of ever decreasing funding, it is increasingly important to allocate funds in both a needs-based and a performance-based manner. The allocation criteria recognize the medical schools' performance in research and teaching and, therefore, serve as incentives for boosting performance. In addition to successful research (as measured by external funding amounts and published results) and teaching activities (as measured by the number of degrees completed and the results of final written examinations), the percentage of women among the scientific staff is also taken into account when funds are allocated.

Separate accounting systems

The allocation of the appropriation amount between departments and institutes is mirrored by separate accounting systems. These systems ensure that the freedom of research and teaching, as guaranteed by the German constitution, is respected, regardless of the allocation scheme used. It is understood that this freedom requires at least a minimum of funding. The Medical Faculty takes these considerations into account and internally allocates the state's appropriation to the departments and institutes in a multi-step process as follows:

1. At the first level, the budgeted funds for the Dean's Office Administration (including the instruments for promoting research and teaching) in an initial step are deducted at source with their reimbursement guaranteed. This is also true for the financial resources allocated to the preclinical institutes for the scientific staff.
2. In a second step, funds are allocated to institutes not involved in patient care, to institutes with minimal involvement in patient care, and to the hospital-related infrastructure subsidy (for administration, nonmedical infrastructure, and central services facilities).
3. The remaining appropriation amount is distributed according to the applicable performance-oriented allocation scheme to the institutes involved in patient care and to the hospital departments. For the hospital departments, the budget for research and teaching is initially broken down by the cost categories Physicians' Services and Medical Supplies; for the institutes involved in patient care, the additional cost category of Medical-Technical Services is included. Other unspecified cost types are bundled into department-based infrastructure subsidies.

At the second level, the appropriation amount is distributed within the hospital departments and institutes on the basis of an internal performance-oriented allocation scheme based on a framework agreement between the UK Essen Board and the Dean's Office of the Medical Faculty. This scheme generally takes into account not only basic needs but also research performance (as measured by external funding amounts and publications) and teaching load (based on the scheme of the Study Advisory Council and Committee for Quality Improvement in Teaching for weighted weekly class hours).

At the institutes involved in patient care and the hospital departments, special circumstances are also taken into account as a strategic back-up for promoting research and teaching activities. Performance-oriented funding allocation (PFA) takes place as follows:

- For the preclinical and theoretical institutes within the consumables budget
- For institutes involved in patient care as a research and teaching budget (R&T budget) for Physicians' Services, Medical-Technical Services, and Medical Supplies
- For the hospital departments as an R&T budget for Physicians' Services, Medical Supplies, and the infrastructure subsidy

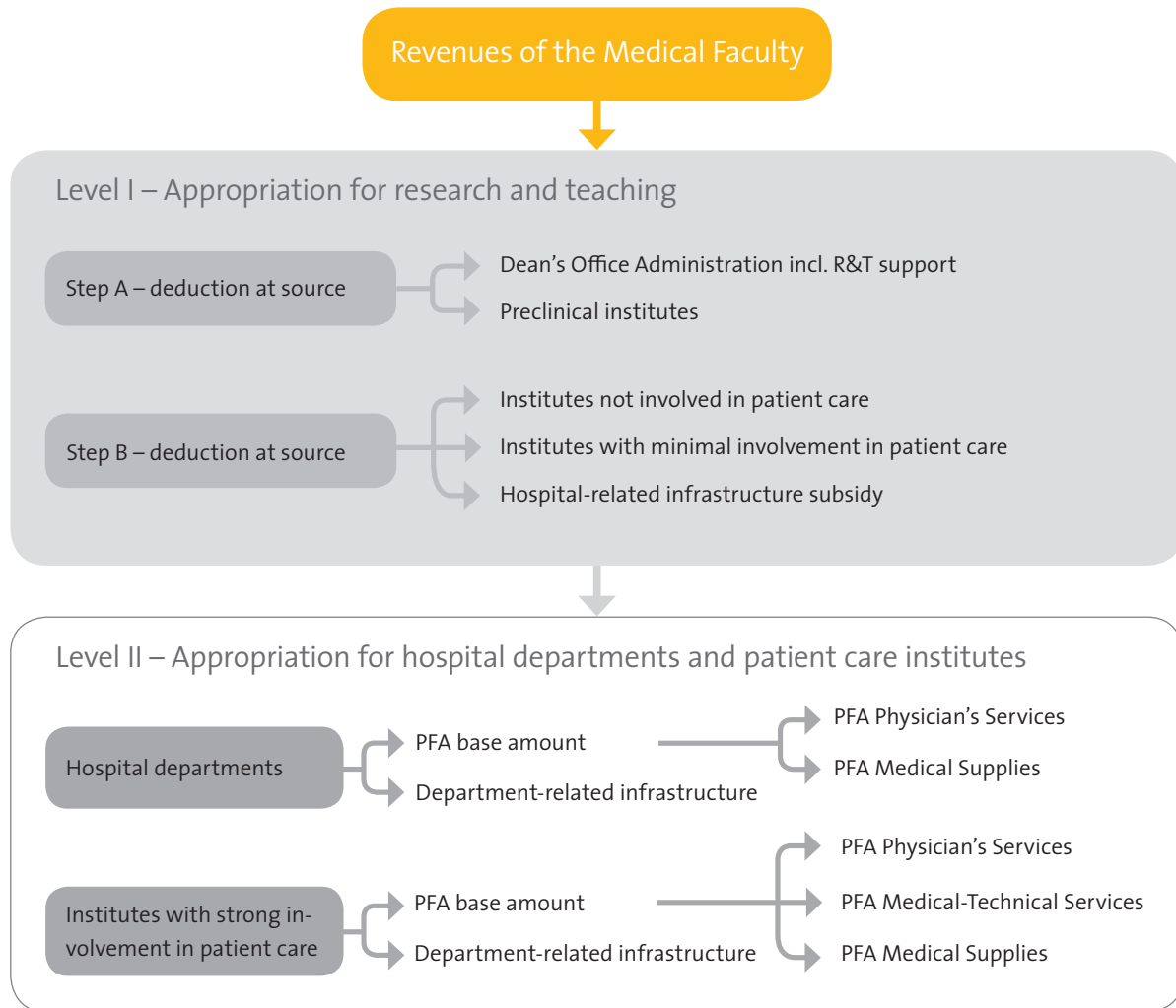




Against the backdrop of coupling and joint processes that do not allow the hospital departments and institutes involved in patient care to separate costs for research and teaching on the one hand from the costs of patient care on the other, a joint committee of the Dean's Office and the Board was formed.

This committee is charged with negotiating framework agreements for resource allocation and their annual adjustments that may lead to structural consequences for the affected departments regarding their ability to fulfil their tasks in research, teaching, and patient care.

Prospective separate accounting



Global budget – institutes not involved in patient care

Since 2015, the funds from the state's appropriation have been provided as a global budget for the institutes not involved in patient care. This global budget has the following components:

- R&T human resources budget (percentage determined on the basis of existing positions)
- R&T nonmonetary resources budget (based on the performance-oriented funding allocation criteria and on negotiations for appointing and retaining professors)
- R&T – special circumstances

Thanks to the global budget, the directors of the R&T institutes have maximum flexibility regarding the use of the institute's resources, because they can autonomously allocate the available means for human resources and equipment. Also, any funds not used during the year can be spent during the first three months of the subsequent year, whereas any deficits will result in budget reductions in the subsequent year.

Investment budget

The investable resources for the hospital departments and institutes involved in patient care are allocated by the Board on the basis of committee recommendations. The investable resources for the institutes not involved in patient care are allocated by the Dean's Office on the basis of the performance-oriented funding allocation scheme, while taking into account any negotiations regarding the appointing and retaining of professors. Any funds from the global budget that have not been used throughout the year may be converted into investable resources, but investable resources can never be added to the global budget.

External funding

The Medical Faculty bases its definition of external funding on that of the current version (2015) of the German Federal Statistical Office. Accordingly, external (or third-party) funding consists of financial resources that are acquired from public and private sponsors in addition to the regular institutional budget and are used for promoting research and development, early career researchers, and teaching activities. External funding may be granted to an institution of higher education, one of its departments (such as faculties or institutes), or individual full-time scientists.

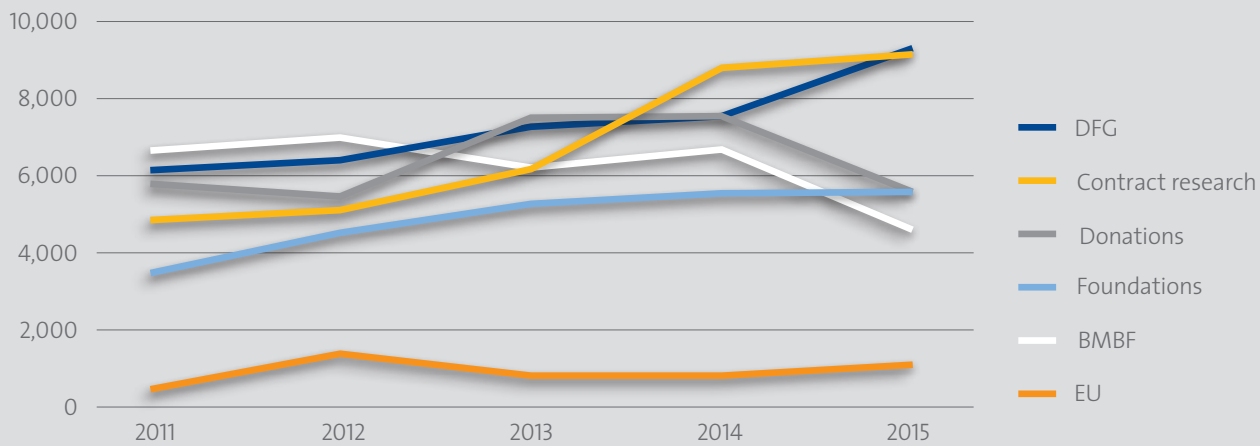
External funding is provided by public and private donors or sponsors. External funding includes monetary donations for research and teaching; grants from public sponsors such as the Deutsche Forschungsgemeinschaft (DFG), the German Federal Ministry of Education and Research (BMBF), and the European Union (EU); and funds paid by private institutions for contract research activities. The amount of acquired external funding is an important output parameter taken into consideration when scientific performance is evaluated.



External funding expenditures of the Medical Faculty for 2011 to 2015 (in thousands of euros)

	2011	2012	2013	2014	2015	Amount by funding source
DFG	6,107	6,404	7,205	7,537	9,318	36,571
BMBF	6,583	6,917	6,167	6,643	4,538	30,848
EU	454	1,381	775	792	1,077	4,479
Foundations	3,444	4,489	5,238	5,532	5,550	24,253
Donations	5,749	5,430	7,492	7,527	5,518	31,716
Contract research	4,854	5,095	6,193	8,798	9,104	34,044

Development of external funding expenditures for 2011 to 2015 by funding source (in thousands of euros)



In recent years, the University of Duisburg-Essen's Medical Faculty was able to continuously and sustainably increase its research output in collaboration with the DFG, the EU, and private contract research clients.

Particularly noteworthy is the increase in EU-based external funding in 2015. This important area of funding was strengthened in 2015 by the creation of a position for an EU Research Officer within the Dean's Office Administration; this person will assist hospital departments and institutes with grant application procedures.

Reporting tool: Controlling of external funding projects

In 2015, the controlling of external funding projects was substantially improved by the establishment of a secure online platform that allows the heads of hospital departments and institutes, as well as the researchers leading these projects, to securely access current financial information about all active projects in customized project reports. These reports contain all of the relevant information for controlling externally funded projects and provide financial benchmarks for planning and monitoring expenditures for human resources and other items. This user-friendly reporting tool, updated daily, replaces the previously used monthly account statements.

Partial matching of external funding

The Program for Internal Research Funding Essen IFORES, which is funded by the state's appropriation, will partially match certain acquired external funding at various levels, namely at 10 percent of the grant amount for DFG funds, 5 percent for EU funds, and 3 percent for BMBF funds and funds supplied by foundations, provided that the grants have been peer-reviewed. These monetary resources are available to the hospital departments and institutes in addition to the acquired external funding and will enable additional investments in human and other resources (see also Chapter 3, Research, on IFORES).

To support the planning and controlling of appropriations and allocations of external funding, the position of a financial commissioner was created in the Dean's Office Administration of the Medical Faculty in 2014.

7.

Rankings

International and National Rankings

National and international rankings of institutions of higher education have been established as monitoring tools in Germany since the beginning of the millennium. There are many reasons for this development. Rankings satisfy an increasing need for information on the part of prospective and current students, scientists, and various interested parties in policy-making and society, including, of course, those of the funders. In addition, rankings reflect the ever-increasing competitive pressure facing universities at the national level, as well as at the European and even wider international level, where they compete not only for funding, but also for human resources.

All rankings are based on specific sets of criteria, and thus reflect only a specific part of the total research and teaching performance of the universities and their various departments. When rankings are interpreted, the various methodological approaches, as well as the quality, validity, completeness, and comparability of the data collected, all factor in. Ranking lists, therefore, must always be seen in context and not as absolutes.

Notwithstanding these limitations, the importance of national and international rankings of institutions of higher education should not be underestimated: When competing for top talent and for research funding, universities are finding it more and more important to showcase their specific achievements. Rankings also may be used to assess the current standing of an institution, and, occasionally, also to define targets.

Selected rankings

CWTS Leiden Ranking

The Leiden Ranking, published by the Centre for Science and Technology Studies (CWTS) of Leiden University, The Netherlands, is a publication-based ranking showing the scientific achievements of the 500 universities worldwide that generate the largest output on the Web of Science. It is based entirely on bibliometric analyses. The Leiden Ranking is published annually (current at the time of this writing was the publication of April 17, 2015).

Method: There actually are several rankings for various published indicators; no overall ranking is given across all indicators. According to the publisher, the most important indicator is the one referred to as “PPTop10%,” namely the proportion of a university’s publications that, compared with other publications in the same field and in the same year, belong to the top 10% most frequently cited. The data are taken from the Thomson Reuters Web of Science database and do not include publications in languages other than English.

Because the ranking method has changed over time, options for comparing results from different years are limited. Since 2014, there has been a separate ranking category for medicine.



Leiden ranking 2015 (based on data about publications and citations from 2010 to 2013):

Selected field: Biomedical and health sciences (size-independent ranking)

1. Collaboration indicators

- a. With respect to interinstitutional collaborations for publications, the UK Essen Medical Faculty, with 86.7% joint publications, ranks 97th among 740 institutions worldwide, first among 47 institutions across Germany, and first among 7 institutions in North Rhine-Westphalia.
- b. With respect to international collaborations for publications, the UK Essen Medical Faculty, with 50.2% joint publications, ranks 133rd among 740 institutions worldwide, 12th among 47 institutions across Germany, and second among 7 institutions in North Rhine-Westphalia.

2. Impact factor indicators

- a. Ranked by number of publications (2010–2013), the UK Essen Medical Faculty with its 1,500 publications ranks 242nd among 714 institutions worldwide, 25th among 47 institutions across Germany, and 6th among 7 institutions in North Rhine-Westphalia.
- b. Ranked by number of most frequently cited publications (PPTop10%), the UK Essen Medical Faculty, with its 11.5% such publications, ranks 151st among 714 institutions worldwide, 8th among 47 institutions across Germany, and 3rd among 7 institutions in North Rhine-Westphalia.

2015 Leiden Ranking

The Medical Faculty of the University of Duisburg-Essen compared with the other medical faculties in North Rhine-Westphalia and additional selected medical faculties

Field: Biomedical and health sciences (size-independent ranking)

Ranking indicator: Number and percentage of most frequently quoted publications (PP top 10%)

Medical faculty	Number of publications (P) 2010 – 2013				Percentage of most frequently cited publications (PPtop10%)			
	Number	Ranking, nationwide	Ranking, worldwide	Ranking, NRW	Percentage	Ranking, nationwide	Ranking, worldwide	Ranking, NRW
Technical University of Munich	2,415	7			13.7	1		
University of Freiburg	2,549	6			12.3	2		
University of Cologne	1,686	19		4	12.0	3		1
Heinrich Heine University Düsseldorf	1,713	17		3	11.8	4		2
Ludwig-Maximilians-University of Munich	4,039	4			11.8	5		
Goethe University Frankfurt	2,217	11			11.7	6		
University of Duisburg-Essen	1,500	25	242	6	11.5	8	151	3
Heidelberg University	4,696	2			11.4	9		
University of Münster	1,923	13		2	11.3	12		4
University of Bonn	2,114	12		1	11.2	14		5
University of Würzburg	1,705	18			10.9	20		
Humboldt University of Berlin	4,571	3			10.8	21		
Free University Berlin	4,734	1			10.7	22		
Hannover Medical School	2,342	8			10.7	23		
University of Tuebingen	2,986	5			9.8	29		
RWTH Aachen University	1,661	20		5	9.7	30		6
Ruhr University Bochum	1,434	27		7	9.2	34		7

Source: www.leidenranking.com



Percentage of interinstitutional collaborations on publications				Percentage of international collaborations on publications			
Percentage	Ranking, nationwide	Ranking, worldwide	Ranking, NRW	Percentage	Ranking, nationwide	Ranking, worldwide	Ranking, NRW
84.0	14			49.7	15		
83.6	17			55.7	2		
85.8	3		2	50.0	13		3
83.9	15		3	46.9	30		6
82.4	22			51.5	7		
78.3	40			46.8	31		
86.7	1	97	1	50.2	12	133	2
82.7	21			49.5	18		
82.9	20		5	49.7	16		4
81.5	31		6	51.7	5		1
84.3	11			50.9	9		
84.9	6			49.7	17		
84.9	8			50.0	14		
80.9	33			48.2	23		
80.2	35			49.2	19		
83.4	18		4	47.6	27		5
76.6	42		7	40.0	43		7

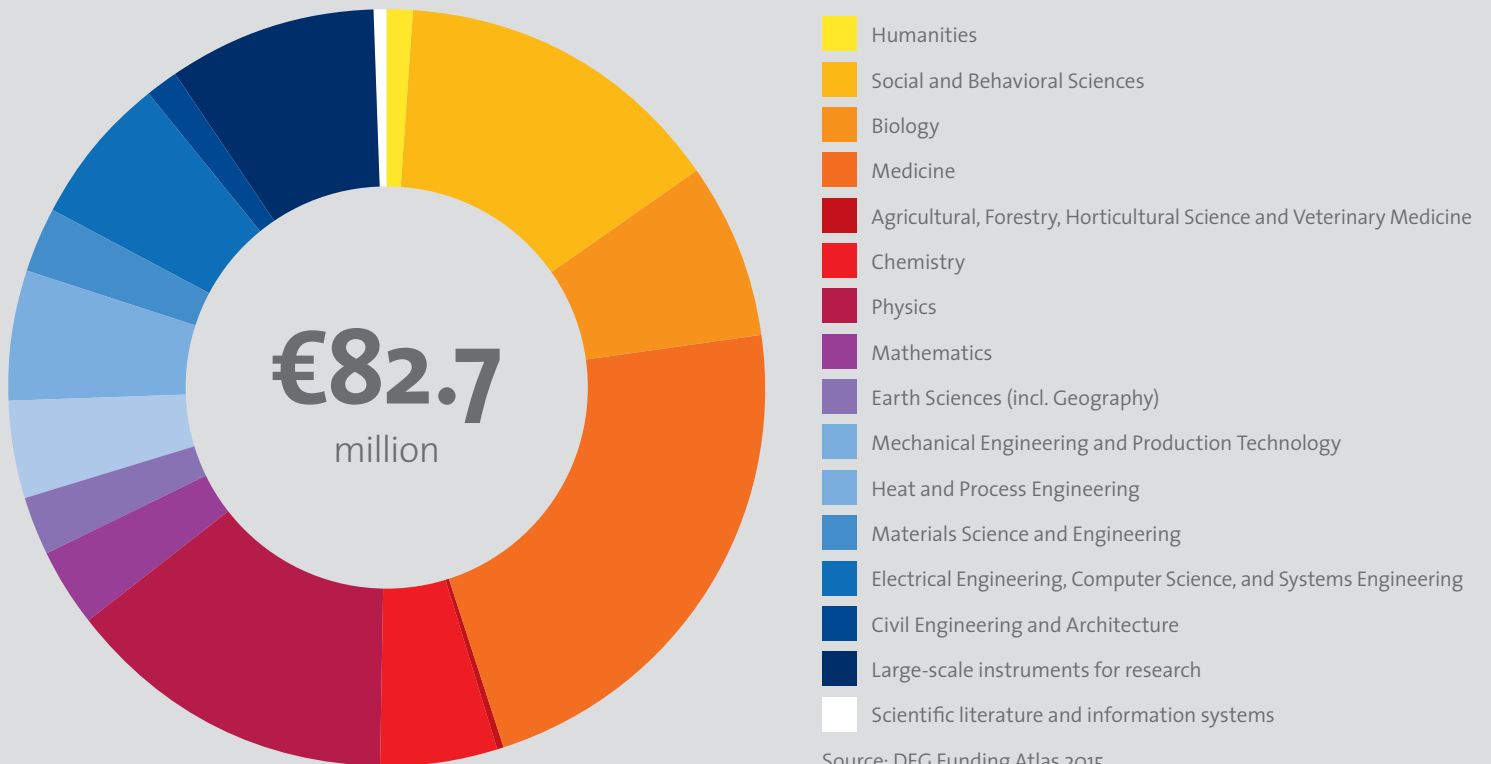
Funding Atlas of the Deutsche Forschungsgemeinschaft (DFG)

In 2012, the DFG, the largest German organization for the funding of research, replaced its funding ranking that was published every three years with a “Funding Atlas.” According to the DFG, the Atlas provides an overview of external (third-party) funding by the DFG, the German Government, and the EU, as well as of support for individual scientists by the Alexander von Humboldt Foundation (AvH), the German

Academic Exchange Service (DAAD), and the European Research Council (ERC), summing up these grants for universities and other research institutions.

The new DFG Funding Atlas 2015 is the seventh volume of this report listing “Key Indicators for Publicly Funded Research in Germany.”

DFG grants to the University of Duisburg-Essen for 2011 to 2013, by discipline



Source: DFG Funding Atlas 2015

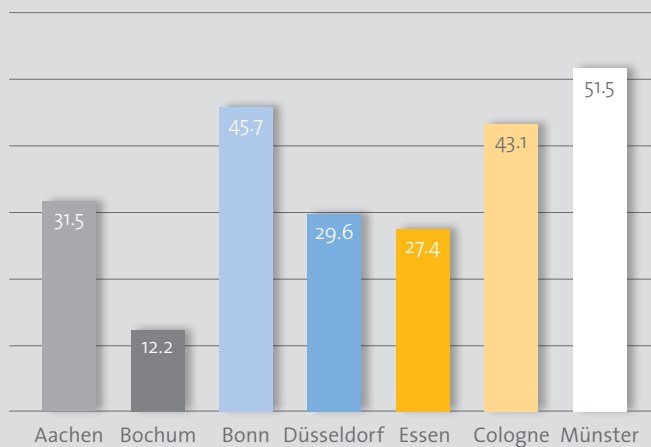
Compared with the other University of Duisburg-Essen faculties, at €27.4 million, the Medical Faculty can take credit for a large percentage (more than 30%) of the DFG funding awarded to the university.

Compared to the amount of money awarded to other medical schools in North Rhine-Westphalia, the amount awarded to the University of Duisburg-Essen's Medical Faculty over the period from 2011 to 2013 is the second-lowest for DFG grants; only Bochum has obtained less funding. Taking into

account the differences in the sizes of the medical faculties, the average amount of DFG funding granted per professor was €391,400 for the University of Duisburg-Essen's Medical Faculty, ranking it at number 5 in NRW, followed by Düsseldorf and Bochum.

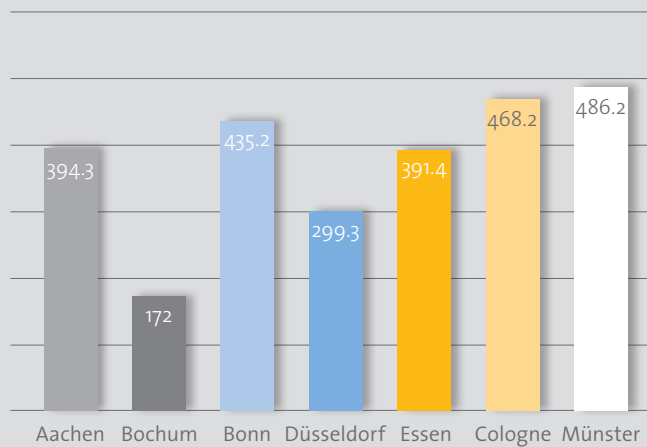
For the period from 2008 to 2010 (DFG Funding Atlas 2012), the amount awarded to the University of Duisburg-Essen's Medical Faculty was €17.8 million total and €239,800 per professor, indicating a substantial increase.

Amounts of DFG grants awarded to the Medical Faculty from 2011 to 2013 (in million euros)



Source: DFG Funding Atlas 2015

DFG grant amounts per professor awarded to the Medical Faculty from 2011 to 2013 (in thousand euros)



Source: DFG Funding Atlas 2015

CHE University Ranking

At the national level, the most important ranking in Germany is the CHE University Ranking. It evaluates universities at the level of individual scientific disciplines according to 37 separate criteria and indicators, including the employability of their graduates, the quality of facilities, research activities, overall assessments, international outlook, rates and grades of graduates,

location of the universities, their students, and their teaching activities.

The data used by CHE come from surveys and statistical data collections. Data are compiled for various groups of disciplines each year; the most current data available for medicine are from 2015.

Research at the University of Duisburg-Essen's Medical Faculty as compared to other medical faculties in NRW

University/ Faculty	RWTH Aachen Faculty of Medicine	Ruhr Univer- sity Bochum Faculty of Medicine	University of Bonn Faculty of Medicine	Heinrich Heine University Düsseldorf Medical Faculty	University of Duisburg- Essen Medical Faculty	University of Cologne Faculty of Medicine *	University of Münster Faculty of Medicine
Publications per professor	15.4	14.5	17.9	16.9	23.8	18.6	19.6
Citations per publication	4.2	4.0	5.3	4.8	5.3	4.6	4.8
Doctorates per professor	1.8	1.7	1.7	0.9	2.4	2.3	2.8
Habilitations per 10 professors	2.3	1.7	3.0	1.8	2.9	–	2.5
Research fund- ing per profes- sor in thousand euros	381.5	312.0	464.9	271.0	352.3	–	466.5

Top ranking
 Intermediate ranking
 Low ranking
 No ranking

* This university does not participate in the CHE University Ranking. Data are exclusively from generally accessible sources.

Source: CHE University Ranking 2015/2016

The University of Duisburg-Essen's Medical Faculty holds its own when compared with other medical schools in North Rhine-Westphalia (NRW) and the rest of Germany. It even ranks in a top position in a Germany-wide comparison of the indicators "publications per professor" and "citations per publication," for which it ranks as number one among the NRW-based medical schools. When it comes to "doctorates per professor" and "habilitations per 10 professors," the Medical Faculty ranks second after the medical schools of the universities of Münster and Bonn.

The Medical Faculty also keeps up with renowned medical schools such as those of the universities of Heidelberg and Tübingen, the Charité – Universitätsmedizin Berlin, the Munich-based TUM School of Medicine, and the medical faculty of the Ludwig Maximilians-Universität, as well as with the Hannover Medical School with respect to the indicators "publications per professor" and "citations per publication." With respect to the other evaluation criteria, the Medical Faculty ranks in intermediate positions, and regarding "research funding per professor," it has some catching up to do.

On the other hand, compared with other NRW-based medical schools, the University of Duisburg-Essen ranks in the top position in the current CHE University Ranking (published in 2015) for some teaching-related criteria. Examples of these are offerings for interested students before they begin their studies and the university's international outlook (in the Master's program). Acceptable intermediate rankings are noted for the Medical Faculty for the indicators "offerings for beginning students," "instructors," "contact with students," "rooms," "library facilities," "IT infrastructure," and "international outlook." Compared to the other NRW-based medical schools, in particular to those based in Aachen and Münster, however, there is clearly room for improvement.

In the meantime, many measures have been implemented and have already led to noticeable improvements. These include the mentoring pro-

grams, the individual analysis of strengths and weaknesses in the Progress Test in Medicine, and focused tutoring sessions. Additionally, major investments were made in infrastructure, for example, in the Skills Laboratory, the simulated patient program, and the construction of the Teaching & Study Center.

Degree-completion data are also favorable: Regarding the indicator "degrees completed after an appropriate duration of study," the University of Duisburg-Essen's Medical Faculty, like all the other NRW-based medical schools, ranks at the top. Regarding the remaining indicators, it ranks in intermediate positions, outranking the medical schools of the Universities of Düsseldorf, Cologne, and Bochum.

Map of Medical Schools (by VUD and MFT)

The Map of Medical Schools ("Landkarte Hochschulmedizin", www.landkarte-hochschulmedizin.de), provided by the Association of German University Hospitals (Verband der Universitätsklinika Deutschlands, VUD) and the Association of German Medical Faculties (Medizinischer Fakultätentag der Bundesrepublik Deutschland, MFT), is a web-based user interface for a database containing information on

- Capabilities
- Structures
- Subject focus areas
- Key indicators of research and teaching

The map does not include assessments or rankings but allows for individual analyses for the period from 2006 to 2012.

The available data offer many customized queries into the main categories of teaching, research, patient care, staffing, finances, and structures. They present both quantitative and qualitative information.

8.

Collaborations, Awards, and Distinctions

Collaborations

Specialized knowledge and expertise are indispensable for medical research and thus for improving and continuously refining treatment methods. A key factor to success in this area involves exchange with other scientists at the regional or national level and is particularly important at the international level.

For this reason, the Medical Faculty maintains numerous collaboration arrangements with other university and non-university research institutions and companies from Germany and abroad, as well as in the region. With respect to the growing globalization of knowledge and academic training, international collaborations are becoming increasingly important. While the interinstitutional scientific collaboration is often arranged by the Medical Faculty or individual departments or institutes, in many cases it is also initiated by individual researchers.

The advantages of specifically promoting local, national, and international interinstitutional collaborations are evident, since they strengthen Essen's scientific advancement and international significance. At the same time, the results of the individual collaborations directly benefit patients cared for at UK Essen. The further benefits are obvious as well: recruiting and committing qualified researchers and students from both Germany and abroad, the opportunity to obtain experience in a foreign country, and just as important, the imparting of international curricular content for the benefit of Medical Faculty students.



The Medical Faculty has maintained numerous collaborations with foreign partner universities for many years:

China

The Medical Faculty has collaborated with various universities in China since 1981. The DFG-funded Collaborative Research Centre Transregio 60 (SFB/TRR 60) is an especially significant cooperation arrangement. Collaborations are also in place with several partner universities in China (Tongji Medical College of Huazhong University of Science and Technology, Wuhan; Tongren Hospital, Beijing; Zhongshan Hospital of Fudan University Shanghai; Sun Yat-Sen Memorial Hospital of Sun Yat-Sen University in Guangzhou). Every year, 12 UK Essen Medical Faculty students travel to the partner universities in Wuhan and Shanghai to participate in internships.

In 2014, a cooperation agreement was signed between the Medical Faculty and the renowned Sun Yat-Sen University in Guangzhou, one of China's top universities. In contrast to the already existing collaborations with partners in China, this partnership focuses not only on infectious diseases, but also on general surgery as well as the diagnosis and treatment of breast cancer.

- The China Commissioner is Prof. Dr. Ulf Dittmer.

Russia

Since 1991, a partnership has been in place based on a cooperation agreement with the Nizhny Novgorod State Medical Academy. During a delegation trip to Nizhny Novgorod, Russia, in 2015 high-ranking representatives of the Medical Faculty and UK Essen agreed to expand collaboration with the Medical Academy. In addition to an intensive exchange with respect to both research and medical care, the partners are now collaborating in the area of health professions, with an emphasis on all levels of nursing training. This lends the collaboration an even broader basis. The collaboration was initiated by pediatric cardiologist Prof. Dr. Achim Schmaltz, formerly of UK Essen, as well as other members of the German-Russian Society.

- The Russia Commissioners are Dr. Wilfried E. E. Eberhardt and Dr. Kurt Trübner.

Japan

The Medical Faculty has a wide range of connections to university partners in Japan. For example, in 2015, UK Essen researchers teamed up with experts in Tsubaka, Japan. As part of a cooperation arrangement initially concluded for five years, they are conducting research in the area of radiation therapy, specifically in the targeted treatment of tumors. In addition, in 2014 a cooperation arrangement was set up with the Southern Tohoku General Hospital Group (STGHG) in Japan's Fukushima Prefecture. This collaboration also focuses on radiation therapy. Since 2015, a collaboration has also been in place between UK Essen and the company QD Laser, Inc., Kawasaki, Japan.

- The Japan Commissioner is Prof. Dr. Wolfgang Sauerwein.

Further international collaborations

USA

- Weill Medical College of Cornell University & Mount Sinai Hospital, New York
- Cornell University and Memorial-Sloan Kettering Cancer Center, New York
- University of Pittsburgh Cancer Institute, Pittsburgh
- Fred Hutchinson Cancer Research Center, Seattle
- Vanderbilt University Medical Center, Nashville

France

- Université Nice-Antipolis, Nice
- Université de Reims Champagne-Ardenne, Reims
- Centre Antoine-Lacassagne, Nice

Mongolia

- Mongolian National University of Medical Sciences, Ulan Bator





Other research alliances and projects

- The Medical Faculty is involved in the BMBF project on Medical Infection Genomics through Prof. Dr. Erich Gulbins.
- Essen is one of the two major methylome-sequencing centers of the BMBF-funded German Epigenome Project (DEEP). Prof. Dr. Bernhard Horsthemke is a member of the DEEP steering committee, head of the Essen methylome-sequencing center and director of another DEEP subproject.
- Prof. Dr. Bernhard Horsthemke is the coordinator of the BMBF research alliance on imprinting disorders, one of 16 research alliances on rare diseases.
- In the BMBF e:med systems medicine network, the Medical Faculty is represented by Prof. Dr. Anke Hinney, Prof. Dr. Johannes Hebebrand, Prof. Dr. Sven Rahmann, and Prof. Dr. Alexander Schramm.

DFG Review Boards

In 2015, nine representatives of the Medical Faculty were elected to the DFG review boards. The review boards decide on the direction in which basic research in Germany is to advance. The membership period is three years. The following members were elected:

- Subject area 204-03:** Prof. Dr. Jan Buer
- Subject area 205-01:** Prof. Dr. Andreas Stang
- Subject area 205-03:** Prof. Dr. Bernhard Horsthemke

- Subject area 205-04:** Prof. Dr. Joachim Fandrey
- Subject area 205-14:** Prof. Dr. Peter Horn
- Subject area 205-15:** Prof. Dr. Elke Cario
- Subject area 205-30:** Prof. Dr. Michael Forsting
- Subject area 206-08:** Prof. Dr. Ulrike Bingel
- Subject area 406-05:** Prof. Dr. Marcus Jäger

The DFG's 48 review boards, which comprise 613 members, play a major role in evaluating the funding applications submitted to the DFG.

Stiftung Universitätsmedizin foundation

The purpose of the Stiftung Universitätsmedizin foundation is to promote innovative research, at the Medical Faculty and Essen University Hospital, foster cutting-edge teaching, and support sophisticated medical care at the Medical Faculty and Essen University Hospital. The founding professors of the two institutions established the foundation's capital with personal financial contributions. Since the foundation was set up as a non-profit institution in 2006, well over €1.5 million has been made available for important projects. The Stiftung Universitätsmedizin foundation supports the Medical Faculty in numerous contexts, including the simulated patient program, as well as the Skills Laboratory, the Deutschlandstipendium scholarship, and "ANSTOSS" (Kick-off), the award for innovation in teaching.





Distinctions and awards

In the past five years, the Medical Faculty's scientists have received a number of national and international distinctions and awards in the area of research and teaching that recognize both outstanding scientific achievements and excellent theses and dissertations as well as exceptional teaching performance.

Some of the distinctions were awarded by the Medical Faculty itself or the Stiftung Universitätsmedizin foundation (such as the Medical Award for Innovative Projects) in order to specifically support achievements in research and move them forward through targeted financial support. Moreover, the University of Duisburg-Essen presents an annual teaching award to honor exceptional dedication and superior performance in teaching.

Nationally and internationally renowned distinctions and awards presented by foundations or professional associations are particularly significant. A special honor in Germany is the awarding of membership in the National Academy of Sciences Leopoldina.

Distinctions such as these promote significant achievements in research and also distinguish the high level of commitment and extraordinary achievements of students, graduates and doctoral candidates during their studies or as part of their theses or dissertations. In addition to the aspect of financial support, certain national and international distinctions are also associated with a special reputation that both the scientists themselves and the Medical Faculty of the University of Duisburg Essen can be part of.



Selected awards and distinctions (Last updated: April 2016)

M. Sc. Alexandra Adamczyk (Institute of Medical Microbiology)

Research grant from the German Society of Mucosal Immunology and the Microbiome (DGMIM), 2016.

Dr. Theodor Baars (Department of Cardiology)

Dr. Deichmann "Pathophysiology" research award of the Society for the Promotion of Cardiovascular Research Essen, 2013

Prof. Dr. Sebastian Bauer (Department of Internal Medicine, Tumor Research)

GIST Award Switzerland of the GIST Group Switzerland – Organization supporting patients with gastrointestinal stromal tumors (GIST), 2015

Prof. Dr. Ulrike Bingel (Department of Neurology)

Heinrich Pette Award of the German Society for Neurology (DGN), 2013
Lyrica Investigator-initiated Research Award (LIIRA), Pfizer, 2011

Prof. Dr. Dr. Dr. Andreas Bockisch

Röntgen badge of the City of Remscheid, 2011
Inducted as a member of the National Academy of Sciences Leopoldina, 2011

Dr. Christian Boy (Department of Nuclear Medicine)

Hans Creutzig Award of the Rhine-Westphalian Society of Nuclear Medicine (RWGN), 2012

Prof. Dr. Sven Brandau (Ear, Nose, and Throat Department)

Research Award of the Oncology Working Group of the German Society of Oto-Rhino-Laryngology, Head and Neck Surgery (DGHNO), 2011

Dr. Frank Breitenbücher (Department of Internal Medicine, Tumor Research)

Award for Science and Research of the Romius Foundation, 2012

Dr. Manual Burggraf (Department of Orthopedics and Emergency Surgery)

Science Prize of the German Interdisciplinary Association for Intensive Care and Emergency Medicine (DIVI), 2012

PD Dr. Anja K. Büscher, Prof. Dr. Stefanie Weber (Department of Pediatrics II)

Johannes Brodehl Award of the Society for Pediatric Nephrology (GPN), 2015

Dr. David-Bruno Bylski (Department of Orthopedics and Emergency Surgery)

Award of the Sparkasse Essen – Best Doctoral Thesis of the Medical Faculty, 2013

Prof. Dr. Ali Canbay (Department of Gastroenterology and Hepatology)

The Hiromasa Ishi Memorial Award of the International Society for Biomedical Research on Alcoholism (ISBRA), Japan, 2012

Prof. Dr. Hans-Christoph Diener

Max Nonne Commemorative Coin of the German Society for Neurology, 2010

Wepfer Award of the European Stroke Organization and the European Stroke Congress, 2013

Honorary President of the German Migraine and Headache Society (DMKG), 2013

Prof. Dr. Dobromir Dobrev

Outstanding Achievement Award, European Cardiac Arrhythmia Society, 2012

Dr. Daniel Dohle (Department of Thoracic and Cardiovascular Surgery)

Young Investigator Award of the European Association for Cardio-Thoracic Surgery (EACTS), 2014

PD Dr. Sebastian Doff (Department of Nephrology)

Rainer Greger Doctoral Award of the German Nephrology Society (DGfN), 2012

Prof. Dr. Nicole Dünker (Department of Anatomy)

Overall teaching excellence award of the University of Duisburg-Essen for particularly dedicated scientists, 2010

Prof. em. Dr. Dr. Friedrich-Wilhelm Eigler

Named honorary member of the Real Acadèmia de Medicina de la Comunidad Valenciana, 2014

Prof. Dr. Sigrid Elsenbruch (Institute of Medical Psychology and Behavioral Immunobiology)

Oskar Medical Award of the Oskar-Helene-Heim Foundation, 2012

Prof. em. Dr. Raimund Erbel

Named Honorary Fellow of the American Society of Echocardiography by the American Society of Echocardiography, 2010

Prof. Dr. Katharina Fleischhauer

DKMS Mechthild Harf Science Award of the DKMS Foundation for Giving Life, 2016

Dr. Katarina Forkmann (Department of Neurology)

German Pain Award, Basic Sciences category, of the German Society for Pain Medicine (DGS) and the German Pain League, 2013

European Pain Award, 2015

Prof. Dr. Michael Forsting

Inducted as a member of the National Academy of Sciences Leopoldina, 2013

PD Dr. Ulrich Frey (Department of Anesthesiology and Intensive Care)

Karl Thomas Prize of the German Society for Anesthesiology and Intensive Care Medicine (DGAI), 2011

Dr. André Görgens (Institute of Transfusion Medicine)

Fritz Schiff Award of the German Society of Transfusion Medicine and Immunohematology (DGTI), 2014

Prof. Dr. Erich Gulbins

Inducted as a member of the National Academy of Sciences Leopoldina, 2011

Annika Liese Award, 2014

Eva and Klaus Grohe Award of the Berlin-Brandenburg Academy of Sciences, 2015

Prof. Dr. Dr. h.c. Gerd Heusch

Appointment to the Scientific Advisory Board of the Centro Nacional de Investigaciones Cardiovasculares, Madrid, 2014

Distinguished Leader Award of the International Society for Heart Research, 2014

Induction as full member of the North Rhine-Westphalia Academy of Sciences and Arts, 2012

Prof. Dr. Peter Horn

Elected chair of the Steering Committee of the Competence Network Stem Cell Research, a project funded by the Ministry of Innovation, Science and Research of the State of North Rhine-Westphalia, 2014

Prof. Dr. Peter Friedrich Hoyer

Awarded the "Golden Kidney" by the European Society for Pediatric Nephrology, 2010

President of the German Society of Pediatric Nephrology (GPN), 2012–2015 and 2015–2018.

Prof. Dr. Marcus Jäger

Science Prize of the Association of Pediatric Orthopedists (VKO), 2011

Dr. Alexander Jánosi (Department of Cardiology)

Hannelore Stübler Award of the Society for the Promotion of Cardiovascular Research Essen, 2011

PD Dr. Stefan Kasper (Department of Internal Medicine, Tumor Research)

Young Investigator Award of the German Society of Internal Medicine (DGIM), 2011

Wiedenfeld Award of the Cancer Research Foundation Duisburg, 2011

Research and Innovation Award of the German Society for Hematology and Oncology (DGHO), 2012

Foundation Award of the Foundation for Research on Head and Neck Cancer, 2015

Dr. Cyrus Khandanpour (Department of Hematology)

Clinical Research Award of the German Society for Hematology and Oncology (DGHO), 2013

PD Dr. Diana Klein (Institute of Cell Biology, Tumor Research)

Dieter Frankenberg Young Investigator Prize of the German Society for Biological Radiation Research (GBS), 2015

Dr. Torben Knuschke (Institute of Medical Microbiology)

Doctoral Thesis Award of the German Society for Hygiene and Microbiology (DGHM), 2013

Prof. Dr. Karl Sebastian Lang

Induction into the North Rhine-Westphalia Academy of Sciences and Arts, 2015

Prof. Dr. Stephan Lang

Induction into the National Academy of Sciences Leopoldina, 2011

Prof. Dr. Bodo Levkau (Institute of Pathophysiology)

Arthur Weber Award of the German Cardiac Society (DGK), 2010

Dr. Peter Lüdike (Department of Cardiology)

Hans and Gertie Fischer Award of the Rhine Westphalian Society for Internal Medicine, 2013

Dr. Susanne Lütje (Department of Nuclear Medicine)

Dagmar Eißner Award of the Central Rhine Society for Nuclear Medicine (MGN), 2015

Dr. Amir Mahabadi (Department of Cardiology)

Dr. Deichmann "Cardiology" research award from the Society for the Promotion of Cardiovascular Research Essen, 2011

M. Sc. Philipp Marx (Department of Thoracic and Cardiovascular Surgery)

Young Investigator Award of the Society for Medical Innovation and Technology (SMIT), 2015

Cand. med. Lars Michel (Department of Hematology)

Young Investigator Award of the German Society for Hematology and Oncology (DGHO), 2013

Prof. Dr. Thomas Minor (Department of General, Visceral and Transplantation Surgery)

Franz J. Köhler Award of the German Society for Thoracic and Cardiovascular Surgery (DGTHG), 2014

Dr. Christian Niedworok (Department of Urology)

Paul Mellin Commemorative Prize of the NRW Society of Urology, 2012

Dr. Claudia Pieper (Institute of Computer Science in Medicine, Biostatistics, and Epidemiology)

Bowel Cancer Communication Award of the German Cancer Society (DKG), the German Cancer Foundation and the foundation "Lebensblicke", 2013

Michael Pogorzelski (Department of Internal Medicine, Tumor Research)

Mildred Scheel Doctoral Program Award Scholarship of German Cancer Aid, 2011

Dr. Julia Pohl (Department of Cardiology)

Hans and Gertie Fischer Award of the Rhine-Westphalian Society for Internal Medicine (RWGIM), 2015

Prof. Dr. Dirk Reinhardt

John Mendelsohn Study Award of the German Cancer Society (DKG) (AML-BFM), 2014
Cancer Follow-up Award for Pediatric Cancer Follow-up, 2014

PD Dr. Simon Schäfer (Department of Anesthesiology and Intensive Care)

Karl Thomas Prize of the German Society for Anesthesiology and Intensive Care Medicine (DGAI), 2014

Prof. Dr. Ulrike Schara (Department of Pediatrics I)

Elected president of the German Pediatric Neurology Society (GNP), 2014
Research Award ("Humanpreis") of the German Duchenne Foundation, 2015

Prof. Dr. Manfred Schedlowski

President, Psychoneuroimmunology Research Society, 2013

Prof. Dr. Norbert Scherbaum

Appointed to the German Medical Association's committee on addiction and drugs, 2011

Prof. Dr. Thomas Schlosser (Institute of Diagnostic and Interventional Radiology and Neuroradiology)

Wilhelm Conrad Röntgen Award of the German Radiological Society (DRG), 2012

PD Dr. Jörg Steinmann (Institute of Medical Microbiology)

Hygiene Award of the Rudolf Schülke Foundation in a working group with Dr. Eike Steinmann of Hanover and Dr. Jochen Steinmann of Bremen, 2011
Becton-Dickinson research award of the Foundation of the German Society for Hygiene and Microbiology (DGHM), 2015

PD Dr. Sefik Tagay (Department of Psychosomatic Medicine and Psychotherapy)

Sponsorship award of the German-speaking Society for Psychotraumatology (DeGPT), 2011

Prof. Dr. Beate Timmermann

Recipient of the Health Media Award Health Angel in the Medical Technology category, 2015

PD Dr. Niels Voigt and Dr. Jordi Heijman (Institute of Pharmacology)

Oskar Lapp Research Award of the German Cardiac Society (DGK), 2015

Prof. Dr. Oliver Witzke and Prof. Dr. Monika Lindemann (Institute of Transfusion Medicine)

Hans-U. Zollinger Prize of the German Nephrology Society (DGfN), 2012

Dr. Regina Wobben (Institute of Physiology)

Award of the Sparkasse Essen – Best Doctoral Thesis of the Medical Faculty, 2015

Dr. Denise Zwanziger (Department of Endocrinology and Metabolic Disorders)

Karl Oberdisse Award of the North Rhine-Westphalian Society for Endocrinology and Diabetology, 2016

9.

Hospital Departments and Institutes

Brief Research and Teaching Profiles

The hospital departments and institutes of the University of Duisburg-Essen's Medical Faculty at Essen University Hospital practice research and teaching at top scientific levels and are closely interconnected. All institutions are involved in at least one of the five research focuses, namely cardiovascular disease, oncology, transplant medicine, infectious diseases and immunology, or genetic medicine. In addition, the hospital's departments and institutes set their own focuses for research and teaching while collaborating with other important institutions and networks in research at both the national and the international levels.

Whereas the first part of this report provided a bird's eye view of the Medical Faculty's performance and achievements, the following brief profiles of the hospital's departments and institutes will allow more specific insights into their work.

The profiles consist of a basic description of the structure of each department or institute, its individual research and teaching profile, its research focus, and a list of five key publications from the past five years that illustrate its research output. Also included for each is a brief strategic outlook outlining anticipated future developments.

Department of General, Visceral, and Transplant Surgery

Director: Prof. Dr. med. Andreas Paul
Deputy Director: Prof. Dr. med. Jürgen Treckmann

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Research and teaching structure

In 2015, the Medical Faculty appointed Prof. Dr. Thomas Minor as a W2 professor of surgical research, and in 2016 it offered PD Dr. Jens Brockmann a W2 professorship in visceral transplant medicine. Research projects in the department are supported by the Deutsche Forschungsgemeinschaft (DFG), by an internal funding program (IFORES), and by two foundations: the Jackstädt Stiftung and the Else Kröner-Fresenius-Stiftung. The department is also involved in work programs 3 and 5 of the FP7-HEALTH 2012 – INNOVATION - 1 (EU joint project COPE): Hypothermic machine perfusion vs. cold storage in expanded criteria donor (ECD) kidney transplants and Experimental liver preservation.

Research focuses

- Reconditioning of previously damaged organs for transplantation
- The role of polo-like kinases 1 and 2 as mediators of hedgehog survival signaling in cholangiocarcinoma cells
- Optimizing hepatitis C treatment before and after liver transplant

Research profile and selected research projects from the past five years

The department's expertise in innovative dynamic reconditioning procedures is leading both in Germany and internationally. Members of the

department have investigated persufflation methods and the mechanisms of action of reconditioning methods, as well as their translational application in randomized, single-center, and multicenter studies. The department is maximally equipped with devices for innovative ex situ organ reconditioning. Examples of research projects are those investigating the role of polo-like kinases 1 and 2 as mediators of hedgehog survival signaling in cholangiocarcinoma cells, the end-ischemic reconditioning of ECD kidneys, and controlled re-warming and machine perfusion for the reconditioning of marginally preserved donor livers and kidneys.

Teaching profile of the past five years

In addition to the main lecture series in general surgery that is available on the Moodle platform, teaching activities also cover vascular, pediatric, sarcoma, and plastic surgery.

Strategic outlook

The department aims to further strengthen its transplant medicine and tumor focuses (within the Comprehensive Cancer Center) by adding to its competency in endocrine surgery.

Selected publications from the past five years

1. Moers C, Pirenne J, Paul A, Ploeg RJ; Machine Preservation Trial Study Group. Machine perfusion or cold storage in deceased-donor kidney transplantation. *N Eng J Med* 2012;366(8):770-771.
2. Fingas CD, Mertens JC, Razumilava N, Sydor S, Bronk SF, Christensen JD, Rizvi SH, Canbay A, Treckmann JW, Paul A, Sirica AE, Gores GJ. Polo-like kinase 2 is a mediator of hedgehog survival signaling in cholangiocarcinoma. *Hepatology* 2013;58(4):1362-1374.
3. Gallinat A, Fox M, Lüer B, Efferz P, Paul A, Minor T. Role of pulsatility in hypothermic reconditioning of porcine kidney grafts by machine perfusion after cold storage. *Transplantation* 2013;96(6):538-542.
4. Xu L, Beckebaum S, Iacob S, Wu G, Kaiser GM, Radtke A, Liu C, Kabir I, Schmidt HH, Zhang X, Lu M, Cicinnati VR. MicroRNA-101 inhibits human hepatocellular carcinoma progression through EZH2 downregulation and increased cytostatic drug sensitivity. *J Hepatol* 2014;60(3):590-598.
5. Kocabayoglu P, Lade A, Lee YA, Dragomir AC, Sun X, Fiel MI, Thung S, Aloman C, Soriano P, Hoshida Y, Friedman SL. β -PDGF receptor expressed by hepatic stellate cells regulates fibrosis in murine liver injury, but not carcinogenesis. *J Hepatol* 2015;63(1):141-147.

Department of Anesthesiology and Intensive Care Medicine

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Teaching profile of the past five years

The department represents its core interests in a medical student curriculum ranging from a preclinical seminar in emergency medicine to courses in anesthesiology, intensive care, and handling emergencies in the 2nd and the 4th clinical semesters, respectively, as well as in the field of pain management with the department coordinating the students' interdisciplinary pain management course. An internship in anesthesiology and intensive care medicine is also available. Teaching quality is improved by research projects in teaching and critical evaluations and is verified by students' evaluations. Teaching efforts were documented by winning several of the Medical Faculty's teaching awards.

Research and teaching structure

With its 116 positions for physicians, including 31 specialists, the department has been adequately staffed in terms of physicians and other academic positions since January 2016.

Research focuses

- Sepsis, respiratory failure / ARDS, extracorporeal membrane oxygenation
- Genetic medicine and signal transduction in cardiovascular systems
- Cardiac remote ischemic preconditioning (RIPC)
- Randomized research in emergency medicine education using simulation

Research profile and selected research projects from the past five years

The department's focus is on translational research at the interface of molecular/genetic medicine, pathophysiology, and clinical practice. Its important research projects address cardiac remote ischemic preconditioning and how it is affected by anesthetics as well as hypoxic gene regulation, innate and adaptive immunity and the coagulation system in sepsis, the effects of mitochondrial DNA on immunity, as well as effects of single nucleotide polymorphisms on adrenergic signal transduction pathways.

Strategic outlook

Another biosafety level 1 laboratory was opened in September 2016 to expand the department's activities in interdisciplinary molecular research on cardiac RIPC, cellular metabolism of immune cells, in alveolar immune phenotypes in sepsis and ARDS, as well as in epigenetic changes in sepsis.

Selected publications from the past five years

1. Schäfer ST, Franken L, Adamzik M, Schumak B, Scherag A, Engler A, Schönborn N, Walden J, Koch S, Baba HA, Steinmann J, Westendorf AM, Fandrey J, Bieber T, Kurts C, Frede S, Peters J, Limmer A. Mitochondrial DNA: An endogenous trigger for immune paralysis. *Anesthesiology* 2016;124(4):923-933.
2. Frey UH, Karlik J, Herbstreit F, Peters J. β 2-Adrenoceptor gene variants affect vasopressor requirements in patients after thoracic epidural anaesthesia. *Br J Anaesth* 2014;112(3):477-484.
3. Frey UH, Muehlischlegel JD, Ochterbeck C, Fox AA, Shernan SK, Collard CD, Lichtner P, Peters J, Body S. GNAS gene variants affect β -blocker-related survival after coronary artery bypass grafting. *Anesthesiology* 2014;120(5):1109-1117.
4. Thielmann M, Kottenberg E, Kleinbongard P, Wendt D, Gedik N, Pasa S, Price V, Tsagakis K, Neuhäuser M, Peters J, Jakob H, Heusch G. Cardioprotective and prognostic effects of remote ischaemic preconditioning in patients undergoing coronary artery bypass surgery: a single-centre randomised, double-blind, controlled trial. *Lancet* 2013;382(9892):597-604.
5. Adamzik M, Broll J, Steinmann J, Westendorf AM, Rehfeld I, Kreissig C, Peters J. An increased alveolar CD4+CD25+Foxp3+ T-regulatory cell ratio in acute respiratory distress syndrome is associated with increased 30-day mortality. *Intensive Care Med* 2013;39(10):1743-1751.

Department of Dermatology

Director: Prof. Dr. med. Dirk Schadendorf
Deputy Director/Head Physician:
Prof. Dr. med. Alexander Rösch (research & teaching)

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Teaching profile of the past five years

The department teaches dermatology in a lecture series accompanied by an intensive seminar, as well as in other bedside teaching sessions.

Research and teaching structure

The department has eight working groups. In 2014, a W2 professorship in dermato-oncology was created, and in 2016 a W2 professorship in immunodermatology was established. The recipient of a W2 professorship in translational dermatosurgery is currently being selected. The department collaborates closely with the West German Cancer Center (WTZ), the Institute of Virology, and the Institute of HIV Research.

Research focuses

- Dermato-oncology
- HIV research
- Psoriasis
- Chronic wounds

Research profile and selected research projects from the past five years

The department's expertise in dermato-oncology and HIV-related medicine is proven. It is involved in national and international networks. The main research projects are the "Priority Program Translational Oncology," supported by the German Cancer Aid, and various EU-funded projects, as well as the BMBF-funded TECAIN study and its participation in the Competence Network for Heart Failure.

Strategic outlook

The focus in dermato-oncology, the research focuses in dermatological surgery, dermatogenetics, and psoriasis, and the interdisciplinary focus on inflammation are slated for expansion. Another aim is stronger networking in the field of infectious diseases.

Selected publications from the past five years

1. Stoffels I, Morscher S, Helfrich I, Hillen U, Leyh J, Burton NC, Sardella TC, Claussen J, Poepfel TD, Bachmann HS, Roesch A, Griewank K, Schadendorf D, Gunzer M, Klode J. Metastatic status of sentinel lymph nodes in melanoma determined noninvasively with multispectral optoacoustic imaging. *Sci Transl Med* 2015;7(317):317ra199. doi: 10.1126/scitranslmed.aad1278.
2. Van Allen EM*, Miao D*, Schilling B*, Shukla SA, Blank C, Zimmer L, Sucker A, Hillen U, Geukes Foppen MH, Goldinger SM, Utikal J, Hassel JC, Weide B, Kaehler KC, Loquai C, Mohr P, Gutzmer R, Dummer R, Gabriel S, Wu CJ, Schadendorf D*, Garraway LA*. Genomic correlates of response to CTLA-4 blockade in metastatic melanoma. *Science*. 2015;350(6257):207-211. *Shared first authorship.
3. Robert C, Karaszewska B, Schachter J, Rutkowski P, Mackiewicz A, Stroiakovski D, Lichinitser M, Dummer R, Grange F, Mortier L, Chiarion-Sileni V, Drucis K, Krajsova I, Hauschild A, Lorigan P, Wolter P, Long GV, Flaherty K, Nathan P, Ribas A, Martin AM, Sun P, Crist W, Legos J, Rubin SD, Little SM, Schadendorf D. Improved overall survival in melanoma with combined dabrafenib and trametinib. *N Engl J Med* 2015;372(1):30-39.
4. Van Allen EM, Wagle N, Sucker A, Treacy DJ, Johannessen CM, Goetz EM, Place CS, Taylor-Weiner A, Whittaker S, Kryukov GV, Hodis E, Rosenberg M, McKenna A, Cibulskis K, Farlow D, Zimmer L, Hillen U, Gutzmer R, Goldinger SM, Ugurel S, Gogas HJ, Egberts F, Berking C, Trefzer U, Loquai C, Weide B, Hassel JC, Gabriel SB, Carter SL, Getz G, Garraway LA, Schadendorf D; Dermatologic Cooperative Oncology Group of Germany (DeCOG). The genetic landscape of clinical resistance to RAF inhibition in metastatic melanoma. *Cancer Discov* 2014;4(1):94-109.
5. Kordelas L, Verheyen J, Beelen DW, Horn PA, Heinold A, Kaiser R, Trensche R, Schadendorf D, Dittmer U, Esser S; Essen HIV AlloSCT Group. Shift of HIV tropism in stem-cell transplantation with CCR5 Delta32 mutation. *N Engl J Med* 2014;371(9):880-882.

Department of Endocrinology and Metabolism

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heath disorders such as cardiac, hepatic and bone disease, cancer, diabetes and lipid metabolism
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Teaching profile of the past five years

The department teaches endocrinology, diabetology, metabolism, internal medicine, clinical chemistry, medical biology and molecular endocrinology. It was awarded teaching prizes in 2013 and 2015 and students regularly evaluate teaching as excellent.

Strategic outlook

Additional research-oriented professorships will strengthen the focus on endocrine/neuroendocrine tumors and on thyroid hormone action. The department pursues beacon projects at the Endocrine Tumor Center of the WestGerman Cancer Center (WTZ) and the ENETS Center of Excellence, in transplantation endocrinology/diabetology and in building-up a structured transition clinic for rare and common endocrine disorders with the aim of establishing Essen as the leading German Center for Endocrine Medicine.

Research and teaching structure

The Department consists of the Hospital Section, the Molecular Endocrine Research Lab and the Section Research and Teaching in Clinical Chemistry. It offers teaching across all areas of endocrinology, diabetology and clinical chemistry, in addition to research in molecular and clinical endocrinology (master, MD and PhD projects). Prof. Dagmar Führer is the spokesperson of the DFG Priority Programme SPP1629 Thyroid Trans Act.

Research focuses

- Endocrine tumors (thyroid, pituitary, gastroenteropancreatic neuroendocrine tumors [GEP-NET]) – ENETS center
- Thyroid hormones in health and disease
- Tumor endocrinology
- Transplantation endocrinology and diabetology (TREND-E)
- Transition in endocrinology and diabetology

Research profile and selected research projects from the past five years

Research in the department is focused on the molecular pathogenesis and optimized care in endocrine/neuroendocrine tumors and hormone action. Special interests are molecular signatures and models of thyroid cancer and endocrine neoplasia and the role of hormones in oncology and transplantation. Furthermore we study classical and non-classical thyroid hormone action in relation to ageing, sex and common

Selected publications from the past five years

1. Special Issue „Recent Advances in Translation of Thyroid Hormone Action beyond Classical Concepts“ 2015 (Editors: D. Führer, K. Brix, H. Biebermann) in the European Thyroid Journal with contributions from Thyroid Trans Act (SPP 1629).
2. Everolimus for the treatment of advanced, non-functional neuroendocrine tumours of the lung or gastrointestinal tract (RADIANT-4): a randomised, placebo-controlled, phase 3 study. Yao JC, Fazio N, Singh S, Buzzoni R, Carnaghi C, Wolin E, Tomasek J, Raderer M, Lahner H, Voi M, Pacaud LB, Rouyrre N, Sachs C, Valle JW, Fave GD, Van Cutsem E, Tesselaar M, Shimada Y, Oh DY, Strosberg J, Kulke MH, Pavel ME; RAD001 in Advanced Neuroendocrine Tumours, Fourth Trial (RADIANT-4) Study Group. *Lancet*. 2015 Dec 15. pii: S0140-6736(15)00817-X. doi: 10.1016/S0140-6736(15)00817-X. [Epub ahead of print].
3. A 6 bp in frame germline deletion in exon 7 of RET leads to increased RET phosphorylation, ERK activation and MEN2A; Latteyer S, Klein-Hitpass L, Khandanpour C, Zwanziger D, Poeppel T, Schmid KW, Fuehrer D, Moeller LC. *J Clin Endocrinol* 2016.
4. The impact of CLAUDIN-1 on follicular thyroid carcinoma aggressiveness. Zwanziger D, Badziog J, Ting S, Moeller LC, Kurt Werner S, Siebolts U, Wickenhauser C, Dralle H, Fuehrer D. *Endocr Relat Cancer*. 2015 Oct;22(5):819-30.
5. Dissecting molecular events in thyroid neoplasia provides evidence for distinct evolution of follicular adenoma and carcinoma. Krause K, Prawitt S, Eszlinger M, Ihling C, Sinz A, Schierle K, Gimm O, Dralle H, Steinert F, Sheu SY, Werner Schmid K, Fuehrer D. *Am J Pathol*. 2011; 179:3066-74.

Department of Diseases of the Posterior Segment of the Eyes

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Research and teaching structure

The department has one C4 professor (Bornfeld). Dr. Claudia Metz is a member of the DFG-funded Clinical Research Unit Ophthalmic Oncology and Genetics. The department is involved in a joint project with the radiation department (Dr. Flühs) investigating brachytherapy of intraocular tumors. A retinoblastoma animal model is being established with funding from the foundation Jackstädt Stiftung (Dr. Eva Biewald).

Research focuses

- Intraocular tumors in adults and children
- Degenerative diseases of the retina

Research profile and selected research projects from the past five years

The department collaborates with experimental researchers in human genetics. In collaboration with the Department of Psychosomatic Medicine and Psychotherapy (LVR), the Clinical Research Unit (with participants from ophthalmology, human genetics, and dermatology) investigates risk-adjusted follow-up in uveal melanoma patients. In one subproject, the Department of Psychosomatic Medicine and Psychotherapy studies the influence of prognostic assessments on quality of life. Another subproject studies the predictive value of the analysis of cell-free DNA from plasma of patients with uveal melanoma for metastatic disease, and a third subproject is dedicated to detecting hereditary predisposition for uveal melanoma.

Other focus areas are the optimization of brachytherapy for intraocular tumors (in collaboration with the Department of Radiation), the establishment of proton therapy for intraocular tumors (Prof. Timmermann), and the optimization of local (intraarterial and intravitreal) retinoblastoma therapies. The department is involved in numerous studies investigating treatments for macular degeneration in diabetes, age-dependent macular degeneration, and pathological myopia.

Teaching profile of the past five years

The department teaches a course in ophthalmologic examination in the first clinical semester and an ophthalmology lecture series and practical course in the fifth clinical semester.

Strategic outlook

The department aims to initiate additional collaborations with additional departments of Essen University Hospital.

Selected publications from the past five years

1. Thomas S, Pütter C, Weber S, Bornfeld N, Lohmann DR, Zeschnigk M. Prognostic significance of chromosome 3 alterations determined by microsatellite analysis in uveal melanoma: a long-term follow-up study. *Br J Cancer*. 2012 Mar 13;106(6):1171-6. doi: 10.1038/bjc.2012.54. Epub 2012 Feb 21.
2. Martin M, Maßhöfer L, Temming P, Rahmann S, Metz C, Bornfeld N, van de Nes J, Klein-Hitpass L, Hinnebusch AG, Horsthemke B, Lohmann DR, Zeschnigk M. Exome sequencing identifies recurrent somatic mutations in EIF1AX and SF3B1 in uveal melanoma with disomy 3. *Nat Genet*. 2013 Aug;45(8):933-6. doi: 10.1038/ng.2674. Epub 2013 Jun 23.
3. Metz CH, Scheulen M, Bornfeld N, Lohmann D, Zeschnigk M. Ultradeep sequencing detects GNAQ and GNA11 mutations in cell-free DNA from plasma of patients with uveal melanoma. *Cancer Med*. 2013 Apr;2(2):208-15. doi: 10.1002/cam4.61. Epub 2013 Feb 14.
4. Sirin S, de Jong MC, de Graaf P, Brisse HJ, Galluzzi P, Maeder P, Bornfeld N, Biewald E, Metz KA, Temming P, Castelijns JA, Goerick SL; European Retinoblastoma Imaging Collaboration. High-Resolution Magnetic Resonance Imaging Can Reliably Detect Orbital Tumor Recurrence after Enucleation in Children with Retinoblastoma. *Ophthalmology*. 2016 Mar;123(3):635-45. doi: 10.1016/j.ophtha.2015.10.054. Epub 2015 Dec 12.
5. Biewald E, Lautner H, Goek M, Horstmann W, Sauerwein W, Flühs D, Bornfeld N. Endoresection of large uveal melanomas. *Br J Ophthalmol* (accepted 2016)

Department of Diseases of the Anterior Segments of the Eyes

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Research and teaching structure

The Department has four Research Units (two of them with DFG funding) with focuses in clinical and basic research. The working group of Prof. Eckstein and Dr. Berchner-Pfannschmidt is involved in GRK2098 and the EU project INDIGO.

Research focuses

- Cornea bank/stem cell transplants: epithelial stem and progenitor cells of ocular surface tissues
- Clinical: inflammatory orbitopathy, strabotomy dosing, market launch study: laser eyewear for people with visual impairments
- Basic research: hypoxia and inflammation, biomedicine of sphingolipids, role of mesenchymal stem cells in orbital inflammatory response, establishment of an animal model of Graves' orbitopathy, effects of gut microbiome on the course of Graves' orbitopathy.

Research profile and selected research projects from the past five years

The department's large patient population provides a unique opportunity for studying a large number of patients with the same underlying disease. The department is the only hospital department in Germany to cultivate limbal epithelial stem cells of the cornea. It also provides cornea and amnion membrane grafts for transplantation. One of the milestones achieved by the department was the establishment of a

murine model of Graves' orbitopathy, which to date outside Essen has been accomplished only in London. The cornea bank studied the effectiveness of stem and progenitor cell transplants in reconstructing damaged ocular surfaces. It has been investigating the functional and molecular characteristics of these cells, working toward a more exact characterization. Another focus is the examination of squamous cell carcinomas of the conjunctiva.

Teaching profile of the past five years

Over the past five years, four doctoral students were supervised in the cornea bank.

Strategic outlook

Collaboration with other departments is to be strengthened by joint projects. There are plans to establish a joint Research Unit with the Department of Endocrinology and the Ear, Nose, and Throat Department.

Selected publications from the past five years

1. Scholz SL, Thomasen H, Hestermann K, Dekowski D, Steuhl KP, Meller D. Long-term results of autologous transplantation of limbal epithelium cultivated ex vivo for limbal stem cell deficiency. *Ophthalmologie*. 2015 Aug 14. [Epub ahead of print]
2. Pauklin M, Thomasen H, Pester A, Steuhl KP, Meller D. Expression of pluripotency and multipotency factors in human ocular surface tissues. *Curr Eye Res*. 2011 Dec;36(12):1086-97.
3. Berchner-Pfannschmidt U, Moshkelgosha S, Diaz-Cano S, Edelmann B, Görtz G-E, Horstmann M, Noble A, Hansen W, Eckstein A, Banga JP. Comparative Assessment of Female Mouse Model of Graves' Orbitopathy Under Different Environments, Accompanied by Proinflammatory Cytokine and T-Cell Responses to Thyrotropin Hormone Receptor Antigen. *Endocrinology* 2016, April, 157(4):1673-1682.
4. Brandau S, Bruderek K, Hestermann K, Görtz GE, Horstmann M, Mattheis S, Lang S, Eckstein A, Berchner-Pfannschmidt U. Orbital Fibroblasts From Graves' Orbitopathy Patients Share Functional and Immunophenotypic Properties With Mesenchymal Stem/Stromal Cells. *Invest Ophthalmol Vis Sci*. 2015 Oct;56(11):6549-57.
5. Johnson KT, Wiesweg B, Schott M, Ehlers M, Müller M, Minich WB, Nagayama Y, Gulbins E, Eckstein AK, Berchner-Pfannschmidt U. Examination of orbital tissues in murine models of Graves' disease reveals expression of UCP-1 and the TSHR in retrobulbar adipose tissues. *Horm Metab Res*. 2013 Jun;45(6):401-7.

Department of Obstetrics and Gynecology

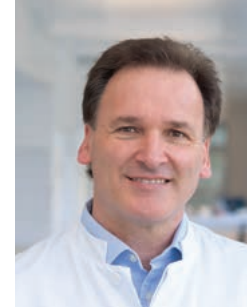
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Teaching profile of the past five years

Teaching activities offered by the department range from courses taught at the beginning of the program to practical classes later on and involvement in objective structured clinical examinations (OSCE). Within the EGONE project, e-learning activities have been successively introduced.

Strategic outlook

Future goals include developing focuses in ontogenetic compartmental surgery and in personalized tumor therapy using CTC and DTC detection and targeted therapy. Another aspiration is the prevention and treatment of pregnancies at risk of early delivery, placental insufficiency, and preeclampsia.

Research and teaching structure

The department established a center for ontogenetic tumor surgery and is one of the leading institutions in robotic gynecological surgery nationwide. It is involved in numerous national and international collaborations with universities and reputable institutions, as well as in the ESGO, EUSOMA, AGO, WSG, and GBG networks. In addition, it supported the establishment of a breast center at the Nanjing University, China. The department hosts various conferences, such as the annual breast cancer conference "Post San Antonio" and "News from Chicago." In 2014, it hosted the annual conference of the Society of European Robotic Gynecological Surgery.

Research focuses

- Gynecological oncology and senology
- Ontogenetic tumor surgery
- Perinatal medicine
- Gynecological endocrinology

Research profile and selected research projects from the past five years

Focal areas of research are the importance of tumor stem cells in gynecological malignomas, as well as the development of strategies and techniques in gynecological surgery. Specific projects addressed ontogenetic tumor surgery, tumor cell research (disseminated tumor cells [DTCs] and circulating tumor cells [CTCs]) in breast and ovarian cancer, polycystic ovarian syndrome endocrinology, and preeclampsia research.

Selected publications from the past five years

1. Does primary neoadjuvant systemic therapy eradicate minimal residual disease? Analysis of disseminated and circulating tumor cells before and after therapy. Kasimir-Bauer S, Bittner AK, König L, Reiter K, Keller T, Kimmig R, Hoffmann O. *Breast Cancer Res.* 2016 Feb 12;18(1):20. doi: 10.1186/s13058-016-0679-3.
2. Intraoperative navigation in robotically assisted compartmental surgery of uterine cancer by visualisation of embryologically derived lymphatic networks with indocyanine-green (ICG). Kimmig R, Aktas B, Buderath P, Rusch P, Heubner M. *J Surg Oncol.* 2016 Jan 21. doi: 10.1002/jso.24174. [Epub ahead of print]
3. ERCC1-positive circulating tumor cells in the blood of ovarian cancer patients as a predictive biomarker for platinum resistance. Kuhlmann JD, Wimberger P, Bankfalvi A, Keller T, Schöler S, Aktas B, Buderath P, Hauch S, Otterbach F, Kimmig R, Kasimir-Bauer S. *Clin Chem.* 2014 Oct;60(10):1282-9. doi: 10.1373/clinchem.2014.224808. Epub 2014 Jul 11.
4. Predictive markers for the FSH sensitivity of women with polycystic ovarian syndrome. Königer A, Sauter L, Edimiris P, Kasimir-Bauer S, Kimmig R, Strowitzki T, Schmidt B. *Hum Reprod.* 2014 Mar;29(3):518-24. doi: 10.1093/humrep/det468. Epub 2014 Jan 12.
5. A phase 3 trial of bevacizumab in ovarian cancer. Perren TJ, Swart AM, Pfisterer J, Ledermann JA, Pujade-Lauraine E, Kristensen G, Carey MS, Beale P, Cervantes A, Kurzeder C, du Bois A, Sehouli J, Kimmig R, Stähler A, Collinson F, Essapen S, Gourley C, Lortholary A, Selle F, Mirza MR, Lemin A, Plante M, Stark D, Qian W, Parmar MK, Oza AM; ICON7 Investigators. *N Engl J Med.* 2011 Dec 29;365(26):2484-96. doi: 10.1056/NEJMoa1103799.

Department of Gastroenterology and Hepatology

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Current projects investigate the mechanisms of NAFLD development and progression, the metabolic development of HCC, prediction of ALF progression, fibrosing and stellate cell activity, and intestinal immunology.

Research and teaching structure

The department has five working groups investigating various fields. It is involved in the DFG program SFB/Transregio 60.

Research focuses

- Nonalcoholic fatty liver disease (NFLD), acute liver failure (ALF), liver cell biology; clinical research
- Immunologic function of different types of liver cells; participation in SFB/TRR60: Treatment of primary liver cells with in vitro generated viruses (HBV, HCV); impact of various types of human liver cells on treatment of HBV infections with nucleic acid-based agents
- Molecular mechanisms of HCC development; transplant hepatology
- Immunity and regulation of tolerance in chronic liver disease
- Mechanisms governing the integrity of the intestinal mucosa barrier

Research profile and selected research projects from the past five years

Research at the department follows a translational approach and addresses diseases of the liver, gallbladder, and intestines. It uses current state-of-the-art molecular biology techniques such as qrt-PCR, gene chips, deep sequencing, Western blots, ELISA, and immunohistochemistry.

Teaching profile of the past five years

The department is involved in lectures and practical courses in internal medicine and in the mentoring program for Practical Year students. It offers seminars, continuing education, and practical training in simulated video endoscopy (ELVIS).

Strategic outlook

The department's goal is to strengthen clinical-translational research, particularly in transplant medicine and liver tumors.

Selected publications from the past five years

1. Beilfuss A, Sowa JP, Sydor S, Beste M, Bechmann LP, Schlattjan M, Syn WK, Wedemeyer I, Mathé Z, Jochum C, Gerken G, Gieseler RK, Canbay A. Vitamin D counteracts fibrogenic TGF- β signaling in human hepatic stellate cells both receptor-dependently and independently. *Gut*. 2015;64(5):791-9.
2. Manka P, Bechmann LP, Coombes JD, Thodou V, Schlattjan M, Kahraman A, Syn WK, Saner F, Gerken G, Baba H, Verheyen J, Timm J, Canbay A. Hepatitis E Virus Infection as a Possible Cause of Acute Liver Failure in Europe. *Clin Gastroenterol Hepatol*. 2015;13(10):1836-1842.
3. Frank M, Hennenberg EM, Eyking A, Rünzi M, Gerken G, Scott P, Parkhill J, Walker AW, Cario E. TLR signaling modulates side effects of anticancer therapy in the small intestine. *J Immunol*. 2015;194(4):1983-95.
4. Bechmann LP, Kocabayoglu P, Sowa JP, Sydor S, Best J, Schlattjan M, Beilfuss A, Schmitt J, Hannivoort RA, Kilicarslan A, Rust C, Berr F, Gerken G, Friedman SL, Geier A, Canbay A. Free fatty acids repress SHP activation and adiponectin counteracts bile acid induced liver injury in super-obese patients with NASH. *Hepatology* 2013;57(4):1394-406.
5. Hadem J, Tacke F, Bruns T, Langgartner J, Strnad P, Denk GU, Fikatas P, Manns MP, Hofmann WP, Gerken G, Grünhage F, Umgelter A, Trautwein C, Canbay A, The Acute Liver Failure Study Group Germany. Etiologies and Outcomes of Acute Liver Failure in Germany. *Clin Gastroenterol Hepatol*. 2012;10(6):664-9.e2.

Ear, Nose, and Throat Department

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organizations providing external funding, as well as interdisciplinary collaborations with the Departments of Neurology, Pathology, Neuroradiology, Pediatrics, Neurosurgery, Ophthalmology, and Human Genetics, are in place. External funding has been acquired for numerous individual projects funded by the DFG or the German Cancer Aid, and for a Europe-wide immunologically oriented COST networking project.

Research and teaching structure

The department has one university professor, three supernumerary (APL) professors, and two adjunct professors. Patient-oriented research and experimental research are intensively interconnected. The department is actively involved in establishing the West German Biobank (WBE). The translational-experimental research focus is in the area of immunology and oncology.

Research focuses

- Immunological tumor-host interactions
- Therapeutic antitumor antibodies
- Immunobiology of mesenchymal stromal cells
- Biomarkers in head and neck oncology
- Diagnosis and treatment of sleep-related breathing disorders
- Experimental rhinology and chemosensory function
- Transoral robot-assisted surgery
- Surgical treatment of Graves' orbitopathy
- Surgical aural rehabilitation and implantable hearing systems
- Imaging facilities for the otocranium and the labyrinth, in collaboration with the Erwin L. Hahn Institute

Research profile and selected research projects from the past five years

The department has developed and supported clinical surgical and translational experimental projects effectively interlinking patient materials and mouse models. Collaborations with industry

Teaching profile of the past five years

The department is involved in teaching activities in the Medical Biology program and in teaching postgraduate and doctoral students in the BIOME Graduate School of Biomedical Science and the School of Oncology of the DKTK. It has developed a modular system of preclinical and clinical examination courses with practical and theoretical parts, and it is involved in Skills Laboratory activities.

Strategic outlook

The department is on its way to becoming the largest clinical and experimental department in the field of head and neck oncology.

Selected publications from the past five years

1. Lang S, Mattheis S, Hasskamp P, Lawson G, Gueldner C, Mandapathil M, Schuler P, Hoffmann T, Scheithauer M, Remacle M (2016) A European Multicenter Study Evaluating the Flex Robotic System in Transoral Robotic Surgery. *Laryngoscope* (in press)
2. Stuck BA, Hummel T. (2015) Olfaction in Allergic Rhinitis – A Systematic Review. *J Allergy Clin Immunol* 136: 1460-70.
3. Dumitru CA, Hemeda H, Jakob M, Lang S, Brandau S. (2014) Stimulation of mesenchymal stromal cells (MSCs) via TLR3 reveals a novel mechanism of autocrine priming. *FASEB J.* 28(9): 3856-66.
4. Brandau S, Jakob M, Bruderek K, Bootz F, Giebel B, Radtke S, Mauel K, Jäger M, Flohé S, Lang S. (2014) Mesenchymal stem cells augment the anti-bacterial activity of neutrophil granulocytes. *PLoS ONE* 9(9): e106903.
5. Trellakis S, Bruderek K, Dumitru CA, Gholaman H, Gu X, Bankfalvi A, Scherag A, Hütte J, Dominas N, Lehnerdt GF, Hoffmann TK, Lang S, Brandau S. (2011) Polymorphonuclear Granulocytes in Human Head and Neck Cancer: Enhanced Inflammatory Activity, Modulation by Cancer Cells and Expansion in Advanced Disease. *Int J Cancer* 129(4): 2183-2193.

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Teaching profile of the past five years

The department's teaching activities include a lecture and a practical course in clinical chemistry and laboratory medicine, the pathophysiology lecture, the main internal medicine lecture, the course in clinical physical examination, the intensive practical course in internal medicine, the seminar in differential diagnoses for internal medicine, and Practical Year activities.

Strategic outlook

The department aims to maintain the study network built as part of the PETAL study. In addition, it plans to continue the development of a GFl1 inhibitor and to establish a clinical scientific area for cancer follow-up activities.

Research and teaching structure

The department has experimental and clinical research groups. The four experimental research groups focus on stem cell biology, the microenvironment, myeloid neoplasia, and lymphoid neoplasia, and a collaboration with the Institute of Molecular Biology is in place. The clinical research focus areas are identical to the clinical specialties of the outpatient centers.

Research focuses

- Basic research in the area of (patho-)physiology of the blood-forming system
- Clinical studies and translational research in the area of disorders of the blood-forming system

Research profile and selected research projects from the past five years

Three projects have been at the center of the department's experimental research, investigating the roles of the GFl1 transcription factor and of the hematopoietic microenvironment in the development of leukemia, as well as the importance of telomeres and telomerases in T-cell polyclonal lymphoma. In clinical research, three multicenter studies on positron emission tomography-guided lymphoma treatment, immune thrombocytopenia, and cold agglutinin disease have been completed.

Selected publications from the past five years

1. Khandanpour C, Phelan JD, Vassen L, Schütte J, Chen R, Horman SR, Gaudreau MC, Krongold J, Zhu J, Paul WE, Dührsen U, Göttgens B, Grimes HL, Möröy T. Growth factor independence 1 antagonizes a p53-induced DNA damage response pathway in lymphoblastic leukemia. *Cancer Cell* 23: 200-214, 2013.
2. Hanoun M, Zhang D, Mizoguchi T, Pinho S, Pierce H, Kunisaki Y, Lacombe J, Armstrong SA, Dührsen U, Frenette PS. Acute myelogenous leukemia-induced sympathetic neuropathy promotes malignancy in an altered hematopoietic stem cell niche. *Cell Stem Cell* 15: 365-375, 2014.
3. Küppers R, Dührsen U, Hansmann M-L. Pathogenesis, diagnosis, and treatment of composite lymphomas. *Lancet Oncol.* 15: e435-446, 2014.
4. Baerlocher GM, Oppliger Leibundgut E, Ottmann OG, Spitzer G, Odenike O, McDevitt MA, Röth A, Daskalakis M, Burington B, Stuart M, Snyder DS. Telomerase inhibitor imetelstat in patients with essential thrombocythemia. *N Engl J Med* 373(10): 920-928, 2015.
5. Röllig C, Serve H, Hüttmann A, Noppeney R, Müller-Tidow C, Krug U, Baldus CD, Brandts CH, Kunzmann V, Einsele H, Krämer A, Schäfer-Eckart K, Neubauer A, Burchert A, Giagounidis A, Krause SW, Mackensen A, Aulitzky W, Herbst R, Hänel M, Kiani A, Frickhofen N, Kullmer J, Kaiser U, Link H, Geer T, Reichle A, Junghansß C, Repp R, Heits F, Dürk H, Hase J, Klut IM, Illmer T, Bornhäuser M, Schaich M, Parmentier S, Görner M, Thiede C, von Bonin M, Schetelig J, Kramer M, Berdel WE, Ehninger G; Study Alliance Leukaemia. Addition of sorafenib versus placebo to standard therapy in patients aged 60 years or younger with newly diagnosed acute myeloid leukaemia (SORAML): a multicentre, phase 2, randomised controlled trial. *Lancet Oncol* 16: 1691-1699, 2015.

Department of Infectious Diseases

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Research and teaching structure

The department was established as an independent department within the Center of Internal Medicine in 2015 and is the first department of its kind at a German university hospital. Its academic profile is to be strengthened by the establishment of a foundation-funded professorship in infectious diseases.

Research focuses

- Evaluation of prophylactic and preventive measures to avoid infectious diseases after solid organ transplantation
- Assessment of experimental models and clinical findings to determine the impact of immunosuppressant treatments, e.g., vaccination, on the immune response of transplant patients and to strengthen patients' immune defenses without provoking transplant rejections.

Research profile and selected research projects from the past five years

Thanks to its close interdisciplinary collaboration with departments of the Medical Center and the Essen University Hospital institutes involved in immunology and infectious disease research, the department bridges the gap between the focuses of transplantation, infectious disease, and immunology. Central areas of interest are the effects of pneumococcal vaccination in transplant patients, vaccine responses to various agents in kidney transplant patients, and the

response to hepatitis B vaccines in patients with kidney disease. Another focus is the investigation of CMV infections after organ transplant with respect to CMV-specific T-cell populations in immunosuppressed patients.

Teaching profile

The department plans to develop a lecture series on infectious diseases as part of the main lecture series in internal medicine, as well as a seminar on differential diagnoses for infectious diseases as a joint undertaking with the institutes of microbiology and virology and the hospital hygiene service unit.

Strategic outlook

Both research and teaching structures are to be further developed and to be supported by the foundation-funded professorship. A continuing education event on infectious diseases in transplant medicine was offered during the annual conference of the German Transplantation Society in Essen in October 2016.

Selected publications from the past five years

1. Rauen T, Eitner F, Fitzner C, Sommerer C, Zeier M, Otte B, Panzer U, Peters H, Benck U, Mertens PR, Kuhlmann U, Witzke O, Gross O, Vielhauer V, Mann JF, Hilgers RD, Floege J; STOP-IgAN Investigators (2015) Intensive Supportive Care plus Immunosuppression in IgA Nephropathy NEJM, 2015 Dec 3;373(23):2225-36.
2. Budde K, Lehner F, Sommerer C, Reinke P, Arns W, Eisenberger U, Wüthrich RP, Mühlfeld A, Heller K, Porstner M, Veit J, Paulus EM, Witzke O; ZEUS Study Investigators (2015) Five-year outcomes in kidney transplant patients converted from cyclosporine to everolimus: the randomized ZEUS study; Am J Transplant 2015 Jan; 15(1):119-28.
3. Hoerning A, Wilde B, Wang J, Tebbe B, Jing L, Wang X, Jian F, Zhu J, Dolf S, Kribben A, Hoyer PF, Witzke O (2015) Pharmacodynamic monitoring of mammalian target of rapamycin inhibition by phosphoflow cytometric determination of p70S6 kinase activity; Transplantation, 2015 Jan;99(1):210-9.
4. Lindemann M, Heinemann FM, Horn PA, Witzke O (2013) Vaccination against Streptococcus pneumoniae does not induce antibodies against HLA or MICA in clinically stable kidney transplant recipients; Hum Immunol 2013 Oct;74(10):1267-70.
5. Guberina H, Witzke O, Timm J, Dittmer U, Müller MA, Drosten C, Bonin F (2014) A patient with severe respiratory failure caused by novel human coronavirus; Infection.2014 Feb;42(1):203-6.

Department of Medical Oncology

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immunology programs in Germany. Clinical and translational studies in relation to molecularly targeted cancer therapies and mechanisms of resistance are conducted in close cooperation with leading national and international partners and networks. Preclinical concepts have been successfully translated into clinical proof-of-concept studies and clinical applications.

Research and teaching structure

The Department of Medical Oncology is devoted to research, education and clinical care to improve treatment options for patients with advanced cancer. It is an integral part of the West German Cancer Center (WTZ), one of 13 designated Oncology Centers of Excellence in Germany, and have been successfully translated DTKK. Currently, the department comprises three full professorships (W3) for Medical and Translational Oncology, and Personalized Cancer Therapy, as well as clinical and translational research groups. It actively participates in the DFG-funded programs GRK1739 and SFB Initiative 1271.

Research focuses

- Clinical drug development with an emphasis on molecularly targeted therapies and immunotherapies
- Multimodal treatment protocols
- Identification and validation of prognostic and predictive biomarkers
- Translational cancer research (Lung cancer, GI cancers, sarcoma, Head/Neck cancer)
- Molecular mechanisms of tumor heterogeneity and treatment resistance and strategies for their circumvention
- Preclinical models of molecularly defined cancers

Research profile and selected research projects from the past five years

The Department of Medical Oncology hosts one of the most active precision oncology and

Teaching profile of the past five years

The department is involved in teaching activities in internal medicine, medical oncology, and palliative medicine. It is involved in the joint program in medical biology and the BIOME Graduate School. Its strong involvement in postgraduate teaching is exemplified by the WTZ Curriculum in Hematology/Medical Oncology, which is jointly run with the Departments of Hematology and Stem Cell Transplantation.

Strategic outlook

The department aims to expand its translational research activities, to create an international outlook via postgraduate programs, and to contribute to the introduction of an interdisciplinary and translational oncology curriculum at the WTZ.

Selected publications from the past five years

1. Eberhardt WE, Pöttgen C, Gauler TC, Friedel G, Veit S, Heinrich V, Welter S, Budach W, Spengler W, Kimmich M, et al. Phase III Study of Surgery Versus Definitive Concurrent Chemoradiotherapy Boost in Patients With Resectable Stage IIIA(N2) and Selected IIIB Non-Small-Cell Lung Cancer After Induction Chemotherapy and Concurrent Chemoradiotherapy (ESPAUE). *J Clin Oncol*. 2015 Dec 10;33(35):4194-201.
2. Wiesweg M, Ting S, Reis H, Worm K, Kasper S, Tewes M, et al. Feasibility of preemptive biomarker profiling for personalized early clinical drug development at a comprehensive cancer center. *Eur J Cancer* 2013;49:3076-3082.
3. George J, Lim JS, Jang SJ, Cun Y, Ozretić L, Kong G, Leenders F, Lu X, Fernández-Cuesta L, et al. Comprehensive genomic profiles of small cell lung cancer. *Nature*. 2015 Aug 6;524(7563):47-53.
4. Richters A, Ketzler J, Getlik M, Grütter C, Schneider R, Heuckmann JM, Heynck S, Sos ML, Gupta A, Unger A, Schultz-Fademrecht C, Thomas RK, Bauer S, and Rauh D. Targeting gain of function and resistance mutations in Abl and KIT by hybrid compound design. *J Med Chem*. 2013;56:5757-72.
5. Sequist LV, Yang JC, Yamamoto N, O'Byrne K, Hirsh V, Mok T, Geater SL, Orlov S, Tsai CM, Boyer M, Su WC, Bannouna J, Kato T, Gorbunova V, Lee KH, Shah R, Massey D, Zazulina V, Shahidi M, Schuler M. Phase III study of afatinib or cisplatin plus pemetrexed in patients with metastatic lung adenocarcinoma with EGFR mutations. *J Clin Oncol*. 2013 Sep 20;31(27):3327-34.

Department of Cardiology and Vascular Medicine

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logical and molecular biological aspects of cardiovascular diseases. In the area of vascular medicine, the focus is on diagnosis of and interventions for vascular diseases. Several working groups are involved in research in clinical, interventional, and molecular biology/biochemistry projects.

Research and teaching structure

The department has a team of experienced physicians and an extensive staff. It also has an interdisciplinary basic research laboratory and represents all areas of cardiovascular medicine in research, teaching, and clinical application. Its Clinical Trial Unit is responsible for coordinating clinical studies.

Research focuses

- Acute myocardial infarction, including cardioprotection, myocardial ischemic and reperfusion damage, ischemic preconditioning and postconditioning, NO metabolism, hypoxic nitrite signaling
- Age-related cardiovascular dysfunction
- Vascular regeneration, hypoxic vasodilation
- Cardiovascular intervention and protection
- Interventional valve treatment
- Subclinical research in atherosclerosis
- Aortic interventions and treatment
- Inflammatory profiling in heart failure

Research profile and selected research projects from the past five years

Focus areas of research in the department are interventional cardiology, angiology, emergency medicine, and intensive care medicine. The department strives to translate basic and clinical research findings into clinical diagnostics and therapy. This translational approach is practiced by several working groups addressing physio-

Teaching profile of the past five years

The department subscribes to a novel concept of central coordination and supervision by a team led by the central teaching coordinator. It teaches the entire curriculum in cardiology, vascular medicine, and critical care medicine. Intensive supervision is provided in one-on-one mentoring programs.

Strategic outlook

The department aims to expand its translational clinical and preclinical research projects, as well as its support of early career scientists and its patient-oriented training of students.

Selected publications from the past five years

1. Rammos C, Hendgen-Cotta UB, Totzeck M, Pohl J, Lüdtke P, Flögel U, Deenen R, Köhrer K, French BA, Gödecke A, Kelm M, Rassaf T. Impact of dietary nitrate on age-related diastolic dysfunction. *European Journal of Heart Failure* (in press) 2016.
2. Rassaf T, Totzeck M, Hendgen-Cotta UB, Shiva S, Heusch G, Kelm M. Circulating nitrite contributes to cardioprotection by remote ischemic preconditioning. *Circulation Research*. 2014;114:1601-1610.
3. Rammos C, Hendgen-Cotta UB, Sobierajski J, Bernard A, Kelm M, Rassaf T. Dietary nitrate reverses vascular dysfunction in older adults with moderately increased cardiovascular risk. *Journal of the American College of Cardiology*. 2014;63:1584-1585.
4. Luedike P, Hendgen-Cotta UB, Sobierajski J, Totzeck M, Reeh M, Dewor M, Lue H, Krisp C, Wolters D, Kelm M, Bernhagen J, Rassaf T. Cardioprotection through s-nitros(y)lation of macrophage migration inhibitory factor. *Circulation*. 2012;125:1880-1889.
5. Totzeck M, Hendgen-Cotta UB, Luedike P, Berenbrink M, Klare JP, Steinhoff HJ, Semmler D, Shiva S, Williams D, Kipar A, Gladwin MT, Schrader J, Kelm M, Cossins AR, Rassaf T. Nitrite regulates hypoxic vasodilation via myoglobin-dependent nitric oxide generation. *Circulation*. 2012;126:325-334.

Department of Pediatrics I

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Research and teaching structure

The department focuses on the fields of neonatology, pediatric intensive care, and pediatric neurology. In 2010, a W2 professorship in pediatric neuromuscular disorders was established.

Research focuses

- Neonatology: mechanisms of perinatal brain damage
- Pediatric intensive medicine: noninvasive ventilation strategies
- Pediatric neurology: neuromuscular disorders

Research profile and selected research projects from the past five years

In neonatology, the department is one of only very few groups in Europe addressing the mechanisms of brain damage in premature and mature neonates, and the identification of molecular targets. In pediatric intensive care, the department scientifically evaluates noninvasive ventilation strategies and infectious diseases. A pediatric neurology project addresses the characterization of molecular mechanisms of inflammation in juvenile dermatomyositis, dystrophinopathies, and alpha-dystroglycanopathies. Another project investigates endocrinological aspects in spinal muscular atrophy and Duchenne muscular dystrophy.

Teaching profile of the past five years

The department offers main lectures, an intensive practical course in pediatrics, and several seminars. It runs a project in which students, together with pediatricians, see families regularly from birth to the child's second year of life. Research laboratory staff is involved in teaching activities in science programs.

Strategic outlook

The department aims to strengthen its translational research in perinatal neuroscience and to expand its neonatal cohorts and long-term evaluations. A primary objective is the development of neuroprotective treatment options.

Selected publications from the past five years

1. Serdar M, Herz J, Kempe K, Lumpe K, Reinboth BS, Sizonenko SV, Hou X, Herrmann R, Hadamitzky M, Heumann R, Hansen W, Siffringer M, van de Looij Y, Felderhoff-Müser U, Bendix I. Fingolimod protects against neonatal white matter damage and long-term cognitive deficits caused by hyperoxia. *Brain Behav Immun* 2016, 52:106-19.
2. Bassler D, Plavka R, Shinwell ES, Hallman M, Jarreau PH, Carnielli V, Van den Anker JN, Meisner C, Engel C, Schwab M, Halliday HL, Poets CF; NEUROSIS Trial Group Collaborators Early Inhaled Budesonide for the Prevention of Bronchopulmonary Dysplasia. *N Engl J Med* 2015, 373:1497-506.
3. Siffringer M, Bendix I, Borner C, Endesfelder S, von Haefen C, Kalb A, Holifanjaniaina S, Prager S, Schlager GW, Keller M, Jacotot E, Felderhoff-Müser U. Prevention of neonatal oxygen-induced brain damage by reduction of intrinsic apoptosis. *Cell Death Dis*. 2012, 3, e250.
4. Taylor RW, Pyle A, Griffin H, Blakely EL, Duff J, He L, Smertenko T, Alston CL, Neeve VC, Best A, Yarham JW, Kirschner J, Schara U, Talim B, Topaloglu H, Baric I, Holinski-Feder E, Abicht A, Czermin B, Kleinle S, Morris AA, Vassallo G, Gorman GS, Ramesh V, Turnbull DM, Santibanez-Koref M, McFarland R, Horvath R, Chinnery PF. Use of Whole-Exome Sequencing to Determine the Genetic Basis of Multiple Mitochondrial Respiratory Chain Complex Deficiencies. *JAMA* 2014, 312:68-77.
5. Buyse GM, Voit T, Schara U, Straathof CS, D'Angelo MG, Bernert G, Cuisset JM, Finkel RS, Goemans N, McDonald CM, Rummey C, Meier T; DELOS Study Group. Efficacy of idebenone on respiratory function in patients with Duchenne muscular dystrophy not using glucocorticoids (DELOS): a double-blind randomised placebo-controlled phase 3 trial. *Lancet* 2015, 385:1748-57.

Department of Pediatrics II

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Research and teaching structure

The department covers the fields of pediatric nephrology, endocrinology, and gastroenterology, including transplant medicine.

Research focuses

- Molecular and genetic causes of kidney, liver, and endocrine disorders
- Autoimmunology, inflammation, and osteopathies
- Optimization of liver and kidney transplant procedures

Research profile and selected research projects from the past five years

In nephrology, the department's research focus is on rare hereditary kidney diseases, acute and chronic kidney failure, and kidney replacement therapies by means of dialysis or kidney transplants. In endocrinology, the department's research focuses on osteopathologies and endocrinological delayed effects after episodes of cancer, on the impact of proton radiation on the functions of the hypothalamus and the pituitary gland, on rare metabolic bone diseases, and on Prader-Willi syndrome. Research focuses in gastroenterology/hepatology address rare autoinflammatory and autoimmune diseases, cholestasis in neonates and infants, and the optimization of treatments after liver transplant and of therapies to avoid the need for a transplant.

Teaching profile of the past five years

One of the department's head physicians (RB) graduated the Master's program in Medical Education (MME), thereby enhancing the department's teaching activities. In addition to postgraduate instructors, the department also trains student tutors who teach basic pediatric skills to their peers. A pediatric Skills Laboratory was established in 2015. Teaching studies have resulted in national and international publications.

Strategic outlook

Studying the genetics of (rare) diseases contributes to an understanding of their underlying pathophysiology and may inform treatments. Novel therapeutic approaches have been developed based on this work, while new long-term effects of these diseases and their treatments continue to be studied.

Selected publications from the past five years

1. Braun DA, Sadowski CE, Kohl S, Lovric S, Astrinidis SA, Pabst WL, Gee HY, Ashraf S, Lawson JA, Shril S, Airik M, Tan W, Schapiro D, Rao J, Choi WI, Hermle T, Kemper MJ, Pohl M, Ozaltin F, Konrad M, Bogdanovic R, Büscher R, Helmchen U, Serdaroglu E, Lifton RP, Antonin W, Hildebrandt F. Mutations in nuclear pore genes NUP93, NUP205, and XPO5 cause steroid-resistant nephrotic syndrome. *Nat Genet.* 2016 Apr;48(4):457-65. doi: 10.1038/ng.3512. Epub 2016 Feb 15.
2. Hoyer PF. New lessons from randomized trials in steroid-sensitive nephrotic syndrome: clear evidence against long steroid therapy. *Kidney Int.* 2015 Jan;87(1):17-9.
3. Büscher AK, Beck BB, Melk A, Hoefele J, Kranz B, Bamborschke D, Baig S, Lange-Sperandio B, Jungraithmayr T, Weber LT, Kemper MJ, Tönshoff B, Hoyer PF, Konrad M, Weber S; German Pediatric Nephrology Association (GPN). Rapid Response to Cyclosporin A and Favorable Renal Outcome in Nongenetic Versus Genetic Steroid-Resistant Nephrotic Syndrome. *Clin J Am Soc Nephrol.* 2015 Dec 14. pii: CJN.07370715.
4. Schlingmann KP, Kaufmann M, Weber S, Irwin A, Goos C, John U, Misselwitz J, Klaus G, Kuwertz-Bröking E, Fehrenbach H, Wingen AM, Güran T, Hoenderop JG, Bindels RJ, Prosser DE, Jones G, Konrad M. Mutations in CYP24A1 and idiopathic infantile hypercalcemia. *N Engl J Med.* 2011 Aug 4;365(5):410-21.
5. Grasemann C, Schündeln MM, Hövel M, Schweiger B, Bergmann C, Herrmann R, Wiezorek D, Zabel B, Hauffa BP, Wieland R (2013): Effects of RANK-ligand Antibody (Denosumab) treatment on bone turnover markers in a girl with Juvenile Paget's Disease *J Clin Endocrinol Metab* 98(8):3121-6.

Department of Pediatrics III

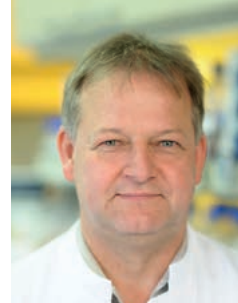
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is aimed at reducing mortality rates in affected children and bringing about novel treatment options.

Teaching profile of the past five years

The department's teaching activities include pediatric hematology/oncology, cardiology, and pulmonology, as well as an elective practical course and the BIOME Graduate School of Biomedical Science.

Strategic outlook

The department aims to intensify its clinical research in the area of leukemias and solid tumors and to build a regional clinical trial center for phase I/II studies in pediatric oncology.

Research and teaching structure

The department covers pediatric hematology, oncology, stem cell therapy, hemostasis, cardiology/rheumatology, and pulmonology. Various groups in the department study the development of tumors and leukemia, clonal evolution in cancer, and work on identifying prognostic and potentially therapeutic targets.

Research focuses

Clinical research

- Optimization of treatments and early drug development
- Acute myeloid leukemia (AML)
- Retinoblastoma
- Recurrent tumors of the brain

Experimental research

- AML development in children
- Interactions of microenvironment and leukemia/tumors
- Resistance mechanisms in tumors
- Clonal evolution and minimal residual disease in leukemias and tumors

Research profile and selected research projects from the past five years

Intensive interaction between experimental, translational, and clinical research has fostered a rapid translation of experimental data on the development of tumors and leukemias, characterization, prognosis, and therapy into clinical research. Established in 2015, the AML-BFM study

Selected publications from the past five years

1. Schramm A, Köster J, Assenov Y, Althoff K, Peifer M, Mahlow E, Odersky A, Beisser D, Ernst C, Henssen AG, Stephan H, Schröder C, Heukamp L, Engesser A, Kahlert Y, Theissen J, Hero B, Roels F, Altmüller J, Nürnberg P, Astrahantseff K, Gloeckner C, De Preter K, Plass C, Lee S, Lode HN, Henrich KO, Gartlgruber M, Speleman F, Schmezer P, Westermann F, Rahmann S, Fischer M, Eggert A, Schulte JH. Mutational dynamics between primary and relapse neuroblastomas. *Nat Genet.* 2015 Aug;47(8):872-7.
2. Creutzig U, Dworzak MN, Zimmermann M, Bourquin JP, Gruhn B, Fleischhack G, Graf N, Klingebiel T, Kremens B, Lehrnbecher T, von Neuhoff C, Stackelberg AV, Starý J, Reinhardt D. Additional treatment with 2-Chloro-2-Deoxyadenosine during consolidation in children with high-risk acute myeloid leukemia does not improve survival. *Leukemia.* 2015 Nov;29(11):2260-3.
3. Emmrich S, Rasche M, Schöning J, Reimer C, Keihani S, Maroz A, Xie Y, Li Z, Schambach A, Reinhardt D, Klusmann JH. miR-99a/100-125b tricistrons regulate hematopoietic stem and progenitor cell homeostasis by shifting the balance between TGF β and Wnt signaling. *Genes Dev.* 2014 Apr 15;28(8):858-74.
4. Creutzig U, Zimmermann M, Bourquin JP, Dworzak MN, Fleischhack G, Graf N, Klingebiel T, Kremens B, Lehrnbecher T, von Neuhoff C, Ritter J, Sander A, Schrauder A, von Stackelberg A, Starý J, Reinhardt D. Randomized trial comparing liposomal daunorubicin with idarubicin as induction for pediatric acute myeloid leukemia: results from Study AML-BFM 2004. *Blood.* 2013 Jul 4;122(1):37-43.
5. Molenaar JJ, Domingo-Fernández R, Ebus ME, Lindner S, Koster J, Drabek K, Mestdagh P, van Sluis P, Valentijn LJ, van Nes J, Broekmans M, Haneveld F, Volckmann R, Bray I, Heukamp L, Sprüssel A, Thor T, Kieckbusch K, Klein-Hitpass L, Fischer M, Vandesompele J, Schramm A, van Noesel MM, Varesio L, Speleman F, Eggert A, Stallings RL, Caron HN, Versteeg R, Schulte JH. LIN28B induces neuroblastoma and enhances MYCN levels via let-7 suppression. *Nat Genet.* 2012 Nov;44(11):1199-206

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Teaching profile of the past five years

The department is involved in teaching activities in internal medicine, hematology, and oncology.

Research and teaching structure

The department has a scientific laboratory providing molecular and immunophenotyping analytics for allogeneic stem cell transplants. It meets all of the requirements for developing and manufacturing novel cell therapeutic preparations.

Research focuses

- Joint translational research activities with the Institute for Experimental Cellular Therapy and the Institute of Transfusion Medicine
- Clinical scientific research, including 11 trials evaluating new substances and procedures for allogeneic stem cell transplants according to the German Medicinal Products Act

Research profile and selected research projects from the past five years

The department contributes substantially to solving current issues in allogeneic stem cell transplantation. The department directs sub-projects in the Comprehensive Cancer Center (TP 13), the BMBF-funded ERA-NET on Translational Cancer Research, the José Carreras Leukämie-Stiftung foundation-funded project no. DJCLS R 15/2, and the BMBF joint project on semantic support for predictive modeling in systems medicine. It is Coordinating Investigator of an international clinical study.

Strategic outlook

The department aims to further develop methods of allogeneic stem cell transplantation and novel cell therapeutic methods, and to test them in clinical trials.

Selected publications from the past five years

1. Elmaagacli AH, Steckel NK, Koldehoff M, Hegerfeldt Y, Trenschel R, Ditschkowski M, Christoph S, Gromke T, Kordelas L, Ottinger HD, Ross RS, Horn PA, Schnittger S, Beelen DW (2011) Early human cytomegalovirus replication after transplantation is associated with a decreased relapse risk: evidence for a putative virus-versus-leukemia effect in acute myeloid leukemia patients. *Blood*. 118: 1402-1412, 2011.
2. Middecke JM, Beelen D, Stadler M Göhring G, Schlegelberger B, Baumann H, Bug G, Bellos F, Mohr B, Buchholz S, Schwerdtfeger R, Martin H, Hegenbart U, Ehninger G, Bornhäuser M, Schetelig J. Cooperative German Transplant Study Group (2012) Outcome of high-risk acute myeloid leukemia after allogeneic hematopoietic cell transplantation: negative impact of abnl(17p) and -5/5q-. *Blood* 120: 2521-2528, 2012.
3. Schmidt-Hieber M, Labopin M, Beelen D, Volin L, Ehninger G, Finke J, Socié G, Schwerdtfeger R, Kröger N, Ganser A, Niederwieser D, Polge E, Blau IW, Mohty M: CMV serostatus still has an important prognostic impact in de novo acute leukemia patients after allogeneic stem cell transplantation: a report from the Acute Leukemia Working Party of EBMT. *Blood* 122:3359-3364, 2013.
4. Stelljes M, Krug U, Beelen DW, Braess J, Sauerland MC, Heinecke A, Ligges S, Sauer T, Tschanter P, Thoennissen GB, Berning B, Kolb HJ, Reichle A, Holler E, Schwerdtfeger R, Arnold R, Scheid C, Müller-Tidow C, Woermann BJ, Hiddemann W, Berdel WE, Büchner T: Allogeneic transplantation versus chemotherapy as postremission therapy for acute myeloid leukemia: a prospective matched pairs analysis. *J Clin Oncol*. 32:288-296, 2014.
5. Kordelas L, Verheyen J, Beelen DW, Horn PA, Heinold A, Kaiser R, Trenschel R, Schadendorf D, Dittmer U, Esser S. Essen HIV AlloSCT Group: Shift of HIV tropism in stem-cell transplantation with CCR5 Delta32 mutation. *N Engl J Med*. 371:880-882, 2014.

Department of Nephrology

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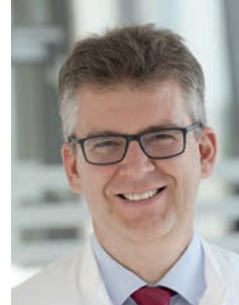
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Teaching profile of the past five years

The department is involved in clinical teaching activities such as a physical examination course, the main lecture in nephrology, an intensive practical course in internal medicine, a differential diagnosis seminar, and an elective practical course in nephrology. It aims to achieve a high level of practical relevance by applying innovative teaching methods. It is also involved in continuing education in specialized nursing in nephrology and contributes to continuing education in specialized nursing in transplant medicine.

Strategic outlook

The department aims to further develop its research using animal models and its clinical research with respect to kidney transplants, autoimmune diseases, and acute kidney failure.

Research and teaching structure

At the core of the department is the interconnectedness of experimental basic research and clinical research. Its research profile will be strengthened by the appointment of a Jackstädt-Stiftung foundation professor in 2016 and through collaboration with the Department of Infectious Diseases.

Research focuses

- Kidney transplants/living donor kidney transplants
- Acute kidney failure
- Chronic kidney disease/autoimmune diseases
- Hypertension disorders

Research profile and selected research projects from the past five years

The department investigates various causes of kidney failure, following an approach that closely connects basic research with clinical applications, relying on both animal models and trials with patients. It aims to develop novel therapeutic approaches. In the area of transplant medicine, the department's interest is in interactions between immunosuppressants and the immune system, as well as in prevention and treatment of diseases in immunosuppressed patients. The department contributes to the development of a mobile device application for scheduling drug dosing, which has already been evaluated in a field trial.

Selected publications from the past five years

1. Wu K, Türk TR, Rauen U, Su S, Feldkamp T, de Groot H, Wiswedel I, Baba HA, Kribben A, Witzke O. Prolonged cold storage using a new histidine-tryptophan-ketoglutarate-based preservation solution in isogenic cardiac mouse grafts. *Eur Heart J*. 2011, 32:509-516.
2. Kribben A, Gerken G, Haag S, Herget-Rosenthal S, Treichel U, Betz C, Sarrazin C, Hoste E, Van Vlierberghe H, Escorsell A, Hafer C, Schreiner O, Galle PR, Mancini E, Caraceni P, Karvellas CJ, Salmhofer H, Knotek M, Ginès P, Kozik-Jaromin J, Rifai K, HELIOS Study Group. Effects of fractionated plasma separation and adsorption on survival in patients with acute-on-chronic liver failure. *Gastroenterology*. 2012, 142: 782-789.
3. Rauen T, Eitner F, Fitzner C, Sommerer C, Zeier M, Otte B, Panzer U, Peters H, Benck U, Mertens PR, Kuhlmann U, Witzke O, Gross O, Vielhauer V, Mann JF, Hilgers RD, Floege J. STOP-IgAN Investigators (2015) Intensive Supportive Care plus Immunosuppression in IgA Nephropathy. *NEJM*. 2015, 373:2225-2236.
4. Budde K, Lehner F, Sommerer C, Reinke P, Arns W, Eisenberger U, Wüthrich RP, Mühlfeld A, Heller K, Porstner M, Veit J, Paulus EM, Witzke O. ZEUS Study Investigators. Five-year outcomes in kidney transplant patients converted from cyclosporine to everolimus: the randomized ZEUS study. *Am J Transplant*. 2015, 15:119-128.
5. Keyzer CA, de Borst MH, van den Berg E, Jahnen-Dechent W, Arampatzis S, Farese S, Bergmann IP, Floege J, Navis G, Bakker SJ, van Goor H, Eisenberger U*, Pasch A*. (*chaired last authorship). Calcification Propensity and Survival among Renal Transplant Recipients. *J Am Soc Nephrol*. 2016, 27:239-248.

Department of Neurosurgery

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Research and teaching structure

In addition to its clinical work and patient care activities, the department emphasizes its research interests as reflected by the establishment of five research groups in imaging, molecular neurosurgery, neurooncology, neuropsychology, and neurosonology.

Research focuses

- Biology, imaging, and clinical aspects of cerebral vascular malformations
- Biology, imaging, and clinical aspects of brain tumors
- Neuropsychology before and after cranial neurosurgery

Research profile and selected research projects from the past five years

The department uses imaging, neuropsychological, and molecular methods to achieve the highest standards in patient care with respect to diagnosis, treatment, and follow-up, aiming to rapidly implement new methods as they become available. One research focus of the molecular neurosurgery working group is the investigation of primary glioblastomas and the activation of glioblastoma cells in conjunction with tumor growth. The imaging working group studies vascular malformations and brain tumors in ultra-high-field MRI in a joint project with the Erwin L. Hahn Institute.

Teaching profile of the past five years

The department supervises students at various stages of their course of study. Students have the opportunity to become acquainted with the clinical field of neurosurgery as an elective during their routine education or to spend a part of their Practical Year at the department. A course in problem-based learning has been offered as an elective since 2016. Additional teaching activities by the neurosurgery laboratory include an introduction to the molecular biology foundation of neurosurgical disorders.

Strategic outlook

In addition to providing high-quality patient care, the department aims to establish beacon projects such as intraoperative imaging to strengthen its national and international profile.

Selected publications from the past five years

1. Matsushige T, Chen B, Ringelstein A, Umutlu L, Forsting M, Quick HH, Sure U, Wrede KH. Giant Intracranial Aneurysms at 7T MRI. *AJNR Am J Neuroradiol.* 2015 Nov 12. [Epub ahead of print] PubMed PMID: 26564437.
2. Zhu Y, Zhao K, Prinz A, Keyvani K, Lambertz N, Kreitschmann-Andermahr I, Lei T, Sure U. Loss of endothelial programmed cell death 10 activates glioblastoma cells and promotes tumor growth. *Neuro Oncol.* 2015 Aug 8. pii: nov155. [Epub ahead of print] PubMed PMID: 26254477.
3. Kreitschmann-Andermahr I, Psaras T, Tsiogka M, Starz D, Kleist B, Siegel S, Milian M, Kohlmann J, Menzel C, Führer-Sakel D, Honegger J, Sure U, Müller O, Buchfelder M. From first symptoms to final diagnosis of Cushing's disease: experiences of 176 patients. *Eur J Endocrinol.* 2015 Jun;172(6):X1. doi: 10.1530/EJE-14-0766e. PubMed PMID: 25976214.
4. El Hindy N, Keyvani K, Pagenstecher A, Dammann P, Sandalcioglu IE, Sure U, Zhu Y. Implications of Dll4-Notch signaling activation in primary glioblastoma multiforme. *Neuro Oncol.* 2013 Oct;15(10):1366-78. doi: 10.1093/neuonc/not071. Epub 2013 Jun 20. PubMed PMID: 23787764; PubMed Central PMCID: PMC3779034.
5. Wrede KH, Dammann P, Mönninghoff C, Johst S, Maderwald S, Sandalcioglu IE, Müller O, Özkan N, Ladd ME, Forsting M, Schlamann MU, Sure U, Umutlu L. Non-enhanced MR imaging of cerebral aneurysms: 7 Tesla versus 1.5 Tesla. *PLoS One.* 2014 Jan 6;9(1):e84562. doi: 10.1371/journal.pone.0084562. eCollection 2014. PubMed PMID: 24400100; PubMed Central PMCID: PMC3882245.

Department of Neurology

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Director Emeritus: Prof. Dr. med. Hans-Christoph Diener
Deputy Director: Prof. Dr. med. Martin Köhrmann

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Research profile and selected research projects from the past five years

The department's research addresses neurological issues, including various multicenter studies on stroke and migraine. Neurobiological mechanisms of pain processing and the blood-brain barrier are additional research interests. The department participates in the Research Unit FOR1581.

Research and teaching structure

In addition to the head and chairman, Prof. Dr. Christoph Kleinschnitz, the department includes four other positions: Prof. Dr. Ulrike Bingel, clinical neurosciences; Prof. Dr. Hans-Christoph Diener, senior professor in clinical neurosciences; Prof. Dr. Dirk Hermann, vascular neurology and research in dementia and aging; and Prof. Dr. Dagmar Timmann-Braun, experimental neurology. Prof. Kleinschnitz is a member of the SFB (CRC) 688; Prof. Bingel is a leading investigator in the DFG-funded Research Unit 1328; and Prof. Hermann is a member of the DFG-funded Research Training Group GRK2098.

Research focuses

- Stroke prevention and treatment
- Neuroimmunology/Multiple Sclerosis
- Pathophysiology of neuromuscular disorders
- Headache treatment and prophylaxis
- Pain processing and placebo effects
- Neurocardiac interaction
- Physiology and pathophysiology of the cerebellum
- Disease models of ischemic stroke and neurodegenerative disorders
- Neuro-oncology

Teaching profile of the past five years

The department is involved in numerous clinical teaching activities at all stages of medical studies and collaborates with six neurological teaching hospitals.

Strategic outlook

The department's research activities are being restructured. The focus will be on the basic and clinical treatment of vascular diseases, with attention to stroke and cardiovascular effects on brain-vessel diseases. Another focus is the pathophysiology of neuroimmunological and neuro-inflammatory disorders (e. g., multiple sclerosis), enhanced by collaboration activities within Essen University Hospital. A third focus will be on neuro-oncology.

Selected publications from the past five years

1. Göbel K, Pankratz S, Kleinschnitz C, et al. Blood coagulation factor XII drives adaptive immunity during neuroinflammation via CD87-mediated modulation of dendritic cells. *Nat Comm* (2016); 7:11626
2. Hermann DM, Bassetti CL. Role of sleep-disorders breathing and sleep-wake disturbances for stroke and stroke recovery. *Neurology* (2016); 87(13):1407-16.
3. Enck, P.*, Bingel, U.*, Schedlowski, M.*, Rief, W.* (2013). The placebo response in medicine: minimize, maximize or personalize? *Nature Reviews Drug Discovery* 12, 191-204.*equal contribution of all authors.
4. Stefanescu MR, Dohnalek M, Maderwald S, Thürling M, Minnerop M, Beck A, Schlamann M, Diedrichsen J, Ladd ME, Timmann D. Structural and functional magnetic resonance imaging abnormalities of cerebellar cortex and nuclei in spinocerebellar ataxia type 3, spinocerebellar ataxia type 6, and Friedreich's ataxia. *Brain* 2015; 38:1182-97.
5. Mademan I, Harmuth F, Timmann D. SYNE1 ataxia is a common recessive ataxia with major non-cerebellar features: a large multicenter study. *Brain* (2016); 139(Pt):1378-93.

Department of Nuclear Medicine

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Research and teaching structure

The department is involved in teaching and research activities in medicine, radiation protection, and specific areas of physics, radiochemistry, and radiopharmacy. The department has a professorship in radiochemistry and radiopharmacy.

Research focuses

- Oncological tumor diagnostics and treatment monitoring, including
- Diagnosis of primary tumors, detection of recurrent tumors and metastases
 - Advanced diagnostics using hybrid imaging modalities such as PET/CT and PET/MRI
 - Targeted tumor therapies
 - Development and characterization of new tracer molecules for diagnostics and treatment

Research profile and selected research projects from the past five years

The department's research focuses on interdisciplinary clinical research and on optimization and evaluation of hybrid imaging, in particular in NET diagnostics using somatostatin receptor-specific analogs and PET/CT or PET/MRI. These may be followed by radionuclide therapies that would be scientifically supervised as well. One central aspect is the entire field of differentiated thyroid cancer diagnostics, including hybrid

imaging, and treatment, including pretherapeutic ¹²⁴I PET/CT dosimetry. The department is developing, testing, and monitoring new oncological diagnostic and therapeutic methods in numerous clinical and preclinical studies, including the development of new tracer molecules, intravascular radionuclide therapy (SIRT), and radioligand therapy for thyroid and prostate cancers, as well as the treatment of radioactive iodine-refractory differentiated thyroid cancer by redifferentiating therapy, to name but a few.

Teaching profile of the past five years

The department is involved in teaching activities of the interdisciplinary/cross-sectional field Q11 (imaging, radiation therapy, radiation protection) of the German standard in medical education. In addition, it offers electives in introductory nuclear medicine and clinical nuclear medicine, treatment and diagnostics, periodic seminars for Practical Year students, and other specialized courses.

Strategic outlook

The department plans to establish small-animal imaging facilities.

Selected publications from the past five years

1. 68Ga-DOTATOC versus 68Ga-DOTATATE PET/CT in functional imaging of neuroendocrine tumors. Poeppel TD, Binse I, Petersenn S, Lahner H, Schott M, Antoch G, Brandau W, Bockisch A, Boy C. J Nucl Med. 2011.
2. Association between sentinel lymph node excision with or without preoperative SPECT/CT and metastatic node detection and disease-free survival in melanoma. Stoffels I, Boy C, Pöppel T, Kuhn J, Klötgen K, Dissemmond J, Schadendorf D, Klode J. JAMA. 2012.
3. Effects of rosiglitazone on radioiodine negative and progressive differentiated thyroid carcinoma as assessed by ¹²⁴I-PET/CT imaging. Rosenbaum-Krumme SJ, Freudenberg LS, Jentzen W, Bockisch A, Nagarajah J. Clin Nucl Med. 2012.
4. Rosenbaum-Krumme S, Nagarajah J, Ruhlmann M, Bockisch A, Jentzen W. ¹²⁴I-PET/CT images of differentiated thyroid cancer patients. Distinguishing lymph node metastases from thyroid remnants using kinetic quantities. Nuklearmedizin. 2012;51(6):213-6.
5. Barsegian V, Hueben C, Mueller SP, Poeppel TD, Horn PA, Bockisch A, et al. Impairment of lymphocyte function following yttrium-90 DOTATOC therapy. Cancer Immunol Immunother. 2015;64(6):755-64.

Department of Orthopaedics and Trauma Surgery

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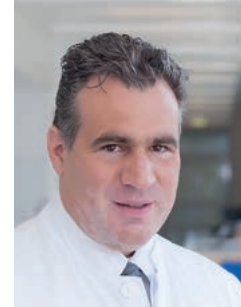
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Research and teaching structure

The department operates two sites, one at Essen University Hospital and one at Evangelisches Krankenhaus (Protestant Hospital) Essen-Werden, both of which are involved in research and teaching. The department has a scientific research laboratory and a motion/gait analysis laboratory. Specializations within the field are reflected by established focus teams in the department.

In critical trauma patient care, the department has been academically represented by a W2 professorship in specialized emergency surgery since 2016.

Research focuses

- Regeneration of bone and cartilage tissues
- Biomaterials (implant medicine)
- Sepsis, trauma, shock
- Motion analysis and imaging

Research profile and selected research projects from the past five years

The department is characterized by its strong emphasis on translational approaches. It aims to apply basic research findings to patient care and has already seen success in some cases, e.g., in developing a special cutting instrument for use in hip arthroscopies and in improving techniques for minimally invasive surgery. These achievements are enabled through collaboration with scientists from various basic research areas.

Teaching profile of the past five years

The department offers lectures in orthopedics and emergency surgery, as well as a preclinical elective course in orthopedic physical examinations. It was involved in establishing the program in Medical Engineering in 2014/15, and it supports the program in Healthcare Management by providing opportunities for auditing lectures. The department was the first surgical department at UK Essen to introduce a Practical Year log book in 2012, and in 2015 it introduced “instructor cue cards” that promote transparency in teaching and aid instructors in teaching according to the documented learning objectives.

Strategic outlook

The department aims to continue expanding its Germany-wide leading position in biomaterials/endoprostheses, critical trauma care, and bone regeneration science and clinical applications.

Selected publications from the past five years

1. Landgraeber S, Theyson J, Claßen T, Jäger M, Warwas S, Hohn HP, Kowalczyk W. Advanced Core Decompression a new Treatment Option of Avascular Necrosis of the Femoral Head – A first Follow-up. *J Tissue Eng Reg Med* 2012 doi: 10.1002/term.1481.
2. Kauther MD, Neuerburg C, Wefelnberg F, Bachmann HS, Schleppe R, Hilken G, Broecker-Preuss M, Grabellus F, Schilling AF, Jäger M, Wedemeyer C. RANKL-associated suppression of particle-induced osteolysis in an aged model of Calcitonin and alpha-CGRP deficiency. *Biomaterials* 34(12): 2911-9 (2013).
3. Landgraeber S, Putz S, Schlattjan M, Bechmann LP, Totsch M, Grabellus F, Hilken G, Jäger M, Canbay A. Adiponectin Attenuates Osteolysis in Aseptic Loosening of Total Hip Replacements. *Acta Biomaterialia* 10(1):384-93 (2014).
4. Wegner A, Elsenbruch S, Maluck J, Grigoleit JS, Engler H, Jäger M, Spreitzer I, Schedlowski M, Benson S. Inflammation-induced hyperalgesia: Delineating effects of timing, dosage, and negative affect on somatic pain sensitivity in human experimental endotoxemia. *Brain, Behavior and Immunity* pii: S0889-1591(14)00123-8 (2014).
5. Wegner A, Elsenbruch S, Rebernik L, Roderigo T, Engelbrecht E, Jäger M, Harald E, Schedlowski M, Benson S. Inflammation-induced pain sensitization in men and women: Does sex matter in experimental endotoxemia? *Pain; PAIN-D-14-13189R1* (2015).

Department of Particle Therapy/West German Proton Therapy Centre Essen (WPE)

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Research and teaching structure

The department is part of Essen University Hospital and is situated at the West German Proton Therapy Centre Essen (WPE). Its state-of-the-art equipment includes four treatment rooms and the latest imaging technology.

Research focuses

- Pediatric tumors, sarcomas, CNS tumors, skull base tumors, head and neck cancer, and prostate cancer
- Prospective evaluation of the benefits of proton therapy
- Technical research for optimization of treatment modalities
- Basic research on cellular and immune response to proton therapy

Research profile and selected research projects from the past five years

The department explores proton therapy, an innovative form of radiation therapy characterized by its favorable safety profile. It is currently used in only a very few centers and requires a high level of expertise and technical equipment. Clinical, technological, and biological projects are run in close collaboration at the Department of Particle Therapy.

Teaching profile of the past five years

The WPE has been approved as a site of continuing medical education, and its director was granted teaching privileges, enabling the department to offer CME activities in particle therapy. The department not only offers activities targeted at students and seminars for graduate students but is also involved in the Research Training Group GRK1739. It provides in-house continuing medical education events for physicians, radiation therapy technologists, and scientists, as well as internships for students and physicians. In addition, a number of academic theses are supervised at the department.

Strategic outlook

The department aims to become an important cornerstone of UK Essen's research and treatment programs, as well as in DKTK projects, and it strives to expand its basic and translational research activities by adding a W2 professorship.

Selected publications from the past five years

1. Rombi B, Ares C, Hug EB, Schneider R, Goitein G, Staab A, Albertini F, Bolsi A, Lomax AJ, Timmermann B. Spot-scanning proton radiation therapy for pediatric chordoma and chondrosarcoma: clinical outcome of 26 patients treated at Paul Scherrer Institute. *Int J Radiat Oncol Biol Phys* 2013; 86(3):578-84.
2. Rombi B, Timmermann B. Proton Beam Therapy for Pediatric Chordomas – State of the Art. *Int J Particle Ther*. 2014;1(2):368-385.
3. Tallen G, Resch A, Calaminus G, Wiener A, Leiss U, Pletschko T, Friedrich C, Langer T, Grabow D, Driever PH, Kortmann RD, Timmermann B, Pietsch T, Warmuth-Metz M, Bison B, Thomale UW, Krauss J, Mynarek M, von Hoff K, Ottensmeier H, Frühwald M, Kramm CM, Temming P, Müller HL, Witt O, Kordes U, Fleischhack G, Gnekow A, Rutkowski S; German Paediatric Brain Tumour Consortium (HIT-Network). Strategies to improve the quality of survival for childhood brain tumour survivors. *Eur J Paediatr Neurol*. 2015 19(6):619-39.
4. Bölling T, Weege J, Eich HT, Timmermann B, Meyer FM, Rube C, Kortmann RD, Fishedick K, Rödel C, Koch R, Willich N. Acute and late side effects to salivary glands and oral mucosa after head and neck radiotherapy in children and adolescents. Results of the "Registry for the evaluation of side effects after radiotherapy in childhood and adolescence" Head Neck. 2015 37(8):1137-41.
5. Bäumer C., Ackermann B., Hillbrand M., Kaiser F.J., Koska B., Latzel H., Lühr A., Menkel S., Timmermann B. Dosimetry intercomparison of four proton therapy institutions in Germany employing spot scanning. *Z Med Phys*. 2016 Jul 16. [Epub ahead of print]

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combination therapies exploiting vulnerabilities caused by tumor-specific mutations in genes coding for chromatin remodeling proteins.

Teaching profile of the past five years

Atlas-based contouring programs for defining target volumes and for contouring healthy tissue in lung tumor, head and neck tumor, and prostate cancer treatment, as well as an interactive image base, have been set up for teaching purposes.

Strategic outlook

The department collaborates closely with departments and institutes at UK Essen and the University of Duisburg-Essen. Risk-adapted tumor-selective radiation therapy in oncology will be developed further on the basis of the joint research activities within GRK1739 and DKTK.

Research and teaching structure

The department and its outpatient clinic have a central radiotherapy unit for experimental in vivo and in vitro radiation, a biosafety level 2 laboratory for experimental radiation research, and a knowledge base of radiation therapy cases for teaching purposes.

Research focuses

- Stereotactic radiation therapy of small target volumes and tracking of moving targets
- Intensification of radiation therapy by alternative fractionation and integrated boosts
- Radiation therapy and simultaneous molecular targeted treatment for tumor-selective inhibition of repopulation and repair

Research profile and selected research projects from the past five years

Investigator-initiated studies on intensifying definitive and neoadjuvant concurrent chemoradiotherapy in lung tumors, evaluation of stereotactic radiation therapy in oligometastatic tumors, and re-irradiation using intensity modulation for local recurrences, as well as radiation therapy optimization for small target volumes using stereotaxis and brachytherapy. Within the DKTK, the department is involved in establishing predictive molecular factors for chemoradiotherapy. Within the Research Training Group GRK1739, the department investigates selective

Selected publications from the past five years

1. Eberhardt WE, Pöttgen C, Gauler TC, Friedel G, Veit S, Heinrich V, Welter S, Budach W, Spengler W, Kimmich M, Fischer B, Schmidberger H, De Ruyscher D, Belka C, Cordes S, Hepp R, Lütke-Brintrup D, Lehmann N, Schuler M, Jöckel KH, Stamatis G, Stuschke M: Phase III Study of Surgery Versus Definitive Concurrent Chemoradiotherapy Boost in Patients With Resectable Stage IIIA(N2) and Selected IIIB Non-Small-Cell Lung Cancer After Induction Chemotherapy and Concurrent Chemoradiotherapy (ES-PATUE). *J Clin Oncol*. 2015 Dec 10;33(35):4194-201.
2. Levegrün S, Pöttgen C, Wittig A, Lübcke W, Abu Jawad J, Stuschke M: Helical tomotherapy for whole-brain irradiation with integrated boost to multiple brain metastases: evaluation of dose distribution characteristics and comparison with alternative techniques. *Int J Radiat Oncol Biol Phys*. 2013 Jul 15;86(4):734-42.
3. Linge A, Lock S, Gudziol V, Nowak A, Lohaus F, von Neubeck C, Jutz M, Abdollahi A, Debus J, Tinhofer I, Budach V, Sak A, Stuschke M, Balermipas P, Rodel C, Avlar M, Grosu AL, Bayer C, Belka C, Pigorsch S, Combs SE, Welz S, Zips D, Buchholz F, Aust DE, Baretton GB, Thames H23, Dubrovskaja A, Alsner J, Overgaard J, Baumann M, Krause M: Low CSC marker expression and low hypoxia identify good prognosis subgroups in HPV(-)HNSCC after postoperative radiochemotherapy: a multicenter study of the DKTK-ROG. *Clin Cancer Res*. 2016 Jan 11. pii: clincanres.1990.2015. [Epub ahead of print]
4. Pöttgen C, Abu Jawad J, Gkika E, Freitag L, Lübcke W, Welter S, Gauler T, Schuler M, Eberhardt WE, Stamatis G, Stuschke M: Accelerated radiotherapy and concurrent chemotherapy for patients with contralateral central or mediastinal lung cancer relapse after pneumonectomy. *J Thorac Dis*. 2015 Mar;7(3):264-72.
5. Stuschke M, Kaiser A, Abu-Jawad J, Pöttgen C, Levegrün S, Farr J: Re-irradiation of recurrent head and neck carcinomas: comparison of robust intensity modulated proton therapy treatment plans with helical tomotherapy. *Radiat Oncol*. 2013 Apr 20;8:93.

Department of Thoracic and Cardiovascular Surgery

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acute and chronic diseases of the thoracic aorta. Examples of current studies include the CABACS Trial, StaRT-CABG, TAo-EmbolX, and a study of remote ischemic preconditioning.

Research and teaching structure

The department carries out research while caring for high-risk patients, allowing continuous refinement of therapeutic options. In-house and visiting instructors regularly provide continuing education activities on current research findings and key topics in the field. A W2 professorship in thoracic organ transplants was established in 2012.

Research focuses

- Coronary surgery
- Minimally invasive and catheter-based heart valve surgery
- Aortic surgery and interventions
- Advanced heart failure
- Heart and lung transplants

Research profile and selected research projects from the past five years

The department carries out clinical and translational research in heart, thoracic, and vascular surgery, while collaborating with other departments at UK Essen and on a national and international level. It enjoys national and international recognition of its achievements in thoracic aortic surgery, thanks in part to its close cooperation with the Department of Cardiology and the establishment of the “Essen Concept” for diagnosis and interventional and surgical treatment of

Teaching profile of the past five years

In addition to the curriculum prescribed by the university, the department periodically also offers wet laboratory classes to generate enthusiasm for the field.

Strategic outlook

The department aims to establish a West German Aorta Center, build/transfer a blood circulation simulator, expand the number of its thoracic transplants and heart failure treatments, and expand its collaborations with other research institutions at UK Essen and the University of Duisburg-Essen.

Selected publications from the past five years

1. Tsagakis K, Benedik J, El Khoury G, Jakob H. Aortic valve repair: Intraoperative evaluation of valve geometry by angioscopy. *J Thorac Cardiovasc Surg.* 2015 Jun;149(6):1666-8.
2. Wendt D, Kahlert P, Pasa S, El-Chilali K, Al-Rashid F, Tsagakis K, Dohle DS, Erbel R, Jakob H, Thielmann M. Transapical transcatheter aortic valve for severe aortic regurgitation: expanding the limits. *JACC Cardiovasc Interv.* 2014 Oct;7(10):1159-67.
3. Thielmann M, Kottenberg E, Kleinbongard P, Wendt D, Gedik N, Pasa S, Price V, Tsagakis K, Neuhäuser M, Peters J, Jakob H, Heusch G. Cardioprotective and prognostic effects of remote ischaemic preconditioning in patients undergoing coronary artery bypass surgery: a single-centre randomised, double-blind, controlled trial. *Lancet.* 2013 Aug 17;382(9892):597-604.
4. Knipp SC, Scherag A, Beyersdorf F, Cremer J, Diener HC, Haverich JA, Jakob HG, Mohr W, Ose C, Reichenspurner H, Walterbusch G, Welz A, Weimar C; CABACS Study Group. Randomized comparison of synchronous CABG and carotid endarterectomy vs. isolated CABG in patients with asymptomatic carotid stenosis: the CABACS trial. *Int J Stroke.* 2012 Jun;7(4):354-60.
5. Tsagakis K, Konorza T, Dohle DS, Kottenberg E, Buck T, Thielmann M, Erbel R, Jakob H. Hybrid operating room concept for combined diagnostics, intervention and surgery in acute type A dissection. *Eur J Cardiothorac Surg* 2013;43(2):397-404.

Department of Urology

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Research and teaching structure

The Department of Urology is headed by Prof. Dr. med. Dr. h.c. Herbert Rübben. The urology research laboratory is headed by Dr. med. Christian Niedworok and Dr. med. Stephan Tschirdewahn. It also employs a scientist and one technician. Its teaching activities are coordinated by Dr. med. Christian Niedworok and are delivered by all employees of the department and by former department members after their habilitation.

Research focuses

- Uro-oncology

Research profile and selected research projects from the past five years

The field of urology is complex and encompasses oncology, andrology, pediatric urology, neuro-urology, and plastic reconstructive urology. Research at the department, therefore, is carried out by several leading scientists, and within its oncology sector, a working group may be required for each tumor entity. Research topics have included the role of extracellular matrix proteins in tumor biology, clinical studies on the role of urine cytology for the diagnosis of bladder cancer, EMDA-assisted chemotherapy delivery for urothelial carcinoma, clinical and experimental examinations in urachal carcinoma, and quality of life in patients with gender dysphoria.

Teaching profile of the past five years

The department offers a practical course for students that includes participating in clinical practice for one morning and a 1.5-hour course in urological imaging plus a lecture, as well as additional continuing education courses. These courses include an annual course in urinary cytology assessments and a course in microsurgical techniques.

Strategic outlook

The department aims to further establish its divisions of pediatric urology and reconstructive urology, and to introduce a prostate cancer focus in addition to the existing bladder cancer focus. Another goal is to further refine minimally invasive techniques in tumor surgery.

Selected publications from the past five years

1. Szarvas T, vom Dorp F, Niedworok C, Melchior-Becker A, Fischer JW, Singer BB, Reis H, Bánkfalvi Á, Schmid KW, Romics I, Ergün S, Rübben H. High insulin-like growth factor mRNA-binding protein 3 (IMP3) protein expression is associated with poor survival in muscle-invasive bladder cancer. *BJU Int.* 2012 Sep;100(6 Pt B):E308-17.
2. Niedworok C, Röck K, Kreschmer I, Freudenberger T, Nagy N, Szarvas T, vom Dorp F, Reis H, Rübben H, Fischer JW. Inhibitory role of the small leucine-rich proteoglycan biglycan in bladder cancer. *PLoS One.* 2013 Nov 6;8(11):e80084.
3. Niedworok C, Kreschmer I, Röck K, vom Dorp F, Szarvas T, Heß J, Freudenberger T, Melchior-Becker A, Rübben H, Fischer JW. The impact of the receptor of hyaluronan-mediated motility (RHAMM) on human urothelial transitional cell cancer of the bladder. *PLoS One.* 2013 Sep 17;8(9):e75681.
4. Niedworok C, Panitz M, Szarvas T, Reis H, Reis AC, Szendrői A, Nyirády P, Szasz AM, Módos O, Rübben H, vom Dorp F. Urachal carcinoma of the bladder – impact of clinical and immunohistochemical parameters on patients' prognosis. *J Urol.* 2015 Dec 8.
5. Niedworok C, vom Dorp F, Tschirdewahn S, Rübben H, Reis H, Szucs M, Szarvas T. Validation of the diagnostic and prognostic relevance of serum MMP-7 levels in renal cell cancer by using a novel automated fluorescent immunoassay method. *Int Urol Nephrol.* 2016 Mar;48(3):355-61.

Department of Oral, Maxillofacial, and Plastic Surgery (Essen-Mitte Hospitals)

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implants for the rehabilitation of tumor patients, trauma patients, and patients with complex craniofacial anomalies.

Research and teaching structure

The university hospital department is one of the largest departments in this field in Germany. It covers the entire range of oral and maxillofacial surgical treatments. Given the high number of patients treated, its research is mainly clinically oriented. The department consists of a number of specialized modules carrying out clinical research in the various subfields of oral and maxillofacial surgery.

Research focuses

- Development of treatment strategies and surgical techniques for the treatment of tumor patients, of patients with complex craniofacial anomalies, and of patients with cleft lip, cleft maxilla, and cleft palate
- Development of treatment strategies and techniques for oral and craniofacial rehabilitation using endosseous dental implants and computer-aided planning, as well as CAD/CAM and DVT technologies

Research profile and selected research projects from the past five years

Research at the department is closely connected to its clinical operations. In the past years, it focused on the development of treatment concepts in tumor surgery, orbital surgery, the use of extraoral and intraoral endosseous dental

Teaching profile of the past five years

The department's teaching focus is on training dual-specialty oral and maxillofacial surgeons, monospecialty oral surgeons, and postgraduates.

Strategic outlook

Over the next few years, the department is to be integrated into a university head center. Another goal is to make the department a reference center for the treatment of oral and maxillofacial tumors, including surgical rehabilitation with endosseous dental implants.

Selected publications from the past five years

1. Metz A, Pfortner R, Schmeling C, Mohr C: Mundschleimhautkarzinom: Mono- oder multimodale Behandlungskonzepte und moderne Techniken der rekonstruktiven Chirurgie. *Best Practice Onkologie*. 2012 Feb; 7(1): 46-53.
2. Metz A, Pfortner R, Schmeling C, Rieger G, Mohr C: Nasal Entrance Correction in Unilateral Cleft Lip Repair. *J Oral Maxillofac Surg*. 2015, doi: 10.1016/j.joms.2015.06.167.
3. Pfortner R, Mohr C, Daamen J, Metz A. Orbital tumors: operative and therapeutic strategies. *Facial Plast Surg*. 2014 Oct;30(5):570-7. Epub 2014 Nov 14.
4. Weischer T, Mohr C: Implantatsofortinsertion unter Dekontaminierung der Alveole mittels antimikrobieller photodynamischer Therapie. *ZMK* 30, 732 (2014)
5. Weischer T, Mohr C: Implantatsofortinsertion bei reduzierten Knochenangebot und apikaler Osteolyse. *Oralchirurgie Journal* 1,16 (2015)

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Research and teaching structure

The department's profile was shaped by its leadership of the research network "Molecular mechanisms in obesity," headed by Prof. J. Hebebrand until 2013. In 2012, a W2 professorship in molecular genetics of eating disorders and obesity was established. There are plans for a junior tenure-track professorship in diet-based prevention and treatment of mental disorders in children and adolescents.

Research focuses

- Molecular genetics of mental disorders and weight control in children and adolescents (eating disorders, obesity, attention-deficit/hyperactivity disorder)
- Nutritional science research on prevention and treatment of mental disorders in children and adolescents (depression, attention-deficit/hyperactivity disorder)
- Comorbidity research: Mental disorders in patients with obesity and eating disorders
- Prevention and therapy in children exhibiting school refusal behaviors
- Mental disorders in unemployed adolescents

Research profile and selected research projects from the past five years

The department is an internationally recognized center addressing obesity and eating disorders with innovative research on the importance of nutrients and dietary patterns for the development and treatment of mental disorders in children

and adolescents. Examples of this research include a joint model project on mental disorders in unemployed adolescents with the Essen unemployment agency, as well as the department's participation in the EU project "The Integrated Neurobiology of Food Intake, Addiction, and Stress" (NeuroFAST) and in the NIKI project on new endemic diseases in children and adolescents.

Teaching profile of the past five years

The department contributes 20 percent of the curricular teaching activities of the Department of Psychiatry and Psychotherapy.

Strategic outlook

Future research is aimed at identifying and characterizing genes associated with eating disorders, obesity, and psychiatric phenotypes in genome-wide association studies. Additionally, a nutrition research focus is being established.

Selected publications from the past five years

1. Speliotes EK, ... Hebebrand J, ... Loos RJ (2010) Association analyses of 249,796 individuals reveal 18 new loci associated with body mass index. *Nat Genet.* 2010; 42:937-48.
2. Hebebrand J, Bulik CM (2011) Critical Appraisal of the Provisional DSM-5 Criteria for Anorexia Nervosa and an Alternative Proposal. *Int J Eat Disord.* 44(8):665-78.
3. Bradfield JP, ... Hebebrand J, ... Grant SF; Early Growth Genetics Consortium (2012) A genome-wide association meta-analysis identifies new childhood obesity loci. *Nat Genet.* 44(5):526-31.
4. Jarick I, ... Hebebrand J, ... Hinney A (2014) Genome-wide analysis of rare copy number variations reveals PARK2 as a candidate gene for attention-deficit/hyperactivity disorder. *Mol Psychiatry* 19(1):115-21
- Mühlig Y, Antel J, Föcker M, Hebebrand J (2015) Are bidirectional associations of obesity and depression already apparent in childhood and adolescence as based on high-quality studies? A systematic review. *Obes Rev.* doi:10.1111/obr.12357.
5. Mühlig Y, Wabitsch M, Moss A, Hebebrand J (2014) Weight Loss in Children and Adolescents – A Systematic Review and Evaluation of Conservative, Non-Pharmacological Obesity Treatment Programs. *Dtsch Arztebl* 111 (48): 818-824.

University Hospital Department of Pulmonology (Ruhrlandklinik)

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Other studies were dedicated to endoscopic lung volume reduction by valve implantation in emphysema patients and to the assessment of the efficacy and safety of nintedanib in idiopathic pulmonary fibrosis, as well as to the approval of chlorin-E6 for the photodynamic therapy of central lung cancer.

Research and teaching structure

Research and teaching are dovetailed to align theory and practice. A study center tasked with coordinating the various interdisciplinary research projects was established in 2013. An Institutional Review Board serves to improve study quality.

Research focuses

- Interstitial lung disorders, sarcoidosis, pulmonary emphysema, COPD, severe asthma, cystic fibrosis
- Lung transplants
- Sleep-related breathing disorders
- Noninvasive ventilation
- Diagnosis of thoracic tumors
- Interventional pulmonology

Research profile and selected research projects from the past five years

The department's research centers on innovative methods in the diagnosis and treatment of pulmonary and bronchial diseases, respiratory control, and respiratory failure. Their efficiency is evaluated with respect to optimizing care, prolonging life, and improving quality of life.

Two studies investigated the risks of treatment and the association of sleep-related breathing disorders with cardiovascular risk factors and environmental factors.

Teaching profile of the past five years

As part of the main lecture series in internal medicine, the department is responsible for the section on pulmonology. It is also involved in teaching activities in differential diagnosis and clinical examination, as well as the intensive practical course in internal medicine.

Strategic outlook

A new W3 professorship was announced in 2015 with the aim of strengthening the department's teaching and research profile.

Selected publications from the past five years

1. Cowie MR, Woehrle H, Wegscheider K, Angermann C, d'Ortho MP, Erdmann E, Levy P, Simonds AK, Somers VK, Zannad F, Teschler H. Adaptive Servo-Ventilation for Central Sleep Apnea in Systolic Heart Failure. *N Engl J Med*. 2015 Sep 17;373(12):1095-105.
2. Costabel U, Inoue Y, Richeldi L, Collard HR, Tschoepe I, Stowasser S, Azuma A. Efficacy of Nintedanib in Idiopathic Pulmonary Fibrosis across Prespecified Subgroups in INPULSIS. *Am J Respir Crit Care Med*. 2016 Jan 15;193(2):178-85.
3. Richeldi L, du Bois RM, Raghu G, Azuma A, Brown KK, Costabel U, Cottin V, Flaherty KR, Hansell DM, Inoue Y, Kim DS, Kolb M, Nicholson AG, Noble PW, Selman M, Taniguchi H, Brun M, Le Maulf F, Girard M, Stowasser S, Schlenker-Herceg R, Disse B, Collard HR; INPULSIS Trial Investigators. Efficacy and safety of nintedanib in idiopathic pulmonary fibrosis. *N Engl J Med*. 2014 May 29;370(22):2071-82.
4. Richeldi L, Costabel U, Selman M, Kim DS, Hansell DM, Nicholson AG, Brown KK, Flaherty KR, Noble PW, Raghu G, Brun M, Gupta A, Juhel N, Klüglich M, du Bois RM. Efficacy of a tyrosine kinase inhibitor in idiopathic pulmonary fibrosis. *N Engl J Med*. 2011 Sep 22;365(12):1079-87.
5. Bonella F, Wijsenbeek M, Molina-Molina M, Duck A, Mele R, Geissler K, Wuyts W. European IPF Patient Charter: unmet needs and a call to action for healthcare policymakers. *Eur Respir J*. 2015 Nov 19. pii: ERJ-01204-2015. doi: 10.1183/13993003.01204-2015. [Epub ahead of print]

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substance-related disorders (SUNRISE), and the promotion of mental health among long-term unemployed persons older than 50 years who have mental health issues (TANDEM).

Teaching profile of the past five years

The department offers (in cooperation with other departments) a joint main lecture in psychiatry, psychosomatics, psychotherapy, and forensic psychiatry and a course about the nervous system and the psyche. It provides materials for the main lecture and courses via the Moodle educational platform.

Strategic outlook

Initial projects aim to develop and evaluate E-Mental-Health measures (diagnosis and treatment of mental disorders using new media). Additional projects currently under development address the impact of alcohol consumption on dementia development and issues at the interface between addiction and pain (e.g., iatrogenic opioid dependence).

Research and teaching structure

The psychiatric department for adults has two parts, namely the Department of Psychiatry and Psychotherapy and the Department of Addictive Behavior and Addiction Medicine. It has one professorship in psychiatry and psychotherapy and one professorship in clinical addiction research.

Research focuses

- Clinical addiction research
- Substance-related disorders and somatic diseases
- Cognitive psychology of psychiatric disorders
- ADHD in adults
- Unemployment and mental disorders
- Dementia research
- Molecular neurobiology

Research profile and selected research projects from the past five years

The department is characterized by its interconnectedness with research units and other departments of the Medical Faculty, as well as its integration into European research networks such as ECCAS and ENTER. Important projects have addressed translational protein research (PURE), new psychotropic substances (several EU projects), intravenous drug use and hepatitis C, the relationship between unemployment and

Selected publications from the past five years

1. Zepf FD, Sánchez CL, Biskup CS, Kötting WF, Bubenzer S, Helmbold K, Eisert A, Gaber TJ, Landgraf M, Dahmen B, Poustka F, Wöckel L, Stadler C, Grabemann M, Mette C, Heinrich V, Uekermann J, Abdel-Hamid M, Kis B, Zimmermann M, Wiltfang J, Kuhn CM. Acute tryptophan depletion – converging evidence for decreasing central nervous serotonin synthesis in rodents and humans. *Acta Psychiatr Scand.* 2014;129(2): 157-9.
2. Gizewski ER, Müller BW, Scherbaum N, Lieb B, Forsting M, Wiltfang J, Leygraf N, Schiffer B. The impact of alcohol dependence on social brain function. *Addict Biol.* 2013;18(1): 109-20.
3. Reimer J, Schmidt CS, Schulte B, Gansefort D, Golz J, Gerken G, Scherbaum N, Verthein U, Backmund M. Psychoeducation Improves Hepatitis C Virus Treatment During Opioid Substitution Therapy: A Controlled, Prospective Multicenter Trial. *Clin Infect Dis.* 2013;57 2: S97-S104.
4. Wagner M, Wolf S, Reischies FM, Daerr M, Wolfsgruber S, Jessen F, Popp J, Maier W, Hüll M, Frölich L, Hampel H, Perneczky R, Peters O, Jahn H, Luckhaus C, Gertz HJ, Schröder J, Pantel J, Lewczuk P, Kornhuber J, Wiltfang J. Biomarker validation of a cued recall memory deficit in prodromal Alzheimer disease. *Neurology.* 2012;78(6): 379-86.
5. Schiffer B, Müller BW, Scherbaum N, Hodgins S, Forsting M, Wiltfang J, Gizewski ER, Leygraf N. Disentangling structural brain alterations associated with violent behavior from those associated with substance use disorders. *Arch Gen Psychiatry.* 2011;68(10): 1039-49.

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Research and teaching structure

The department's research is closely tied to the Medical Faculty's focuses in oncology, transplant medicine, cardiology, and immunology. Over the past few years, its research with respect to somatopsychological care and psychotherapy has been particularly expanded.

Research focuses

Current projects address the following topics:

- Psycho-oncology
- Eating disorders
- Psychotraumatology
- Resources and resilience
- Transplantation medicine
- Somatoform disorders
- Migration and health
- Transsexuality
- Psychometrics: Development of testing methods and clinical diagnostics

Research profile and selected research projects from the past five years

Health services research is at the center of the department's research focuses. Several projects in psycho-oncology and transplantation medicine investigate various oncological diseases, such as choroid melanoma, thyroid cancer, and breast cancer, while following an interdisciplinary and multicentric approach. Research on eating disorders is another focus.

Teaching profile of the past five years

Future physicians need to learn empathy and communication skills if they are to respond to patients adequately. A core teaching task involves imparting aspects of the patient-physician relationship and experiencing this relationship in direct encounters with patients. In addition to interactions with real patients, these skills are further developed with the help of simulated patients.

Strategic outlook

The department aims to further develop its psycho-oncological research, particularly with respect to advising and treating patients, and it strives to develop needs-based screening methods. Additionally, more services will be provided for traumatized refugees and will be accompanied by relevant research projects.

Selected publications from the past five years

1. Wu M, Brockmeyer T, Hartmann M, Skunde M, Herzog W, Friederich HC. Reward-related decision making in eating and weight disorders: A systematic review and meta-analysis of the evidence from neuropsychological studies. *Neurosci Biobehav Rev.* 2016 Feb;61:177-96.
2. Simon J1, Skunde M2, Wu M2, Schnell K3, Herpertz SC3, Bendszus M4, Herzog W2, Friederich HC5. Neural dissociation of food- and money-related reward processing using an abstract incentive delay task. *Soc Cogn Affect Neurosci.* 2015 Aug;10(8):1113-20. doi: 10.1093/scan/ nsu162. Epub 2014 Dec 30.
3. Zipfel S, Wild B, Groß G, Friederich HC, Teufel M, Schellberg D, Giel KE, de Zwaan M, Dinkel A, Herpertz S, Burgmer M, Löwe B, Tagay S, von Wietersheim J, Zeeck A, Schade-Brittinger C, Schauenburg H, Herzog W. Focal psychodynamic therapy, cognitive behaviour therapy, and optimised treatment as usual in outpatients with anorexia nervosa (ANTOP study): randomised controlled trial. *The Lancet.* 2014, 11: 127-37.
4. Tagay S, Repic N, Düllman S, Schlottbohm S, Hermans E, Hiller R, Holtmann M, Frosch D, Senf W. Traumatische Ereignisse, psychische Belastung und Prädiktoren der PTBS-Symptomatik bei Kindern und Jugendlichen. *Kindheit und Entwicklung.* 2013, 22: 70-79.
5. Trellakis S, Tagay S, Fischer C, Rydleuskaya A, Scherag A, Bruderek K, Schlegel S, Greve J, Canbay AE, Lang S, Brandau S. Ghrelin, Leptin and Adiponectin as Possible Predictors of the Hedonic Value of Odors. *Regulatory Peptides.* 2011, 167: 112-7.

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Teaching profile of the past five years

Thoracic surgery is taught in lectures, electives, suture classes, and as part of the Practical Year.

Research and teaching structure

The department of thoracic surgery is one of the largest in Germany, known beyond the region for its expertise. Since the beginning of 2016, it has one of only three W3 professorships in thoracic surgery in Germany.

Research focuses

- Lung cancer and metastases in the lungs
- Oncological and functional thoracic surgery
- Translational research in thoracic surgery

Research profile and selected research projects from the past five years

The department excels at clinical research on lung cancer and pulmonary metastases. Several prospective multicenter studies at the national and international levels have led to prestigious publications in these fields. The establishment of the West German Biobank (WBE) at the West German Tumor Center (WTZ) and its new laboratory provide a perfect basis for basic and translational research addressing oncological issues encountered in clinical situations, leading to new findings relevant to patient care.

Strategic outlook

Establishing a translational thoracic surgery research laboratory will strengthen the department's oncological profile. The department also strives to achieve an even closer collaboration with and exchange between clinical practice and translational research to bring results from bench to bedside even more rapidly. Extracorporeal life support technologies will broaden the spectrum of the department's future thoracic surgery possibilities. A structured teaching program for the clinical education of students and in clinical and translational research is intended to provide attractive opportunities for working and continuing education at the department.

Selected publications from the past five years

1. Eberhardt WE, Pöttgen C, Gauler TC, Friedel G, Veit S, Heinrich V, Welter S, Budach W, Spengler W, Kimmich M, Fischer B, Schmidberger H, De Ruysscher D, Belka C, Cordes S, Hepp R, Lütke-Brintrup D, Lehmann N, Schuler M, Jöckel KH, Stamatis G, Stuschke M. Phase III Study of Surgery Versus Definitive Concurrent Chemoradiotherapy Boost in Patients With Resectable Stage IIIA(N2) and Selected IIIB Non-Small-Cell Lung Cancer After Induction Chemotherapy and Concurrent Chemoradiotherapy (ESPAUE). *J Clin Oncol.* 2015 Dec 10;33(35):4194-201.
2. Cheufou DH, Welter S, Chalvatzoulis E, Christof D, Theegarten D, Stamatis G. Surgery of primary lung cancer with oligometastatic m1b synchronous single brain metastasis: analysis of 37 cases. *Thorac Cardiovasc Surg.* 2014 Oct;62(7):612-5.
3. Welter S, Cheufou D, Ketscher C, Darwiche K, Maletzki F, Stamatis G. Risk factors for impaired lung function after pulmonary metastasectomy: a prospective observational study of 117 cases. *Eur J Cardiothorac Surg.* 2012 Aug;42(2):e22-7.
4. Welter S, Stöcker C, Dicken V, Kühl H, Krass S, Stamatis G. Lung segment geometry study: simulation of largest possible tumours that fit into bronchopulmonary segments. *Thorac Cardiovasc Surg.* 2012 Mar;60(2):93-100.
5. Welter S, Jacobs J, Krbek T, Halder R, Stamatis G. A new endoscopic technique for intraluminal repair of posterior tracheal laceration. *Ann Thorac Surg.* 2010 Aug;90(2):686-8

Institute of General Practice

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Research and teaching structure

The institute is structured by its activities in research, teaching, continuing medical education, and patient care and is part of a network including more than 180 physician's offices involved in teaching and research. An interdisciplinary research unit established over the course of the past three years conducts evidence-based research projects relevant to primary care physicians as well as innovative teaching projects. An association for continuing education in general medicine was established in 2010.

Research focuses

- Research on primary care physician's offices focusing on patient-oriented office management and projects relating to the work of primary care physicians
- Implementation strategies for the primary care physician office setting
- Cross-sector care solutions using electronic support tools to improve interprofessional treatment of patients in primary care

Research profile and selected research projects from the past five years

The institute's research is guided by learning from primary care physician settings, developing solutions for such settings, and bringing these solutions to actual primary care physicians' offices. It addresses issues that arise in real primary care settings and aims to develop solutions that are relevant in the real world. Examples of projects include those addressing cardiovascular

diseases, particularly hypertension, vaccination management, structured and evidence-based treatment management, patient self-management of upper respiratory tract viral infections, and the primary care physician's office as a workplace.

Teaching profile of the past five years

The institute's teaching focuses on communication and technical skills, as well as on evidence-based strategies for diagnosis and treatment. Teaching offices as educational spaces reflect the clinical practice of general medicine. A virtual primary care physician set-up in the e-learning platform Moodle focuses on preparing students for their internships and a comprehensive mentoring program in general medicine. The institute is an important contributor to the curriculum in physician communication and to the learning objectives catalog at the University of Duisburg-Essen.

Strategic outlook

Developing the institute's Research Unit, deepening and initiating collaborations, and ensuring continued expertise in research methods at decentralized treatment sites and in intervention strategies relevant to clinical practice are at the core of the institute's future activities.

Selected publications from the past five years

1. Weltermann BM, Markic M, Thielmann A, Gesenhues S, Hermann M. Vaccination Management and Vaccination Errors: A Representative Online-Survey among Primary Care Physicians. *PLoS ONE* 2014, 9: e105119.
2. Weltermann B, Viehmann A, Kersting C. Hypertension management in primary care: study protocol for a cluster randomized controlled trial. *Trials* 2015, 16: 105.
3. Weltermann B, Kersting C, Viehmann A. Hypertension management in primary care – A cluster randomized trial of a physician-focused educational intervention. *Dtsch Arzteblatt International* 2016; 113 (in press).
4. Weltermann BM, Rock T, Brix G, Schegerer A, Berndt P, Viehmann A, Reinders S, Gesenhues S. Multiple procedures and cumulative individual radiation exposure in interventional cardiology: a long-term retrospective study. *European Radiology* 2015, 25: 2567-2574.
5. Weltermann BM, Driouach-Bleckmann Y, Reinders S, Berndt P, Gesenhues S. Stroke knowledge among diabetics: a cross-sectional study on the influence of age, gender, education, and migration status. *BMC Neurology* 2013, 13: 202.

Institute of Anatomy

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Research and teaching structure

The institute comprises the anatomy unit, with its associated Center of Continuing Education in Clinical Anatomy (KAFZE), and the Media Center.

Research focuses

- Signaling in reproduction
- Molecular signaling in female reproduction
- Cell biological mechanisms of prostate cancer development
- Development of new treatment options for retinoblastoma

Research profile and selected research projects from the past five years

Research at the institute focuses on cellular signaling mechanisms in male and female reproduction. At its center is the treatment of infertility. The institute engages in basic translational research, collaborating with numerous institutions at the national and international levels. In addition to investigating the causes of infertility, specific diagnostics and treatments are developed. Single-cell studies investigated the molecular control mechanisms of sperm during the process of fertilization. Another research focus is the identification of signaling molecules of the immune system (CEACAM). A study combining in vitro methods with an in vivo-like, but animal-free, model is investigating the effects of Trefoil factor family peptides (TFF) in the human retina and in particular in primary retinoblastoma cell lines and retinoblastoma.

Teaching profile of the past five years

At the center of the institute's teaching activities are lectures and courses in microscopic and macroscopic anatomy, osteology, and neuroanatomy, accompanied by tutorials and other classes. The institute offers seminars on tomography and ultrasound imaging-based anatomy, as well as an elective on the development of the nervous system. Examination-preparation classes in microscopic and macroscopic anatomy are offered for students preparing for the first part of their medical examination. The KAFZE offers continuing education classes for and with colleagues from the clinical departments teaching novel surgical techniques.

Strategic outlook

A main objective of the institute is to develop more international collaborations, because networking is a prerequisite for translating research results into clinical practice, and because it improves the professional situation for early career researchers. Currently, a start-up company dedicated to developing and marketing diagnostics is being formed.

Selected publications from the past five years

1. Normal Fertility Requires the Expression of Carbonic Anhydrases II and IV in Sperm. Wandernoth PM, Mannowetz N, Szczyrba J, Grannemann L, Wolf A, Becker HM, Sly WS, Wennemuth G. *J Biol Chem.* 2015 Dec 4;290(49):29202-16.
2. Busch, M, Dünker, N (2015) Trefoil factor family peptides - friends or foes? *Biomol Concepts.* 2015 Dec;6(5-6):343-59.
3. Episodic rolling and transient attachments create diversity in sperm swimming behaviors. DF Babcock, P Wandernoth and G Wennemuth. *BMC Biology* 2014, 12:67.
4. Claudin-3, -7, and -10 show different distribution patterns during decidualization and trophoblast invasion in mouse and human. Schumann S, Buck VU, Classen-Linke I, Wennemuth G, Grümmer R (2015) *Histochem Cell Biol* 144: 571–585.
5. CEACAM1-3S Drives Melanoma Cells into NK Cell-Mediated Cytolysis and Enhances Patient Survival. Ullrich N, Heinemann A, Nilewski E, Scheffrahn I, Klode J, Scherag A, Schadendorf D, Singer BB, Helfrich I. *Cancer Res.* 2015 May 1;75(9):1897-907.

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Establishing and evaluating integrated hybrid PET/MRI imaging techniques is one of the focuses of the institute's research, and it has been able to document the added value of these techniques in various studies.

Research and teaching structure

In addition to lectures and e-learning modules, the institute offers an elective intensive practical course in diagnostic radiology, as well as an in-house continuing education program for resident physicians. Numerous groups are involved in scientific research. The institute allows its employees to take off time for research and supports applications for research grants (IFORES). The institute has established itself as a constant in the international hybrid imaging research community since it implemented one of the first PET/MRI scanners in 2012.

Research focuses

- Hybrid imaging (PET/MRI)
- Ultra-high-field imaging (7 Tesla MRI)
- Cardiovascular imaging
- Neuroradiological imaging and interventions
- Automated monitoring and evaluation of ionizing radiation (CT)

Research profile and selected research projects from the past five years

The institute has developed new techniques for improving existing diagnostics. New methods aim to lower radiation exposure while maintaining the same level of diagnostic quality.

Teaching profile of the past five years

The high-quality teaching at the institute includes seminars, lectures, and the option of an elective term in radiology during the Practical Year. All of the institute's teaching activities are regularly evaluated by its students in anonymous surveys.

Strategic outlook

The institute strives to maintain and improve its high standard of teaching, patient care, and research, with the goal of offering patients even better diagnostic methods in the future.

Selected publications from the past five years

1. Integrated FDG PET/MR Imaging for the Assessment of Myocardial Salvage in Reperfused Acute Myocardial Infarction. Nensa F, Poeppel T, Tezgah E, Heusch P, Nassenstein K, Mahabadi AA, Forsting M, Bockisch A, Erbel R, Heusch G, Schlosser T. *Radiology*. 2015 Aug;276(2):400-7. doi: 10.1148/radiol.2015140564. Epub 2015 Apr 3.
2. Diagnostic value of diffusion-weighted imaging in simultaneous 18F-FDG PET/MR imaging for whole-body staging of women with pelvic malignancies. Grueneisen J, Schaarschmidt BM, Beiderwellen K, Schulze-Hagen A, Heubner M, Kinner S, Forsting M, Lauenstein T, Ruhlmann V, Umutlu L. *J Nucl Med*. 2014 Dec; 55(12):1930-5. doi: 10.2967/jnumed.114.146886. Epub 2014 Nov 13.
3. Hybrid PET/MR imaging of the heart: feasibility and initial results. Nensa F, Poeppel TD, Beiderwellen K, Schelhorn J, Mahabadi AA, Erbel R, Heusch P, Nassenstein K, Bockisch A, Forsting M, Schlosser T. *Radiology*. 2013 Aug;268(2):366-73. doi: 10.1148/radiol.13130231. Epub 2013 May 7.
4. Simultaneous 18F choline positron emission tomography/ magnetic resonance imaging of the prostate: initial results. Wetter A, Lipponer C, Nensa F, Beiderwellen K, Olbricht T, Rübber H, Bockisch A, Schlosser T, Heusner TA, Lauenstein TC. *Invest Radiol*. 2013 May;48(5):256-62. doi: 10.1097/RLI.0b013e318282c654.
5. Dynamic contrast-enhanced renal MRI at 7 Tesla: preliminary results. Umutlu L, Kraff O, Orzada S, Fischer A, Kinner S, Maderwald S, Antoch G, Quick HH, Forsting M, Ladd ME, Lauenstein TC. *Invest Radiol*. 2011 Jul;46(7):425-33. doi: 10.1097/RLI.0b013e31820e1467.

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procedures offer method-based insights into the biology of immune cells, creating new diagnostic options. The institute has developed a transgenic mouse line that for the first time enables the highly selective visualization and genetic modification of neutrophils. It has also proven that neutrophils exacerbate the negative effects of stroke and that selective inhibition of neutrophils may be a new treatment concept for this disease.

Research and teaching structure

The institute's director is an interdisciplinary professor with laboratories in the Centre for Medical Biotechnology (ZMB) and in the Medical Research Center (MFZ) and is the founder of the Imaging Center Essen (IMCES). He is a member of the Medical Faculty and has been a co-opted member of the Faculty of Biology. In 2014, a W2 professorship in immunodynamics was created. External funding comes primarily from the DFG, the EU (FP7 and Horizon 2020), and the Stiftung Mercator foundation.

Research focuses

- Biology of neutrophils in normal and inflammatory states (infection, stroke, tumors) in experimental systems
- PET/MRI visualization of fungal infections
- Quantification of human leukocyte migration as a potential new diagnostic marker
- 3D structure and quantification of the functional structure of complex organ systems
- Development of new imaging procedures for experimental and clinical inflammation research and diagnostics

Research profile and selected research projects from the past five years

The institute uses modern imaging methods and experimental model systems to study the biology of neutrophils. It has contributed substantially to understanding their physiology and pathophysiology in fungal infections and stroke. Newly established animal models and imaging

Teaching profile of the past five years

The institute teaches basic classes in immunology, physiology, and nanobiophotonics and offers a practical course in immunology. Students are involved in scientific projects and publications at various levels. Currently, the institute has four doctoral candidates in the sciences. As part of IMCES, the institute offers consultations and support for the use of microscopic methods and data analysis.

Strategic outlook

In the future, based on its own research, the institute will focus on developing imaging methods for clinical applications, new diagnostic tools and procedures, and treatment concepts with respect to neutrophils.

Selected publications from the past five years

1. Rolle, A. M., et al. (2016). ImmunoPET/MR imaging allows specific detection of *Aspergillus fumigatus* lung infection in vivo. *Proc Natl Acad Sci U S A*.*
2. Hasenberg, A., et al. (2015). Catchup: a mouse model for imaging-based tracking and modulation of neutrophil granulocytes. *Nat Methods* 12(5): 445-452.*
3. Neumann, J., et al. (2015). Very-late-antigen-4 (VLA-4)-mediated brain invasion by neutrophils leads to interactions with microglia, increased ischemic injury and impaired behavior in experimental stroke. *Acta Neuropathol* 129(2): 259-277.*
4. Stoffels, I., et al. (2015). Metastatic status of sentinel lymph nodes in melanoma determined noninvasively with multispectral optoacoustic imaging. *Sci Transl. Med* 7(317): 317ra199.
5. Klingberg, A, Hasenberg, A, Ludwig-Portugall, I, Medyukhina, A, Männ, L, Brenzel, A, Engel, DR, Figge, MT, Kurts, C, Gunzer, M: Fully Automated Evaluation of Total Glomerular Number and Capillary Tuft Size in Nephritic Kidneys Using Lightsheet Microscopy. *J Am Soc Nephrol*, 2016 (in press)

*Gunzer is the senior author of this publication.

Institute for HIV Research

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Research and teaching structure

The institute was founded in 2015 and is expanding. At the core of its research and teaching activities is the human immunodeficiency virus (HIV). Worldwide, more than 30 million people have been infected with HIV, and more than 2 million with HIV die every year. HIV infection is a poverty-related disease. Among the hardest hit groups are African women infected at an early age. In Germany, approximately 80,000 people are infected with HIV, and the rate of new infections has been increasing for years.

Research focuses

- Immunology, virology, and pathogenesis of HIV
- New approaches for treating and curing HIV infections
- HIV vaccine research and implementation in an international context
- Understanding causes of cardiovascular disease and cancer development in HIV patients

Research profile and selected research projects from the past five years

The institute's scientific approach falls between preclinical research and clinical development. Complex immunological issues in the field of vaccine and cure research are addressed within an international network. The institute investigates several immunological aspects of vaccination

response and of disease pathogenesis. For example, the institute was among the first groups to describe HIV-specific T-follicular helper cells (Tfh) that are important for building an effective antibody response, but also appear to be an important HIV reservoir in patients receiving treatment. Because the institute participates in the US Military HIV Research Program (US MHRP), it has access to international vaccine studies and to clinical studies on HIV and Ebola treatment in countries such as Uganda, Nigeria, Mozambique, Kenya, and Thailand. The institute cooperates closely with the HPSTD outpatient clinic to gain an understanding of pathomechanisms of cardiovascular diseases in HIV-infected patients.

Strategic outlook

The institute deals with all aspects of HIV infection, with the goal of improving the quality of life of those infected, and it will continue to grow in the coming years. The development and testing of prophylactic and therapeutic HIV vaccines will continue to be an important area of work.

Selected publications from the past five years

1. Schultz BT, Teigler JE, Pissani F, Oster AF, Kranias G, Alter G, Marovich M, Eller MA, Dittmer U, Robb ML, Kim JH, Michael NL, Bolton D, Streeck H. Circulating HIV-Specific Interleukin-21(+) CD4(+) T Cells Represent Peripheral Tfh Cells with Antigen-Dependent Helper Functions. *Immunity*. 2016 Jan 19;44(1):167-78. doi: 10.1016/j.immuni.2015.12.011.
2. Streeck H. AIDS virus seeks refuge in B cell follicles. *Nat Med*. 2015 Feb;21(2):111-2. doi: 10.1038/nm.3795. PubMed PMID: 25654598.
3. Jessen H., Allen TM, Streeck H. How a single patient influenced HIV research: 15-year follow-up. *New Engl J Med (NEJM)* 2014.
4. Ranasinghe S, Cutler S, Davis I, Lu R, Soghoian DZ, Qi Y, Sidney J, Kranias G, Flanders MD, Lindqvist M, Kuhl B, Alter G, Deeks SG, Walker BD, Gao X, Sette A, Carrington M, Streeck H. Association of HLA-DRB1-restricted CD4β T cell responses with HIV immune control. *Nat Med*. 2013 Jul;19(7):930-3. doi: 10.1038/nm.3229.
5. Lindqvist M, van Lunzen J, Soghoian DZ, Kuhl BD, Ranasinghe S, Kranias G, Flanders MD, Cutler S, Yudanin N, Muller MI, Davis I, Farber D, Hartjen P, Haag F, Alter G, Schulze zur Wiesch J, Streeck H. Expansion of HIV-specific T follicular helper cells in chronic HIV infection. *J Clin Invest*. 2012 Sep;122(9):3271-80. doi: 10.1172/JCI64314

Institute of Human Genetics

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Research and teaching structure

The institute has one C4, one W2, and one W3 professorship. Prof. Horsthemke's research interest is in epigenetics. Prof. Lohmann heads the clinical researchers' group in ophthalmologic oncology and genetics. Prof. Rahmann has been professor of genome informatics since 2011 and has been a MERCUR-supported co-opted University Alliance Ruhr (UA Ruhr) professor of computational biology at TU Dortmund's Department of Computer Science since 2013, where he is part of SFB876.

Research focuses

- Epigenetics
- Syndromology
- Tumor genetics
- Genome informatics
- Cellular models

Research profile and selected research projects from the past five years

Clinical and experimental research and the five focal areas of research at the institute are closely connected to each other. Research is organized in several DFG-funded projects, as well as in the BMBF-funded research networks "German epigenome programme DEEP," "Network for Imprinting Diseases," "FACE," and "CraniRare." In DEEP, genome-wide epigenetic maps of primary

human cells are created and compared with each other. In genome informatics, new algorithms and mathematical methods are investigated. This research is done in part within the DFG-funded SFB 876 and SPP 1704, and within the networks "eBio-Verbund" and "eMed-Verbund." The DFG-funded Clinical Research Unit Ophthalmic Oncology and Genetics has used exome sequencing to identify genetic variations that are characteristic of the various classes of uveal melanoma. It also completed a joint study with other departments, following up on patients with retinoblastoma.

Teaching profile of the past five years

The institute offers lectures, practical courses, and seminars. As a UA Ruhr professor, Prof. Rahmann also holds lectures in informatics at TU Dortmund.

Strategic outlook

The institute aims to become a base for genomic medicine.

Selected publications from the past five years

1. Dauwerse JG, Dixon J, Seland S, Ruivenkamp CA, van Haeringen A, Hoefsloot LH, Peters DJ, Boers AC, Daumer-Haas C, Maiwald R, Zweier C, Kerr B, Cobo AM, Toral JF, Hoogeboom AJ, Lohmann DR, Hehr U, Dixon MJ, Breuning MH, Wieczorek D (2011) Mutations in genes encoding subunits of RNA polymerases I and III cause Treacher Collins syndrome. *Nat Genet.* 43:20-2.
2. Neumann LC, Markaki Y, Mladenov E, Hoffmann D, Buiting K, Horsthemke B (2012) The imprinted NPAP1/C15orf2 gene in the Prader-Willi syndrome region encodes a nuclear pore complex associated protein. *Hum Mol Genet.* 21:4038-48.
3. Köster J, Rahmann S (2012) Snakemake - a scalable bioinformatics workflow engine. *Bioinformatics* 28(19):2520-2.
4. Martin M, Maßhöfer L, Temming P, Rahmann S, Metz C, Bornfeld N, van de Nes J, Klein-Hitpass L, Hinnebusch AG, Horsthemke B, Lohmann DR, Zeschnick M (2013) Exome sequencing identifies recurrent somatic mutations in EIF1AX and SF3B1 in uveal melanoma with disomy 3. *Nat Genet.* 45(8):933-6.
5. Grothaus K, Kanber D, Gellhaus A, Mikat B, Kolarova J, Siebert R, Wieczorek D, Horsthemke B (2016) Genome-wide methylation analysis of retrocopy-associated CpG islands and their genomic environment. *Epigenetics*, 2016.1145330.

Institute of Immunology

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Research and teaching structure

The institute's structures are completely focused on immunological research. The institute participates in the Collaborative Projects GRK1949, GRK2098, SFB/TRR60 ("Mutual interaction of chronic viruses with cells of the immune system: from fundamental research to immunotherapy and vaccination"), and SFB974 ("Communication and System Relevance in Liver Damage and Regeneration").

Research focuses

- Antiviral immune response
- Antiviral effector mechanisms
- Development of autoimmunity

Research profile and selected research projects from the past five years

At the core of the institute's work is the discovery of cells that become deliberately infected, thereby activating the immune system, resulting in enforced viral replication. Another focus is on mechanisms leading to autoimmunity. For some viruses, enforced viral replication is important for efficient activation of the immune system. One project addresses the questions as to which molecules influence viral replication, in which cells they are active, and how they cause immune system activation, immunopathologies, or both.

Teaching profile of the past five years

To enhance creative thinking at the institute, a practical course for Bachelor's program students has been introduced in which they can create their own experiments and carry them out under supervision. In lectures and practical courses, the institute uses the Airvote system to enhance student attention and to allow instructors to track how well students understand their lectures.

Strategic outlook

Additional working groups led by young, internationally recognized top scientists are to be established with the aim of creating an excellent research environment in immunology.

Selected publications from the past five years

1. Khairnar V, Duhan V, Maney S, Honke N, Shaabani N, Pandya A, Pozdeev V, Xu HC, Seifert M, Sharma P, Baldin F, Marquardsen F, Kirschning C, Merches K, Westendorf AM, Häussinger D, Dittmer U, Küppers R, Recher M, Hardt C, Scheffrahn I, Beauchemin N, Göthert JR, Singer BB, Lang PA & Lang KS. CEACAM1 induces B-cell survival and is essential for protective antiviral antibody production *Nature communications* 2015; 6:6217.
2. Xu HC, Grusdat M, Pandya AA, Polz R, Huang J, Sharma P, Deenen R, Köhler K, Rhabar R, Diefenbach A, Gibbert K, Löhning M, Höcker L, Waibler Z, Häussinger D, Mak TW, Ohashi PS, Lang KS & Lang PA. Type I interferon protects anti-viral CD8+ T cells from NK cell cytotoxicity *Immunity* 2014; 40(6):949-60.
3. Honke N, Shaabani N, Cadreddu G, Sorg UR, Zhang DE, Trilling M, Klingel K, Sauter M, Kandolf R, Gailus N, van Rooijen N, Burkart C, Baldus SE, Grusdat M, Löhning M, Hengel H, Pfeffer K, Tanaka M, Häussinger D, Recher M, Lang PA & Lang KS. Enforced viral replication activates adaptive immunity and is essential for the control of a cytopathic virus. *Nat Immunol* 2012; 13:51-57.
4. McIlwain DR, Lang PA, Maretzky T, Hamada K, Ohishi K, Maney SK, Berger T, Murthy A, Duncan G, Xu HC, Lang KS, Häussinger D, Wakeham A, Itie-Youten A, Khokha R, Ohashi PS, Blobel CP & Mak TW. iRhomb2 regulation of TACE controls TNF-mediated protection against *Listeria* and responses to LPS. *Science* 2012; 335:229-232.
5. Pellegrini M, Calzascia T, Toe JG, Preston SP, Lin AE, Elford AR, Shahinian A, Lang PA, Lang KS, Morre M, Assouline B, Lahl K, Sparwasser T, Tedder TF, Paik JH, DePinho RA, Basta S, Ohashi PS & Mak TW. IL-7 engages multiple mechanisms to overcome chronic viral infection and limit organ pathology. *Cell* 2011; 144:601-613.

Institute for Medical Informatics, Biostatistics, and Epidemiology

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Additional projects: AeKO (Occupational health research within an epidemiological cohort study), NIKI (New endemic diseases in children and adolescents), quality management and design for the German telemedicine portal, SLEEP studies, and viniyoga adherence optimization in patients with hypertension.

Research and teaching structure

The institute has five working groups, as well as the Centers of Clinical Epidemiology and Urban Epidemiology. In addition, it includes the Centre for Clinical Trials Essen (ZKSE) and the Clinical Cancer Registry (KKR).

Research focuses

- Identifying risk factors for chronic diseases for prevention and treatment
- Therapeutic, diagnostic, and preventive methods in medicine
- Roles of molecular markers and of genetic information for disease development
- Effect of care settings on treatment success
- Impact of digital innovation and technology on health
- Reporting on health and health statistics with respect to small areas of living

Research profile and selected research projects from the past five years

The institute is experienced in conducting large-scale cohort studies. Examples of these studies are the Heinz Nixdorf Recall Study, initiated in 2000, and the subsequent Multigeneration Study. The institute participated intensively in designing and planning the German National Cohort (NAKO) and is currently examining 10,000 residents of Essen, with 6,000 subjects undergoing an MRI scan. The institute's scientific work is characterized by multidisciplinary and interdisciplinary approaches.

Teaching profile of the past five years

In teaching, the institute's responsibilities include the interdisciplinary fields of epidemiology, biometry and medical informatics, disease prevention and health promotion, and clinical environmental medicine. It is also involved in the BIOME Graduate School "Clinical Studies" and in the ELAN Doctoral School.

Strategic outlook

The institute plans to participate in long-term and joint projects (funded by the DFG, BMBF, and various foundations) as well as to collaborate with industry-based and other partners. A new professorship will serve to further expand the research focus on cardiovascular epidemiology. A methods center with clinical and epidemiological expertise is to be built.

Selected publications from the past five years

1. Jöckel KH, Stang A. Cohort studies with low baseline response may not be generalisable to populations with different exposure distributions. *Eur J Epidemiol* 2013;28:223-227.
2. Locke AE, , Jöckel KH, ...Moebus S, ...Speliotes EK. Genetic studies of body mass index yield new insights for obesity biology. *Nature* 2015;518:197-206.
3. Eberhardt WE, ... , Lütke-Brintrup D, Lehmann N, Schuler M, Jöckel KH, Stamatis G, Stuschke M. Phase III Study of Surgery Versus Definitive Concurrent Chemoradiotherapy Boost in Patients With Resectable Stage IIIA(N2) and Selected IIIB Non-Small-Cell Lung Cancer After Induction Chemotherapy and Concurrent Chemoradiotherapy (ESPATUE). *J Clin Oncol*. 2015 Dec 10;33(35):4194-201.
4. Stang A, Kowall B, Rusner C, Trabert B, Bray F, Schüz, McGlynn KA, Kuss O. A novel method for identifying settings for well-motivated ecologic studies of cancer. *Int J Cancer* 2016;138:1887-93.
5. Orban E, McDonald K, Sutcliffe R, Hoffmann B, Fuks KB, Dragano N, Viehmann A, Erbel R, Jöckel KH, Pundt N, Moebus S. Residential Road Traffic Noise and High Depressive Symptoms after Five Years of Follow-up: Results from the Heinz Nixdorf Recall Study. *Environ Health Perspect*. 2015 Nov 25. [Epub ahead of print]

Institute of Medical Microbiology

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The regulation of pathogen-specific immunity working group examines the role of gram-positive bacterial RNA as the main cause of sepsis pathogenesis and tests approaches for therapeutically blocking its main cellular receptor.

Research and teaching structure

The institute addresses four research fields: immunology of infectious diseases, molecular immunology of infectious diseases, regulation of pathogen-specific immunity, and cystic fibrosis. A W3 professorship in immunology of infectious diseases was established in 2012, and a W2 professorship in molecular immunology of infectious diseases was established in 2013. The institute actively participates in the joint research projects SFB/TRR60, GRK1949, GRK2098, and DKTK.

Research focuses

- Clinical microbiology and mycology
- Immunology of infectious diseases
- Cellular recognition of microbial immunostimulant products

Research profile and selected research projects from the past five years

The institute's research focuses on development and testing of diagnostic and therapeutic concepts for patients with acute and chronic infectious diseases, inflammatory mucosal diseases, and cancer. The cystic fibrosis working group addresses the role of bacteria and fungi in patients with cystic fibrosis. The immunology of infectious diseases and the molecular immunology of infectious diseases working groups study the immunological regulation of infectious diseases and cancer.

Teaching profile of the past five years

The institute offers lectures and practical courses on microorganisms for students of medicine and for scientists. Doctoral students are taught science- and microbiology-related content via the BIOME Graduate School of Biomedical Science.

Strategic outlook

In the future, important activities will include securing extensions of SFB/TRR 60 (2017) and GRK1949 (2018) and a continued involvement in DKTK.

Selected publications from the past five years

1. Oldenburg M, Krüger A, Ferstl R, Kaufmann A, Nees G, Sigmund A, Bathke B, Lauterbach H, Suter M, Dreher S, Koedel U, Akira S, Kawai T, Buer J, Wagner H, Bauer S, Hochrein H, Kirschning CJ. TLR13 recognizes bacterial 23S rRNA devoid of erythromycin resistance-forming modification. *Science*. 2012 Aug 31;337(6098):1111-5.
2. Hansen W, Hutzler M, Abel S, Alter C, Stockmann C, Kliche S, Albert J, Sparwasser T, Sakaguchi S, Westendorf AM, Schadendorf D, Buer J, Helfrich I. Neuropilin 1 deficiency on CD4+Foxp3+ regulatory T cells impairs mouse melanoma growth. *J Exp Med*. 2012 Oct 22;209(11):2001-16.
3. Steinmann J, Hamprecht A, Vehreschild MJGT, Cornely OA, Buchheidt D, Spiess B, Koldehoff M, Buer J, Meis JF, Rath P-M. Emergence of azole-resistant invasive aspergillosis in hematopoietic stem-cell transplant recipients in Germany. *J Antimicrob Chemother* 2015 May;70(5):1522-6.
4. Krüger A, Oldenburg M, Chebroly C, Beisser D, Kolter J, Sigmund AM, Steinmann J, Schäfer S, Hochrein H, Rahmann S, Wagner H, Henneke P, Hornung V, Buer J, Kirschning CJ. Human TLR8 senses UR/URR motifs in bacterial and mitochondrial RNA. *EMBO Rep*. 2015 Dec;16(12):1656-63.
5. Wadwa M, Klopffleisch R, Adamczyk A, Frede A, Pastille E, Mahnke K, Hansen W, Geffers R, Lang KS, Buer J, Büning J, Westendorf AM. IL-10 downregulates CXCR3 expression on Th1 cells and interferes with their migration to intestinal inflammatory sites. *Mucosal Immunol*. 2016 Jan 6. (Epub ahead)

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functional imaging. The institute's working groups are currently actively involved in DFG-funded research projects, some of which are integrated into FOR1328 and FOR1581.

Teaching profile of the past five years

The institute offers both mandatory and elective classes for medical students in the preclinical phase of the program. These classes have repeatedly won teaching awards from the Medical Faculty. Late in the semester, an examination-preparation class is offered to help students prepare for the "Physikum" examination. In addition, the institute is involved in the BIOME Graduate School of Biomedical Science.

Strategic outlook

With respect to research, the institute focuses on the expansion of the DFG Research Units FOR 1328 and FOR 1581 into transregional Collaborative Research Centres (TRR/SFB). Against this backdrop, the institute endeavors to create and consolidate a behavioral medicine clinic either at the institute or at the university in general that would provide behavioral therapy for patients with various disorders, as well as a coaching unit for Essen University Hospital employees.

Research and teaching structure

The institute has four working groups that collaborate closely and receive additional funding from the DFG and other research funding agencies. It has one Heisenberg professor in experimental psychobiology (Prof. Dr. S. Elsenbruch). The working groups participate in the DFG Research Units FOR1328 and FOR1581. The Counseling Center for medical students is associated with the institute.

Research focuses

- Communication between mental processes, the brain, and bodily functions
- Mental and neuronal processing of pain stimuli
- Functional relationships between neuronal processes and peripheral immune function
- Development of new treatment options and optimization of existing treatment approaches

Research profile and selected research projects from the past five years

The institute's research is characterized by a translational approach and distinguished by a broad range of psychological, neurobiological, and immunological methods and research approaches. These include animal experiments founded in basic neurobiological and immunological basic research, molecular methods, and

Selected publications from the past five years

1. Schedlowski M, Enck P, Rief W and Bingel U (2015) Neuro-bio-behavioral mechanisms of placebo and nocebo responses: Implications for clinical trials and clinical practice. *Pharmacol Rev* 67:697-730.
2. Elsenbruch S and Enck P (2015) Placebo effects and their determinants in gastrointestinal disorders. *Nat Rev Gastroenterol Hepatol* 12: 472-85.
3. Albring A, Wendt L, Benson S, Nissen S, Yavuz Z, Engler H, Witzke O and Schedlowski M (2014) Preserving learned immunosuppressive placebo response: perspectives for clinical application. *Clin Pharmacol Ther* 96:247-255.
4. Enck P, Bingel U, Schedlowski M and Rief W (2013) The placebo response in medicine: minimize, maximize or personalize? *Nat Rev Drug Discov* 12:191-204.
5. Giovanoli S, Engler H, Engler A, Richetto J, Voget M, Willi R, Winter C, Riva MA, Mortensen PB, Feldon J, Schedlowski M and Meyer U (2013) Stress in puberty unmasks latent neuropathological consequences of prenatal immune activation in mice. *Science* 339:1095-1099.

Institute of Medical Radiation Biology

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that investigated potential improvements of radiation protection for astronauts, the involvement in international projects such as EU-COST Action CM1201, and studies of the mechanism of action of novel PARP inhibitors. The latter are conducted in collaboration with the US NRG Sarcoma Group and the US National Cancer Institute.

Research and teaching structure

The institute has one professor and four research scientists, as well as several positions for graduate and postgraduate students, technicians, and one secretary.

Research focuses

- Mechanisms of repair of DNA double-strand breaks and their impact on eucaryotic cell response to ionizing radiation and the development of cancer
- Radiation sensitization of mammalian cells by targeted inhibition of selected repair pathways, focusing on nucleoside analogs and PARP inhibitors
- Mechanisms of checkpoint activation and strategies of radiation sensitization by means of their inhibition
- Basics of particle therapy for tumors

Research profile and selected research projects from the past five years

The institute is an international leader in the investigation of functions of alternative repair mechanisms for DNA double-strand breaks that play a decisive role in cancer development. Currently, the relative contributions of several pathways involved in this repair are being investigated, and the checkpoint contributions within these processes are studied. This research is supported by four BMBF-funded projects.

Additional focuses include a completed study commissioned by the European Space Agency

Teaching profile of the past five years

The institute coordinates and in part conducts lectures and practical courses in biology for medical students (during their first preclinical semester). It contributes to lectures on imaging, radiation therapy, radiation protection (2nd and 3rd semesters of the second phase of the program), and to those of the Centre for Medical Biotechnology (ZMB). It is also significantly involved in GRK1739.

Strategic outlook

The institute plans to continue investigating the mechanisms of DNA double-strand break repair with the aim of integrating the results into the understanding of mechanisms of carcinogenesis and radiation response.

Selected publications from the past five years

1. Arakawa H, Bednar T, Wang M, Paul K, Mladenov E, Bencsik-Theilen AA, Iliakis G, Functional redundancy between DNA ligases I and III in DNA replication in vertebrate cells. *Nucleic Acids Res*, 2012, 40: 2599-2610.
2. Soni A, Siemann M, Grabos M, Murmann T, Pantelias GE, Iliakis G, Requirement for Parp-1 and DNA ligases 1 or 3 but not of Xrcc1 in chromosomal translocation formation by backup end joining. *Nucleic Acids Res*, 2014, 42: 6380-6392.
3. Costantino L, Sotiriou SK, Rantala JK, Magin S, Mladenov E, Helleday T, Haber JE, Iliakis G, Kallioniemi OP, Halazonetis TD, Break Induced Replication Repair of Damaged Forks Induced Genomic Duplications in Human Cells. *Science*, 2014, 343: 88-91.
4. Magin S, Papaioannou M, Saha J, Staudt C, Iliakis G, Inhibition of homologous recombination and promotion of mutagenic repair of DNA double-strand breaks underpins arabinoside-nucleoside analog-radiosensitization. *Mol Cancer Ther*, 2015, 14: 1424-1433.
5. Cheng Y, Li F, Mladenov E, Iliakis G, The yield of DNA double strand breaks determined after exclusion of those forming from heat-labile lesions predicts tumor cell radiosensitivity to killing. *Radiother Oncol*, 2015, 116: 366-373.

Institute of Molecular Biology

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Teaching profile of the past five years

The institute represents the elective subject of molecular immunology of infectious diseases and is also involved in teaching students in the Medical Biology program, in a practical course in physiology, and leads the GRK 2098 teaching activities.

Additional information

From 2007 until 2013, Prof. Erich Gulbins was the spokesperson of DFG Research Unit 1267. Since the beginning of 2014, he has been the deputy spokesperson of DFG Research Unit 2123, and since October 2015 he has also served as the spokesperson of GRK 2098.

Strategic outlook

The institute's overarching goal is to understand the biomedical importance of sphingolipids.

Research and teaching structure

The institute has four research groups, headed by Dr. Katrin Becker-Flegler, Dr. Alexander Carpinteiro, Dr. Heike Grassmé, and Prof. Dr. Erich Gulbins.

Research focuses

- Sphingolipid biomedicine
- Sphingolipids in infections, depression, and tumor diseases

Research profile and selected research projects from the past five years

At the center of the institute's research is the investigation of the molecular regulation and biomedical importance of sphingolipids, in particular of the sphingomyelin > acid sphingomyelinase > ceramide > acid ceramidase > sphingosine > sphingosine kinase > S1P signaling pathway. A second area of interest is the role of neutral sphingomyelinase in bacterial infections. The groups particularly focus on the importance of ceramide and sphingosine in cystic fibrosis, bacterial pneumonia, and bacterial infections; the function of acid sphingomyelinase in endogenous depression; and the role of acid sphingomyelinase, ceramide, and acid ceramidase in tumor growth and metastasis.

Selected publications from the past five years

1. Henry BD*, Neill DR*, Becker KA*, Gore S, Bricio-Moreno L, Ziobro R, Edwards MJ, Mühlemann K, Steinmann J, Kleuser B, Japtok L, Luginbühl M, Wolfmeier, Scherag A, Gulbins E*, Kadioglu A*, Draeger A*, Babychuk EB*. Biomimetic, toxin-sequestering therapy for the treatment of severe invasive bacterial infections. *Nat Biotechnol* 2015;33:81-8. *Shared first authorship and senior authorship.
2. Carpinteiro A, Becker KA, Japtok L, Hessler G, Keitsch S, Pozgajova M, Schmid KW, Adams C, Müller S, Kleuser B, Edwards MJ, Grassmé H, Helfrich I, Gulbins E. Regulation of hematogenous tumor metastasis by acid sphingomyelinase. *EMBO Mol Med* 2015;7:714-34.
3. Pewzner-Jung Y, Tavakoli Tabazavareh S, Grassmé H, Becker KA, Japtok L, Steinmann J, Joseph T, Lang S, Tuemmler B, Schuchman EH, Lentsch AB, Kleuser B, Edwards MJ, Futerman AH, Gulbins E. Sphingoid long chain bases prevent lung infection by *Pseudomonas aeruginosa*. *EMBO Mol Med* 2014;6:1205-1.
4. Gulbins E, Palmada M, Reichel M, Lüth A, Böhmer C, Amato D, Müller CP, Tischbirek CH, Groemer TW, Tabatabai G, Becker KA, Tripal P, Staedtler S, Ackermann TF, v. Brederode J, Alzheimer C, Weller M, Lang UE, Kleuser B, Grassmé H, Kornhuber J. Acid sphingomyelinase/ceramide system mediates effects of antidepressant drugs. *Nat Med* 2013;19:934-8.
5. Zhang Y, Li X, Carpinteiro A, Goettel JA, Soddemann M, Gulbins E. Kinase suppressor of Ras-1 protects against pulmonary *Pseudomonas aeruginosa* infections. *Nat Med* 2011;17:341-6.

Institute of Neuropathology

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Research and teaching structure

The institute employs seven scientists working in medicine and biology. It has received individual support from the DFG since 2015 (guaranteed for three years). The institute's director also coordinates the Master's program in Medical Management.

Research focuses

- The role of kallikrein-8 in Alzheimer's disease (individually supported by the DFG for three years, beginning in August 2015)
- Reelin-dependent transmembrane signaling cascade in Alzheimer's disease
- Intraindividual and transgenerational effects of physical activity on Alzheimer pathology
- The role of miRNA in multiple sclerosis diagnosis and treatment

Research profile and selected research projects from the past five years

The institute's research focuses on the prevention and treatment of Alzheimer's disease, including biomarkers for the early diagnosis of this disease. With a project on the role of kallikrein-8 (KLK8) in Alzheimer disease, the institute's researchers demonstrated that short-term intraventricular application of inhibiting kallikrein-8 antibodies counteracts the amyloid- β and tau pathology characteristic of Alzheimer's disease. Currently, they are investigating the protective effects of

blocking KLK8 and the optimum therapeutic window for such a treatment. Another project is investigating transgenerational effects of physical activity on Alzheimer pathology.

Teaching profile of the past five years

The subject of neuropathology bridges clinical practice and basic research and is distinguished by expanding the diagnostic potential and by progress in understanding pathogenesis and repair mechanisms of nerve and muscle disorders, all thanks to new molecular techniques.

Strategic outlook

Ongoing research is paving the way for pharmaceutical marketing of agents inhibiting KLK8 for use in the treatment of Alzheimer's disease.

These agents are currently under patent protection. The patents rights belong to the University of Duisburg-Essen.

Selected publications from the past five years

1. Herring A, Münster Y, Akkaya T, Moghaddam S, Deinsberger K, Meyer J, Zahel J, Sanchez-Mendoza E, Wang Y, Hermann DM, Arzberger T, Teuber-Hanselmann S, Keyvani K. Kallikrein-8 inhibition attenuates Alzheimer's pathology in mice. *Alzheimers Dement.* 2016 Jun 18. pii: S1552-5260(16)30280-.
2. Herring A, Münster Y, Metzendorf J, Bolczek B, Krüssel S, Krieter D, Yavuz I, Karim F, Roggendorf C, Stang A, Wang Y, Hermann DM, Teuber-Hanselmann S, Keyvani K. Late running is not too late against Alzheimer's pathology. *Neurobiol Dis.* 2016, 14:94:44-54.
3. Müller-Schiffmann , Herring , Abdel-Hafiz, Chepkova AN, Schäble S, Wedel D, Horn AH, Sticht H, de Souza Silva MA, Gottmann K, Sergeeva OA, Huston JP, Keyvani K, Korh C. Amyloid- β dimers in the absence of plaque pathology impair learning and synaptic plasticity. *Brain* 2015 Dec 10. pii: awv355.
4. Gilden D, White T, Khmeleva N, Heintzman A, Choe A, Boyer PJ, Grose C, Carpenter JE, Rempel A, Bos N, Kandasamy B, Lear-Kaul K, Holmes DB, Bennett JL, Cohrs RJ, Mahalingam R, Mandava N, Eberhart CG, Bockelman B, Poppiti RJ, Tamhankar MA, Fogt F, Amato M, Wood E, Durairaj V, Rasmussen S, Petursdottir V, Pollak L, Mendlovic S, Chatelain D, Keyvani K, Brueck W, Nagel MA. Prevalence and distribution of VZV in temporal arteries of patients with giant cell arteritis. *Neurology* 2015, 84:1948-55.
5. Fritschi SK, Langer F, Kaeser SA, Maia LF, Portelius E, Pinotsi D, Kaminski CF, Winkler DT, Maetzler W, Keyvani K, Spitzer P, Wiltfang J, Kaminski Schierle GS, Zetterberg H, Staufenbiel M, Jucker M. Highly potent soluble amyloid- β seeds in human Alzheimer brain but not cerebrospinal fluid. *Brain* 2014, 137:2909-15.

Institute of Pathology

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Research and teaching structure

In 2016, a new W2 professorship in oncological pathology will be announced with the intention of strengthening the research focus on molecular profiling. More research is also expected in the fields of endocrine tumors, sarcomas, tumors of the urogenital tract, and lung and pleura tumors, all of this in collaboration with the corresponding hospital departments. The institute is the main operator of the West German Biobank (WBE) in the area of solid tumors.

Research focuses

- Molecular profiling
- Detection, evaluation, and validation of diagnostic and predictive biomarkers in oncological diseases
- Optimization of pretransplant diagnostics
- Pulmonary and infection pathology

Research profile and selected research projects from the past five years

At the center of the institute's research is the investigation of diagnostic and therapeutic indicators for various types of tumors. The aim of this research is to better understand the complex interactions between tumor and immune system, and to develop personalized treatments based on this understanding.



Teaching profile of the past five years

Teaching at the institute encompasses general and special pathology, a clinical pathological consultation board, the selected areas of the elective subject of pathology, the elective module of pathology in the Medical Biology program, discussions of difficult cases at the discussion microscope, and clinical pathological demonstrations of autopsies. E-learning activities are offered as well.

Strategic outlook

The new pathology/forensic medicine building offers new research opportunities, which will significantly strengthen the oncology and transplant focuses. Strategic development in the fields of pulmonary and infectious disease pathology, endocrine tumors, sarcomas, and urogenital tumors is planned as well.

Selected publications from the past five years

1. Vollbrecht C, Werner R, Walter RF, Christoph DC, Heukamp LC, Peifer M, Hirsch B, Burbat L, Mairinger T, Schmid KW, Wohlschlaeger J, Mairinger FD. Mutational analysis of pulmonary tumours with neuroendocrine features using targeted massive parallel sequencing: a comparison of a neglected tumour group. *Br J Cancer*. 2015 Dec 22;113(12):1704-11.
2. Koelsch B, van den Berg L, Fischer C, Winzen-Reichert B, Kutritz A, Kindler-Röhrborn A. Chemically Induced Oncogenesis in the Peripheral Nervous System Is Suppressed in Congenic BDIX.BDIV-Mss1 and -Mss7 Rats. *G3 (Bethesda)*. 2015 Nov 3;6(1):59-65.
3. Walter RF, Werner R, Ting S, Vollbrecht C, Theegarten D, Christoph DC, Schmid KW, Wohlschlaeger J, Mairinger FD. Identification of deregulation of apoptosis and cell cycle in neuroendocrine tumors of the lung via NanoString nCounter expression analysis. *Oncotarget*. 2015 Sep 22;6(28):24690-8.
4. Reis H, Pütter C, Megger DA, Bracht T, Weber F, Hoffmann AC, Bertram S, Wohlschlaeger J, Hagemann S, Eisenacher M, Scherag A, Schlaak JF, Canbay A, Meyer HE, Sitek B, Baba HA. A structured proteomic approach identifies 14-3-3Sigma as a novel and reliable protein biomarker in panel based differential diagnostics of liver tumors. *Biochim Biophys Acta*. 2015 Jun;1854(6):641-50.
5. Reis H, Herold T, Ting S, Worm K, Huber U, Christoph DC, Eberhardt WE, Kostbade K, Kasper S, Stamatis G, Welter S, Darwiche K, Karpf-Wissel R, Theegarten D, Schmid KW, Schuler M, Wiesweg M. HER2 expression and markers of phosphoinositide-3-kinase pathway activation define a favorable subgroup of metastatic pulmonary adenocarcinomas. *Lung Cancer*. 2015 Apr;88(1):34-41.

Institute for Pathophysiology

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Research and teaching structure

The institute is made up of three working groups. The first group uses the pig as a large-animal model to address issues in myocardial infarction pathophysiology, in endogenous protective strategies and their signal transduction. The second group studies remote cardiac conditioning and analyzes its signal transduction ex vivo. The third group studies atherosclerosis. Currently, the institute is actively involved in seven DFG-funded projects.

Research focuses

- Atherosclerosis
- Remote cardiac conditioning
- Cardioprotection
- Myocardial ischemia/reperfusion
- Cardiovascular system signal transduction

Research profile and selected research projects from the past five years

The institute has a strong translational research focus and is studying atherosclerosis, myocardial infarction, and cardioprotection not only at the basic research level in animal experiments and ex vivo, but also in patients, in close collaboration with other departments at the hospital. Research projects have addressed signal transduction in cardioprotection, remote cardiac preconditioning, and HDL dysfunction in CAD due to low HDL S1P levels.

Teaching profile of the past five years

The institute organizes the lecture series in pathophysiology for the first and second clinical semester jointly with other departments, covering the topics of atherosclerosis, arrhythmias, coronary artery disease, heart failure, congenital heart disease, and valvular defects.

Strategic outlook

The institute's translational myocardial infarction research focus will be further expanded and will be oriented more toward the remodeling process leading to heart failure. In collaboration with other departments, the analogy of myocardial infarction and stroke will be addressed, and the transfer of protection in remote cardiac condition will be elucidated.

Selected publications from the past five years

1. Kleinbongard P, Böse D, Baars T, Möhlenkamp S, Konorza T, Schöner S, Elter-Schulz M, Eggebrecht H, Degen H, Haude M, Levkau B, Schulz R, Erbel R, Heusch G (2011) Vasoconstrictor potential of coronary aspirate from patients undergoing stenting of saphenous vein aortocoronary bypass grafts and its pharmacological attenuation. *Circ Res* 108: 344-352.
2. Heusch G, Musiolik J, Kottenberg E, Peters J, Jakob H, Thielmann M (2012) STAT5 activation and cardioprotection by remote ischemic preconditioning in humans. *Circ Res* 110: 111-115.
3. Thielmann M, Kottenberg E, Kleinbongard P, Wendt D, Gedik N, Pasa S, Price V, Tsagakis K, Neuhäuser M, Peters J, Jakob H, Heusch G (2013) Cardioprotective and prognostic effects of remote ischaemic preconditioning in patients undergoing coronary artery bypass surgery: a single-centre randomised, double-blind, controlled trial. *Lancet* 382: 597-604.
4. Skyschally A, Gent S, Amanakis G, Schulte C, Kleinbongard P, Heusch G (2015) Across-species transfer of protection by remote ischemic preconditioning with species-specific myocardial signal transduction by RISK and SAFE pathways. *Circ Res* 117: 279-288.
5. Sattler K, Gräler M, Keul P, Weske S, Reimann CM, Jindrová H, Kleinbongard P, Sabbadini R, Bröcker-Preuss M, Erbel R, Heusch G, Levkau B (2015) Defects of High-Density Lipoproteins in Coronary Artery Disease Caused by Low Sphingosine-1-Phosphate Content. Correction by Sphingosine-1-Phosphate-Loading. *J Am Coll Cardiol* 66:1470-1485.

Institute of Pharmacogenetics

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Research and teaching structure

The institute's research focuses on genetic variations affecting an individual's response to drugs and other medical treatments. In addition, the institute studies genetic changes involved in treatment response and its course in cardiovascular diseases and cancer. The institute has one professor, three research scientists, three technicians, and two secretaries.

Research focuses

- Pharmacogenetics of tumor diseases and other disorders
- Detection and validation of pharmacogenetically relevant markers
- Functional importance of splice variants

Research profile and selected research projects from the past five years

The characterization of functional genetic polymorphisms, splice and transcript variants, and their possible effect on drug activity are most important for the institute's research. Its researchers study the expression and regulation of FTase variants, their interactions with the other subunits, function and effects of FTase inhibitors, and effects of polymorphisms on expression and function of these variants.

Translational research projects focus on potential effects on prognosis and predictive potential for individual therapies. Additionally, possible effects of gene variants on the effectivity of mTOR inhibitors are investigated both at the clinical and the cellular level for renal cell carcinoma, tuberous sclerosis, and after organ transplants.

Teaching profile of the past five years

The institute is responsible for teaching the subject of clinical pharmacology.

Strategic outlook

The Institute of Pharmacogenetics plans to intensify its research and diagnostic collaboration with the Institute of Pathology.

Selected publications from the past five years

1. H. S. Bachmann, W. Meier, Bois A. du, R. Kimmig, J. D. Kuhlmann, W. Siffert, J. Sehouli, K. Wollschlaeger, J. Huober, P. Hillemanns, A. Burges, B. Schmalfeldt, B. Aminossadati, and P. Wimberger. The FNTB promoter polymorphism rs11623866 as a potential predictive biomarker for Ionafarnib treatment of ovarian cancer patients. *Br.J.Clin.Pharmacol.* 80 (5):1139-1148, 2015.
2. N. Akdeli, K. Riemann, J. Westphal, J. Hess, W. Siffert, and H. S. Bachmann. A 3'UTR polymorphism modulates mRNA stability of the oncogene and drug target Polo-like Kinase 1. *Mol.Cancer* 13:87, 2014.
3. M. Adamzik, U. H. Frey, S. Mohlenkamp, A. Scherag, C. Waydhas, G. Marggraf, M. Dammann, J. Steinmann, W. Siffert, and J. Peters. Aquaporin 5 gene promoter -1364A/C polymorphism associated with 30-day survival in severe sepsis. *Anesthesiology* 114 (4):912-917, 2011.
4. H. S. Bachmann, L. C. Heukamp, K. J. Schmitz, C. F. Hilburn, P. Kahl, R. Buettner, H. Nuckel, A. Eisenhardt, H. Rubben, K. W. Schmid, W. Siffert, A. Eggert, A. Schramm, and J. H. Schulte. Regulatory BCL2 promoter polymorphism (-938C>A) is associated with adverse outcome in patients with prostate carcinoma. *Int.J. Cancer* 129 (10):2390-2399, 2011.
5. S. Klenke and W. Siffert. SNPs in genes encoding G proteins in pharmacogenetics. *Pharmacogenomics.* 12 (5):633-654, 2011.

Institute of Pharmacology

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calcium homeostasis and signal transduction in cardiovascular diseases, along with remodeling mechanisms of ion channels and transport proteins in the heart, with the aim of discovering suitable targets for new drugs and treatment approaches.

Research and teaching structure

The Institute is part of the West German Heart and Vascular Center Essen (WHGZ). It has been headed by Prof. Dr. med. Dobromir Dobrev, Full Professor of Pharmacology and Toxicology, since 2012.

Research focuses

- Molecular mechanisms of cardiovascular diseases
- Molecular pathophysiology of arrhythmias, in particular of atrial fibrillation
- Mechanisms of ion channel and transport protein remodeling within the cardiovascular system
- Regulation of cardiac calcium homeostasis and signal transduction in cardiovascular diseases

Research profile and selected research projects from the past five years

The institute's research focuses on elucidating the molecular pathophysiology of atrial fibrillation and on the discovery of novel drug targets for treating it. Although approximately one million people are affected by atrial fibrillation in Germany, the underlying causes of this endemic disease are not yet fully understood, and current treatment options are only moderately effective. The Institute investigates the molecular mechanisms of arrhythmias and atrial fibrillation. At the forefront of its work is the regulation of cardiac

Teaching profile of the past five years

Teaching at the institute concerns the mechanisms of action of drugs, special considerations in drug application, and the basics of the pharmacological treatment of various diseases.

Strategic outlook

The Institute aims to further expand its international reputation in the study of the molecular basis of arrhythmias, in particular of atrial fibrillation, and to establish more collaboration with other institutions. A long-term goal is the development of more-effective drugs with better safety profiles for the optimized treatment of patients with atrial fibrillation.

Selected publications from the past five years

1. Voigt N, Li N, Wang Q, Wang W, Trafford AW, Abu-Taha I, Sun Q, Wieland T, Nattel S, Ravens U, Wehrens XHT, Dobrev D (2012) Enhanced Sarcoplasmic Reticulum Ca²⁺-Leak and Increased Na⁺-Ca²⁺-Exchanger Function Underlie Delayed Afterdepolarizations in Patients with Chronic Atrial Fibrillation. *Circulation*, 125: 2059-2070.
2. Dobrev D, Carlsson L, Nattel S (2012) Novel molecular targets for atrial fibrillation therapy. *Nat Rev Drug Discov*, 11(4): 275-91.
3. Voigt N*, Heijman J*, Wang Q, Chiang DY, Li N, Karck M, Wehrens XHT, Nattel S, Dobrev D (2014) Cellular and Molecular Mechanisms of Atrial Arrhythmogenesis in Patients with Paroxysmal Atrial Fibrillation. *Circulation*, 129(2): 145-156. *equally contributing first authors
4. Heijman J, Voigt N, Nattel S, Dobrev D (2014) Cellular and Molecular Electrophysiology of Atrial Fibrillation Initiation, Maintenance and Progression. *Circ Res*, 114(9): 1483-99.
5. Schmidt C, Wiedmann F, Voigt N, Zhou XB, Heijman J, Lang S, Albert V, Kallenberger S, Ruhparwar A, Szabó G, Kallenbach K, Karck M, Borggrefe M, Biliczki P, Ehrlich JR, Baczkó I, Lugenbiel P, Schweizer PA, Donner BC, Katus HA, Dobrev D*, Thomas D* (2015) Upregulation of K₂P_{3.1} K⁺ current causes action potential shortening in patients with chronic atrial fibrillation. *Circulation*, 132:82-92. *equally contributing senior authors

Institute of Physiology

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Groups in the institute have the expertise required to study the mechanisms of adapting to hypoxia at all levels, from submolecular structures to entire organisms.

Research and teaching structure

The institute has three independent research groups who study the adaptation to changes in oxygen supply. The groups collaborate to teach all fields of physiology. The institute is a founding member of the study program in Medical-Biological Chemistry, as well as of the Centre for Medical Biotechnology (ZMB), and it is involved in GRKs 1431, 1739, and 2098.

Research focuses

- Activation of oxygen-dependent gene expression
- Hypoxia-inducible gene expression in the neuronal development and in the differentiation of neural precursor cells
- High-resolution microscopy of protein/protein interactions
- Expression and regulation of oxygen-dependent hydroxylases
- Hypoxia and HIF-1 in the proliferation, stimulation of apoptosis, and radiation sensitivity of cultured tumor cells
- Interactions of metabolic pathways
- Differential regulation of erythropoietin gene expression

Research profile and selected research projects from the past five years

The institute's scientific focus is on processes leading to the assembly of the HIF-1 transcription factor, the enzyme activity controlling HIF-1 activation and, mechanisms triggering cell death.

Teaching profile of the past five years

The institute is responsible for classes in physiology, offering lectures, seminars, practical courses and an examination-preparation class. It is involved in the programs in Medical-Biological Chemistry, Medical Biology, and Medical Engineering.

Strategic outlook

The institute plans to further enhance its capacity to study physiology and pathophysiology of hypoxic adaptation from molecules to the organism within research networks, particularly under translational research aspects. Teaching activities are to be consolidated in an effort to make the instruction of at least 225 students per year more efficient.

Selected publications from the past five years

1. Klose R, Krzywinska E, Castells M, Gotthardt D, Putz EM, Kantari-Mimoun C, Chikdene N, Meinecke AK, Schrödter K, Helfrich I, Fandrey J, Sexl V, Stockmann C. Targeting VEGF-A in myeloid cells enhances natural killer cell responses to chemotherapy and ameliorates cachexia. *Nat Commun.* 2016 Aug 19;7:12528
2. Flück K, Breves G, Fandrey J, Winning S. Hypoxia-inducible factor 1 in dendritic cells is crucial for the activation of protective regulatory T cells in murine colitis. *Mucosal Immunol.* 2015 Jul 29. doi: 10.1038/mi.2015.67.
3. Janke K, Brockmeier U, Kuhlmann K, Eisenacher M, Nolde J, Meyer HE, Mairböuml H, Metzen E. Factor inhibiting HIF-1 (FIH-1) modulates protein interactions of apoptosis-stimulating p53 binding protein 2 (ASPP2). *J Cell Sci.* 2013 Jun 15;126(Pt 12):2629-40.
4. Bernardini A, Brockmeier U, Metzen E, Berchner-Pfannschmidt U, Harde E, Acker-Palmer A, Papkovsky D, Acker H, Fandrey J. Type I cell ROS kinetics under hypoxia in the intact mouse carotid body ex vivo: a FRET-based study. *Am J Physiol Cell Physiol.* 2015 Jan 1;308(1):C61-7.
5. Hussmann M, Janke K, Kranz P, Neumann F, Mersch E, Baumann M, Goepelt K, Brockmeier U, Metzen E. Depletion of the thiol oxidoreductase ERp57 in tumor cells inhibits proliferation and increases sensitivity to ionizing radiation and chemotherapeutics. *Oncotarget.* 2015 Nov 17;6(36):39247-61.

Institute of Physiological Chemistry

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Research and teaching structure

The institute has two working groups, one named after the late Prof. de Groot, the former head of the institute, and one named after Prof. Rauen. It was a founding member of the Collaborative Research Centre “Supramolecular Chemistry on Proteins” (SFB 1093) and continues its work on a subproject within the SFB. It is also involved, along with other departments and institutes, in the establishment and running of the ELAN Doctoral School, which is funded by the Else Kröner-Fresenius-Stiftung foundation.

Research focuses

- Artificial oxygen carriers, intestinal ischemia, hemorrhagic shock, septic shock, acid-base balance, redox pathways of the electron transport chain
- Preservation damage in transplants, solutions for improved cold storage and rewarming of cells and tissues, cryopreservation of critical cell types

Research profile and selected research projects from the past five years

Research is split between the two aforementioned working groups. The de Groot group focuses on the investigation of cell- and tissue-damaging mechanisms in diseases in which a blood supply that is restricted or cut off entirely, resulting in hypoxia, plays a central role. The Rauen group focuses on studying the molecular mechanisms of preservation damage of trans-

plants and the mechanisms of cold-induced apoptosis or cell damage. Current projects involve the development of nanocapsules as artificial oxygen carriers, the investigation of pathomechanisms involved in ischemic intestinal damage, and the development of a new solution for protecting organs.

Teaching profile of the past five years

The institute is involved in curricular teaching activities in the programs of Medicine, Medical Biology, Chemistry, and Medical Engineering, as well as in coordinating the Transplantation Medicine core of the BIOME Graduate School. Additionally, it is involved in establishing and heading the ELAN Doctoral School.

Strategic outlook

The institute plans to intensify its work in some aspects of basic research, in particular with respect to organ regeneration and organ protection, the acid-base balance, and the translational implementation of research results in clinical therapy.

Selected publications from the past five years

1. Laudien J, Groß-Heitfeld C, Mayer C, de Groot H, Kirsch M, Ferenz KB. Perfluorodecalin-filled Poly(n-butyl-cyanoacrylate) nanocapsules as potential artificial oxygen carriers: Preclinical safety and biocompatibility. *J. Nanosci. Nanotechnol.* 15(8), 5637-48 (2015).
2. Hamburger T, Broecker-Preuss M, Hartmann M, Schade U, de Groot H, Petrat F. Effects of glycine, pyruvate, resveratrol, and nitrite on tissue injury and cytokine response in endotoxemic rats. *J. Surg. Res.* 183(1), e7-e21 (2013).
3. Petrat F, Böngler K, Schulz R, de Groot H. Glycine, a simple physiological compound protecting by yet puzzling mechanism(s) against ischemia-reperfusion injury: current knowledge. *Br. J. Pharmacol.* 165(7), 2059-72 (2012).
4. Pless-Petig G, Singer BB, Rauen U. Cold storage of rat hepatocyte suspensions for one week in a customized cold storage solution – preservation of cell attachment and metabolism. *PLoS One*, 7:e40444 (2012).
5. Fingas CD, Wu S, Gu Y, Wohlschlaeger J, Scherag A, Dahmen U, Paul A, de Groot H, Rauen U. Assessment of a chloride-poor vs. a chloride-containing modified HTK solution in a rat liver transplantation model. *Liver Transpl.* 17:650-660 (2011).

Institute of Legal Medicine

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analyses in sudden infant death syndrome, in victims of drowning, and in bladder, penis, and colon cancer), forensic medicine/medical law (causes of sudden death in children, unnatural deaths of infants/child abuse, analysis of medical malpractice), and forensic toxicology (homicides/suicides with pharmaceutical drugs/poisons, alternative sampling materials in intoxication, pharmacokinetics of toxicologically relevant substances).

Research and teaching structure

The institute's staff is responsible for teaching students of both the Medical Faculty of the University of Duisburg-Essen and the Medical Faculty of the Ruhr-University Bochum. The scientists participate in various scientific associations and serve as editors and peer reviewers for several German and international journals. In addition, the institute's staff carries out forensic medical services within the jurisdiction of the Essen and Bochum regional courts.

Research focuses

- Epidemiology, pathophysiology, and molecular genetics of sudden infant death
- Genetics of drowning and arrhythmias
- Transfer of traces of epithelial cells, population genetics, tumor genetics

Research profile and selected research projects from the past five years

The main topics of the institute's research are forensic pathology, genetics, and toxicology. The institute is working on projects in the fields of population genetics (analysis of autosomal, X-, and Y-chromosomal short tandem repeats, predominantly in African, Southeast European, and Asian populations, to establish assays for the determination of population origin of unknown crime scene samples), forensic genetics (studying transfer pathways of epithelial cells), clinical genetics/tumor genetics (molecular genetic

Teaching profile of the past five years

The institute is involved in teaching all aspects of forensic medicine to medical students of the Ruhr-University Bochum and of the University of Duisburg-Essen.

Strategic outlook

Thanks to construction of a new center of pathology and forensic medicine on the current site, improved working conditions will be available beginning in 2020/2021.

Selected publications from the past five years

1. Kamphausen T, Fandel SB, Gutmann JS, Bajanowski T, Poetsch M. Everything clean? Transfer of DNA traces between textiles in the washtub. *Int J Legal Med* 2015;129(4):709-714.
2. Kuepper U, Herbstreit F, Peters J, Madea B, Musshoff F (2012) Degradation and elimination of succinylcholine and succinylmonocholine: a definition of their respective detection windows in blood and urine for forensic purposes. *Int J Legal Med* 126:259-269.
3. Poetsch M, Blöhm R, Harder M, Inuoe H, von Wurmb-Schwark N, Freitag-Wolf S (2012) Prediction of people's origin from degraded DNA – Presentation of SNP assays and calculation of probability. *Int J Legal Med* 127: 347-357.
4. Ballantyne K, Goedbloed M, Fan R, Schaap O, Lao O, Choi Y, van Duijn K, Vermeulen M, Brauer S, Decorte R, Poetsch M, von Wurmb-Schwark N, de Knijff P, Knoblauch H, Lessig R, Roewer L, Ploski R, Dobosz T, Henke L, Henke J, Furtado MR, Kayser M (2010) Mutability of Y-chromosomal microsatellites: rates, characteristics, molecular bases and forensic implications. *Am J Human Genet* 87:341-353.
5. Tzimas I, Bajanowski T, Poetsch M. The role of hereditary KCNQ1 mutations in water-related death. *Int J Legal Med* 2016;130(2):361-363.

Institute of Transfusion Medicine

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immune biological importance of classic and non-classic HLA molecules, and the detection of predictive markers for rejection reactions in transplant recipients.

Teaching profile of the past five years

The institute offers various lecture series, as well as specialist training in transfusion medicine, laboratory diagnostics, computer science in medicine, and continuing medical education programs offering the Consultant Immunologist certificate (DGfI) and a certificate in immunogenetics (DGI). The institute is also involved in the BIOME Graduate School and the ELAN Doctoral School.

Strategic outlook

The institute aims to further expand its basic and translational research activities and to obtain a license to manufacture innovative therapeutics ("Herstellungserlaubnis nach § 13 AMG"). It also strives to test new cellular treatment strategies in clinical trials.

Research and teaching structure

The institute studies the biology of hematopoietic stem cells, issues in transplantation and tumor immunology. It is also involved in the translational development of novel hematologic cell therapies. Members of the institute are also actively involved in the boards and committees of the German Society of Immunogenetics (DGI), the German Society of Transfusion Medicine and Immune Hematology (DGTI), and the European Federation for Immunogenetics (EFI).

Research focuses

- Hematopoietic differentiation of pluripotent stem cells (iPS and ESCs)
- Developmental biology of somatic stem cells
- Immunogenetics and transplant immunology
- Optimization of donor selection for stem cell transplants
- GMP-compliant development of cellular therapeutic agents

Research profile and selected research projects from the past five years

The institute's research focuses on stem cells and patient-oriented research in transplant and tumor immunology. Various working groups address the analysis of early human hematopoiesis, the in vitro production of hematopoietic stem cells from embryonal and induced pluripotent stem cells, the molecular control of embryonal hematopoiesis and stem cell expansion, the

Selected publications from the past five years

1. Kordelas L, Verheyen J, Beelen DW, Horn PA, Heinold A, Kaiser R, Trenschele R, Schadendorf D, Dittmer U, Esser S. Shift of HIV Tropism in Stem-Cell Transplantation with CCR5 Delta32 Mutation. *N Engl J Med.* 2014; 371(9): 880-2.
2. Kordelas L, Rebmann V, Ludwig AK, Radtke S, Ruesing J, Doepfner TR, Epple M, Horn PA, Beelen DW, Giebel B. MSC-derived exosomes: a novel tool to treat therapy-refractory graft-versus-host disease. *Leukemia.* 2014; 28(4): 970-3.
3. Heinrichs S, Conover LF, Bueso-Ramos CE, Kilpivaara O, Stevenson K, Neuberger D, Loh ML, Wu WS, Rodig SJ, Garcia-Manero G, Kantarjian HM, Look AT. MYBL2 is a sub-haploinsufficient tumor suppressor gene in myeloid malignancy. *Elife.* 2013; 2: e00825.
4. Görgens A, Radtke S, Moellmann M, Cross M, Duerig J, Horn PA, Giebel B. Revision of the Human Hematopoietic Tree: Granulocyte Subtypes Derive from Distinct Hematopoietic Lineages. *Cell Reports.* 2013; 3(5): 1539-52.
5. Elmaagacli AH, Koldehoff M, Lindemann M, Sonius M, Ditschkowski M, Steckel N, Beelen DW. T cells are required for the CMV-induced antileukemia effect after transplant. *Blood.* 2012; 119(4): 1090-1. antileukemia effect after transplant. *Blood.* 2012; 119(4): 1090-1.

Institute of Virology

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understanding of the interactions between chronic viruses and cells of the immune system as a basis for developing immunotherapeutic strategies and vaccines. Many of its research projects are part of the DFG-funded joint projects SFB/TRR60 and GRK1949.

Research and teaching structure

The institute has ten working groups. Since 1996, it has been the national reference center for hepatitis C and the consulting laboratory for rabies, as designated by the Federal Ministry of Health and the Robert Koch Institute. In 2012 a junior professorship was established, and in 2016 a W2 professor in virology was appointed.

Research focuses

- Prophylactic and therapeutic vaccination against retroviruses and hepatitis viruses
- Principles of cellular and molecular anti-retroviral immune defense mechanisms
- CMV-specific cellular immune responses after stem cell and organ transplantations
- Antiviral activity of interferon-alpha subtypes
- Anti-HSV antibody treatment and HSV vaccines
- Role of the innate immune response in controlling hepatitis B virus infections
- Epidemiological studies on HCV infection, potential new hepatitis viruses, and the rabies virus
- CMV immune evasion, mechanisms of HIV-1 drug resistance
- Molecular biology of hepatitis C and D infections

Research profile and selected research projects from the past five years

The institute investigates basic mechanisms of immunity to chronic viruses, such as hepatitis, herpes, and retroviruses. It aims to gain a better

Teaching profile of the past five years

The institute offers lectures and practical courses for medical students and students in the Bachelor's and Master's programs in Medical Biology.

Strategic outlook

In 2017, the DFG joint projects on infectious diseases are up for extensions. The appointment of Prof. Ciesek is expected to strengthen the research activities addressing the molecular biology of hepatitis viruses, as well as to enter into further collaborations with clinical hepatologists. The institute's HIV research is to be expanded in collaboration with the Institute for HIV Research and the HIV Clinic.

Selected publications from the past five years

1. PD-L1 Expression on Retrovirus-Infected Cells Mediates Immune Escape from CD8+ T Cell Killing. Akhmetzyanova I, Drabczyk M, Neff CP, Gibbert K, Dietze KK, Werner T, Liu J, Chen L, Lang KS, Palmer BE, Dittmer U, Zelinskyy G. *PLoS Pathog.* 2015 Oct 20;11(10):e1005224.
2. Enhancing virus-specific immunity in vivo by combining therapeutic vaccination and PD-L1 blockade in chronic hepadnaviral infection. Liu J, Zhang E, Ma Z, Wu W, Kosinska A, Zhang X, Möller I, Seiz P, Glebe D, Wang B, Yang D, Lu M, Roggendorf M. *PLoS Pathog.* 2014 Jan;10(1):e1003856.
3. Interferon-alpha subtype 11 activates NK cells and enables control of retroviral infection. Gibbert K, Joedicke JJ, Meryk A, Trilling M, Francois S, Duppach J, Kraft A, Lang KS, Dittmer U. *PLoS Pathog.* 2012;8(8):e1002868.
4. Krawczyk A, Arndt M A, Grosse-Hovest L, Weichert W, Giebel B, Dittmer U, Hengel H, Jager D, Schneeweis K E, Eis-Hubinger A M, Roggendorf M, and Krauss J. 2013. Overcoming drug-resistant herpes simplex virus (HSV) infection by a humanized antibody. *Proceedings of the National Academy of Sciences of the United States of America* 110:6760-6765.
5. Transient depletion of regulatory T cells in transgenic mice reactivates virus-specific CD8+ T cells and reduces chronic retroviral set points. Dietze KK, Zelinskyy G, Gibbert K, Schimmer S, Francois S, Myers L, Sparwasser T, Hasenkrug KJ, Dittmer U. *Proc Natl Acad Sci U S A.* 2011 Feb 8;108(6):2420-5.

Institute of Cell Biology (Tumor Research)

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addressing its research focuses but is also involved in various joint projects, such as the DFG-funded SFB/TRR60 and GRK1739; a Research Unit on T-cell lymphomas; the BMBF-funded National Consortium on Radiation Sensitivity (ZiSS); the International Cancer Genome Consortium; and the EU-funded projects Marie Skłodowska-Curie action ITN RADIATE and Blueprint.

Research and teaching structure

The institute is home to the chairs in cell biology and molecular genetics, with currently three early career scientist groups, and to the DNA repair laboratory and the BioChip laboratory. The institute's researchers initiate and support national and international joint projects, such as the DFG-funded GRK1739, of which Prof. Jendrossek has been the spokesperson since 2012; the EU ITN RADIATE project, of which Prof. Jendrossek has been the deputy coordinator since 2015; and the SFB/TRR60, in which Prof. Küppers has participated since 2009.

Research focuses

- Mechanisms of cell response to ionizing radiation, of intrinsic and microenvironment-mediated radiation resistance, and of radiation-induced toxicity to healthy tissues, radiation-induced changes in the immune system, strategies for improving radiation effectiveness
- B-cell immunology in humans, pathogenesis of B- and T-cell lymphomas and leukemias

Research profile and selected research projects from the past five years

Prof. Jendrossek's group studies the effects of ionizing radiation on tumor and normal tissues, as well as new therapeutic interventions. Prof. Küppers' group has acquired important expertise in the immunology of healthy B-cell and the pathogenesis of B-cell lymphomas in humans. The institute conducts individual projects

Teaching profile of the past five years

The institute participates in teaching biology to medical students. In the Medical Biology program, it is involved in teaching molecular and cell biology for students in the Bachelor's and Master's programs, and immunology for students in the Master's program. It supervises graduate and postgraduate students working on their Bachelor's and Master's theses, doctoral dissertations, and IFORES research grant recipients. It also participates in the BIOME Graduate School, in the Research Training Group GRK1739, and in the RADIATE training network. Two scientists completed their habilitations in 2015.

Strategic outlook

The institute aims to expand its focus on radiation research, strengthen its early career scientist groups, and further develop the BioChip Laboratory.

Selected publications from the past five years

1. Wirsdörfer F, de Leve S, et al.,..., Jendrossek V (2016) Extracellular adenosine production by ecto-5'-nucleotidase (CD73) enhances radiation-induced lung fibrosis. *Cancer Res* 2016 Feb 26. pii: canres.2310.2015. [Epub ahead of print]
2. Klein D, et al.,..., Jendrossek V (2016) Therapy with multipotent mesenchymal stromal cells protects lungs from radiation-induced injury and reduces the risk of metastasis. *Antioxid Redox Signal*. 24(2), 53-69.
3. Seifert M, Sellmann L, Bloehdorn J, Wein F, Stilgenbauer S, Dürig J, Küppers R (2012) Cellular origin and pathophysiology of chronic lymphocytic leukemia. *J Exp Med*, 209, 2183-2198.
4. Seifert M, Przekopowicz M, Taudien S, Lollies A, Ronge V, Drees B, Lindemann M, Hillen U, Engler H, Singer BB, Küppers R (2015) Functional capacities of human IgM memory B cells in early inflammatory responses and secondary germinal center reactions. *Proc Natl Acad Sci USA*, 112, E546-E555.
5. Budeus B, Schweigle de Reynoso S, Przekopowicz M, Hoffmann D, Seifert M, Küppers R (2015) The complexity of the human memory B cell compartment is determined by the versatility of clonal diversification in germinal centres. *Proc Natl Acad Sci USA*, 112, E5281-E5289.

Institute for Experimental Cellular Therapy

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are addressing mechanisms of T-cell alloreactivity to mismatched HLA DP antigens, the characterization of HLA loss immune evasion mechanisms of posttransplant leukemia relapse, and the role of peptides in the immunotherapy of leukemias.

Research and teaching structure

The institute was founded in 2013. Its main tasks are in translational research on allogenic hematopoietic stem cell transplantation for the treatment of hematologic cancers. The institute has developed close collaborations with the Department of Hematopoietic Stem Cell Transplantation and with the Institute of Transfusion Medicine. These collaborations have enabled the institute to obtain external funding from the EU and from various foundations, including the José Carreras Leukämie Stiftung, the Jackstädt Stiftung, and the Joseph-Senker-Stiftung.

Research focuses

- Immunogenetics of allogeneic hematopoietic stem cell transplantation
- Adaptive immune response, with special consideration of T-cell alloreactivity
- Immunobiology of recurrent leukemia after allogeneic hematopoietic stem cell transplantation
- Diagnostic methods of HLA typing and chimerism follow-up in allogeneic hematopoietic stem cell transplantation

Research profile and selected research projects from the past five years

Research at the institute is focused on experimentally investigating immune-related physiological and pathological processes in allogeneic hematopoietic stem cell transplantation. Current projects

Teaching profile of the past five years

The institute is involved in teaching activities at the BIOME Graduate School and in conjunction with the training school for medical technicians. These activities include practical courses and seminars for the ELAN Doctoral School and practical courses for medical technicians in training.

Strategic outlook

The institute aims to expand its collaborations with other UK Essen departments and institutes, to participate in the establishment of a biobank for viable blood specimens, to build on its national and international collaborations, and to offer additional teaching activities.

Selected publications from the past five years

1. Crivello P, Heinold A, Rebmann V, Ottinger HD, Horn PA, Beelen DW, Fleischhauer K. Functional distance between recipient and donor HLA-DPB1 determines nonpermissive mismatches in unrelated HCT. *Blood* 2016;128(1):120-129.
2. Fleischhauer K. Immunogenetics of HLA-DP – a new view of permissible mismatches. *New England J Med* 2015 Aug 13;373(7):669-72.
3. Crivello P, Zito L, Sizzano F, Zino E, Maiers M, Mulder A, Toffalori C, Naldini L, Ciceri F, Vago L, Fleischhauer K. The impact of amino acid variability on alloreactivity defines a functional distance predictive of permissible HLA-DPB1 mismatches in hematopoietic stem cell transplantation. *Biol Blood Marrow Transplant* 2015 Feb;21(2):233-41.
4. Fleischhauer K, Fernandez-Viña MA, Wang T, Haagensohn M, Battiwala M, Baxter-Lowe LA, Ciceri F, Dehn J, Gajewski J, Hale GA, Heemskerck MBA, Marino SR, McCarthy PL, Miklos D, Oudshoorn M, Pollack MS, Reddy V, Senitzer D, Shaw BE, Waller EK, Lee SJ, Spellman SR. Risk-associations between HLA-DPB1 T cell epitope matching and outcome of unrelated hematopoietic cell transplantation are independent from HLA-DPA1. *Bone Marrow Transplant* 2014 Sep;49(9):1176-83.
5. Fleischhauer K, Shaw BE, Gooley T, Malkki M, Bardy P, Bignon JD, Dubois V, Horowitz MM, Madrigal JA, Morishima Y, Oudshoorn M, Ringden O, Spellman S, Velardi A, Zino E, Petersdorf EW. Effect of T-cell-epitope matching at HLA-DPB1 in recipients of unrelated donor haemopoietic-cell transplantation: a retrospective study. *Lancet Oncol* 2012 Apr;13(4):366-74.

Institute of Forensic Psychiatry

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Research and teaching structure

The institute is part of the LVR Hospital Essen and is at the same time an institute of the University of Duisburg-Essen.

Research focuses

- The institute's research focuses on the scientific study of prognosis and treatment of offenders with mental health and substance abuse disorders, accompanying the treatment of these patients in a setting of forensic psychiatry.
- Neuropsychiatric aspects of sexual delinquency

Research profile and selected research projects from the past five years

Because the institute is associated with the LVR, its research is informed by clinical settings and clinical relevance for the provision of forensic psychiatric services. One example is a long-term study funded by the Ministry of Health (MGEPA) of the state of North Rhine-Westphalia, conducted between 2009 and 2017 to evaluate forensic psychiatric treatments according to section 64 of the German criminal code (StGB). This study includes 16 hospital departments and 300 patients, as well as a control group of 300 prisoners.

Additionally, characteristics of ward settings were registered at 104 psychiatric wards as part of a DFG-funded study on ward atmosphere in forensic and general psychiatric wards. The resultant publication analyzes relationships between objective characteristics and the ward

atmosphere. Other examples of the institute's research include a DFG-funded study of neuronal and neurocognitive dysfunction in deviant sexual behavior, and a BMBF NeMUP project entitled "Neural Mechanisms underlying pedophilia and sexual offending against children." These projects are aimed at validating the specificity of existing imaging findings by systematically controlling for confounding variables in a four-group design, eventually allowing the differentiation between delinquency-associated and preference-associated changes.

Linking multimodal imaging studies with other factors of differential importance is intended to improve our understanding of mechanisms underlying pedophilic preferences and sexual abuse of children.

Teaching profile of the past five years

The institute is involved in the critical portrayal of forensic psychiatric practices with respect to the evaluation of potentially mentally ill delinquents, as well as to options for in-patient and out-patient treatments within a legal context.

Strategic outlook

The institute aims to create stronger interaction between criminological and addiction-research activities.

Selected publications from the past five years

1. Leygraf N (2014) Zur Phänomenologie islamistisch-terroristischer Straftäter. *Forensische Psychiatrie Psychologie Kriminologie* 8:237-245.
2. Leygraf N (2015) Tötungsdelikte in und nach Beziehungen. *Forensische Psychiatrie Psychologie Kriminologie* 9:211-219.
3. Schalast N, Laan JM (im Druck, 2016) Measuring social climate in German prisons using the Essen Climate Evaluation Schema. *The Prison Journal*.
4. Schiffer B, Müller BW, Scherbaum N, Hodgins S, Forsting M, Wiltfang J, Gizewski ER, Leygraf N (2011) Disentangling Structural Brain Alterations Associated With Violent Behavior From Those Associated With Substance Use Disorders. *Arch Gen Psychiatry* 68:1039-1049.
5. Schiffer B, Leygraf N, Müller B, Scherbaum N, Gizewski E, Forsting M, Wiltfang J, Hodgins S (2013) Structural brain alterations associated with schizophrenia preceded by conduct disorder: A common and distinct subtype of schizophrenia? *Schizophrenia Bulletin*. 39:1115-1128.

10.

Strategic Outlook

Thanks to its broad research success and excellence in teaching, the Medical Faculty of the University of Duisburg-Essen can look back on a period of extremely positive development. The strategic goal for the future involves pushing this development forward, strengthening it, and further enhancing its external visibility.

The people whose achievements have made the Medical Faculty what it is today are indispensable key factors in reaching these goals. First and foremost are the high-ranking scientists who not only advance research but also train the up-and-coming generations of excellent medical doctors.

To foster this aspect, the Medical Faculty pursues an efficient and highly dynamic faculty appointment policy. This policy has allowed the recruitment to Essen of numerous new “great minds” who reinforce existing structures or initiate

brand new ones. This concept will also be specifically continued at the Medical Faculty, particularly with respect to rejuvenating the teaching staff and underscoring the research focuses.

Essen also specifically looks for students who see medicine not just as a career but also as a calling. The Medical Faculty is meeting this expectation and will continue to do so by using selection interviews, a time-consuming but rewarding process. At the same time, on the basis of the new agreement in Germany’s University Pact III, the number of places for students will remain steady at a high level. This steady number of places not only guarantees efficient and successful instruction at the preclinical institutes but also strengthens research and teaching in medicine over the long term, thanks to the loyalty of the students to “their” medical school.



One of the primary teaching goals also includes improving the promotion of Essen as an attractive location for medical students and increasing the visibility of the existing strengths even more. The newly constructed cutting-edge Teaching & Learning Center already allows the Medical Faculty to offer both space and infrastructure for study. Future improvements will therefore focus especially on enhancing process quality in teaching and on optimizing examination results.

In the past, concentrating on selected priority areas has proved to be a successful strategic concept, in part because for several years this focus has been conducted in an interdisciplinary manner, with close cooperation among the research focuses. And although the Medical Faculty has the lowest appropriation of all of the university hospitals in North Rhine-Westphalia, it has still chalked up outstanding results in the research focuses. For example, the oncology research area in particular, the immunology research area, and the infectious disease research area have earned outstanding reputations in recent years, including at the international level. In the other research areas, the chances of achieving similar successes in the future are excellent, in part because of recent faculty appointments and in particular because of participation in research alliances.

In the future, the Medical Faculty will place a particular focus on the further initiation and establishment of research alliances, especially the DFG-funded collaborative projects (Collaborative Research Centers, Research Training

Groups, Research Units, etc.), which will both sharpen its profile and also expand its top-level research. Furthermore, plans call for expansion of collaborations with non-university partners. These highly successful efforts were demonstrated by the recent joint appointments with the German Cancer Research Center (DKFZ) and the Leibniz Institute for Analytical Sciences (ISAS) in Dortmund.

Plans also call for additional networking between the basic research facilities and the clinical and scientific institutions; this networking will strengthen translational research projects and increase the chances for additional DFG-funded collaborative projects. A further expansion of EU-funded projects and the further development of international networks, in particular European networks, are currently on the agenda of the Medical Faculty of Essen University Hospital. Other items on the agenda include stepping up the initiative in regional networks and promising collaborations, such as within the University Alliance Ruhr and with the other medical schools in North Rhine-Westphalia. For example, Essen scientists are already collaborating with the Heinrich Heine University Düsseldorf in two Collaborative Research Centers.

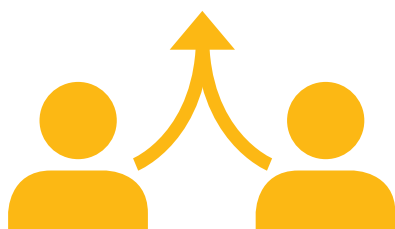
Conducive basic conditions are a key factor for future success. After all, a functioning infrastructure is indispensable for both research and teaching. The Ruhr area's central location itself offers numerous advantages, both for clinical research and for cohort studies, because it makes possible the recruitment of a large number of patients as participants. Moreover, the development of the Medical Faculty's facilities also plays an important role in its future development. The construction projects planned for the period up to 2025 particularly focus on research. By establishing additional

research and laboratory space, the Medical Faculty is taking the special priorities of research into consideration. However, because these measures will probably not completely cover future needs, adjustments will be necessary in the future, and new solutions will be sought.

Information technology is another key topic for the future, and Essen is no exception. Internationally competitive medical research is impossible without modern information technology, and information processing and exchange are crucial factors for further development in medicine. Establishing and expanding operational structures for state-of-the-art information technology will play an important role in future performance. UK Essen and the Medical Faculty will work together to make progress in this key area.

Another declared goal is the continuous improvement of the organizational administrative structures. For example, UK Essen will improve the scheme for allocating research space and optimizing the management of third-party funding. Many of these goals are already being successfully implemented.

With respect to promoting early career researchers, the IFORES program and its funding instruments will also be continually reviewed in the future and will be expanded and adapted to meet changing needs. A new instrument that also takes account of the promotion of excellent scientists from the Medical Faculty was introduced in 2016. In the future, a particular focus will continue to be placed on promoting women and especially on increasing the percentage of female scientists in upper-level career stages (habilitation, professorship). The Medical Faculty will expressly continue the measures that have been taken and will continually evaluate their effectiveness. To improve the compatibility of family and career, the Medical Faculty will also work to meet the particular requirements of both male and female scientists.



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UNIVERSITY OF DUISBURG-ESSEN



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