

Unique!



# Exciting times



Our university's new development plan – a strategic roadmap for development up to 2024 – has just been completed.

One starting point for our strategy was the huge opportunity presented by the new industrial revolution and "postgenomic, digital medicine". These developments will have a direct impact on teaching, research and routine care.

While in teaching virtual reality and simulation are the big buzzwords, research in the coming years will be characterised by precision medicine, renaming of diseases, synthetic biology, gene editing and neurocognitive research. In patient care, robotics, bionics, machine learning and telemedicine will open up many new possibilities. In these exciting times, MedUni Vienna will do all in its power to fulfil its role as a leading medical institution in Austria and an ambassador of medical innovation, and to succeed in increasing its international competitiveness by sharpening its profile and attracting the best talent.

To support this, in the coming years we will invest in our students and staff – our "software" – and in the very best infrastructure – our "hardware". Our aim is to position Austria even more strongly as an attractive, global location for medicine.

Professor Markus Müller Rector, Medical University of Vienna

## Contents

### MedUni Vienna in brief

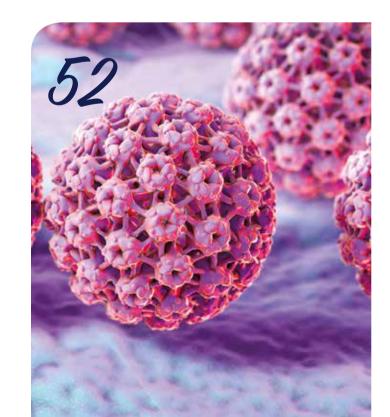
- 06 Supporting health with outstanding performance
- 07 Patents and innovations
- 07 Cooperations and third-party funding
- 08 Large-scale employer and research centre
- 08 Research success
- 09 Treating and curing illness
- 09 Teaching and learning

## 2024 Roadmap

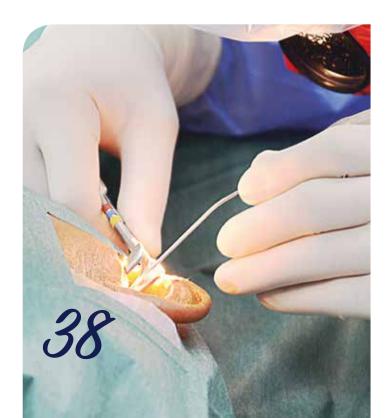
- 12 University development plan
- 13 Research: focus on preventive and precision medicine
- 14 Teaching: research-led and practice-based
- 18 Patient care: taskforces deliver results
- 20 People: international experts in Vienna
- 21 Infrastructure: the MedUni Vienna General Hospital Campus

### ZPM – Center for Precision Medicine

- 26 Shaping the future of medicine
- 28 As unique as each individual
- 30 MedUni Vienna launches fundraising for precision medicine







### Getting more out of life – precision medicine

- 34 A bright future -
- even after a cancer diagnosis
- 37 Hope for children with brain tumours
- 38 Hearing restored for the deaf
- 40 Just one look in your eyes tells all
- 42 Initial treatment successes for incurable liver disease
- 43 Robotic techniques improving surgery
- 44 World-class research: significantly better quality of life and longer life expectancies for breast cancer patients
- 46 Lung transplant recipients celebrate conquering Kilimanjaro
- 47 Personalised heart pumps give patients a feeling of security
- 48 Privately funded initiatives support women's health
- 50 A breath of fresh air for asthma sufferers
- 52 New HPV vaccine saves lives
- 54 Safe stem cell treatments
- 55 Protein for potential diabetes treatments
- 56 Real alternative for patients with severe nerve damage
- 57 Kidney transplants: new strategies for longer organ lifespans

# Partners, careers, awards

60 Outstanding performance in medicine

# How MedUni Vienna is organised

68 Administration74 Financial statements

# Supporting health with outstanding performance

**Two outstanding institutions** located on the same site: the Medical University of Vienna (MedUni Vienna) and Vienna General Hospital, one of the biggest hospitals in Europe with around 2,000 beds. Founded in 1365 as the medical faculty of the University of Vienna and made an independent university in 2004, today MedUni Vienna is among Europe's most highly respected centres of medical training and research – and with 8,000 students, the largest in the German-speaking region.

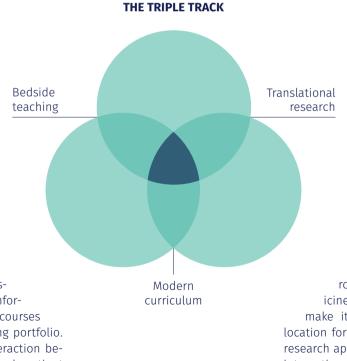
## The triple track – driving progress

With 5,500 staff, 27 clinical departments and three clinical institutes, as well as

12 medical research centres and numerous highly specialised laboratories, the university is one of Europe's major biomedical research institutions. The triple track of research, teaching and patient care underpins MedUni Vienna's position as a leading scientific centre, higher education institution and driver of innovation.

#### Putting knowledge to use

MedUni Vienna provides the medical staff for Vienna General Hospital, a leading institution regionally and nationally that accounts for over 20% of all inpatient admissions in Vienna. This means the university campus fully meets its remit to provide comprehensive, high-quality tertiary medical care, and additionally provides a high proportion of secondary and primary care.



## Generating knowledge

MedUni Vienna has five research clusters – focused on immunology, cancer research/oncology, medical neuroscience, cardiovascular medicine and medical imaging – that make it an internationally attractive location for researchers. The translational research approach is a key component: by integrating basic research and clinical application, patients benefit directly from the outcomes of clinical trials.

## Conveying knowledge

The curriculum encompasses medicine and dentistry degree programmes and doctoral studies, as well as a master's programme in medical informatics. Continuing education courses complete the extensive learning portfolio. Students benefit from the interaction between research, education and patient care – with Vienna General Hospital playing an integral role in teaching.

## Patents and innovations

A number of scientists at MedUni Vienna are among the most cited researchers worldwide in their fields. The university's extensive research infrastructure supports their work. The high level of research activity is reflected in the large number of projects with third-party funding. In no other OECD country has clinical research output grown so sharply in the last 25 years as it has in Austria – and MedUni Vienna has played a significant part in this.

## High output thanks to focus areas

The focus on five specific areas of research in clusters results in high scientific output at MedUni Vienna, and has produced a marked, consistent upward curve in corresponding indicators.

# **Cooperations and third-party funding**

**Cooperation agreements with** partner institutions are at the heart of the global scientific and research network that plays a vital role in MedUni Vienna's success. Almost 60% of all publications

**PUBLICATIONS BASED ON** 

by MedUni Vienna researchers are the result of international partnerships, and roughly a fifth of all funding for research and teaching activities comes from sources of independent (third-party) finance. Third-party funding for research and development increased to over EUR 100 million in 2017.



#### THIRD-PARTY FUNDING: REVENUE FROM R&D PROJECTS AND DONATIONS (EUR)



# Large-scale employer and research centre

**Its more than 5,500** employees make MedUni Vienna one of the most important medical education and research centres in Central Europe. The proportion of employees accounted for by academic staff is significantly above 80% – an outstanding ratio. 3,654 academic staff (1,659 women and 1,995 men) work for the university as researchers, lecturers and doctors. Three new professors (four women and five men) were appointed in 2017 and 47 post-doctoral lecturing qualifications were awarded (to 17 women and 30 men; 24 non-surgical specialists and 17 surgical specialists and six biomedical basic research specialists).

## Research success

**Since its establishment** as an independent university in 2004, as a result of numerous innovative approaches MedUni Vienna has notably increased its research output, in terms of the impact of publications by its researchers. Three recent publications provide excellent examples of this success.

WOMEN

3.067

MFN

2.444

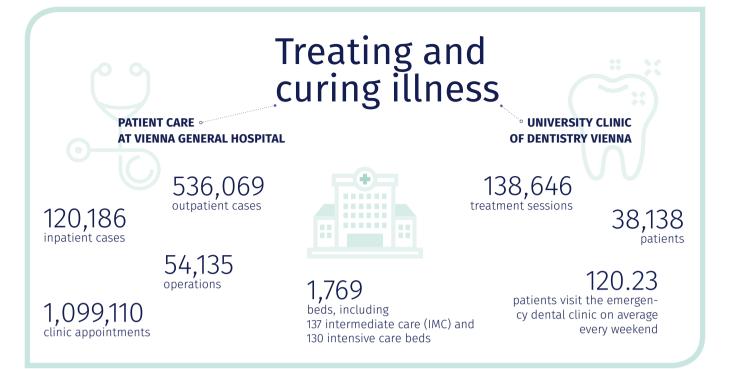
Josef Smolen, Head of the Division of Rheumatology and the third most frequently cited rheumatologist worldwide, and his team demonstrated that combination therapy using methotrexate with tofacitinib is just as effective as the current standard combination of methotrexate with adalimumab. Adalimumab must be administered intravenously every two weeks, whilst the new option simply requires two tablets to be taken each day – clearly an advantage for patients. The groundbreaking study was published in The Lancet.

In a study published in the New England Journal of Medicine, a team led by Kaan Boztug from the Department of Paediatrics and Adolescent Medicine showed that a single genetic mutation during childhood can lead to inflammatory bowel disease. Thanks to the new discoveries at the molecular level, a drug that already has approval was identified as a treatment for patients. Stem cells control other nearby cells and are responsible for inducing specific functions in them. In a world first, this phenomenon – the "language of stem cells" – was revealed in the leading journal Nature Communications, in a paper by lead author Margit Rosner together with Markus Henstschläger's team at the university's Institute of Medical Genetics.

#### **IMPACT FACTORS OF SCIENTIFIC PUBLICATIONS, 2005-2016**

Total impact factors show that scientific output and the quality of research at MedUni Vienna are rising continuously.





# Teaching and learning

**MedUni Vienna has** a diversified educational offering, from undergraduate degrees to continuing education courses and PhD programmes.

- Medicine degree programme
- Dentistry degree programme
- Medical Informatics master's programme
- PhD programmes (17 research themes)
- Applied Medical Science doctoral programme (ten research themes with a focus on clinical research)
- 19 postgraduate continuing education courses and three certificate courses

Over 104 teaching hospitals in Austria, 59 general medical practices and numerous teaching hospitals abroad are accredited for clinical practice training.

Students	٢̈́	۱	
by nationality	Women	Men	Total
Austria	2,753	2,562	5,315
EU	862	818	1,680
Other countries	506	403	909
Total	4,121	3,783	7,904

Source: 2017 intellectual capital report - winter semester 2017/as at 5 January 2018

#### Students in mobility programmes

(outgoing/incoming)	Women	Men	Total
EU host country/country of origin	201/168	205/86	406/254
Non-EU host country/ country of origin	125/44	121/29	246/73
Total	326/212	326/115	652/327

Source: 2017 intellectual capital report – 2016/17 academic year

PhD/doctoral programmes	Women	Men	Total
Austria	430	446	876
EU	139	106	245
Other countries	127	94	221
Total	696	646	1,342

Source: 2017 intellectual capital report – winter semester 2017/as at 5 January 2018

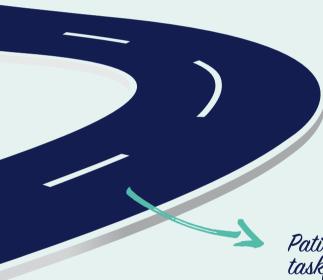
Research: focus on preventive and precision medicine

> Teaching: research-led and practice-based

HR: new opportunities for top talent

Infrastructure: the MedUni Vienna General Hospital Campus

# 2024 Roadmap



Medical science is developing at a more dynamic rate than ever before – presenting major opportunities for MedUni Vienna.

Patient care: taskforces deliver results

The 2019-2024 development plan sets out exactly how MedUni Vienna aims to take advantage of the transformation in medicine. MedUni Vienna General Hospital Campus and the Center for Precision Medicine are on the way, smart technologies will drive forward preventive and precision medicine, and the curriculum will become even more innovative.

## University development plan



**Key indicators used** for international comparison – such as impact factors, citation rates, the volume of third-party funding, knowledge transfer and PhDs awarded – show that MedUni Vienna is charting the right course. Rector Markus Müller explains what makes this possible: "We can thank the outstanding performance of our people – in all aspects of the triple track: research, teaching and patient care. All three contribute equally to the university's medical and scientific performance, and enrich one another."

The achievements of recent years provide the basis for the next steps to be taken in positioning MedUni Vienna even more strongly as a centre of medical science. Professor Müller presented the strategy for reaching this ambitious goal in October 2017 at an information event for management staff, introducing the development plan for the 2019-2024 period. The presentation also looked at the challenges MedUni Vienna has to meet, specific planned development measures, and five central focus areas. "This means we have established the framework in which we will work for the next six years," explains the rector, who was confirmed to remain in his role until 2023 by the University Council and the Senate of MedUni Vienna. "We have put our heart and soul into the plan – it is our roadmap for the future, and we have a lot to do."



Markus Müller Rector MedUni Vienna is putting everything into achieving success as a leading global medical institution. Investments in staff, students and infrastructure are aimed at making Austria an even more attractive location for medicine.

#### Research: focus on preventive and precision medicine

With the needs of people always in the foreground, MedUni Vienna pursues research that is interdisciplinary. translational and involves international cooperation. Digitalisation in particular offers major new opportunities that will benefit patients. Innovative technologies including artificial intelligence and machine learning will drive research forward. The focus is also sharpening on preventive medicine, which could reduce the number of inpatient admissions and have extremely far-reaching benefits that are as yet unknown. Med-Uni Vienna therefore wants to make high-tech prevention using smart technologies a core part of its activities in the future.

#### Big data and digitalisation

In the coming years, this major theme will determine the direction of travel in basic, translational and clinical research, and for the university's five research clusters (read more about these from page 19). Making use of big data a preoccupation of complexity science researcher Stefan Thurner from MedUni Vienna, who was named Scientist of the Year 2017 (see page 14) - is an integral part of this and could open up wholly new possibilities in modern medicine. At relatively low cost, big data allows insights to be generated from millions of data entries that can then be incorporated into individual diagnosis and therapy for a specific patient. It is precisely this kind of data-driven medicine that will be the focus at the Center for Precision Medicine, which will open in 2022.



Michaela Fritz Vice Rector for Research and Innovation The planned investments in research infrastructure will further enhance the university's international profile.

### Inventor of the Year

Rolf Ziesche of the Division of Pulmonology in the university's Department of Medicine II was named MedUni Vienna's Inventor of the Year. He was able to identify relevant markers for chronic obstructive pulmonary disease (COPD) that open up a new approach to diagnosis and treatment of this disorder. According to the World Health Organization (WHO), by 2020 COPD will become the third most common cause of death worldwide, claiming six million lives that year. Ziesche's research was conducted in collaboration with the Austrian Workers' Compensation Board (AUVA), the Austrian Institute of Technology (AIT) and international partners.



### Teaching: research-led and practice-based

The number of applicants who took the aptitude test for medical studies rose again in 2017: 609 more candidates sat the examination, taking the total to 12,760. This shows a sustained interest in studying medicine - which is carried through into successful candidates' period of study: "The graduation rate is 90%, and most students complete their medical degree in the minimum time or within the tolerance semester period." explains Anita Rieder, MedUni Vienna's Vice Rector for Education. Candidates took the MedAT aptitude exams on 7 July 2017. The 740 study places available at MedUni Vienna went to 391 women (52.8%) and 349 men (47.2%).

## Supporting excellent student performance

The MedAT admissions test – in addition to the introduction of a modern, continuously developed integrated curriculum in 2002 and its organisational implementation – has had a highly positive impact at MedUni Vienna. The number of graduating students is stable, and the drop-out rate has fallen to below 5%. MedAT is a standardised, transparent, academically-based and fair admissions process that clearly promotes social diversity among candidates and students. This was shown in the first full survey of all MedAT candidates at MedUni Vienna in 2017.



**Celebrating a double:** after Alexandra Kautzky-Willer was named Scientist of the Year 2016, Stefan Thurner – another MedUni Vienna staff member – was awarded the accolade in 2017.

## Scientist of the Year 2017

Complexity science researcher Stefan Thurner – Austria's first Professor of the Science of Complex Systems – was named Scientist of the Year 2017 by Austria's *Klub der Bildungs- und Wissenschaftsjournalisten* (Association of Education and Science Journalists). His work at MedUni Vienna is about understanding complex questions. That is also the focus of the Complexity Science Hub Vienna (CSH), which Professor Thurner initiated and manages. The use of big data opens up the possibility of decoding the patterns behind complex issues. An example is identifying the connections and time periods between the onset of individual illnesses, allowing the development of diseases and even new illnesses to be predicted more accurately. For instance, Thurner and his team discovered that people with diabetes have a higher chance of developing Parkinson's disease.



At the very beginning of a medicine or dentistry degree, candidates sit the MedAT aptitude test, which also ensures a balanced social mix of students.



Anita Rieder Vice Rector for Education For us, research-led teaching and adherence to international quality standards are basic requirements for good education. Our medical degree is accredited in accordance with the WFME\* Global Standards for Quality Improvement: Basic Medical Education.

#### Focusing on training doctors and framework conditions

The impending shortage of doctors that is frequently bemoaned in the public sphere is not due to a lack of medical graduates in Austria, but to the fact that so many move abroad. That is why MedUni Vienna wants to work together with policymakers on the framework conditions in the healthcare sector, as well as addressing the topic of medical education in a focused manner. The new regulation for medical education that came into effect in 2015 (on the basis of the *Ärztegesetz* [Doctors Act]) should, among other things, slow the pace of emigration by young doctors. Additionally, since 2016 MedUni Vienna's medical education task force has been working on a complete relaunch of education at Vienna's university hospital. In 2018, the university will continue to focus intensively on the curriculum, since the institution's future-readiness is determined to a great degree by the quality of training received by our upand-coming colleagues.

## Good marks in university rankings

Developing the university's high-quality academic teaching and training will also help to further boost MedUni Vienna's admirable performance in international rankings. In the respected US News university rankings, MedUni Vienna was again among the top 100 European universities, at place 89. It was also confirmed as one of the world's best medical universities, taking place 56 in the Clinical Medicine category. Austria's largest medical university has received top marks in the International Orientation category several times. MedUni Vienna also scored highly when it comes to knowledge transfer. Other noteworthy achievements in teaching in 2017 included receiving the German Association for Medical Education's award for innovative teaching project ideas, and the relaunch of the teach the teacher programme.



An interest in medicine and health can't start early enough – following this principle, the children's medical university welcomes thousands of curious young scientists every year.

## > The children's medical university

*KinderuniWien* celebrated its 15th birthday in 2017. In July, once again various higher education institutions in Vienna opened their doors to curious young researchers aged between seven and 12. At MedUni Vienna, the *KinderuniMedizin* programme revolved around the theme of "Save lives, help people." Around 6,000 children attended a total of 87 classes. MedUni Vienna's children's medical university aims to kindle an interest in medicine in the next generation and inspire enthusiasm for science and research. The teddy bear hospital, a cooperation between MedUni Vienna, the Austrian Medical Students' Association (AMSA), the Vienna Medical Chamber and the Academic Student Association of Austrian Pharmacists, is always a big hit: in 2017 as always, the hospital's services for teddies, dolls and other soft toys were in high demand.

### Simulation training and patient actors

In the university's simulated patient programme, actors play the roles of real patients, presenting disease and life histories. The actors receive training at MedUni Vienna in a group setting before they play their part in communication skills training and assessment for future doctors.

Since the 2016-17 academic year, the university's Department of Pediatrics and Adolescent Medicine has provided interprofessional simulation training for students at MedUni Vienna and Vienna General Hospital's School of Child and Youth Care. The initiator of the project, Michael Wagner of the Department of Pediatrics and Adolescent Medicine, received a prize for interprofessional team training in education at the Austrian Patient Safety Awards.

The technology for the programme is provided by SimCharacters, a MedUni Vienna spin-off. SimCharacters creates high-tech, convincingly life-like simulated patients, from newborns upwards, to simulate medical emergencies as realistically as possible for doctors' education and training. In 2017 the young company was awarded the largest private research funding prize in Austria, the Houskapreis, worth EUR 150,000.



## Patient admissions – a sticking point

The long-term roadmap for patient care was defined in January 2016 by three agreements - the cooperation agreement, the finance and target control agreement, and the construction framework agreement. The issue of patient admissions will continue to be challenging in the future. More than 400 specialised clinics are open to patients - a very broad provision, which is in high demand. MedUni Vienna is obliged to cover 28% of primary care cases in Vienna – but the actual figure is 36%. The agreed quota of 25% of inpatient admissions is also regularly exceeded. This means that Vienna General Hospital exceeds fulfilment of care provision. and treats an above-average proportion of cases in comparison with other university hospitals.

### Patient care: taskforces deliver results

New efforts will work against this trend to ensure that teaching and research continue to receive due priority in the future. Strengthening the role of the Vice Rector for Clinical Affairs is set to have a positive impact: newly established taskforces will focus on issues such as medical training, the MedUni Vienna General Hospital Campus, and the University Medicine 2020 project. Individual taskforces dedicated to specific topics have already met with success, for example in restructuring shift schedules, which was necessary following the revision of the Hospital Working Hours Act.

### Internal quality management certification

In October 2017 MedUni Vienna was awarded AO Austria certification for internal quality management by the Agency for Quality Assurance and Accreditation Austria. This means the university's internal quality management system underwent a successful audit in accordance with the guidelines for assessing such systems at higher education institutions. Unlike at many other universities, the audit included central administrative services, in particular the Studies and Examinations Department, University Library and Clinical Trials Coordination Centre.

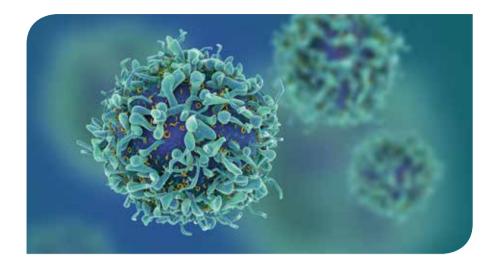
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## Vienna Cancer Center

In May 2017 Executive City Councillor Sandra Frauenberger, Michael Binder of Vienna Hospitals Association and Christoph Zielinski from MedUni Vienna presented the new Vienna Cancer Center (VCC). Cancer patients will benefit from pooled experience thanks to collaboration between six of Vienna's other hospitals in addition to MedUni Vienna/Vienna General Hospital, and the centre will add to and permanently bolster Vienna's position as a location for science and research, facilitating more and bigger cancer-specific studies.

## Centres for oncology extend life expectancies

"Better collaboration between experts thanks to the Vienna Cancer Center means that tumour patients can benefit directly from scientific progress by taking part in clinical trials," emphasises Christoph Zielinski, Head of the university's Department of Medicine I and of the Comprehensive Cancer Center (CCC), which provides a model for the VCC. In other cities where oncology centres like the VCC have already been established, life expectancies for cancer patients have clearly improved.

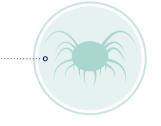


#### • Cancer Research/Oncology Research Cluster

MedUni Vienna has established an interdisciplinary centre, the Comprehensive Cancer Center (CCC), on the basis of the Cancer Research/Oncology Research Cluster. A joint facility of MedUni Vienna and Vienna General Hospital, the CCC combines interdisciplinary care for cancer patients with clinical and basic research, and research-led teaching. This results in innovative diagnostic and treatment methods that the CCC makes available to patients. Patients also have the opportunity to take part in the latest Austrian and international research programmes.



Oswald Wagner Vice Rector for Clinical Affairs A key objective of joint operational management is for Vienna General Hospital to focus on research-driven medicine. Plans are progressing for the clinical centres for paediatrics, cardiovascular medicine, perioperative care and neurology.



#### Immunology Research Cluster •

Conditions such as rheumatoid arthritis, arteriosclerosis, diabetes mellitus, allergies and inflammatory bowel disease are among the most common consequences of defective immune system responses. However, infectious diseases are also a growing threat. As the complexity of immunological disorders requires an interdisciplinary approach, the Immunology Research Cluster brings together research into allergies, inflammation and infectious diseases, and develops new concepts for diagnosis and treatment.





**Herwig Wetzlinger** Director, Vienna General Hospital (a business unit of Vienna Hospitals Association)

Two years in, the cooperation agreement between Vienna General Hospital and MedUni Vienna is running smoothly, with both partners looking forward to meeting the challenges ahead.

### People: international experts in Vienna

"The university is not the buildings and the operations, but the fantastic people that perform outstandingly here every day," says MedUni Vienna Rector Markus Müller. HR policy for the coming years has one overarching goal: to bring even more top international researchers to Vienna, helping to establish planned focus areas and enhancing MedUni Vienna's position as a leading medical university.

## New opportunities for top talent

In addition, the new career progression model will be further developed. Müller highlights the internal model that includes a development agreement: "At a time when there is competition for the best talent, it is important to present an attractive offer to top experts, so that they want to come here and stay. We have already filled 30 such positions, and further invitations for applications were published at the beginning of 2018." The University Council also has new members, appointed for the 2018-2023 period. Brigitte Ettl, Medical Director of Hietzing Hospital and Thomas Zeltner, former Director General of the Swiss Federal Office of Public Health and WHO Special Envoy, were nominated by the University Senate, and the Austrian federal government appointed newspaper publisher Eva Dichand (who is the new chairperson) as well as radiologist and former State Secretary of Health Reinhart Waneck. The University Council elected Professor Irene Virgolini of the Medical University of Innsbruck to be its fifth member

## > Top prizes

In January 2017, the prestigious Fritz J. and Dolores H. Russ Prize – often called the "Nobel prize for engineering" – was awarded to Christoph Hitzenberger and Adolf Fercher (who sadly died just a few weeks later). The two researchers from Vienna were significantly involved in the development of optical coherence tomography (OCT), a laser technology that is used for medical imaging and that led to a revolution in ophthalmological diagnosis. Read more about the latest developments in OCT on pages 40 and 41.



#### Infrastructure: the MedUni Vienna General Hospital Campus

EUR 1.4 billion will be invested in building and infrastructure projects at the Vienna General Hospital site to 2030. This will be a landmark investment drive for MedUni Vienna, enabling the creation of the integrated MedUni Vienna General Hospital Campus. The green light has already been given for two new research centres that will open on the campus by 2025, and financing has already been secured for the Center for Translational Medicine and Therapies. The Center for Precision Medicine will be paid for by private donations, sponsors and third-party funding - see page 24 for further details.

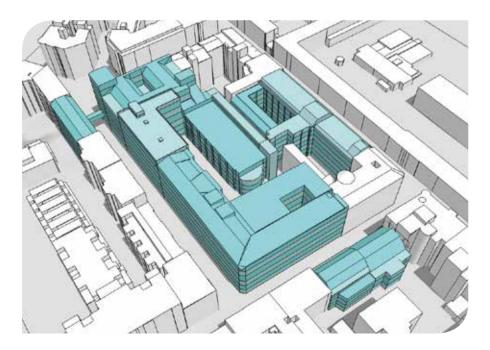
#### MedUni Campus Mariannengasse project under way

Work on the Mariannengasse Campus project started in autumn 2017. This will bring significant areas of preclinical care together over 35,000 square metres of floor space. The new investments are expected to result in better use of synergies and infrastructure. The campus will be fully operational as part of the university from the 2025 winter semester. An architecture competition is the next step, with the winning project to be announced in summer 2018. A functional layout concept is already in place. The key priority is to integrate research and teaching in one complex.



Volkan Talazoglu Vice Rector for Finance With the start of work on the MedUni Mariannengasse Campus, we have laid the foundation for realising the vision of an integrated, comprehensive MedUni Campus that will reflect cooperation between basic, translational and clinical research as well as medical education.

Begun in autumn 2017, the MedUni Mariannengasse Campus construction project will create 35,000 square metres of floor space.



#### • Cardiovascular Medicine Research Cluster

Numerous factors play a part in the development of cardiovascular conditions, which affect all of the body's organ systems. In addition to cardiovascular disease, the principal objects of the Cardiovascular Medicine Research Cluster's research are imaging and non-imaging diagnosis, as well as epidemiology and genetic research. The cluster is also known for its basic research into vascular biology and thrombosis, and interdisciplinary activities ranging from biomechanics to gene and stem cell therapy.



#### Medical Imaging Research Cluster

The Medical Imaging cluster brings together the MedUni Vienna institutes and research facilities involved in imaging – covering diagnosis, individual risk stratification, and therapy planning and monitoring for personalised diagnosis and treatment plans. Due to the complexity of imaging research, a range of methods from various specialist fields are integrated in the cluster. It aims to enable earlier diagnosis and improved characterisation of diseases, and to develop new therapy approaches.



#### • Medical Neuroscience Research Cluster

MedUni Vienna researchers focusing on Alzheimer's, depression, multiple sclerosis and pain have an outstanding international reputation. The Medical Neuroscience Research Cluster carries out research into all areas of neuroscience and the psychosocial sciences. The principle goal is to increase understanding of the pathophysiology of nervous system disorders. Research findings lead to improved diagnosis and treatment for patients with these conditions.





## University Clinic of Dentistry: "Better with a smile"

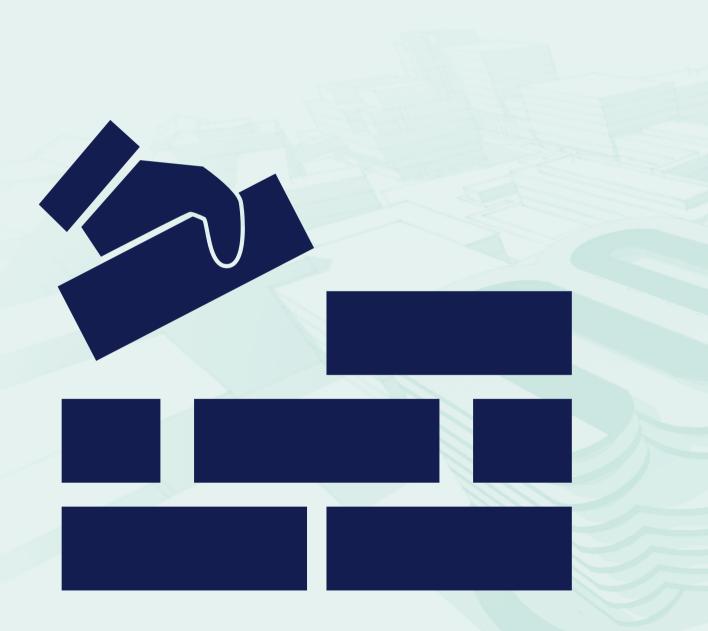
The open day at the Clinic of Dentistry on 20 October was a great success, with close to 1,000 visitors coming to the Clinic to hear short talks, take part in practical demonstrations and tour the individual departments. All of the different Clinical divisions, specialist clinics and research units had the chance to present the latest new treatments and research findings.

The Clinic of Dentistry added three more specialist clinics in January 2017:

the Bleaching Specialist Clinic headed by Anja Jankovic-Pejicic, the Digital Dentistry Specialist Clinic headed by Christoph Kurzmann, and the Mineralisation Disorder (Molar Incisor Hypomineralisation) Specialist Clinic under Katrin Bekes.

In September 2017 Florian Beck and Hermann Agis of the Clinic of Dentistry were both presented with a Robert Frank Award at the Oral Health Research Congress of the International Association for Dental Research: Florian Beck took first place in the Senior Clinical Research category, and Hermann Agis received second place in the Senior Basic Science category.

Vienna's University Clinic of Dentistry, a subsidiary of the Medical University of Vienna, has around 400 employees and is one of the largest and most advanced university dental hospitals in Europe. In 2017 it treated a total of 38,138 patients, providing 138,646 treatments.



# ZPM – Center for Precision Medicine

Serious illnesses no longer mean the end.

"A future free from fear" is the vision behind precision medicine, a discipline which promises to deliver a paradigm shift in the way that patients are treated. A grand vision which calls for private donations before it can be realised.

# Shaping the future of medicine

MedUni Vienna is making a clear statement of intent with the ZPM – Center for Precision Medicine and two other research centres: towards a new approach to medicine.

**In one of the University's** biggest ever investment programmes, three centres on the Vienna General Hospital campus covering a total of around 60,000m<sup>2</sup> will shape the future of medicine in the 21st century: the ZPM – Center for Precision Medicine, Center for Translational Medicine and Therapies, and Center for Technology Transfer. The goal is to finance the Center for Precision Medicine through private donations, sponsorship and third-party contributions. Funding for the other two centres has already been secured.

#### Leading centre planned

Construction of the EUR 60 million Center for Precision Medicine is scheduled to begin in 2022. The facility is destined to become one of the leading research and development centres for this discipline, and play a major role in shaping medical progress in the twenty-first century.

## Significant benefits for patients

The new centre will focus on biomedical research, clinical trials, genome technology, bioinformatics and IT. Its close proximity to Vienna General Hospital delivers an additional advantage for patients: clinical practitioners and basic researchers can easily get together to collaborate and share cutting-edge findings with one another, giving patients better access to the very latest treatments. Michael Gnant Chair of the Senate 2017 saw a number of important watershed moments for the future of leading-edge medicine: the best medicine is always research led – basic, translational and clinical research will allow us to maintain our leading role into the future.

### > ZPM – Center for Precision Medicine

Scheduled start of construction: 2022

Cost:	EUR 60 million
Financing:	external funding, private donations
Gross floor space:	7,800m²



Erhard Busek Chair of the University Council MedUni Vienna is making impressive strides. This is not only reflected in its international profile, but can also be seen in the energy and dedication that goes into setting standards in infrastructure, research and teaching in a changing world, to meet the major challenges facing healthcare in Austria.

## Committed to world-class medicine

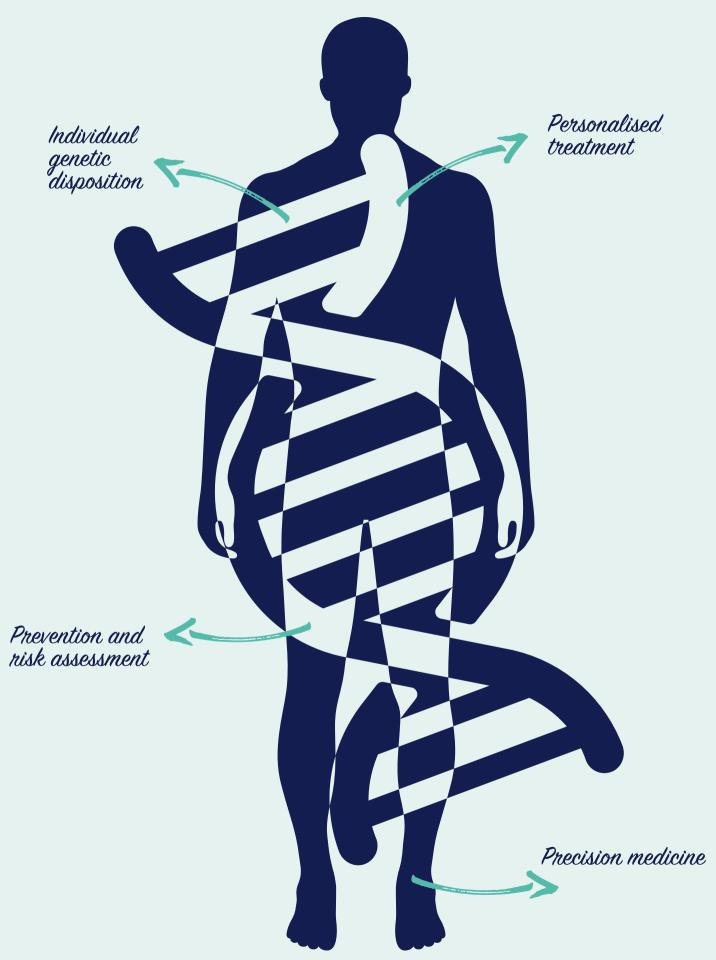
MedUni Vienna sees the Center for Precision Medicine as part of its tradition of defending and building on its leading international role, as one of the very best medical universities in the German-speaking countries. Many of the university's researchers are among the most published scientists worldwide. And Vienna General Hospital is one of the largest hospitals in Europe, with a reputation to match.

#### A duty to the future

Famous names such as Karl Landsteiner, who discovered blood groups, and hygiene pioneer Ignaz Philipp Semmelweis, as well as the founding of the world's first skin, eye, and ear, nose and throat clinics all provide an impressive reminder of the role played by Viennese medicine, and have established a tradition of excellence that it is our duty to uphold in the future.

## > Rethinking medicine

Precision medicine – also known as personalised medicine – is driving a paradigm shift in medicine. Contemporary diagnostic techniques including genome sequencing and molecular imaging are the foundation of precision medicine. This will make it easier to give patients more targeted and individualised treatment in future.



# As unique as each individual

Each person has a different, highly individual genetic disposition. And this is why they are potentially at risk from particular diseases. As a result, the best form of treatment and prevention is personalised medical care – precision medicine.

This approach – as we can clearly see even at this early stage – is set to put countless previous medical advances in the shade. The traditional one-size-fitsall approach to treatment is often accompanied by significant side effects as well as poor outcomes in some cases.

## Looking for the underlying cause

Precision medicine is about much more than simply focusing on superficial symptoms. It aims to identify the true cause of a disease at the molecular level. This significantly increases an individual's chances of recovery, and brings peace of mind to people who are facing the prospect of illness. Molecular and digital analysis techniques such as genomics, metabolomics, molecular imaging, real-time monitoring, as well as high-throughput analysis such as drug screening are some of the technological applications that will be called upon - and will open the door to closely targeted prevention, diagnosis and treatment of disease.

#### Prevention and risk assessment offer peace of mind

Precision medicine also makes it easier to assess the risk of patients developing a certain condition. For instance, some people are at greater risk of heart failure on account of their genetic disposition. Thanks to precision medicine, it will be possible to pinpoint genetic defects like this and take appropriate measures in good time. Analysing genetic disposition helps to predict which patients will respond best to which medicines and therapies.

## Fewer side effects, better outcomes

Analysis using precision medicine will make it possible to determine the response rates to a given therapy more precisely in advance, while reducing or avoiding side effects for patients and bringing about significantly more successful outcomes – for a large number of conditions:

- Cardiovascular disease
- Mental illness
- Respiratory diseases
- Metabolic disorders and obesity
- Cancer
- Genetic diseases
- Infectious diseases
- Allergies
- Rheumatic diseases
- Autoimmune diseases
- Haematological diseases
- Neurological diseases
- Eye and ear diseases
- Urological diseases

# MedUni Vienna launches fundraising for precision medicine

Inspired by the slogan "serious illnesses no longer mean the end", MedUni Vienna launched a major fundraising campaign in October 2017 designed to raise awareness of precision medicine and generate funds for the construction of the ZPM – Center for Precision Medicine.



Markus Müller Rector The biggest opportunities brought forth by the new industrial revolution and postgenomic, digital medicine will have an immediate impact on teaching, research and personalised routine care.

RUMBA, CHA CHA, RHEUMATISI

#### Milestone for medicine

"The Center for Precision Medicine represents a major milestone for medicine in Austria. Doctors and researchers at this facility will make a major contribution towards ensuring that serious illnesses no longer mean "the end" in future. The discoveries made here will benefit all patients," explained MedUni Vienna Rector Markus Müller. "We hope that raising awareness in this way will enable us to reach potential supporters for the new centre."

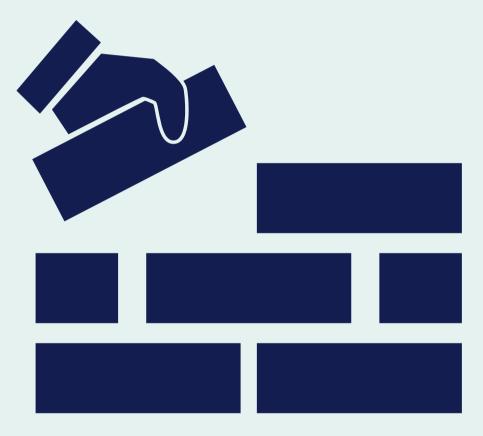
#### Life goes on – despite serious illness

Besides generating donations and raising awareness, the focus of the fundraising measures will also be on showing which conditions could be better treated or even cured through precision medicine. Illnesses can strike when people are in the prime of life, but thanks to precision medicine life goes on – serious illness no longer means the end. The campaign, featuring fullsize billboards, backlit posters and online banners was launched in autumn 2017.

> Serious illnesses are no longer the end. To make incurable conditions curable, please help us make the Centre for Precision Hedicine a reality.

# Make a donation now

Every euro counts – your support will help us to make twenty-first century medicine a reality with Center for Precision Medicine. And cure the incurable!



#### **Account details**

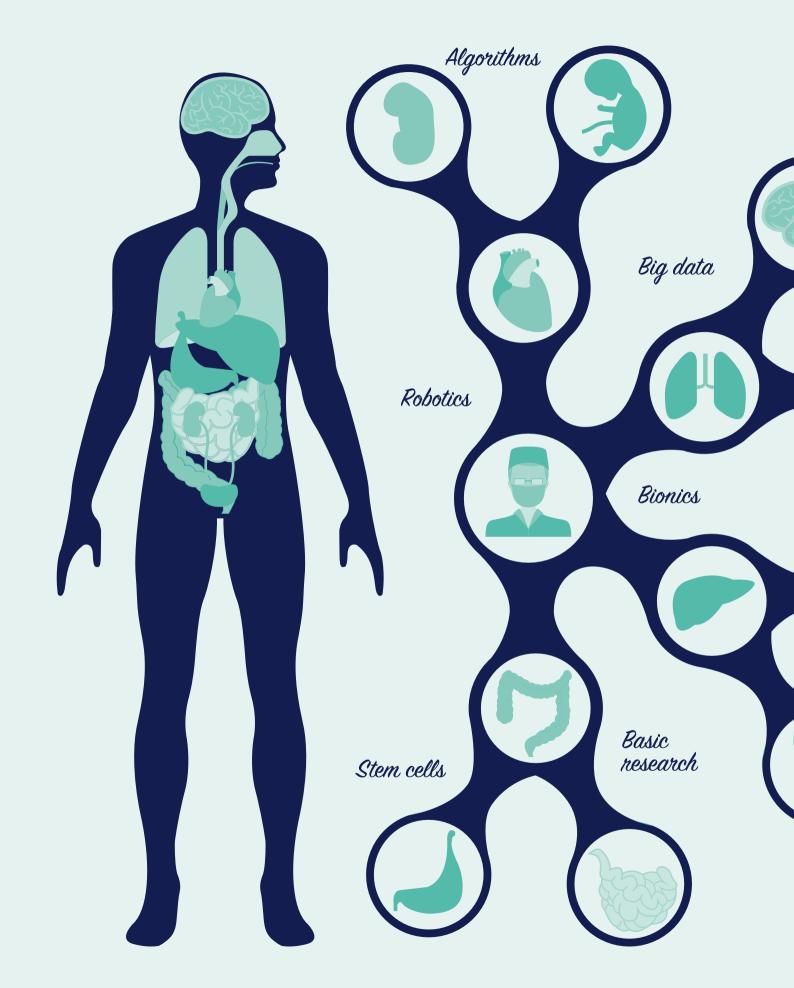
Erste Bank MedUni Wien ZPM IBAN: AT46 2011 1404 1007 0714 BIC: GIBAATWWXXX

#### **Donor service**

You can reach us by telephone Monday-Friday 9am–4pm Tel. +43 (0)1 40160-11525 fundraising@meduniwien.ac.at

Medical University of Vienna Fundraising Spitalgasse 23, 1090 Vienna meduniwien.ac.at zpm.at www.fb.com/zpmwien

Important: Donations for the Center for Precision Medicine are tax-deductible for taxpayers in Austria.



Artificial intelligence

# Getting more out of life – precision medicine



Medical science is currently changing at a fundamental level. The latest discoveries at MedUni Vienna show just how much.

Vaccinations

Heart disease, cancer, diabetes, autoimmune conditions, bionics, stem cell treatments and much more besides – the discoveries made at MedUni Vienna in 2017 are improving quality of life and extending life expectancy. Treatments based on molecular analysis are making a key contribution.

This approach will play an increasing role with the construction of the interdisciplinary Center for Precision Medicine, for which fundraising activities were launched in 2017.

## A bright future – even after a cancer diagnosis

Personalised treatment for cancer makes sense and is feasible: this is the central conclusion of the EXACT study, which was developed and carried out by Comprehensive Cancer Center (CCC), a joint institution of MedUni Vienna and Vienna General Hospital.

The study shows significantly longer survival times compared with traditional standard therapies, and stabilisation of the disease in around 60% of patients. Researchers at the CCC have successfully demonstrated the efficacy of personalised treatment and made a strong case for its inclusion in everyday clinical practice in future.

## Effective when all else fails

The study followed a group of patients who suffered from advanced cancer that was no longer responding to standard treatment approaches. Their tumours were characterised using molecular pathological tests to determine



»Depending on the type of tumour, long-term survival is now possible even in advanced stages of the illness, which until now have led to death in a very short space of time.«

#### New method: liposomes take therapeutic agents directly to target

Liposomes are phospholipid vesicles that can be used as drug delivery vehicles for medicines prescribed to treat several types of cancer. They are also used for treatment of fungal infections and in pain management. A group of Vienna-based researchers led by Anna Repic at MedUni Vienna developed a new, more direct method for optimising liposomes as delivery vehicles for specific types of cancer in collaboration with a team from the University of Minho, Braga, Portugal.

Hannes Stockinger, senior author of the study explains: "Major efforts are currently being made – with some success – to identify tumour-specific target structures in antibodies on individual tumours. This method, linked with our specifically functionalised liposomes, gives hope for personalised treatment of cancer patients, with fewer side effects." The study was funded at the Medical University of Vienna by the EU FP7 and Horizon 2020 NANOFOL and FOLSMART projects.

their specific features. These data were then used as the starting point for creating a treatment plan tailored to the individual patient's situation. Gerald Prager, lead study author: "We were able to show that patients with a solid tumour that is resistant to standard therapies benefit from molecular tumour characterisation."



## Important role played by basic research

Characterisation of the individual tumours required biopsy tissue to be removed by interventional radiologists, for analysis by molecular pathologists – demonstrating that personalised treatment approaches are only feasible in an interdisciplinary setting. Basic research played a special role here.

#### Translational research: from laboratory to clinic and back again

Patients also benefit directly from the latest findings of basic research: scientists can see the effectiveness of medications and which genetic mutations occur most frequently. "This then provides the next incentive for us to ask the question why, and get to work looking for new findings. This kind of feedback loop, essential to precision medicine, is what we call translational research," explained Maria Sibilia, Head of the Institute for Cancer Research and Deputy Head of the CCC.

#### Innovative substances improve prognoses and quality of life

Targeted cancer treatment is undergoing a paradigm shift at present. Cancer therapy research has progressed in leaps and bounds in recent years. New treatments are being approved on an ongoing basis, and the use of innovative immune therapies is being extended to new types of tumours. As a result, life expectancies are increasing all the time - as well as quality of life for patients. Experts are already talking about a revolution in oncology. With good reason, as shown at a press release hosted by Vienna MedUni in February a few days ahead of World Cancer Day. One example is treatment of tumours of the genitourinary tract, which are now significantly more treatable. "Depending on the type of tumour, long-term survival is now possible even in advanced stages of the illness, which until now have led to death in a very short space of time," confirmed Manuela Schmidinger from the Department of Medicine I. The most recent example of progress is in treatment of bladder carcinomas - the ninth most commonly occurring malignant tumour.

### Sexually active even after radiotherapy

Radiotherapy used to treat cervical, vaginal or vulvar cancer commonly leads to significant side effects on the vagina that prove a barrier to sexual activity. New medical methods and technologies which enable personalised treatment tuned precisely to the needs of the individual patient mean that is increasingly possible for women to remain sexually active following radiation therapy. This breakthrough brings together three pillars of precision medicine in radiation oncology: optimal prevention, precise radiotherapy of the tumour, and finally sex counselling. This was confirmed by sexual medicine expert Kathrin Kirchheiner from the university's Department of Radiotherapy, at the European Society of Gynaecological Oncology (ESGO) congress which took place at the Austria Center Vienna under the auspices of MedUni Vienna.

# Hope for children with brain tumours

A biomarker has been discovered that could make it possible to classify malignant brain tumours in children more precisely – the presence of the enzyme telomerase can provide information about the progression of the disease and significantly increase quality of life for children.

Primary tumours of the brain and spinal cord are the second most common form of cancer in children and adolescents. after leukaemia. The presence of the enzyme telomerase characterising a particularly malignant subgroup of cerebellar ependymomas could provide information that allows a more accurate prognosis and, as a result, more precise choice of treatment. This was shown in the results of a study conducted at the Comprehensive Cancer Center (CCC) and published in top journal Neuro-Oncology.

#### Better quality of life for sufferers

The study looked at whether telomerase could be used as a biomarker for ependymomas. Study leader Johannes Gojo from MedUni Vienna: "We were able to show that telomerase was reactivated chiefly in particularly aggressive tumours – meaning where the tumour recurred despite surgical removal and subsequent radio and chemotherapy." The researchers believe this could be an effective way to identify which patients would benefit from a more intensive course of treatment. Conversely, patients with less aggressive tumours could be spared chemotherapy. This would mean a huge improvement in quality of life for those affected.

#### International cooperation

The project is a collaboration between the Institute for Cancer Research at MedUni Vienna, the Neuromed Campus Linz and the German Cancer Research Center in Heidelberg. The study was funded at MedUni Vienna by the Jubilee Fund of the Oesterreichische Nationalbank, the

Mayor of Vienna's Medical-Scientific Fund, the Herzfelder Family Foundation and the Research Association for Cerebral Tumours.



# Hearing restored for the deaf

A modified virus works like a Trojan horse to deliver genes to repair genetically caused hearing loss. This "trick" can make the hair cells in the inner ear into working properly again.

There are more than 300 genetic defects that can prevent the hair cells in the human inner ear - its sensory nerve centre - from working properly. This can result in severely impaired hearing or even complete hearing loss. Together with researchers from the Harvard Medical School in Boston, Lukas Landegger of MedUni Vienna's Department of Ear. Nose and Throat Diseases has now successfully repaired this defect in an animal model for the very first time by using a modified, non-pathogenic adeno-associated virus (Anc80L65), which is introduced into the ear like a Trojan horse to deliver genes to restore the functionality of the damaged hair cells. The study was published in top journal Nature Biotechnology.

#### MedUni Vienna a leading ear, nose and throat centre

At the moment, ear, nose and throat specialists are able to use cochlear implants to restore hearing for people with genetically caused hearing loss. The Medical University of Vienna emerged internationally as a leader in the development and use of cochlear



implants in 1977, when the world's first multichannel cochlear implant was fitted in Vienna. "However, these electronic implants with their twelve electrodes cannot 100% replace the more than 3,000 hair cells in the inner ear, which give us much finer hearing," says Wolfgang Gstöttner, Head of Department of Otorhinolaryngology at MedUni Vienna. This problem could be solved by the new method.

#### New surgical method restores patient's hearing

Doctors at MedUni Vienna are already able to treat another condition with a method that offers new possibilities for the removal of benign tumours from the auditory nerve. A vestibular schwannoma is a benign tumour consisting of connective tissue and nerve tissue, which usually presses on the vestibular nerve and at the same time damages the auditory nerve.

Up until now it has not been possible to remove the tumour and simultaneously restore the patient's hearing. This is exactly what Christoph Arnoldner of the Department of Ear. Nose and Throat Diseases at MedUni Vienna and Christian Matula (Department of Neurosurgery) have now succeeded in doing for the very first time in Austria. "In an operation lasting approximately nine hours, we managed to remove the benign tumour on the vestibular nerve. which had caused deafness in the patient," Arnoldner explained. "And, by using a special access and measuring the function of the auditory nerve during the operation, we were also able to insert a cochlear implant during the same operation. So the patient is not only tumour-free, but has also had her hearing restored."

#### Just one look in your eyes tells all



## Improved 3D imaging with digital OCT technology

**Previously, optical coherence tomography (OCT)** required expensive adaptive lenses to correct images in order to achieve the best results. Now, MedUni Vienna researchers from the Center for Medical Physics and Biomedical Engineering have developed line field (LF) OCT, which makes examining cellular processes in the eye easier and enables more accurate diagnosis.

LF OCT technology – which corrects artefacts digitally, rather than optically – was presented by doctoral candidate Laurin Ginner, under the direction of Rainer Leitgeb, Head of the Christian Doppler Laboratory for Innovative Op-

tical Imaging and its Translation to Medicine.





Using personalised medicine, big data and artificial intelligence, a look into the eye can provide an accurate picture of general health.

According to Ursula Schmidt-Erfurth, Head of the Department of Ophthalmology and Optometrics and MedUni Vienna's leading expert in the field, the digital imaging of the retina delivers an enormous amount of data, yielding information about a patient's entire medical status. With the help of digi-

**Every year about** 

30,000

people are examined using OCT

technology at MedUni Vienna's

Department of Ophthalmology

and Optometry – the largest clinic of its type in Europe

tal methods and big data analysis, by examining the eye experts can gain insights into a patient's general medical condition and make early diagnoses. This precision medicine approach is all about ensuring "the right treatment for the right patient at the right time", Schmidt-Erfurth explains.

#### World first: diabetes diagnosis using retinal screening

"As a window on the condition of a person's brain and vascular system, the retina offers huge insights into a patient's life science data," says

Schmidt-Erfurth. In the future, at Med-Uni Vienna it will be possible to diagnose diabetes using the first automated retinal screening technique – and without the need for an ophthalmologist.

#### Viennese pioneers of ophthalmic diagnostics

The OCT data is analysed with the help of algorithms that are generated on the basis of artificial intelligence (AI). Both the device and the AI method were developed by MedUni Vienna. In 2017. Christoph Hitzenberger and Adolf Fercher from the Center for Medical Physics and Biomedical Engineering won the Dolores H. Russ Prize - the "Nobel Prize of Engineering" - for the development of the OCT technique. In the same year, Ursula Schmidt-Erfurth - who holds several patents for the development of the algorithms - was awarded the J. Donald Gass Medal by the prestigious Macula Society for establishing AI in ophthalmic diagnostics.

# Initial treatment successes for incurable liver disease

The liver disease primary sclerosing cholangitis is currently incurable. However, a European multicentre phase II trial has shown that it could be cured using a synthetically produced bile acid.

#### **"Primary sclerosing cholangitis** is one of the last unsolved mysteries of hepatology," explains Michael Trauner,

Head of MedUni Vienna's Division of Gastroenterology and Hepatology, who led the study. "Curing it with norUrso [active agent: nor-ursodeoxycholic acid/nor-urso] would represent a major breakthrough in hepatology." Primary sclerosing cholangitis is a rare disease with a poor prognosis. It mostly affects younger people aged between 30 and 40 and can lead to liver cirrhosis and cancer of the bile duct.

#### Effective, safe and well-tolerated

The trial was carried out in collaboration with the Medical University of Graz and Hannover Medical School. Published in the prestigious Journal of Hepatology, the results demonstrated that norUrso was clinically effective, safe and well-tolerated. It works directly on the bile duct and flushes the biliary tract of toxins. The study also offered hope that norUrso could be used in other ways, such as to help halt the progression of liver fibrosis and improve connective tissue. Investigation of these aspects will form part of a phase III clinical trial.





Benefits for

of all patients

90%

#### Robotic techniques improving surgery

Until recently, the removal of bowel tumours in the lesser pelvis (rectal cancers) generally involved a major invasive operation. Thanks to an innovative new procedure, this surgery can now be carried out in a way that has much less negative impact on the body.

The procedure uses improved 3D imaging and robotic instruments to keep surgical trauma and incisions to a minimum. It also produces excellent results in terms of tumour removal. At the beginning of 2017, the Comprehensive Cancer Center (CCC) became the first facility in Austria to receive European Academy of Robotic Colorectal Surgery (EARCS) certification, when the EARCS awarded the CCC's robotic colorectal surgery programme its seal of approval. The centre's robotic surgery experts Thomas Bachleitner-Hofmann and Michael Bergmann estimate that in future some 90% of rectal surgery procedures will be performed using robot-assisted techniques.

#### Certified surgeons help to ensure quality

The EARCS provides surgeons with comprehensive training in new robotic surgery methods to ensure uniform standards of treatment and further improve patient safety. Currently, there are only about 25 surgeons with this type of training and certification in Europe. Bachleitner-Hofmann and Bergmann were the first to be certified in Austria.

#### Benefitting over 1,000 patients a year

Around 1,100 people are diagnosed with rectal cancer in Austria every year – about a third of these with a tumour at the end of the gastrointestinal tract, termed a low-lying tumour. The location of these tumours presents a big challenge for surgeons. They are also surrounded by dense networks of nerves, which if damaged can easily result in incontinence or loss of sexual function.

### GASTROINTESTINAL TRACT

# **BREAST**

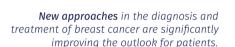
#### World-class research: significantly better quality of life and longer life expectancies for breast cancer patients

Fatality rates for women diagnosed with breast cancer have fallen by a third over the past 30 years. Interdisciplinary treatment strategies and molecularbiological approaches have played an important part in this.





The St. Gallen International Breast Cancer Conference is one of the largest meetings on the topic and took place in Vienna in March 2017.



5.000 women are diagnosed with breast cancer in Austria every year. However, prospects for patients are improving. Michael Gnant, Head of the Department of Surgery, President of the Austrian Breast and Colorectal Cancer Study Group (ABCSG) and Deputy Head of the CCC explains: "These days it's difficult to imagine being able to provide effective treatment without taking an interdisciplinary approach. We can do this at the CCC because we've combined all the disciplines under one roof - from basic cancer research, to the various specialisms involved, to clinical research. This also enables us to stay at the forefront of medical advances." Florian Fitzal, from the Department of Surgery and Head of the CCC's Surgical Breast Health Center, adds: "Collaboration between basic researchers and clinical practitioners is a primary objective." This type of interdisciplinary approach to treatment was also a central focus of the 2017 St. Gallen International Breast Cancer Conference - one of the largest international conferences on the topic - which took place in Vienna in March.

#### Potential overtreatment a hot topic

On the eve of the St. Gallen International Breast Cancer Conference, the Vienna Breast Surgery Day hosted by MedUni Vienna put the spotlight on the issue of overtreatment of breast cancer. For instance, there is potential for improvement in the treatment of ductal carcinoma in situ (DCIS), with which 30% of all breast cancer patients are diagnosed, as Fitzal explains: "Overtreatment often means severe side effects for patients without any therapeutic benefit. This is why we are looking into the best form of treatment for DCIS together with international experts at the conference. The long-term aim is to categorise DCIS cases more precisely into biological subtypes, so we can more accurately identify the patients who don't require any further treatment following surgery."

#### Postmenopausal breast cancer: shorter treatment and fewer side effects

In another area of breast cancer treatment, there is now reliable evidence that shorter periods of treatment are sufficient. In cases of postmenopausal breast cancer, five years of hormone therapy (also called endocrine therapy) after a tumour has been surgically removed is a standard treatment. However, the results of a study (ABCSG 16/S.A.L.S.A.) carried out by the ABCSG show that two years of secondary therapy with the aromatase inhibitor anastrozole is enough. If the treatment is administered for five years there is no improvement in outcome, but side effects can worsen.

#### Breast reconstruction following tumour removal

For many breast cancer patients, coming to terms with the complete or partial loss of their breasts is traumatic. "This doesn't have to be the case. because there are a variety of breast reconstruction methods which can restore physical integrity and help women to keep their sense of femininity. The treatment just needs to be planned at an early stage, and undertaken at a dedicated centre like the one we have at MedUni Vienna and Vienna General Hospital," explained Christine Radtke, Head of the Division of Plastic and Reconstructive Surgery, member of the CCC and an expert in breast reconstruction. during Breast Cancer Awareness Month in October.

### Lung transplant recipients celebrate conquering Kilimanjaro

MedUni Vienna organised an expedition to climb Kilimanjaro and provided scientific support.

**In June 2017** ten people with lung transplants from a variety of countries climbed Mount Kilimanjaro – Africa's tallest mountain at 5,895 metres. The climbers were aged between 23 and 63 and had all received a lung transplant at MedUni Vienna and Vienna General Hospital's Department of Surgery in the previous 15 years. One of the partic-

ipants had even had a combined liver and lung transplant.

#### A test of physical endurance under medical supervision

Doctors, physiotherapists and nurses who were part of the 24-strong support team examined the climbers every day to ensure that they received proper care and were not putting their health at risk. MedUni Vienna staff carried out a range of scientific tests to measure the impact of the participants' physical exertion.

#### Leading an active life following a transplant

The expedition was initiated by Peter Jaksch from the Department of Surgery. Several publications based on the scientific results of the project and the overall concept are planned. Jaksch has already reached one clear conclusion: "The expedition proves that it's possible to lead an active life again after suffering serious illness and undergoing lung transplantation surgery."



»The world's most intelligent pump system.«



#### Personalised heart pumps give patients a feeling of security

This new technology makes it possible, for the first time anywhere, to precisely monitor patients who have a heart pump implant.

**"This is the most intelligent** pump system in the world," claim Heinrich Schima and Francesco Moscato from MedUni Vienna's Center for Medical Physics and Biomedical Engineering. The new system makes it possible to analyse every detail of the performance of both the heart and the pump. The goal is that in the future, the data will be accessible at any time in clinical practice to support personalised therapy. This innovation was presented at the conference of the European Society for Artificial Organs – the largest gathering in this field in the world – which was held in September 2017 at MedUni Vienna.

#### Artificial hearts – the bridge to survival

An artificial heart programme, started in 1967 at the Second Department of Surgery, made Vienna into an international centre for the development and testing of pumps to support the functioning of the heart. Today, thousands of rotary pumps are used in clinical treatment worldwide. A significant amount of the development work for this device took place in Vienna. To celebrate the 50th anniversary of the start of the programme in 2017, the Josephinum at MedUni Vienna staged an exhibition entitled Artificial Hearts – the Bridge to Survival.

#### Greater security for patients

At present, 20 patients have received a mini heart pump – as a temporary implant while waiting for a transplant – equipped with the intelligent system. The data are checked when the patient leaves the hospital, at clinic appointments and if a patient reports irregularities. Moscato explains: "We can measure and analyse cardiac arrhythmia, blood clot formation or hypertension episodes."

# IMMUNE SYST

# Privately funded initiatives support women's health

Around 300,000 women are affected by endometriosis in Austria alone. New, groundbreaking discoveries made thanks to an innovative endometriosis-specific blood and tissue bank are giving cause for hope – partly made possible by private funding from businesswoman Ingrid Flick.



# EM

Long-term funding amounting to a six-figure sum for the Interdisciplinary New Gynecological Research Group in the Field of Endometriotic Disease (IN-GRID) has secured research projects at MedUni Vienna focused on endometriosis, a condition for which the cause is not yet clear and that is often difficult to diagnose. In one of these projects, promising biomarkers – the adhesion molecules soluble VCAM-I (SVCAM-I) and soluble ICAM-I (SICAM-I) – could make diagnosis of the disease much easier. "There is a great need for a non-invasive method of diagnosis –

firstly, to spare patients a surgical intervention and the associated risks if possible, and secondly so that targeted treatment can be started more quickly," explain study authors Heinrich Husslein and Lorenz Küssel of the Department of Obstetrics and Gynecology.

#### First-class scientific research thanks to private support

"Private initiatives like this have a decisive role to play in Vienna's advancement as a top global location for research," comments MedUni Vienna Rector Markus Müller. "Mrs Flick's generous contribution joins MedUni Vienna's major fundraising initiative for building the Center for Precision Medicine at the MedUni Vienna General Hospital Campus.

#### Austria needs more private funding in the medical research sector

"Medical research in particular has enormous potential to improve people's lives significantly through new discoveries. That is why I think it would be good to see many more privately funded medical research projects in Austria in the future than there are now," says Ingrid Flick, who has actively supported science and research for many years.

»Private initiatives have a decisive role to play.«



### Targeted manipulation of the immune system

A serious bacterial infection – for example caused by Listeria – can activate the immune system in such a way that subsequent inflammatory reactions and their consequences quickly become fatal. Scientists from MedUni Vienna and Max F. Perutz Laboratories, led by Gerhard Zlabinger, were able to show in animal models that this kind of excessive reaction by the immune system can be controlled by targeted manipulation of sugar metabolism, resulting in an efficient immune response without damaging side effects. Manipulation of sugar metabolism and the accompanying regulation of the immune system could open up new treatment options for certain infectious and autoimmune diseases. A number of projects in this area have been initiated at MedUni Vienna's Institute of Immunology.

# A breath of fresh air for asthma sufferers

# ALLERGIES

A new approach removes the triggers of allergic asthma by sucking out antibodies. And a combination therapy based on this promises to deliver even better results.

»New methods offer greater quality of life.«

Allergies are the most common cause of asthma, due to the production of antibodies called immunoglobulin E (IgE). MedUni Vienna scientists have a method of sucking these antibodies out of the blood. The researchers, headed by Rudolf Valenta and lead authors Christian Lupanek, Kurt Derfler and Ventzislav Petkov, were able to show that the removal of the antibodies significantly improved the quality of life of patients during the pollen season. The method they developed is named the IgEnio column. This specific, single use adsorber for treatment of disorders caused by IgE reduces IgE levels in the blood.

#### Combination therapy for even better results

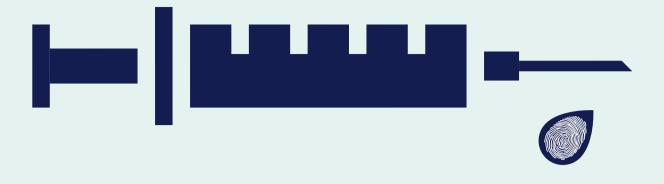
Particularly for people with high levels of IgE in their blood, and who still suffer from asthma symptoms despite taking medication, the treatment can significantly improve quality of life. And not only that – the research showed that a combination of IgE adsorption and the conventional medication omalizumab produces even better results.

#### > Apple allergy sufferers able to enjoy apples again

Birch pollen-related food allergy commonly accompanies a birch pollen allergy, with about 70% of birch pollen allergy sufferers also allergic to apples. A research group headed up by Barbara Bohle of the Institute of Pathophysiology and Allergy Research, working in close collaboration with Tamar Kinaciyan at the Department of Dermatology, demonstrated that the apple allergen Mal d 1 significantly alleviates apple allergy symptoms: "Following treatment, six of the 20 participants could eat two apples a day without any complaints. All of the other participants reported significantly reduced symptoms, meaning they no longer had to completely avoid eating apples," Bohle reports.

The results of the phase II study will now be verified in a phase III study – once this is complete and a pharmaceutical industry partner can be found, the new immune therapy for apple allergy sufferers could be available within a few years.





## New HPV vaccine saves lives

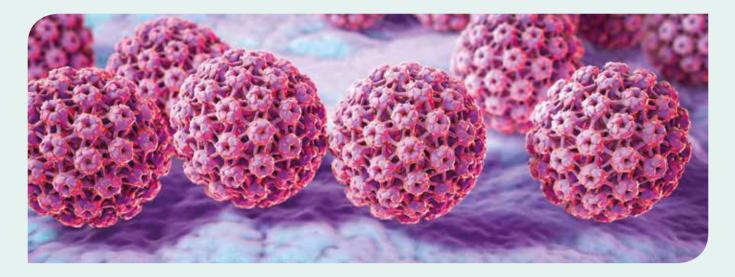
A vaccine against new subtypes of the human papilloma virus (HPV), which was partly developed at MedUni Vienna and approved in 2015, has demonstrated a positive impact in a long-term study: it can prevent 90% of all diseases triggered by HPV.

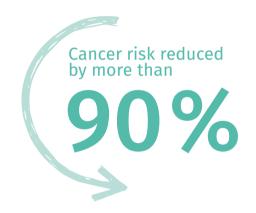


The new vaccine is 20% more effective at providing protection against cervical cancer than the first generation of HPV immunisations: up to 30% more effective against early cervical cancer, and 5-15% more effective at preventing other forms of cancer (e.g. vaginal or anal carcinomas). The vaccine has demonstrated up to 98% efficiency. It has been approved in Western Europe as well as various Eastern European countries, in the USA and most recently in Australia.

#### Cancer risk reduced by 90%

"This vaccine is one of the best-studied and safest there is," explains study author Elmar Joura from MedUni Vienna's Department of Obstetrics and Gynecology. "With high immunisation rates, HPV-related diseases could be eliminated over the long term." In combination, HPV screening and the nine-valent HPV vaccine reduce cancer risk by more





than 90%, according to the results of the study, published in respected journal The Lancet.

#### HPV to become a "rare disease"?

The nine-valent vaccine in combination with HPV screening provides the best protection. Austria is the first country in the world to offer girls and boys the nine-valent HPV vaccine at age nine, free of charge. This combination is so promising that Canada, for example, has made the eradication of HPV a health policy goal. A goal that, according to Joura, is not unrealistic if the effects of immunisation have a cross-generational impact. After some years, Joura believes, it may be that HPV will be regarded as a "rare disease." Nevertheless, everyone should have themselves vaccinated against HPV, even older people.

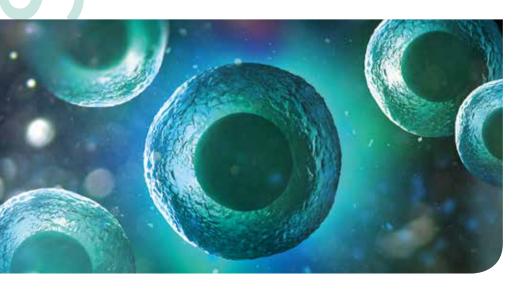
#### > Dangerous HPV

Strains of human papilloma virus (HPV) infect epithelial cells in the skin and mucous membranes. and can cause tumorous growths. Some of these viruses can cause malignant tumours - in particular cervical cancer. Men can also develop cancer as a result of HPV infection. In Austria, up to 400 women contract invasive cervical cancer every year. In over 90% of these cases, HPV is responsible. Between 150 and 180 patients die from this form of cancer annually, according to Statistics Austria. In addition, 6,000 women are admitted to hospital in Austria each year for surgery to treat early cervical cancer.

# Safe stem cell treatments

Stem cells control other nearby cells and are responsible for inducing specific functions in them. In a world first, this phenomenon – the "language of stem cells" – was revealed in the leading journal Nature Communications.

#### New stem cell treatments for a wide range of diseases are currently under development in dozens of international clinical trials. The underlying principle behind such treatments is the use of stem cells to produce specific human cells in the laboratory, such as cardiac muscle cells, nerve cells and pancreatic islets, for transplantation into patients. One of the problems the researchers are trying to overcome is that stem cells can also cause tumours.



#### The enticing call of the stem cell

Stem cells sometimes lead to the development of tumours by attracting other cells from surrounding tissue using their own special "language". The signals they emit tell nearby cells to leave their current location in order to perform specific functions in other parts of the body. "Observing the big changes stem cells bring about in the body's cells is fascinating," says the publication's lead author, Margit Rosner. Tumour growth as a potential side effect of stem cell therapy is therefore always a result of a symbiosis between the stem cells and the cells they recruit from surrounding tissue.

#### Effective inhibition of stem cell tumours

The authors of the study also managed to decipher the underling molecular mechanism. "We were able to demonstrate that blocking this mechanism can effectively inhibit stem cell tumour development," comments Markus Hengstschläger, Head of the Institute of Medical Genetics.

# DIABETES

# Protein for potential diabetes treatments

Premature beta cell death disrupts insulin release in diabetes sufferers. Katarzyna Malenczyk from MedUni Vienna's Center for Brain Research and an international team of researchers were able to demonstrate that loss of the protein secretagogin causes beta cells to die more quickly – and that this is preventable.



"We showed for the first time that there are significantly lower levels of secretagogin in diabetes suffers, from which we inferred that there could be a direct link between levels of this protein and the disease," explains Tibor Harkany, Head of the Division of Molecular Neurosciences at the Center for Brain Research. The conclusion: "If we can keep the beta cells active, we will also be able to ensure their survival."

#### A trigger for secretagogin

Malenczyk and the research team were able to prove that the protein's activity can be controlled by stimulating TRPV ion channels. The protein TRPV1 is expressed in the nervous system as well as in the B cells of the pancreas. More secretagogin is produced if this receptor is stimulated. This can be achieved by administering capsaicin, which is found in chilli peppers. Capsaicin binds directly to TRPV1 ion channels and stimulates the regulation of numerous proteins. One of the most important of these is secretagogin.

#### Basis for new treatments

"Our discovery may well by a first step on the way to developing an effective diabetes treatment, and we need to conduct follow-up studies. It could also lead to doctors recommending that diabetes suffers eat more chillies," says Malenczyk.

#### Secretagogin – a Viennese discovery

Secretagogin was discovered in Vienna by Ludwig Wagner in 2000. He is also one of the co-authors of this paper, which sheds light on the exact role of the protein. Wagner is very pleased with the latest research: "I'm delighted that investigation into this protein has reached a stage where the molecular understanding of its function will lead to the development of new treatment possibilities."

# BIONICS



#### Major advances in man-machine interfaces on the horizon

In collaboration with Dario Farina from Imperial College London, a research team led by Oskar Aszmann decoded the "language of movement control". By carrying out a series of experiments they managed to identify the impulse patterns of individual motor units and translate them to bionic movement control. "The combination of cognitive nerve transfers with the signal decoding we described has enabled, for the first time, the development of intuitive control algorithms, allowing unprecedented freedom of movement. Ongoing experiments show that there is still massive potential to be exploited here, and that we are on course for huge advances in man-machine interfaces over the next few years," says Aszmann.

# Real alternative for patients with severe nerve damage

A new treatment algorithm is being used to help determine which patients could benefit from a bionic prosthesis.

When developing the algorithm the researchers drew on their experiences in treating patients with global damage to the brachial plexus network of nerves, at the Division of Plastic and Reconstructive Surgery between 2011 and 2015. For 16 of these patients, the nerve damage was so severe that they had lost complete function in a hand and were offered a totally new treatment: replacement of the hand with a myoelectric prosthesis – a bionic hand. The innovative technique attracted international attention and was covered by The Wall Street Journal and the BBC.

#### Identifying the right patients

The treatment algorithm developed by lead author Laura Hruby and her colleagues gives a reliable and objective indication of whether bionic hand reconstruction will be suitable for a particular patient. Oskar Aszmann from the Department of Surgery comments: "I have been treating patients with severe peripheral nerve lesions for over 25 years now. Bionic reconstruction as described in this paper is a significant breakthrough because it really helps patients who have no alternative and offers them renewed hope."



#### Kidney transplants: new strategies for longer organ lifespans



#### Medical applications of spider silk

Repairing damaged nerves and tissue with spider silk is an exciting new method for plastic and reconstructive surgery being developed by Christine Radtke, Head of the Division of Plastic and Reconstructive Surgery. The silk, which comes from Tanzanian golden orb-weavers, is more tear-resistant than nylon and four times more elastic than steel. It is also heat-stable up to 250 degrees Celsius, extremely waterproof and has antibacterial properties. These characteristics also make the material appealing to biomedical researchers. Initial studies carried out by Radtke in animal models show that the silk has enormous potential for nerve and tissue repair applications. Work is underway on certifying it as a medical product in preparation for human clinical trials.

Leading journal The Lancet invited Rainer Oberbauer to conduct a review of the current status of research and innovation.

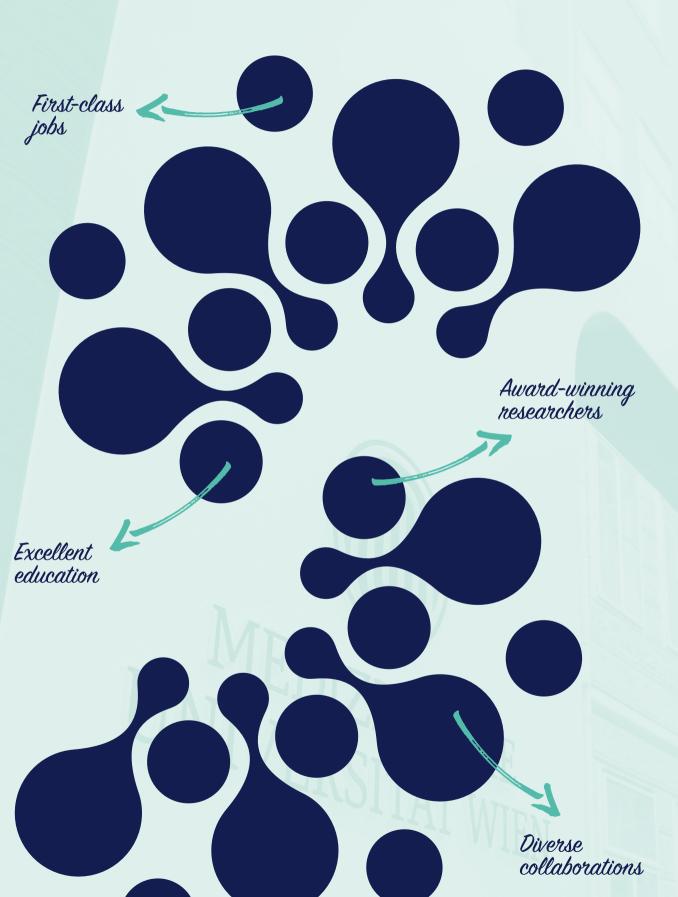
Thanks to the treatment strategies introduced over the last few decades, 95% of transplanted kidneys function well for at least a year, and their average lifespan is ten to 15 years. This was one of the key findings to emerge from a review of the current status of research which Rainer Oberbauer, Head of the Division of Nephrology and Dialysis, was invited to carry out by The Lancet.

#### Combined transplantation improves acceptance by the body

New approaches will help to further improve the positive prognosis for kidney transplant patients. Probably the most innovative of these was investigated by the review's lead author, Thomas Wekerle of the Department of Surgery: in addition to a kidney the patient also receives donated bone marrow to achieve tolerance. Initial trials confirm that this is a very promising method. The main benefit is that it would no longer be necessary to use immunosuppressants to counteract immune response.

#### Encouraging research in progress

Better donor-recipient matching, and considering whether relations or friends would be suitable donors at an early stage are further strategies that are growing in significance. Refrigeration of donor kidneys also leads to substantial improvements. A similar effect can be achieved by pumping fluids through the kidney prior to transplantation.



### Partners, careers, awards

MedUni Vienna has numerous cooperations and subsidiaries, outstanding researchers and a diversified educational offering.

> The university has built up excellent national and international links in life sciences. Its capabilities make Vienna one of the leading centres for medical science in Europe.

#### The EU factor

Programme and Euratom. 17 projects started in 2017.



# MedUni Vienna participated in a total of 65 projects with EU funding in 2017. MedUni researchers were involved in 39 new projects selected for the EU's highly competitive eighth framework programme, Horizon 2020, and 15 projects that continued in 2017 under the seventh framework programme. Six EU consortia were coordinated by MedUni Vienna staff. A further 12 projects were part of other programmes including the Innovative Medicine Initiative, the Third Health

#### European Research Council (ERC) award recipients

#### Starting grants

- Bernhard Baumann, OPTIMALZ Center for Medical Physics and Biomedical Engineering, 2015-2020
- Kaan Boztug, ImmunoCore CeMM and MedUni Vienna, 2013-2018
- Christoph Bock, EpigenomeProgramming CeMM and MedUni Vienna, 2016-2021
- Andreas Bergthaler, CMIL CeMM and MedUni Vienna, 2016-2021

#### **Consolidator grants**

- Igor Adameyko, STEMMING-FROM-NERVE Division of Molecular Neurosciences/Center for Brain Research, 2015-2020
- Alwin Köhler, NPC-BUILD Division of Molecular Cell Biology/Center for Medical Biochemistry, 2018-2023
- Stefan Kubicek, CHROMABOLISM CeMM and MedUni Vienna, 2018–2023

#### Advanced grants

- Maria Sibilia, TNT-TUMORS Division of Cancer Research, 2016-2021
- Tibor Harkany, Secret-Cells Division of Molecular Neurosciences/Center for Brain Research, 2016-2021
- Giulio Superti-Furga, Game of Gates CeMM and MedUni Vienna, 2016-2021

#### Money for basic research

Without basic research, many of the scientific advances that ben-



efit patients in a huge range of ways would never have come about. Financing the "foundation of research" therefore cannot be too highly valued. The most important funders of medical basic and clinical research in Austria are:

- the Austrian Science Fund (FWF);
- the Vienna Science and Technology Fund (WWTF);
- the Mayor of Vienna's Medical-Scientific Fund;
- the Oesterreichische Nationalbank's Jubilee Fund, and
- the EU Commission.

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#### > Spin-offs and investments

#### Alumni Club

Staying connected with the alma mater: the Alumni Club is the postgraduate knowledge, dialogue and career platform for MedUni Vienna graduates, students and staff.

#### CB Med GmbH – Center for Biomarker Research in Medicine

In addition to MedUni Vienna and Graz's three universities, shareholders in the innovative CBmed research centre include the Austrian Institute of Technology (AIT) and Joanneum Research, as well as numerous partners in science and industry.

#### Forensisches DNA-Zentrallabor Wien GmbH (DNA Central Laboratory)

This specialised laboratory provides trace analysis and forensic DNA analysis in relation to criminal and parentage investigations.

#### Josephinum – Collections of the Medical University of Vienna

The Josephinum brings the Medical University of Vienna's rich heritage and history to life. It houses and maintains the university's medical history collections, and operates a museum and exhibitions to make them accessible to the public.

#### Max F. Perutz Laboratories Support GmbH (MFPL)

Researchers at MFPL work in various cutting-edge areas of life sciences: they investigate the structure of essential cell molecules, as well as their role in developmental biology and in disease. MFPL is a joint facility with the University of Vienna.

#### Medical University of Vienna International GmbH (MUVI)

MUVI is an international healthcare consultancy that is specialised in providing management, knowledge transfer and academic medicine solutions in emerging markets.

#### Karl Landsteiner Privatuniversität für Gesundheitswissenschaften GmbH

MedUni Vienna is one of the four maintaining bodies of the private Karl Landsteiner University of Health Sciences in Krems.

#### Universitätszahnklinik Wien GmbH

The University Clinic of Dentistry, a subsidiary of the Medical University of Vienna, has around 400 employees and is one of the largest and most advanced university dental hospitals in Europe.

#### Superbrands Austria Award 2017

MedUni Vienna completely relaunched its branding and corporate identity in August 2016 following an extensive redevelopment process. At the end of 2017, the university received the Business Superbrands Austria Award 2017 for its new identity.

#### > Making knowledge marketable

From basic research to commercial application: as joint institutions of MedUni Vienna, partners in industry and the Christian Doppler Research Association, these Christian Doppler Laboratories make marketable products out of scientific discoveries.

- Molecular Stress Research in Peritoneal Dialysis (Head: Klaus Kratochwill; commercial partner: Zytoprotec GmbH)
- Clinical Molecular MR Imaging (Head: Siegfried Trattnig; commercial partner: Siemens AG Österreich)
- Innovative Optical Imaging and its Translation to Medicine (Head: Rainer Leitgeb; commercial partners: Carl Zeiss Meditec Inc., Exalos AG)
- Complement Research (Head: Peter Steinberger; commercial partner: Alexion Pharmaceuticals, Inc.)
- Ocular and Dermatological Effects of Thiomers (Head: René Werkmeister; commercial partner: Croma-Pharma Gesellschaft m.b.H.)
- **Ophthalmic Image Analysis** (Head: Ursula Schmidt-Erfurth; commercial partner: Novartis Pharma AG)
- **Recovery of Extremity Function** (Head: Oscar Aszmann; commercial partner: Otto Bock Healthcare Products GmbH)
- Medical Radiation Research for Radiation Oncology (Head: Dietmar Georg; commercial partners: EBG MedAustron GmbH, PEG MedAustron GmbH, Siemens AG Österreich - Sector Healthcare, Elekta GmbH)

#### A strong Austrian partner



The Ludwig Boltzmann Gesellschaft is an important partner of MedUni Vienna for exter-

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nally financed research. Currently, the following Ludwig Boltzmann Institutes (LBI) and Ludwig Boltzmann Clusters (LB Cluster) are located at the university.

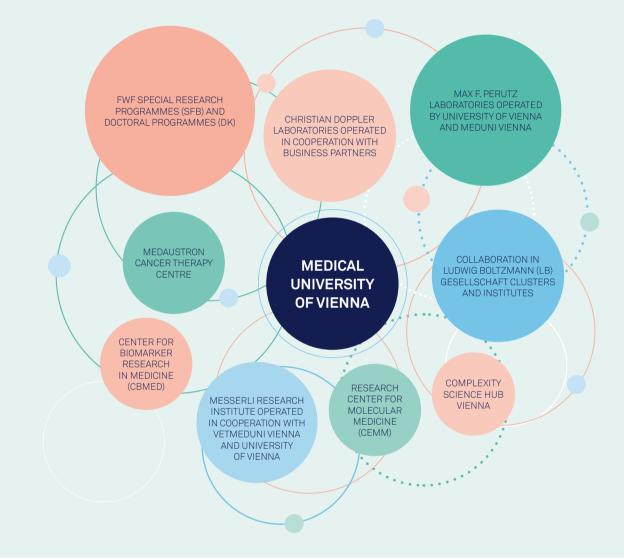
 LBI for Rare and Undiagnosed Diseases
 (Head: Keen Besturg)

(Head: Kaan Boztug)

- LBI for Applied Diagnostics (Head: Markus Mitterhauser)
- LBI for Cancer Research (Head: Richard Moriggl)
- LB Cluster for Cardiovascular Research (Head: Johann Wojta)
- LB Cluster for Oncology (Head: Peter Valent)
- LB Cluster for Arthritis and Rehabilitation (Head: Günter Steiner)

#### > At the centre of life sciences

MedUni Vienna has an excellent nationwide and international network and plays a central role in life sciences research in Austria. Various research consortia have close ties to the university, or are headed or managed by MedUni Vienna experts.



#### > Special Research Programmes

MedUni Vienna currently coordinates the following Special Research Programmes (SFB) financed by the Austrian Science Fund (FWF).

- Inflammation and Thrombosis (Project Leader: Johannes Schmid, Center for Physiology and Pharmacology)
- Myeloproliferative Neoplasms (Project Leader: Peter Valent, Department of Medicine I)
- Strategies for the Prevention and Treatment of Allergies

(Project Leader: Rudolf Valenta, Institute of Pathophysiology and Allergy Research)

- **RNA Regulation of the Transcriptome** (Project Leader: Franz-Michael Jantsch)
- Transmembrane Transporters in Health and Disease
   (Preject Leader: Useald II, Sitte

(Project Leader: Harald H. Sitte, Institute of Pharmacology)

#### IT experts for medicine



The Medical Informatics master's programme is focused on providing professional academic training so that graduates have the capability to design and implement informatics projects in the fields of biomedical research. medicine and healthcare. Students can choose to specialise in bioinformatics, neuroinformatics, clinical informatics, informatics for assistive technology or public health informatics. The curriculum focuses on practical, research-related, medical and clinical scenarios, as required. Learning the communication skills needed to tackle such issues in collaboration with scientists from other disciplines and doctors forms a key part of the programme. MedUni Vienna offers an ideal environment for this.

#### > Springboard for up-and-coming academics

With its PhD, doctorate degree and doctoral programmes, MedUni Vienna has a broad offering for young researchers. 1,342 scientists are currently completing PhD or other doctoral studies, and most of these are employed by the university on temporary contracts as integral members of research groups. PhD students lay the foundations for subsequent specialisation and complete numerous scientific publications by the time they graduate. Admissions to the doctoral research programmes funded by the Austrian Science Fund (FWF) are subject to a two-stage selection process that incorporates international review. The applied medical sciences doctoral programmes provide in-depth training in applied biomedical research.

#### **Thematic PhD programmes**

- Cell Communication in Health and Disease (doctoral research programme)
- Endocrinology and Metabolism
- Immunology
- Inflammation and Immunity (doctoral research programme)
- Integrative Structural Biology (doctoral research programme)
- Malignant Diseases
- Medical Imaging
- Medical Informatics, Biostatistics and Complex Systems
- Medical Physics
- Molecular, Cellular and Clinical Allergology (doctoral research programme)
- Molecular Drug Targets (doctoral research programme)
- Molecular Mechanisms of Cell Biology
- Molecular Signal Transduction
- Neuroscience
- RNA Biology (doctoral research programme)
- Signaling Mechanisms in Cellular Homeostasis (doctoral research programme)
- Vascular Biology

#### Thematic programmes in the Applied Medical Science doctoral programme

- Biomedical Engineering
- Cardiovascular and Pulmonary Disease
- Clinical Experimental Oncology
- Clinical Endocrinology, Metabolism and Nutrition
- Clinical Neurosciences (CLINS)
- Mental Health and Behavioural Medicine
- POeT Program for Organ Failure, Replacement and Transplantation
- Preclinical and Clinical Research for Drug Development
- Public Health

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• Regeneration of Bones and Joints

#### Specialised continuing education

Continuing to study after becoming qualified is an important means of life-long learning. With master's programmes resulting in an MSc, MAS or MBA, as well as certificate courses, and continuing education courses providing certification to practise in a particular field, MedUni Vienna offers a wide variety of possibilities in this regard. All of these parttime courses provide excellent postgraduate training, with lecturers and teaching staff from Austria and abroad, as well as cooperations with other top universities and institutions.

#### Master of Science (MSc)

- Ergonomics and Fitness for Work
- Clinical Research
- Forensic Sciences
- Gender Medicine
- Interdisciplinary Pain Medicine (ISMED)
- Periodontology
- Prosthodontics
- Psychotherapy Research
- Study Management
- Toxicology
- Traditional Chinese Medicine (TCM)
- Transcultural Medicine and Diversity Care

#### Master of Public Health (MPH)

• Public Health

#### Master of Business Administration (MBA)

• Health Care Management (HCM)

#### Master of Advanced Studies (MAS)

Insurance Medicine

#### Continuing education courses with certification

- Clinical Trials Manager
- Medical Hypnosis
- Medical Physics
- Medical Hypnosis for Dental Care

#### **Certificate courses**

- Crisis Intervention and Suicide Prevention
- Sleep Coaching
- Clinical Trials Assistant

#### > International appointments

MedUni Vienna appointed three new professors in 2017.



**Christian Hengstenberg** moved to Vienna from the Department of Cardiovascular Diseases at the German Heart Centre Munich. He is the new head of the Division of Cardiology at the university's Department of Medicine II.

**Marco Idzko** previously worked at University Medical Center Freiburg. He now heads the Division of Pulmonology in the Department of Medicine II. His area of specialisation is chronic obstructive pulmonary disease (COPD).





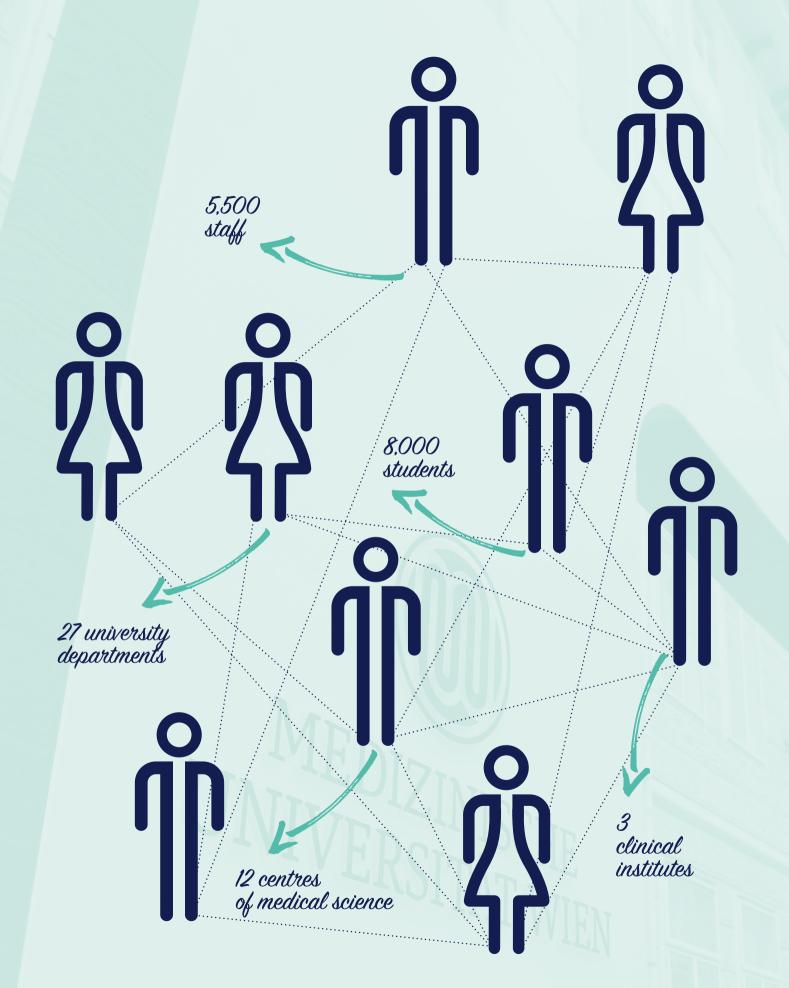
**Joachim Widder** returned to MedUni Vienna after more than ten years at the radiotherapy department of the University Medical Center Groningen (UMCG). In March 2017 he was appointed Professor of Radiotherapy and Radiation Oncology.

#### > Researchers of the month

Each month, MedUni Vienna names one or more young scientists "Researcher of the Month." The researchers who received this recognition in 2017 were honoured at a special ceremony.



Konstantin Krychtiuk, Daniel Moritz Felsenreich, Stefan Tögel, Gabriela Katharina Muschitz, Daniel Dalos, Johannes Hofer, Laura D. Gallego Valle, Sandra Haider, together with Rector Markus Müller, Vice Rector Michaela Fritz and jury members Klaus Markstaller, Daniela Pollak and Bruno Podesser (not pictured: Georg Goliasch, Andreas Schober, Michael Ramharter and Bernhard Scharinger).



### How MedUni Vienna is organised

Facts and figures

5,500 staff work at MedUni Vienna in 27 university hospital departments, three clinical institutes and 12 centres of medical science – all with the purpose of improving health. 660,000 patients receive the highest quality treatment from MedUni Vienna and Vienna General Hospital each year, with 110,000 of them admitted as inpatients. The university's 8,000 students secure the future of medical treatment.

# **Organisational structure** as at 31 December 2017

	SENATE 26 MEMBERS	°······•• RECTO	ORATE DR AND RECTORS	UNIVERSITY COUNCIL 5 MEMBERS	SCIENTIFIC ADVISORY BOARD
	• : 0	 ò	• •		
COMMITTEES • Working Group on Equal Opportunities • Ethics Committee • Arbitration Committee • Works Council for Academic Staff • Works Council for Academic Staff • Students Union (ÖH) • Advisory Board for People with Disabilities • Data Protection Com- mission	MEDICAL SCIENCE DIVISION 12 centres • Anatomy and Cell Biology • Physiology and Pharmacology • Public Health • Brain Research • Pathobiochemistry and Genetics • Pathophysiology, Infectiology and Immunology • Medical Physics and Biomedical Engineering • Medical Statistics, Informatics and Intelligent Systems • Medical	CLINICAL DIVISION 27 university departments • Medicine I • Medicine III • Medicine III • Surgery • Obstetrics and Gynecology • Otorhinolaryngology • Otorhinolaryngology • Anesthesia, Critical Care and Pain Medicine • Psychiatry and Psychotherapy • Pediatrics and Adolescent Medicine • Dermatology • Biomedical Imaging and Image-guided therapy	ORGANISATIONAL UNITS WITH SPECIAL SERVICE FUNCTIONS • Comprehensive Cancer Center • Core Facilities • University Library • History of Medicine and Historical Collections • Teaching Center	ORGANISATIONAL UNITS WITH UNIVER- SITY MANAGEMENT RESPONSIBILITIES University Management Office • Human Resources • Legal Department • Corporate Communications • Studies and Examinations Department • Research Service • Clinical Trials Coordination Centre • Finance Department • Facility Management • IT Systems and	SPIN-OFFS -Alumni Club -Medical University of Vienna International GmbH -Universitätszahn- klinik Wien GmbH -Max F. Perutz Laboratories -FDZ-Forensisches DNA-Zentrallabor GmbH -CBmed GmbH -Karl Landsteiner Privatuniversität für Gesundheitswissen- schaften GmbH -Josephinum – Medizinische Sammlungen GmbH
<ul> <li>Medicine</li> <li>Dentistry</li> <li>PhD programmes</li> <li>Continuing education courses</li> <li>Medical Informatics master's programme</li> </ul>	<ul> <li>Medical Biochemistry</li> <li>Virology</li> <li>Forensic Medicine</li> <li>Biomedical Research</li> </ul>	<ul> <li>Radiotherapy</li> <li>Trauma-Surgery</li> <li>Orthopedics</li> <li>Urology</li> <li>Neurosurgery</li> <li>Oral, Maxillary and Facial Surgery</li> <li>Emergency Medicine</li> <li>Neurology</li> <li>Physical Medicine, Rehabilitation and Occupational Medicine</li> <li>Child and Adolescent Psychiatry</li> <li>Psychoanalysis and</li> </ul>		Communications <b>4 staff units</b> • Internal Audit • Evaluation and Quality Management • Gender Mainstreaming • Controlling	

Psychotherapy •Ophthalmology and . Optometrics •Blood Group Serology and Transfusion Medicine

 Hospital Epidemiology and Infection Control Clinical Pharmacology • University Clinic of Dentistry

3 clinical institutes • Laboratory Medicine Pathology Neurology

#### University management • Rectorate

The Rectorate is the university's executive management body. Prof. Markus Müller, Rector Dr. Michaela Fritz, Vice Rector for Research and Innovation Prof. Anita Rieder, Vice Rector for Education Dr. Volkan Talazoglu, Vice Rector for Finance Prof. Oswald Wagner, Vice Rector for Clinical Affairs www.meduniwien.ac.at/rectorate

#### • University Council

The University Council is one of the University's three most senior management bodies, alongside the Rectorate and the Senate. Two of the Council's members are appointed by the Senate of the Medical University of Vienna, and two by the federal government. A fifth member is elected by these four members.

Dr. Erhard Busek (Chair) Dr. Elisabeth Hagen Prof. Veronika Sexl Dr. Walter Dorner (deceased on 10 July 2017) Prof. Robert Schwarcz Dr. Maximilian Kothbauer (from 1 December 2017) www.meduniwien.ac.at/universitycouncil

#### • Senate

The Senate is made up of 13 representatives from among the university's full professors, six representatives of teaching and research staff, one representative of the general university staff and six student representatives, appointed by election or, in the case of student representatives, by delegation in accordance with section 25 Universities Act 2002.

#### PROFESSORS

Prof. Michael Gnant (Chair) Prof. Ursula Wiedermann-Schmidt Prof. Rudolf Valenta Prof. Elisabeth Presterl (Fourth Deputy) Prof. Klaus Markstaller Prof. Hannes Stockinger Prof. Renate Koppensteiner Prof. Barbara Bohle Prof. Michael Trauner Prof. Angelika Berger Prof. Maria Sibilia Prof. Harald Sitte Prof. Irene Lang \*)

\* Currently deputy curriculum director for the Doctoral Programme in Applied Medical Science (N790), PhD programme (N094) and the Medical Informatics master's programme (N066 936), and therefore unable to exercise her mandate due to the regulation on conflicts of interest. The mandate is currently exercised by Prof. Thomas Helbich.

TEACHING AND RESEARCH STAFF Prof. Diana Bonderman Prof. Ivo Volf Prof. Birgit Willinger Dr. Martin Andreas Dr. Regina Patricia Schukro (First Deputy) Prof. René Wenzl

#### STUDENTS

Carina Borst Johanna Zechmeister (Second Deputy until 12 October 2017) Leon Fierek (Second Deputy from 13 October 2017) Serkan Asilkan (until 12 October 2017) Julia Wunsch Markus Seibt Lukas Wedrich (from 13 October 2017) Daniela Kitzmantl (from 13 October 2017)

GENERAL UNIVERSITY STAFF Gerda Bernhard (Third Deputy)

CO-OPTED MEMBER – WORKING GROUP ON EQUAL OPPORTUNITIES Prof. Alexandra Kautzky-Willer www.meduniwien.ac.at/senate

#### COMMITTEES

• Arbitration Committee Chair: Dr. Anna Sporrer Deputy Chair: Prof. Herbert Watzke www.meduniwien.ac.at/arbitrationcommittee

#### • Ethics Committee

Prof. Jürgen Zezula and Dr. Martin Brunner www.meduniwien.ac.at/ethics

#### • Works Council for General University Staff

Chair: Gabriele Waidringer First Deputy Chair: Gerda Bernhard Second Deputy Chair: Helga Kalser www.meduniwien.ac.at/wc-gus

#### Works Council for Academic Staff

Chair: Dr. Ingwald Strasser Deputy: Dr. Stefan Konrad Deputy: Prof. Michael Holzer Deputy: Prof. Harald Leitich www.meduniwien.ac.at/wc-sus

#### • Working Group on Equal Opportunities

Chair: Prof. Alexandra Kautzky-Willer First Deputy Chair: Prof. Ulrike Willinger Second Deputy Chair: Irene Bednar www.meduniwien.ac.at/equalopportunities

#### • Student Union (ÖH Med Wien)

Until 30 June 2017 Chair: Johanna Zechmeister First Deputy: Julia Wunsch Second Deputy: Lukas Wedrich

#### From 1 July 2017

Chair: Julia Wunsch First Deputy: Lisa Leutgeb (until 11 October 2017) First Deputy: Jakob Eichelter (from 11 October 2017) Second Deputy: Leopold Buvier-Azula www.oehmedwien.at

#### • Advisory Board for People with Disabilities

Chair: Prof. Richard Crevenna Deputy Chair: Prof. Johannes Wancata www.meduniwien.ac.at/disabilities

#### • Intra-university Data Protection Commission

Chair: Dr. Markus Grimm Deputy Chair: Ernst Eigenbauer www.meduniwien.ac.at/dbc

#### Medicine Curriculum Director

Prof. Gerhard-Johann Zlabinger Deputy: Prof. Franz Kainberger Deputy: Prof. Werner Horn Deputy: Prof. Anahit Anvari-Pirsch Deputy: Dr. Barbara Steinlechner

#### • Dentistry Curriculum Director

Prof. Anita Holzinger Deputy: Prof. Andrea Nell Deputy: Prof. Martina Schmid-Schwap

#### PhD Programmes Curriculum Director and Medical Informatics master's programme Prof. Stefan Böhm

Deputy: Prof. Irene Lang Deputy: Prof. Georg Dorffner

#### • Continuing Education

**Curriculum Director** Prof. Michael Hiesmayr Deputy: Prof. Henriette Löffler-Stastka

#### Scientific Advisory Board

This external body advises the MedUni Vienna Rectorate on all matters related to research, with the aim of safeguarding the University's strategic positioning for the long term.

- Frederica Salusto Institute for Research in Biomedicine Bellinzona, Schweiz
- Hedvig Hricak Chair, Department of Radiology, Memorial Sloan-Kettering Cancer Center, New York City, USA
- Joseph Thomas Coyle Professor of Psychiatry and Neuroscience, Harvard Medical School
- Fortunato Ciardiello Professor of Medical Oncology, Second University of Naples
- Jeroen J. Bax Professor of Cardiology, Leiden University

#### **University Departments**

MedUni Vienna's clinical division consists of 27 departments, including three clinical institutes. 11 of these comprise a number of different divisions (in accordance with section 31(4) Universities Act). Departments, institutes and divisions also serve as patient care departments (pursuant to section 7(4) Hospitals Act).

#### Department of Medicine I

Head: Prof. Christoph Zielinski (until 30 September 2017) Interim Head: Prof. Herbert Watzke (form 1 October 2017)

- Division of Oncology
- Division of Hematology and Hemostaseology
- Division of Palliative Medicine
- Division of Infectious Diseases and Tropical Medicine
- Division of Cancer Research (not a patient care department pursuant to section 7(4) Hospitals Act)

#### **Department of Medicine II**

Head: Prof. Christian Hengstenberg (from 1 October 2017)

- Interim Head: Prof. Irene Lang
- Division of Cardiology
- Division of Angiology
- Division of Pulmonology

#### **Department of Medicine III**

Head: Prof. Josef Smolen

- Division of Endocrinology and Metabolism
- Division of Nephrology and Dialysis
- Division of Rheumatology
- Division of Gastroenterology and Hepatology

#### **Department of Surgery**

Head: Prof. Michael Gnant

- Division of General Surgery
- Division of Cardiac Surgery
- Division of Thoracic Surgery
- Division of Vascular Surgery
- Division of Transplantation Division of Plastic and
- Reconstructive Surgery
- Division of Pediatric Surgery

#### Department of Obstetrics and Gynecology

Head: Prof. Peter Wolf Husslein

- Division of Obstetrics and Feto-Maternal medicine
- Division of General Gynecology and Gynecologic Oncology
- Division of Gynecological Endocrinology and Reproductive Medicine

#### Department of Otorhinolaryngology

Head: Prof. Wolfgang Gstöttner

- Division of General Ear, Nose and Throat Diseases
- Division of Speech and Language Therapy

#### Department of Anesthesia, Critical Care and Pain Medicine Head: Prof. Klaus Markstaller

- Division of General Anesthesia and Intensive Care Medicine
- Division of Specialist Anesthesia and Pain Medicine
- Division of Cardiothoracic and Vascular Anesthesia and Intensive Care Medicine

#### Department of Psychiatry and Psychotherapy

Head: Prof. Siegfried Kasper

- Division of Biological Psychiatry
- Division of Social Psychiatry

#### Department of Pediatrics and Adolescent Medicine

Head: Prof. Susanne Greber-Platzer

- Division of Neonatalogy, Intensive Care Medicine and Neuropediatrics
- Division of Pediatric Cardiology
- Division of Pediatric Pulmonology, Allergology and Endocrinology
- Division of Pediatric Nephrology and Gastroenterology
- Division of Pediatrics with special focus on Pediatric Hemotology-Oncology (St. Anna Children's Hospital)

#### Department of Biomedical Imaging and Image-guided Therapy

Head: Prof. Christian Herold

- Division of General and Paediatric Radiology
- Division of Cardiovascular and Interventional Radiology
- Division of Neuroradiology and Musculoskeletal Radiology
- Division of Nuclear Medicine

#### **Department of Dermatology**

Head: Prof. Georg Stingl (until 30 September 2017) Interim Head: Prof. Peter Petzelbauer (from 1 October 2017) **Department of Radiotherapy** Head: Prof. Joachim Widder

Department of Trauma-Surgery Head: Prof. Stefan Hajdu

**Department of Orthopedics** Head: Prof. Reinhard Windhager

**Department of Urology** Head: Prof. Shahrokh Shariat

**Department of Neurosurgery** Head: Prof. Engelbert Knosp

Department of Oral, Maxillary and Facial Surgery Head: Prof. Emeka Nkenke

Department of Emergency Medicine Head: Prof. Anton Laggner

#### Department of Neurology

Head: Prof. Eduard Auff (until 30 September 2017) Interim Head: Prof. Christian Müller (from 1 October 2017)

#### Department of Physical Medicine,

Rehabilitation and Occupational Medicine Head: Prof. Richard Crevenna

Department of Child and Adolescent Psychiatry Interim Head: Dr. Christine Vesely

Department of Psychoanalysis and Psychotherapy Head: Prof. Stephan Doering

Department of Ophthalmology and Optometrics Head: Prof. Ursula Schmidt-Erfurth

#### Department of Blood Group Serology and Transfusion Medicine Interim Head: Prof. Simon Panzer

(until 30 September 2017) Interim Head: Dr. Gerda Leitner (from 1 October 2017) **Department of Clinical Pharmacology** Interim Head: Prof. Markus Zeitlinger

**University Clinic of Dentistry Vienna** (Hospital in the meaning of section 2(1)(7) Hospitals Act) Head: Prof. Andreas Moritz

Department of Hospital Epidemiology and Infection Control Head: Prof. Elisabeth Presterl

#### Department of Laboratory Medicine

Head: Prof. Oswald Wagner

- Division of Medical-Chemical Laboratory Diagnostics
- Division of Clinical Microbiology
- Division of Clinical Virology

**Department of Pathology** 

Head: Prof. Renate Kain

#### Institute of Neurology

Interim Head: Prof. Johann Hainfellner

#### CENTRES OF MEDICAL SCIENCE

The medical science division is organised into centres and departments. While the departments – like university clinical departments – generally cover a single scientific discipline, the centres are tasked with efficiently combining the priorities of research and teaching, with various disciplines clustered in accordance with international practice.

#### Center for Anatomy and Cell Biology

Head: Prof. Franz-Michael Jantsch

- General Division of the Center for Anatomy and Cell Biology
- Division of Anatomy
- Division of Cell and Developmental Biology

#### Center for Physiology and Pharmacology

Head: Prof. Michael Freissmuth

- Institute of Vascular Biology and Thrombosis Research
- Institute of Pharmacology
- Institute of Physiology
- Division of Neurophysiology and Neuropharmacology

#### **Center for Public Health**

Head: Prof. Anita Rieder

- Department of General Practice and Family Medicine
- Department of Social and Preventive Medicine
- Department of Environmental Health
- Department of Epidemiology
- Department of Medical Psychology
- Department of Health Economics

#### **Center for Brain Research**

Head: Prof. Jürgen Sandkühler (until 31 May 2017) Head: Prof. Thomas Klausberger (from 1 June 2017)

- Division of Neuroimmunology
- Division of Neurophysiology
- Division of Molecular Neurosciences
- Division of Neuronal Cell Biology
- Division of Cognitive Neurobiology
- Division of Pathobiology of the Nervous System

#### Center for Pathobiochemistry and Genetics

Head: Prof. Markus Hengstschläger

- Institute of Medical Genetics
- Institute of Medical Chemistry and Pathobiochemistry

#### Center for Pathophysiology, Infectiology and Immunology

Head: Prof. Hannes Stockinger

- Institute of Pathophysiology and Allergy Research
- Institute of Immunology
- Institute of Specific Prophylaxis and Tropical Medicine
- Institute of Hygiene and Applied Immunology

Center for Medical Physics and Biomedical Engineering Head: Prof. Wolfgang Drexler

#### **Center for Medical Statistics, Informatics and Intelligent Systems** Head: Prof. Martin Posch

Head: Prof. Martin Posch Conoral Division of the C

- General Division of the Center for Medical Statistics, Informatics and Intelligent Systems
- Institute of Medical Statistics
- Institute of Clinical Biometrics
- Institute of Biosimulation and Bioinformatics
- Institute of Medical Information Management

- Institute of the Science of Complex Systems
- Institute of Artificial Intelligence and Decision Support
- Institute of Outcomes Research

#### Department of Medical Biochemistry

Part of Max F. Perutz Laboratories, a joint venture of MedUni Vienna and the University of Vienna for research in the field of molecular biosciences. Head: Prof. Graham Warren (until 31 March 2017) Head: Arndt von Haeseler (from 1 April 2017)

- Division of Molecular Biology
- Division of Molecular Genetics

#### **Department of Virology**

- Head: Prof. Elisabeth Puchhammer
- Division of Applied Medical Virology

#### **Department of Forensic Medicine** Head: Prof. Daniele Risser

#### **Department of Biomedical Research**

Head: Prof. Bruno Podesser

- Division of Laboratory Animal Science and Genetics
- Division of Decentralized Biomedical Facilities
- Division of Biomedical Research

#### Organisational Units with special Service Functions

**Comprehensive Cancer Center** Head: Prof. Christoph Zielinski

#### **Core Facilities**

Head: Prof. Johann Wojta

- Genomics: DNA analysis
- Genomics: genome analysis
- Imaging
- Proteomics
- Cell Sorting

#### Library

Head: Bruno Bauer

#### Ethics, History of Medicine and Historical Collections

Head: Dr. Christiane Druml

Teaching Center

Head: Prof. Gerhard Zlabinger

#### **Central Services**

#### Administrative support

- University Management Office
- Human Resources
- Legal Department
- Corporate Communications
- Studies and Examinations Department
- Research Service
- Clinical Trials Coordination Centre
- Finance Department
- Facility Management
- IT Systems and Communications

#### Staff units

- Internal Audit
- Evaluation and Quality Management
- Gender Mainstreaming
- Controlling

#### Financial statements

#### I. Statement of financial position as at 31 December 2017

#### **ASSETS**

	31 December 2017 EUR			31 December 2016 EUR ,000		6	
.Fixed assets							
I. Intangible assets							
1. Concessions and similar rights, and licences thereto		670,653.43			94(	)	
of which acquired by purchase	670,653.43				940		
2. Rights of use		20,000,000.00	20,670,653.43		20,000	20,940	
II. Property, plant and equipment							
<ol> <li>Land, leasehold rights and buildings including buildings on third-party land</li> </ol>		18,113,880.05			15,87	1	
a) of which land value	587,155.00				587		
b) of which building value	904,168.28				960		
c) of which investments in third-party buildings and land	16,538,355.42				14,324		
2. Plant and machinery		12,321,063.66			10,552	2	
3. Scientific literature and other scientific data media		7,081,578.90			6,919	)	
<ul> <li>4. Other fixtures and fittings, operating and business equipment</li> </ul>		3,100,918.91			2,784	ł	
5. Advance payments and assets under construction		5,920,805.36	46,538,246.88		5,609	41,735	
III. Financial assets							
1. Investments in subsidiaries and associates		3,083,650.18			3,384	ł	
2. Loans to subsidiaries and associates		810,765.79			918	3	
<ol> <li>Securities and similar instruments held as fixed assets</li> </ol>		54,522,969.18	58,417,385.15	125,626,285.46	50,000	54,302	116,977

#### **B. Current assets**

I. Inventories						
1. Inventories	450,000.00			404		
2. Services rendered to third parties not yet invoiced	72,062,629.76	72,512,629.76		80,528	80,932	
II. Receivables and other assets						
1. Trade receivables	10,776,322.65			9,028		
2. Receivables from associates	2,076,682.95			1,396		
3. Other receivables and other assets	23,301,152.46	36,154,158.06		19,187	29,611	
III. Securities and equity interests		5,292,174.64			29,898	
IV. Cash and cash equivalents		159,575,049.33	273,534,011.79		108,581	249,0

C. Deferred income	1,689,641.61	1,481
TOTAL ASSETS	400,849,938.86	367,480

The 2017 financial statements were given an unqualified audit certificate by auditors Leitgeb, Leonhard und Partner Wirtschaftsprüfung Steuerprüfung GmbH.

#### LIABILITIES

	31 December 2017 EUR			31 December 2016 EUR ,000	
A. Negative equity					
1. Equity		-8,334,166.31		-8,334	
2. Net loss		-3,529,812.60	-11,863,978.91	-7,958	-16,292
of which loss/profit brought forward	-7,958,078.58			-8,565	
B. Investment grants			31,458,222.15		31,599
C. Provisions					
1. Provisions for severance payments		15,746,682.94		14,018	
2. Other provisions		141,484,283.97	157,230,966.91	142,679	156,697
D. Liabilities					
1. Advances received		126,010,209.72		124,815	
of which deductible from inventories	69,826,726.35			78,002	
2. Trade payables		17,643,265.53		10,735	
3. Payables to associates		2,838,549.30		288	
4. Other liabilities		18,466,850.66	164,958,875.21	17,340	153,178
E. Deferred income			59,065,853.50		42,298
TOTAL LIABILITIES		40	0,849,938.86		367,480

Note regarding equity:

In previous years, as in 2017, the university has recognised negative equity. The Univ. RechnungsabschlussVO (University Financial Statements Order) 2010 provides for medical universities to have the option of capitalising investments relating to additional clinical expense, research and teaching, as rights of use. Capitalising these investments, taking into account investment grants as at 31 December 2017, results in positive equity in the meaning of section 16(2) University Financial Statements Order of EUR 19,594thsd (2016: EUR 15,307thsd).

#### II. Statement of profit or loss 2017

	2017 EUR		2016 EUR ,000	
1. Revenue				
a) Revenue from Federal Goverment global budget allocation		405,463,652.03	390,848	
b) Revenue from tuition fees		931,682.42	915	
c) Revenue from tuition fee compensation by Federal Government		4,727,335.20	4,721	
d) Revenue from postgraduate training programmes		845,805.75	1,466	
e) Revenue pursuant to section 27 Universities Act		88,081,030.06	80,876	
f) Reimbursements of costs pursuant section 26 Universities Act		16,387,761.89	16,356	
g) Other revenue and reimbursements		18,100,385.50	17,743	
of which revenue from federal ministries	7,303,322.37		7,301	
		534,537,652.85	512,925	
2. Change in services rendered to third parties not yet invoiced		-8,465,828.20	-3,669	
3. Other operating income				
a) Income from disposal and revaluation of fixed assets		20,636.22	15	
b) Income from reversal of provisions		4,444,434.40	4,045	
c) Other		16,631,467.86	14,582	
of which from reversal of investment grants	10,480,494.32		10,318	
		21,096,538.48	18,642	
4. Expenditure for materials, consumables and purchased services				
a) Expenditure for materials and consumabels		-13,226,036.53	-12,581	
b) Expenditure for purchased services		-5,551,430.63	-4,658	
		-18,777,467.16	-17,239	
5. Staff costs				
a) Salaries and wages		-303,343,254.04	-296,250	
of which refunds to the Federal Government for officials assigned to the university	71,706,894.20		73,327	
b) Expenditure for external teaching staff		-151,385.52	-144	
c) Cost of severance payments and payments to employee benefits funds		-5,965,805.11	-4,271	
of which refunds to the Federal Government for officials assigned to the university	0.00		137	
d) Cost of pensions		-9,056,236.28	-8,687	
of which refunds to the Federal Government for officials assigned to the university	406,448.85		403	
e) Social security contributions and other pay-related contributions		-68,117,543.78	-69,380	
of which refunds to the Federal Government for officials assigned to the university	16,817,836.85		17,382	
f) Other employee benefits		-2,915,548.50	-3,003	
		-389,549,773.23	-381,735	

		2017 EUR	2016 EUR ,000
6. Depreciation and amortisation		-19,685,533.84	-19,308
7. Other operating expenses			
a) Taxes other than those under item 13		-775,271.30	-796
b) Reimbursements to hospital operator pursuant section 33 Universities Act		-50,094,074.33	-50,098
c) Other		-45,453,582.67	-43,341
		-96,322,928.30	-94,235
8. Subtotal items 1 to 7		22,832,660.60	15,380
9. Income from financial resources and investments		851,499.73	615
a) of which from write-ups	55,982.59		28
10. Expenditure arising from financial resources and equity holdings		-19,069,657.80	-15,252
a) of which from write-downs	35,526.40		9
b) of which expenditure arising from subsidiaries and associates	18,734,000.00		15,205
11. Subtotal items 9 to 10		-18,218,158.07	-14,637
12. Earnings before tax (sum of items 8 and 11)		4,614,502.53	743
13. Taxes on income and profit		-186,236.55	-136
14. Loss/profit after tax		4,428,265.98	607
15. Loss/profit brought forward		-7,958,078.58	-8,565
16. Net loss		-3,529,812.60	-7,958

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