Med Uni Graz

Pioneering Minds

www.medunigraz.at

Central Research Infrastructures

Center for Medical Research

The Center for Medical Research (ZMF) opened in 2004 to provide first-class biomedical research infrastructure for clinicians and basic research scientists working at the Medical University of Graz. Housed within an imposing, custom-built modern building located on the University Hospital campus, the ZMF comprises more than 4000 m^2 of well-equipped laboratory and office space for cutting-edge basic and translational biomedical research.

Considerable effort has been invested in developing a flexible structure. To ensure maximum efficiency, candidate projects are reviewed by an independent commission. Access to ZMF is granted only during the project funding period. In addition to the labs directly assigned to a specific project, other infrastructure at the ZMF (isotope lab, SL2 and SL3 cell-culture labs, immunohistochemistry unit, etc.) may be accessed by project personnel following safety instructions.

Head: Dr. Christian Gülly
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Nine highly specialized core facilities, four radioactivity laboratory units and the Science-Technology Interface: Structural Biology provide access to instruments, technologies, methods, services as well as expert consultation and other services for scientific and clinical investigators. All central research supporting units and the core facilities are certified according to ISO 9001:2015.

Core facilities (CFs):

- Molecular Biology
- Computational Bioanalytics
- Imaging
- Mass Spectrometry
- Ultrastructure Analysis
- Clinical Trials Unit
- Prototype Construction
- Experimental Biomodels*
- Alternative Biomodels and Preclinical Imaging*

*CFs in the Division of Biomedical Research

Core Facility Molecular Biology

Who we are…

Our core expertise lies in the field of microbial community characterization with multi OMICS technologies, eukaryotic gene expression analysis and single cell analysis tools. CF Molecular Biology offers trendsetting technologies in a multiplicity of nucleic acid research methods.

Core instrumentation:

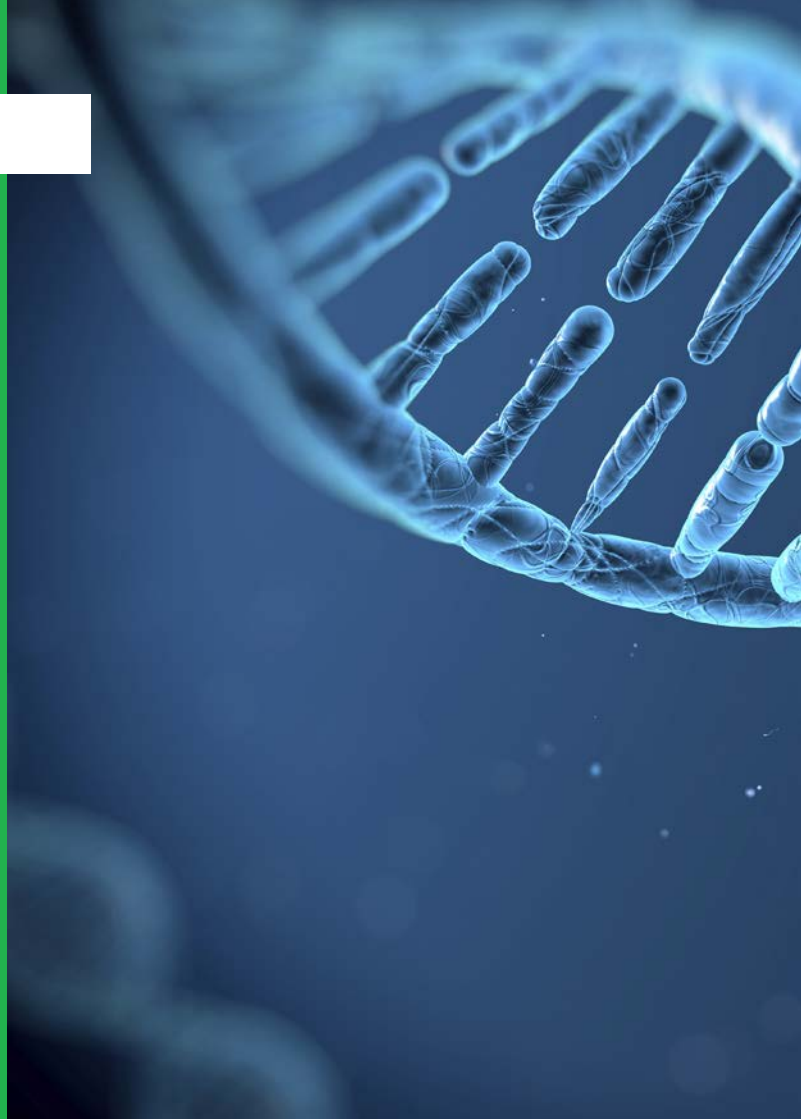
- Illumina MiSeq
- Nanostring nCounter® Prepstation
- 10X Genomics Chromium Single Cell Controller
- Biorad QX200 Droplet generator and reader
- Qiagen QIASymphony SP
- Various qRT-PCR cyclers

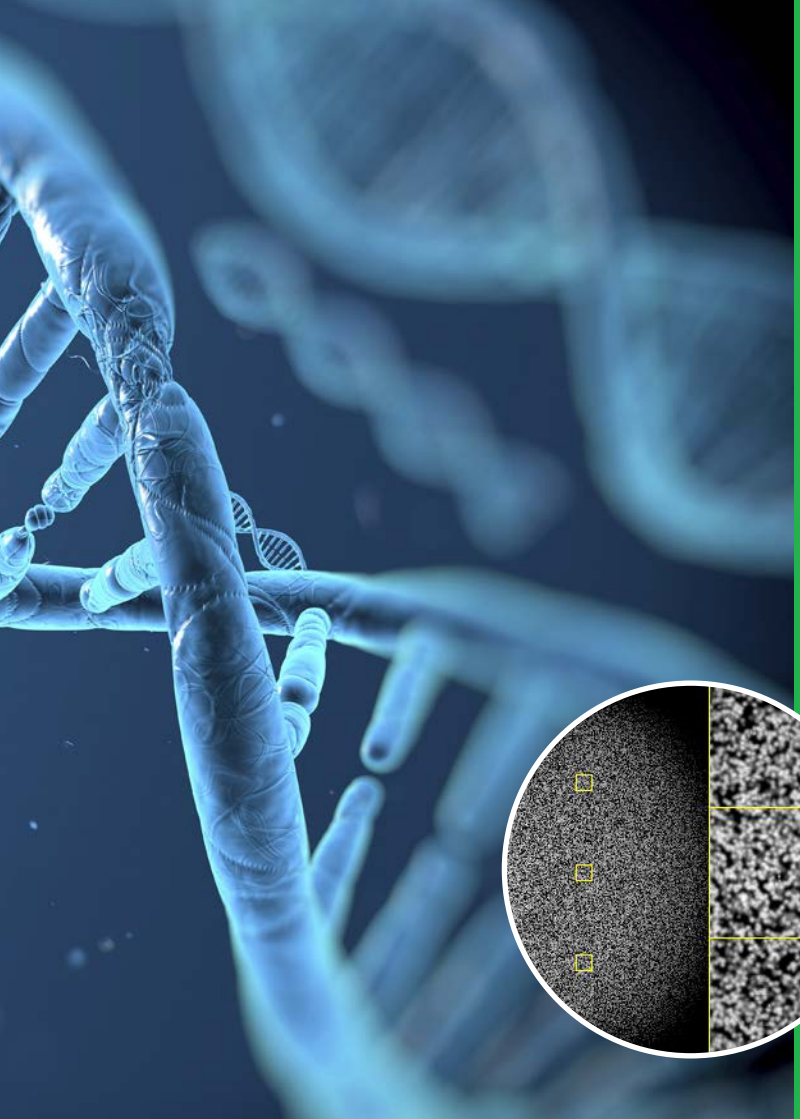
Methods can be customized or newly developed on special request.

…and what we can do for you:

NGS based Library Preparations for Microbiome & Metagenome

- Microbiome 16S/18S Amplicon analysis
- Metagenome Shotgun analysis
- Metagenome Shallow Seq analysis





NGS based Library Preparations for Transcriptomics

- » RNA Seq (rRNA Depletion, mRNA enrichment)
- » Prokaryotic Transcriptomics

NGS based Library Preparations for Single Cell Analysis

- » Gene Expression
- » Immune Profiling
- » Feature Barcoding

NGS based Library Preparations for Spatial Transcriptomics Analysis (Fresh Frozen and FFPE Material)

Gene Expression Analysis (qPCR, ddPCR, Nanostring mRNA and miRNA Analysis)

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Core Facility Computational Bioanalytics

The facility analyses genomic and clinical data in the field of applied medical research following the guidelines of Good Scientific Practice.

We provide…

- Experimental design and consulting: support from the first concept/study design (f.e. power calculation) to data interpretation
- State-of-the art know how for bioinformatics and statistical data analysis
- Training: a broad range of postgraduate hands-on training courses focused on bioinformatics and biostatistics
- Customized pipelines for NGS as well as proteomics data processing and analysis
- Access to a web-based platform for accessible, reproducible, and transparent computational biomedical research (https://galaxy.medunigraz.at)
- Access to MedBioNode, a High Performance Computing Cluster for comprehensive data analysis

The main focus of our bioinformatics expertise is Next Generation Sequencing data analysis (microbiome data, metagenomics, RNA-Seq, single cell, transcriptomics, epigenetics as well as qPCR and ChIP-Seq data).

A partner of the Austrian Bioinformatics Platform (ATBI http://www.bioinformatik) and a member of the Austrian Statistical Society (ÖSG http://www.osg.or.at), we closely cooperate with bioinformatics and biostatistics research groups to develop and implement valid methods for use by the scientific community.

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Core Facility Imaging

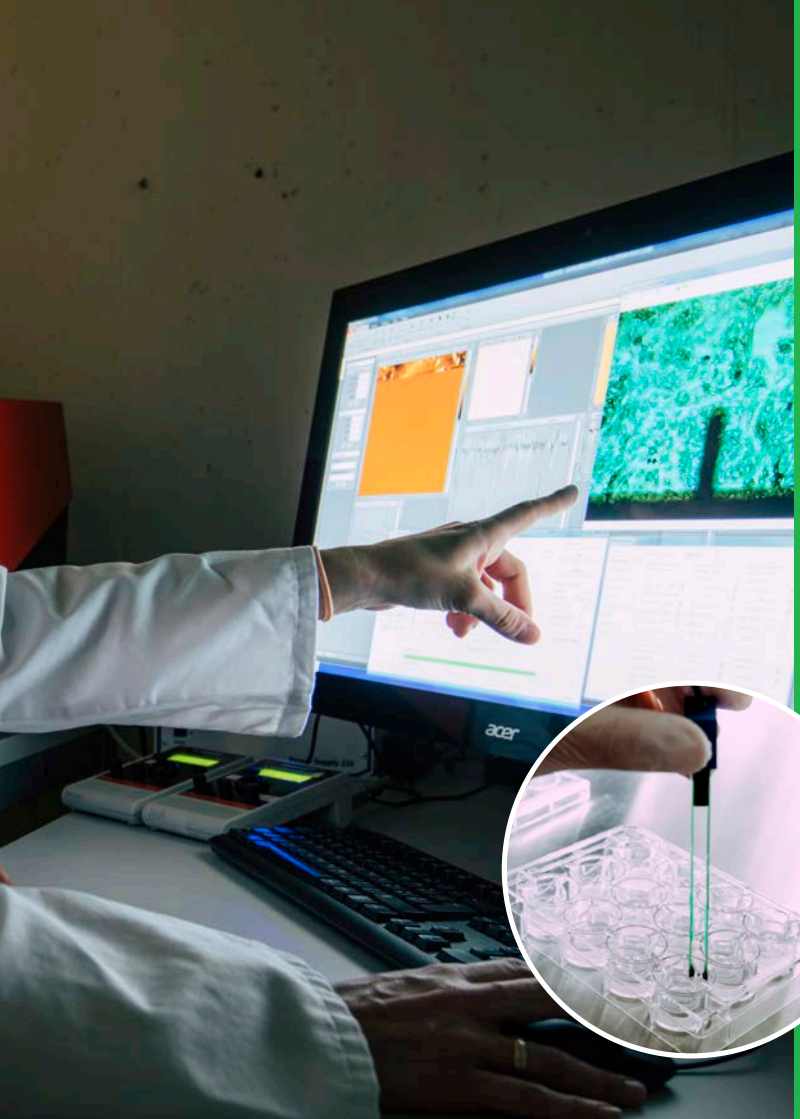
Core Facility Imaging offers analyses of cells based on colorimetric, fluorescent and luminescent detection methods using microscopy, flow cytometry and spectrophotometry.

Core instrumentation and main applications in microscopy:

- Nikon A1R - Live cell imaging for detection fast events (e.g. calcium imaging)
- Nikon TiE + C2 confocal high content screening, Zeiss Cell Observer – slow cellular changes (e.g. cell migration)
- Nikon A1R and Zeiss LSM510 Meta confocal microscopy
- AFM nanosurf FlexAna and FluidFM surface morphology and force measurements

Core instrumentation and main applications in flow cytometry:

- CytoFLEX/BC - multicolour flow cytometry
- FACS Aria/BD – high speed digital cell sorting
- BioPlex-200 – simultaneous quantitative analysis of multiple analytes with multiplex suspension bead array system



- NanoSight NS300 - analysis of the size and concentration of nanoparticles in liquid suspension

Other applications:

- Screening for cell cytotoxicity (according to ISO 10993 standard)
- Genotoxicity testing
- Hemocompatibility testing
- Immunotoxicity testing
- 3D models for short-term and long-term cell exposure and physiologically relevant models for respiratory exposure
- Basic tissue analysis techniques including embedding, sectioning, immuno-histochemical and histological staining, digital documentation and quantification of staining

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Core Facility Mass Spectrometry

The Core Facility Mass Spectrometry focuses on the analysis of lipids, metabolites, and proteins by targeted and non-targeted mass spectrometry-based approaches. To optimally support biomedical research we are constantly improving our -omics toolbox to provide cutting-edge workflows. Development of customer-tailored methods is a big part of our daily business.

Our core instrumentation…
…diverse MS in combination with GC/LC systems

- Agilent MSD
- Bruker Maxis II ETD
- Bruker Amazon Speed ETD
- Thermo LTQ Orbitrap Velos
- Thermo Q Exactive Focus

We provide…

- scientific support during
  - » project planning
  - » experimental design
  - » data interpretation
- non-targeted lipid-, metabol-, and proteomic assays
- customer-tailored targeted analyses
- omics-data visualization
- compound verification & structural elucidation

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Core Facility Ultrastructure Analysis

Core Facility Ultrastructure Analysis provides services in electron microscopy. Based on Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM), our key area of expertise is the characterization of ultrastructures in tissues or cells by applying serial sectioning, electron tomography and 3D reconstruction.

Core instrumentation and main applications:

- **ATUMTome /SEM**
  - SEM and STEM imaging of serial sections and 3D reconstruction
  - Connectomics – reconstruction of neurons and synapses in close collaboration with the Research Unit Electron Microscopic Techniques (EMT) at the Division of Cell Biology, Histology and Embryology
- **Tecnai 20 - Analytical TEM (performed together with the Research Unit EMT)**
  - Detection of chemical elements within cells and tissues

Other applications

- Correlative Light and Electron Microscopy (C.L.E.M.; performed together with Core Facility Imaging) combines the capabilities of two typically separate microscopy platforms (e.g. light and electron microscopy) to sequentially image the same cell/structure exploiting the advantages of both technologies
- Immunogold labelling techniques to localize antigens within tissues or cells at highest optical resolution
- High-pressure freezing in combination with Cryo-SEM to preserve functional characteristics of ultrastructures

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Medical Research Academy Graz

Medical Research Academy Graz offers high-quality courses to post-graduates in different areas of life science technologies. In practice-oriented courses, participants gain comprehensive knowledge and profound practical experience in an environment with state-of-the-art equipment.

Biostatistics and Bioinformatics

- Statistical Data Analysis with SPSS for Life Science Researchers SPSS Basics and Group Comparison
- Statistical Data Analysis with SPSS for Life Science Researchers Survival Analysis and Analysing Categorical
- Statistical Data Analysis with SPSS for Life Science Researchers Analysis of Variance and Regression Analysis
- Statistical Errors in Medical Research
- Data Management
- Introduction into R for Life Science Researchers
- Advanced R for Life Sciences
- Short Introduction to Linux and Command Line Data Analysis
- Introduction in working with MedBioNode cluster
- Using SLURM on MedBioNode for parallel computing

Galaxy

- 16s rRNA Microbiome Data Analysis in Galaxy
- Introduction into Galaxy for Life Science Researchers

Animal Experimentation

- Basics course of laboratory animal science EU function A, implementation of procedures with animal, (former FELASA B)
- Basic course in animal studies, pig module
- Basic training course in laboratory animal sciene, mouse modul
- National legislation for animal experimentation - guidelines for project application

Lab Techniques

- Real time PCR Workshop
- Flow Cytometry Basic Course

For more information, please check the Medical Research Academy Graz website: **https://zmf.medunigraz.at/en/merag**

Core Facility Clinical Trials Unit

The Clinical Trials Unit (CTU) is a fully equipped clinical research facility (12 treatment units including 8 hospital beds) that supports researchers at the Medical University of Graz and University Hospital in realizing and conducting clinical trial projects according to their needs.

In addition to facilities, equipment, logistics and qualified specialist personnel, the CTU also provides the following services:

- Project management
- Study planning and design
- Protocol writing
- Scientific support
- Document development (CRF, SDF, etc.)
- Report writing
- Laboratory management
- Recruitment
- Monitoring
- Quality management
- Auditing

Our experienced and dedicated staff efficiently plans and conducts clinical trials in accordance with the Declaration of Helsinki, international Good Clinical Practice standards (ICH-GCP), legal requirements and the highest safety and quality standards. The CTU is ISO 9001:2015 certified and has particular expertise in phase I trials.

The CTU primarily supports academic and investigator-initiated clinical research as well as industry-sponsored trials.

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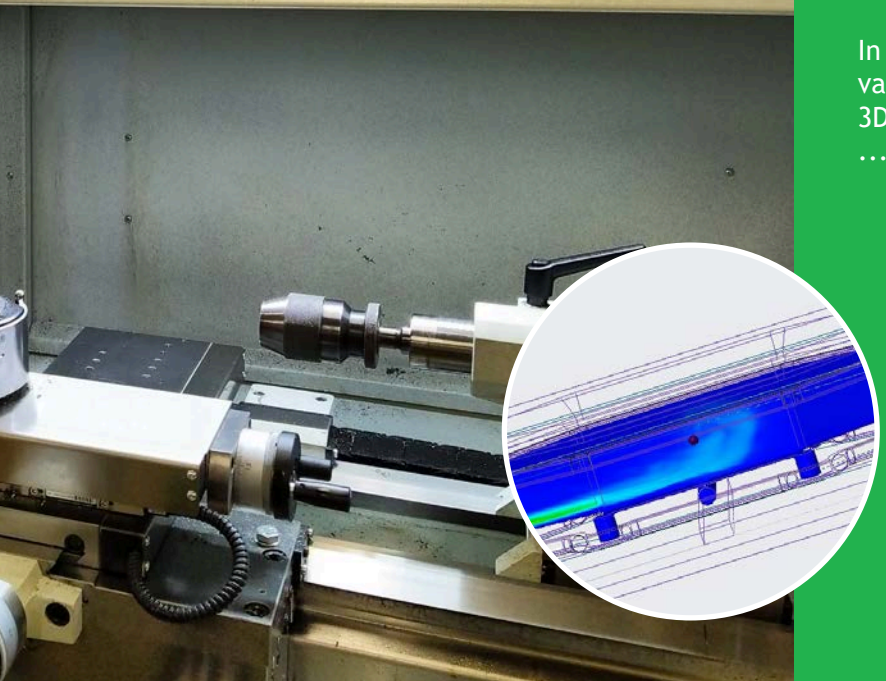
Core Facility Prototype Construction

The focus of Core Facility Prototype Construction is on custom-tailored mechanical equipment, hardware extensions and special gadgets that are commercially unavailable.

Based on specifications and technical requirements, computer aided design (CAD) software assists in rapidly designing descriptive 3D views. Computer aided manufacturing (CAM) software is used to create computer numerical control (CNC) code capable of running CNC machines (mill, lathe) and cutting and shaping metal (aluminium, stainless steel, etc.), plastic or other materials.



In-house services include:

- 3D-construction (Creo)
- CAM programming (Creo)
- Turning and milling
- Laser cut
- Fabrication

In cooperation with external strategic partners, various innovative technologies are available:
3D printing (metal or plastics)
...and much more.

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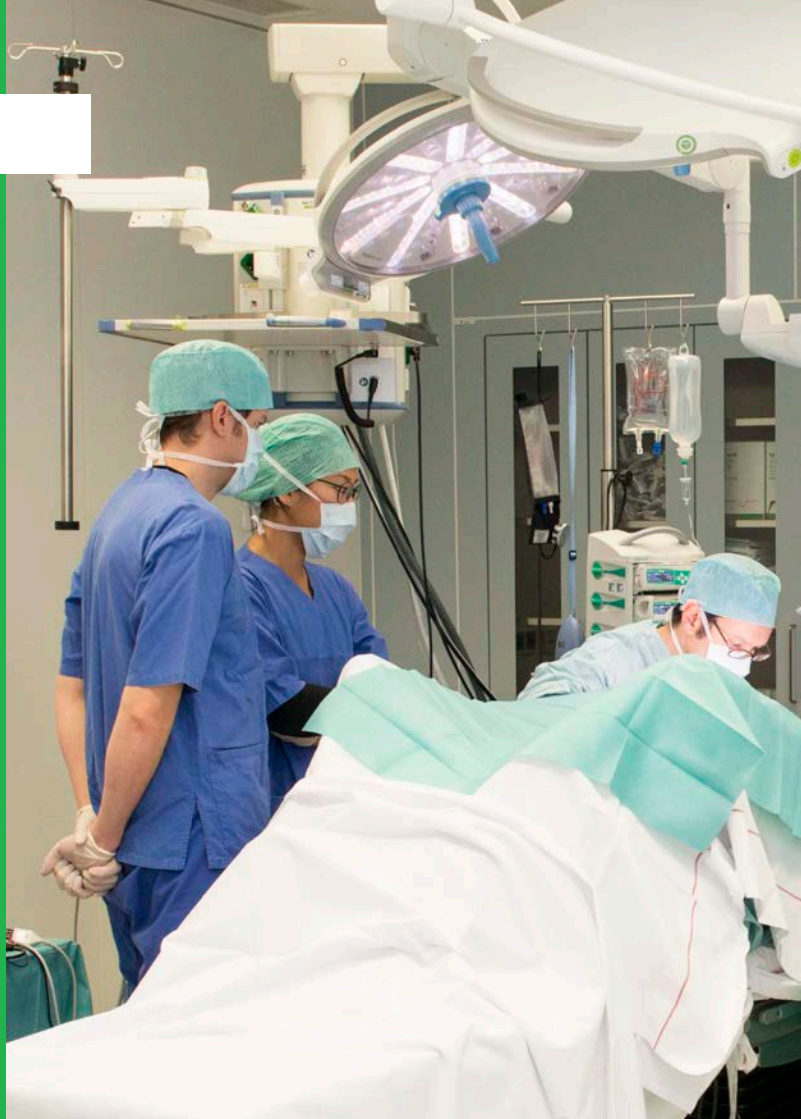
Core Facility Experimental Biomodels

With its know-how and state-of-the-art infrastructure, Core Facility Experimental Biomodels plays a central role in the preclinical research field of the Medical University of Graz.

Know-how:

- Assistance in project application
- Perioperative anaesthesia and analgesia in laboratory animals, surgical support in lab animal experiments, pre-, intra- and post-operative lab animal care, including pain management
- Course on laboratory animal sciences

Our staff includes a team of five specialized veterinarians including 1 ECVAA Diplomate (European College of Veterinary Anaesthesia and Analgesia).



Infrastructure:

- 300 m^2 surgical research area including
  - 2 operation theatres (including three anaesthesia machines for large lab animals)
  - 1 preparation / recovery room
  - 1 mobile C-arm (x-ray)
  - 1 endoscopy tower

Core Facility Experimental Biomodels is a Satellite Training Centre of the ECVAA (European College of Veterinary Anaesthesia and Analgesia).

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Core Facility Alternative Biomodels and Preclinical Imaging

Who we are…

Core Facility Alternative Biomodels and Preclinical Imaging focuses on the establishment and use of adequate human- and animal-derived cell culture models as well as the standardized integration of preclinical imaging techniques into ongoing projects in order to meet the 3Rs (Replacement, Reduction, Refinement). We strive to develop experimental alternatives to animal testing in order to reduce the number of animal trials while maintaining informative content and value.

Core Instrumentation:

- Micro-Ultrasound System Vevo770 and Vevo3100 (Visualsonics FUJIFILM)
- Micro-Computed Tomography SkyScan 1276 (Bruker)
- Optical Imaging System Lago (OncoMed Solutions)
- Biological Irradiator Small Animal and Cell Irradiation RS 2000 (Rad Source)
- Live Cell Analysis System xCELLigence Real-time (OLS OMNI Life Science)
- ExoView TM R200 (NanoView Biosciences)

Our team is happily to answer individual questions about project planning, project implementation and special training.

We provide …

- CellBank Graz: Human and animal cell lines (catalogue upon request)
- Establishment and characterization of cell lines
- Mycoplasma testing; identification by STR profile
- Viability and migration assays
- Autologous tumor modesl for personalized medicine
- Collection of alternative approaches to animal testing at the MedUni Graz
- Preclinical Imaging
- Orthotopic tumor models
- Isolation and characterization of extracellular vesicles (Evs)

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Special Laboratories

Beside the ZMF Core Facilities and numerous standard wet-labs we provide special laboratories for various applications in biomedical research. All cell culture labs are equipped according to BSL-2 or BSL-3 standards. We have installed specialized infrastructure and workstations to provide anaerobic or hypoxic conditions for cultivation of bacteria and eukaryotes. When working with cytostatic agents or radioactive substances, the ZMF provides special laboratories, which ensure safe working conditions. The laboratory for experimental biomodels is operated by the BMF, including pick-up and delivery service of animals.

- » BSL-2 Cell Culture Laboratory
- » BSL-3 Cell Culture Laboratory
- » Hypoxia Workstation

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» Anaerobic Workstation

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» Cytostatics Workstation

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» Experimental Biomodels/Animal Facility Laboratory

Contact: Mag.^{a} Dr.^{in} Birgit Reininger-Gutmann
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» Radioactivity/Isotope Laboratory Unit

Contact: Ing.^{in} Birgit Reiter
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T: +43 316 385 73511

Special Services (for internal use only)

To ensure that experiments run smoothly we support researchers with following services …

» Database for Technical Equipment
- The database lists high-end equipment situated at the Med Uni Graz. This enables cooperations and provides easier/faster access to equipment.
- Available via the following web address: https://infrastructure-database.meduni-graz.at/

Contact: Mag. Dr. Christian Gülly
E: christian.guelly@medunigraz.at
T: +43 316 385 - 73001

» Freezer Inventory Database (FInDB)
- The database is an easy-to-use software tool to inventorise and document biospecimen storage in a highly fluctuating multi-user environment; used for samples in freezers and liquid nitrogen tanks.

Contact: ZMF Referat
E: zmf.referat@medunigraz.at
T: +43 316 385 - 73020

» Shipment of Dangerous Goods
- We provide certified staff for shipment of dangerous goods according to IATA and ADR requirements. Categories: UN 3373 Cat. B, UN 1845 Dry ice, UN 2814 Cat. A inf. in humans, UN 2900 Cat. A, inf. in animals, UN 3245 GMOs and GMMOs.

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