LUDWIG BOLTZMANN INSTITUTE Osteology

ANNUAL REPORT 2023

www.osteologie.lbg.ac.at

Contents

1 Abbreviations – Abkürzungen

AFM	Atomic Force Microscopy
AGEs	Advanced Glycation End products
AI	Artificial Intelligence
ALL	Acute Lymphoblastic Leukaemia
ALP	Alkaline Phosphatase
AN	Anorexia Nervosa
ATP	Adenosintriphosphat
BMD	Bone Mineral Density
BMDD	Bone Mineralisation Density Distribution
BP	Bisphosphonate
BV/TV	Bone Volume per Trabecular Volume
Ca	Calcium
CaMean	mittlere Ca-Konzentration
CaPeak	häufigste auftretende Ca-Konzentration
CaWidth	Peak-Breite der Knochenmineralisationsdichteverteilung
CaYoung	Mineral Content between the Labels
CKD	Chronic Kidney Disease
CKD-MBD	Chronic Kidney Disease–Mineral Bone Disorder
CLSM	Confocal Laser Scanning Microscopy
COL1A1	Collagen Type I alpha 1
COL1A2	Collagen Type I alpha 2
CRISPR/Cas	Clustered Regularly Interspaced Short Palindromic Repeats/ CRISPR-associated
CT	Computertomographie
DNA	Deoxyribonucleic Acid
DXA	Dual Energy X-Ray Absorptiometry
ECM	Extracellular Matrix
ERN BOND	European Reference Network on Rare Bone Diseases
ESRF	European Synchrotron Radiation Facility
FESEM	Field Emission Scanning Electron Microscope
FGF23	Fibroblast Growth Factor 23
FLS	Fracture Liaison Service
FRAX	Fracture Risk Assessment Tool
FTIR	Fourier Transform Infrared
FTIRI	Fourier Transform Infrared Imaging
FWF	Fonds zur Förderung der wissenschaftlichen Forschung (Austrian Science Fund)
Fx	Fracture
GAG	Glycosaminoglycan
HbA1c	Hämoglobin A1 (Glykierung)
HGPS	Hutchinson-Gilford Progeria Syndrome
HPP	Hypophosphatasia
IOF	International Osteoporosis Foundation
ko	Knockout
MC3T3-E1	Mouse Osteoblastic Cell Line
MIO	Male Idiopathic Osteoporosis
miRNA	microRNA
MM	Mineral/Matrix
MMC	Mineral/Maturity/Crystallinity
NGS	Next-Generation Sequencing
NIH	National Institutes of Health

OA	Osteoarthritis
OI	Osteogenesis imperfecta
OLCN	Osteocyte Lacuna Canaliculi Network
OLS	Osteocyte Lacunae Section
OPG	Osteoprotegerin
OVX	Ovariektomised
PEN	Pentosidine
PF	Pelvic Fracture
PMMA	Polymethyl Methacrylate
PTH	Parathyroid Hormone
Pyd	Pyridinoline
qBEI	quantitative Backscattered Electron Imaging
QoL	Quality of Life
RANKL	ReceRANKLptor Activator of NFkappa-B Ligand
ROD	Renal Osteodystrophy
SAM	Scanning Acoustic Microscope
SASAM	Saarland Scanning Acoustic Microscopy
SAXS	Small Angle X-Ray Scattering
SEM	Scanning Electron Microscope
SERS	Surface-Enhanced Raman Spectroscopy
T1DM	Type 1 Diabetes mellitus
TBS	Trabecular Bone Score
TERS	Tip-Enhanced Raman Spectroscopy
ttw	tiptoe walking
VBGC	Vienna Bone & Growth Center
WT	Wild type
XLH	X-Linked Hypophosphatemia

2 Overview of the Institute

The Ludwig Boltzmann Institute of Osteology (LBIO) was founded in 1991 through a partnership agreement between Austrian Workers' Compensation Board (AUVA), Vienna Health Insurance Fund (WGKK) – now Austrian Social Health Insurance Fund (OEGK) and Ludwig Boltzmann Gesellschaft (LBG) at the Hanusch Hospital and the Trauma Centre Meidling, with Prof Klaus Klaushofer, MD, serving as the Scientific and Administrative Head until the end of 2018. As from 1st January 2019, he was succeeded by Assoc.Prof Jochen Zwerina, MD. A Board oversees the scientific and administrative activities of the LBIO with Board members representing the partner institutions (AUVA, OEGK, LBG). Special emphasis was placed on the organisation and performance of multidisciplinary basic and clinical research in bone and mineral metabolism with the main focus on translational medicine. Thus, the LBIO serves as the scientific core centre within a multidisciplinary clinical network located at the two hospitals targeting diagnosis and treatment of bone and joint diseases.

2.1 Mission Statement

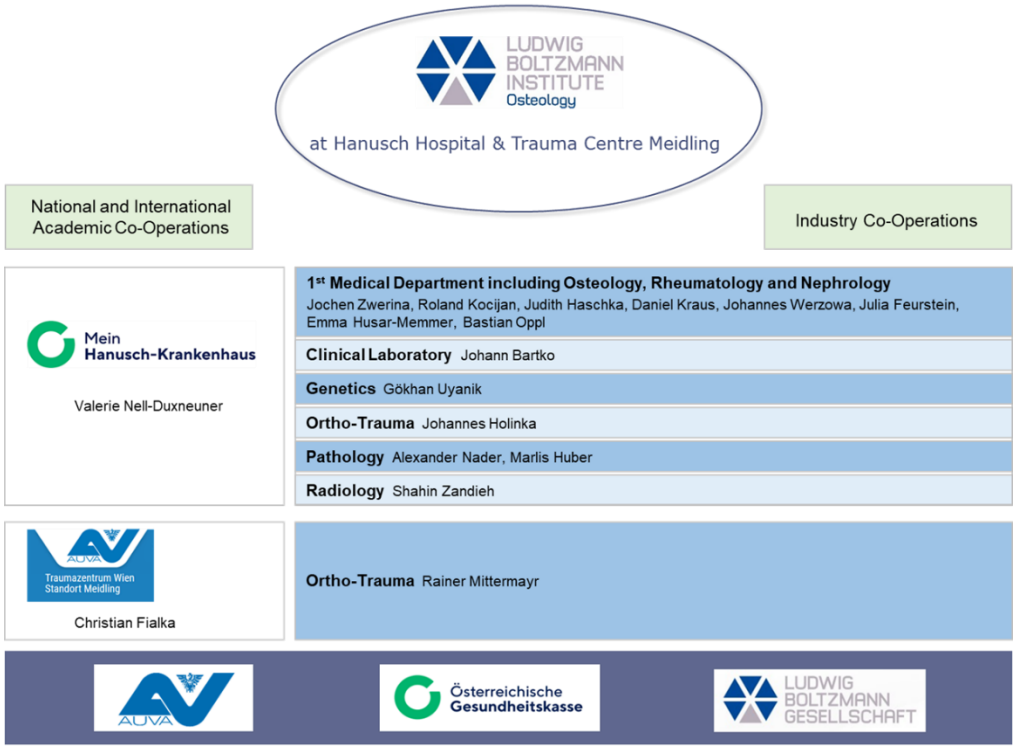
LBIO's **mission** is to achieve the highest level of scientific excellence through basic and clinical research, as well as the training of young scientists in clinical and experimental Osteology and the gender-neutral development of their careers.

LBIO’s **goal** is the improvement of patient care. Towards this goal, the study of bone is undertaken at all hierarchical levels through a combination of techniques, unique worldwide

The **aim** is the elucidation of the mechanisms underlying the basic function of bone, and musculoskeletal diseases, leading to the discovery and development of effective strategies for diagnosis, prevention, and treatment.

To **achieve** the stated goal, LBIO basic scientists and clinicians in tandem with scientists of the Department of Biomaterials of the Max Planck Institute of Colloids and Interfaces, Potsdam, Germany, as well as national and international collaborators and industry, are utilizing in partnerships the globally unparalleled LBIO expertise and available combination of analytical approaches to study bone at all hierarchical levels. The existing combination of instrumental capabilities allows analyses to be performed from a clinical, cell & molecular biology, physical chemical, and material science perspective.

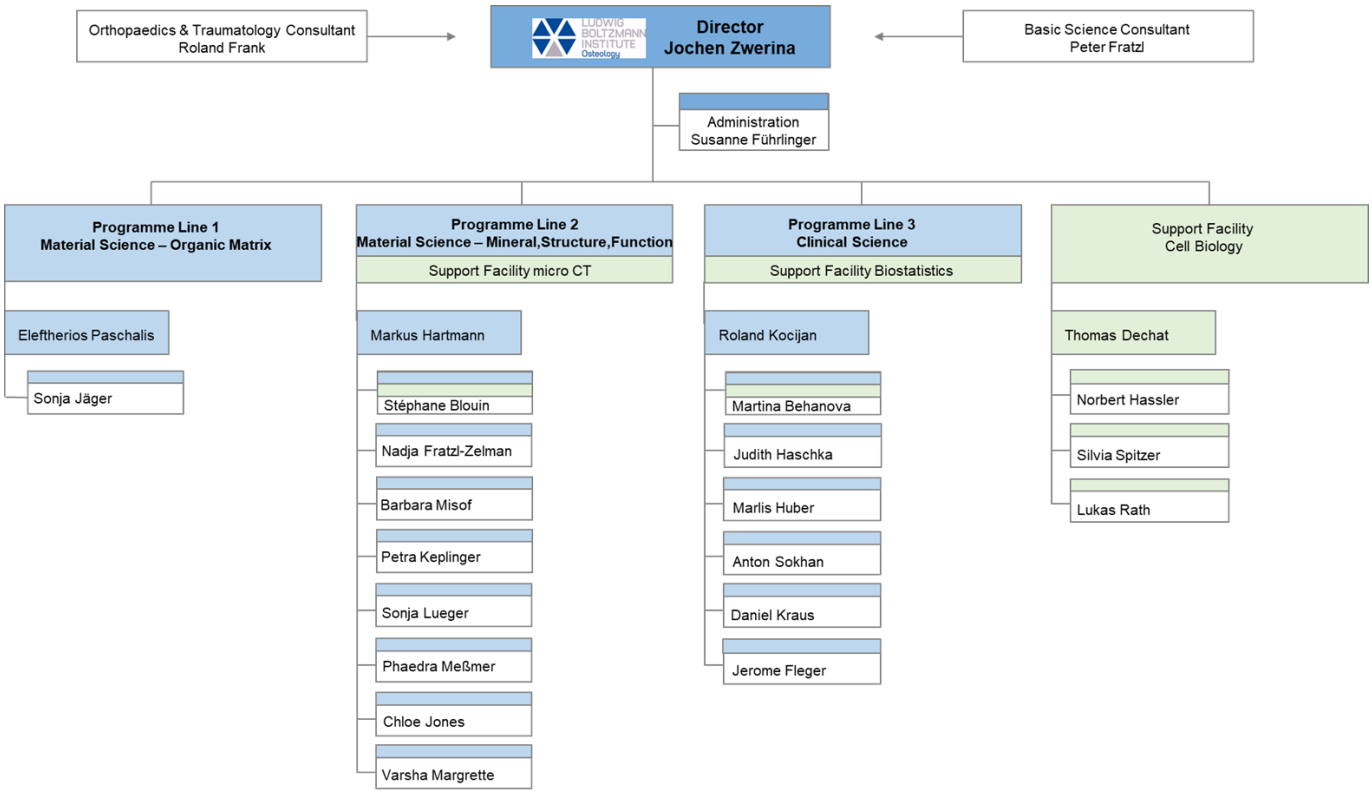
2.2 Organisation



Board members:
GD Mag. Alexander Bernart (President) (Allgemeine Unfallversicherungsanstalt)
Erol Holawatsch, MSc (Vicepresident) (Österreichische Gesundheitskasse)
Dir.-Stv. Dr. Alexander Biach (Wirtschaftskammer Wien)
Mario Ferrari (Österreichische Gesundheitskasse)
ÄD Dr. Roland Frank, MSc (Allgemeine Unfallversicherungsanstalt)
Mag. Alexander Hayn (Wirtschaftskammer Wien)
Ing. Martin Heimhilcher (Österreichische Gesundheitskasse)
ÄD Priv.Doz. Dr. Valerie Nell-Duxneuner (Österreichische Gesundheitskasse)

Representatives of the Ludwig Boltzmann Society:
Dipl.-Ing. Dr. Elvira Welzig, MSc.
Mag. Jürgen Busch, LL.M / Dr. Karine Köhrer

Internal Organisation



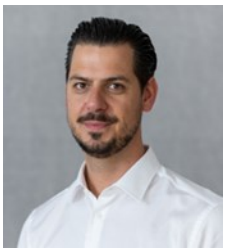
Managing Director
Priv.Doz. Jochen Zwerina, MD
1st Medical Department, Hanusch Hospital
A-1140 Vienna, Heinrich Collin-Str. 30
Tel.: +43 (0)1 91021-57400
Fax: +43 (0)1 91021-86929
Email: jochen.zwerina@osteologie.lbg.ac.at

Orthopaedics & Traumatology Consultant
Roland Frank, MD, MSc
Medical Director AUVA
A-1100 Vienna, Wienerbergstr. 11
Tel.: +43 (0)5 9393-20121
Fax: +43 (0)5 9393-20129
Email: roland.frank@auva.at

Basic Science Consultant
Prof Peter Fratzl, PhD
Max Planck Institute of Colloids and Interfaces
D-14424 Potsdam
Tel.: +49 331 567 9401
Fax: +49 331 567 9402
Email: peter.fratzl@mpikg.mpg.de

PL1 Material Science - Organic Matrix
Eleftherios Paschalis, PhD
A-1140 Vienna, Heinrich Collin-Str. 30
Tel.: +43 (0)1 91021-86940
Fax: +43 (0)1 91021-86929
Email: eleftherios.paschalis@osteologie.lbg.ac.at

PL2 Material Science – Mineral, Structure, Function
Priv.Doz. Markus Hartmann, PhD
A-1120 Vienna, Kundratstr. 37
Tel.: +43 (0)5 9393-55770
Fax: +43 (0)5 9393-55771
Email: markus.hartmann@osteologie.lbg.ac.at



PL3 Clinical Science
Assoc.Prof Priv.Doz. Roland Kocijan, MD
A-1140 Vienna, Heinrich Collin-Str. 30
Tel.: +43 (0)1 91021-86924
Fax: +43 (0)1 91021-86929
Email: roland.kocijan@osteologie.lbg.ac.at

3 Co-operations

3.1 Partners

Allgemeine Unfallversicherungsanstalt und Traumazentrum Wien Meidling

Österreichische Gesundheitskasse

Hanusch-Krankenhaus

Ludwig Boltzmann Gesellschaft

3.2 Ongoing scientific co-operations

AGES, Institute of Medical Microbiology and Hygiene, Vienna, Austria (Assoc.Prof Alexander Indra, Dr Florian Heger)

Angers University Hospital, Department of Paediatric Endocrinology and Diabetology, Angers, France (Dr Aurélie Donzeau)

Avicenna AI, La Ciotat, France (Charlotte Castineira)

Columbia University, Division of Endocrinology, New York, USA (Prof John P. Bilezikian, Prof Elizabeth Shane, Dr Mishaela Rubin)

Columbia University, Medical Center, Nephrology, New York, USA (Prof Tom Nickolas)

Creighton University School of Medicine, Department of Endocrinology, Omaha, USA (Prof Robert R. Recker, Prof Mohammed P Akhter)

Eunice Kennedy Shriver National Institute of Child Health and Human Development, Bone and Extracellular Matrix Branch, Bethesda, USA (Dr Joan Marini)

Helen Hayes Hospital, Regional Bone Center, West Haverstraw, USA (Prof David Dempster, Dr Robert Lindsay)

Helsinki University Central Hospital and University of Helsinki, Department of Paediatrics, Helsinki, Finland (Dr Pauliina Utriainen)

Image Biopsy Lab GmbH, Vienna, Austria (DI Richard Ljuhar, Mag Philip Meier)

Institute of Physiology CAS, Laboratory of Molecular Physiology of Bone, Prague, Czech Republic (Dr Michaela Tencerova)

Karolinska Institute, Department of Biosciences and Nutrition, Stockholm, Sweden (Prof Maria Eriksson)

Kepler University Hospital, Department of Paediatrics and Adolescent Medicine, Linz, Austria (Prof Wolfgang Högler)

Leiden University Medical Center, Department of Endocrinology, Leiden, The Netherlands (Prof Sokrates Papapoulos, Prof Clemens Lowik, Dr Rutger van Bezooijen)

Ludwig Boltzmann Institute for Experimental and Clinical Traumatology, Vienna, Austria (Prof Johannes Grillari)

Marienhaus Hospital, Clinic for Orthopaedics and Trauma Surgery, Mainz, Germany (Prof Andreas Kurth)

Massachusetts General Hospital, Harvard Medical School, Endocrine Division, Boston, USA (Dr Mary Bouxsein, Prof Roland Baron)

Max-Planck-Institute of Colloids and Interfaces, Department of Biomaterials, Potsdam, Germany (Prof Peter Fratzl, Dr Richard Weinkamer, Dr Emeline Raguin, Dr Maximilian Rummler)

Mayo Clinic, Department of Orthopedic Surgery, Rochester, USA (Dr Roman Thaler)

McGill University Shriners Hospital for Children, Genetics Unit, Montreal, Canada (Prof Frank Rauch, Prof Francis H. Glorieux)

Medical University of Innsbruck, Department of Medicine I and Christian Doppler Laboratory on Iron and Phosphate Biology, Innsbruck, Austria (Prof Heinz Zoller)

Medical University of Vienna, Department of Forensic Medicine, Vienna, Austria (Prof Andrea Berzlanovich)

Medical University of Vienna, Department of Paediatrics and Adolescent Medicine, Vienna, Austria (Prof Gabriele Häusler, Dr Julia Vodopiutz)

Medical University of Vienna, Institute of Medical Genetics, Vienna, Austria (Assoc.Prof Franco Laccone)

Medical University of Vienna, Department of Medical Biochemistry, Max Perutz Labs, Vienna, Austria (Prof Roland Foisner)

Medical University of Vienna, University Clinic of Dentistry, Vienna, Austria (Prof Reinhard Gruber)

National Human Genome Research Institute, National Institutes of Health, Center for Precision Health Research, Molecular Genetics Section Bethesda, USA (Dr Wayne Cabral)

Orthopaedic Hospital Vienna-Speising, 2nd Orthopaedic Department, Vienna, Austria (Assoc.Prof Jochen Hofstätter)

Orthopaedic Hospital Vienna-Speising, Department of Paediatric Orthopaedics, Deformity Correction, Neuroorthopaedics and Adult Foot and Ankle Surgery (Dr Gabriel Mindler)

Oslo University, Department of Endocrinology, Morbid Obesity and Preventive Medicine, Aker, Norway (Prof Erik Fink Eriksen)

Paris-Lodron University, Department Chemistry and Physics of Materials, Salzburg, Austria (Prof Maurizio Musso, Prof Bodo Wilts, Dr Ljubomir Vitkov, Dr Andreas Roschger, Dr Barbara Schamberger)

Phoenix Children’s Hospital and the University of Arizona, College of Medicine, Phoenix, USA (Dr Katherine Wesseling-Perry)

Politecnico di Milano, Department of Chemistry, Materials and Chemical Engineering "Giulio Natta", Laboratory of Biological Structure Mechanics (LaBS), Milan, Italy (Assoc.Prof Pasquale Vena)

TAmiRNA, Vienna, Austria (Dr Matthias Hackl)

Trauma Centre Meidling of AUVA, Vienna, Austria (Dr Heinrich Thaler, Dr Rainer Mittermayr)

UCLA Medical Center, David Geffen School of Medicine, Los Angeles, USA (Dr Patrick Heizer)

Université Paris Saclay, Department of Endocrinology and Childhood Diabetes, GHU APHP (Prof Agnès Linglart)

University Hospital Münster, Department of Paediatrics and Adolescent Medicine, Münster, Germany (Prof Frank Rutsch)

University of Applied Sciences Wiener Neustadt, Study Programme Biotechnical Processes, Wr. Neustadt, Austria (Dr Katerina Prohaska)

University of Birmingham, Department of Endocrinology & Diabetes, Birmingham, UK (Dr Suma Uday)

University of Liège, Mechanics of Biological and Bioinspired Materials Laboratory, Liège, Belgium (Prof Davide Ruffoni)

University of Melbourne, St Vincent's Institute and Department of Medicine at St Vincent's Hospital, Fitzroy, Australia (Prof Natalie A. Sims)

University of Natural Resources and Life Sciences (BOKU), Vienna, Austria (Prof Helga Lichtenegger)

University of Pavia, Department of Molecular Medicine, Unit of Biochemistry, Pavia, Italy (Prof Antonella Forlino)

University of Vienna, Computational Physics Group, Vienna, Austria (Prof Christoph Dellago)

Vienna University of Technology, Institute of Lightweight Design and Structural Biomechanics, Vienna, Austria (Prof Philipp Thurner)

4 Infrastructur/Methods

Technique	Outcome
Light Microscopy/ Histomorphometry	Structural parameters, parameters of static bone formation and resorption, dynamic bone formation. Pathohistological diagnostic evaluation of bone biopsies in collaboration with the Department of Pathology at the Hanusch Hospital
Confocal Laser Scanning Microscopy (CLSM)	3-D fluorescence imaging of labelled bone tissue, cellular structures & cytoskeletal architecture. Imaging of resorption lacunae in in-vitro assays.
qBEI (quantitative backscattered electron imaging)	Bone mineral density distribution (BMDD) in a spatially resolved manner at the μm-range. Characterisation of the osteocyte lacunae sections (OLS)
EDX (energy dispersive X-ray micro-analysis)	Elemental composition of bone (sensitivity of quantification 0.1%)
HR-BEI (high-resolution backscatter electron imaging)	Visualisation of bone matrix in nm-range (limit 4nm)
Scanning SAXS (Small-angle X-ray scattering) in coop. with Prof Fratzl	Information on bone mineral crystallites characteristics in a spatially resolved manner at the nanometre range.
Nanoindentation in coop. with Prof Fratzl	Spatial distribution of elastic properties of bone composite.
SASAM (Saarland scanning acoustic microscopy)	Spatially resolved acoustic properties of bone material at the μm-range.
FTIRI (Fourier transform infrared imaging)	Spatial distribution of mineral crystallite maturity and collagen cross-links ratio at the 6.3 μm spatial level
ATR-FTIR (Attenuated total reflectance Fourier transform infrared)	Attenuated total reflectance FTIR spectroscopy coupled to a flow-through chamber for real-time analysis of extracellular matrix in *in situ* cell cultures.
RAMAN	Spatial distribution of mineral characteristics at the 0.6-1 μm spatial level; Nanoporosity Mineral crystallite and collagen fibre orientation Spatial distribution of pyridinoline collagen cross-link content Lipids, AGEs, Pyrophosphate, Proteoglycans
AFM TERS Raman	Spatial resolution of ≥ 10 nm Confocal microscopy, Topography, Bio-mechanical outcomes (Under development)
Multiwell live-cell brightfield microscopy	Live-cell imaging of whole cell cultures in multi-well plates over several days with a maximum scan speed of one scan per hour to study cell proliferation and migration

CytoSMART Omni (Automated live-cell imaging bright-field microscope)	Long time (days up to weeks) high resolution phase contrast live cell imaging of whole cell cultures growing in various culture vessels (flasks, petri dishes and multi-well plates)
Micro-computed tomography (micro-CT) instrument shared with Prof Grillari	Architecture/structure of mineralised bone sample

Clinical methods	
Dual Energy X-ray Absorptiometry (DXA)	Bone mineral density measurement *in vivo*
Trabecular Bone Score (TBS)	Non-invasive application for the assessment of trabecular bone texture
Bone Turnover Markers (BTM)	CTX, Osteocalcin, ALP, Vitamin D, Calcium, Phosphate

Cell Biology methods
Cell Biology: cell culture techniques (e.g. cultivating cell lines as well as primary cells and stem cells, cell differentiation, cell transfection, genome editing using the CRISPR/Cas9 system, immunofluorescence microscopy) and molecular biology and biochemical techniques (e.g. cloning, expression analyses using quantitative RT-PCR and RNA deep sequencing, cell extraction and fractionation, Western Blot, immunoprecipitation, chromatin immunoprecipitation, expression and purification of recombinant proteins)

5 Closed projects and published manuscripts

5.1 Accelerated mineralization kinetics in children with osteogenesis imperfecta type 1

Not much is known about the time course of mineralization in newly formed bone from healthy individuals nor in patients with bone disease. To investigate the early phase of mineral accumulation in human bone, we measured the mean mineralization content between double fluorescence labels (CaYoung) with quantitative backscattered electron imaging (qBEI) in human transiliac biopsy samples. Fluorescent labels for histomorphometric evaluation were administered over two 2-day periods separated by a 10-day-free interval, 4–5 days before biopsy procedure. We compared n = 19 children with osteogenesis imperfecta type 1 (OI, 6 girls/13 boys, age-range 2.2–14.1 years) with both a reference group of n = 38 healthy children (REF, 24 girls/14 boys, age-range 1.5–20.9 years) and an age-matched subgroup (n = 17) of the latter (CON, 5 girls/12 boys, age-range 2.0–14.7 years).

We observed significantly higher levels of CaYoung in OI type 1 compared to CON and REF in both cortical bone (Ct.CaYoung, +8.3 % and +7.0 %, respectively) and cancellous bone (Cn.CaYoung, +6.5 % and +4.9 %, all $p < 0.001$). When comparing cortical and cancellous compartments intra-individually, we found a significantly higher Cn.CaYoung than Ct.CaYoung in REF (2.3 ± 2.9 %, $p < 0.001$), but not in the OI group (0.6 ± 1.6 %, not significant). In the REF group, n = 7 samples also contained double labels in primary woven bone (which is deposited at the external cortex during growth/lateral drift of the iliac crest). This primary woven bone in REF had a higher CaYoung than secondary osteonal bone (4.9 ± 2.7 %).

Our findings suggest that bone in OI has an accelerated mineral accumulation compared to healthy bone. This is reflecting the overall increased bone mineralization in OI as reported previously, and indicates that the higher levels of mineralization than those seen in healthy individuals are already achieved in OI type 1 early after onset of mineralization.

Bone 166:116580 IF 4.626 (1710)

5.2 Osteocyte lacunae in transiliac bone biopsy samples across life span

Osteocytes act as bone mechanosensors, regulators of osteoblast/osteoclast activity and mineral homeostasis, however, knowledge about their functional/morphological changes throughout life is limited. We used quantitative backscattered electron imaging (qBEI) to investigate osteocyte lacunae sections (OLS) as a 2D-surrogate characterizing the osteocytes. OLS characteristics, the density of mineralized osteocyte lacunae (i.e., micropetrotic osteocytes, md.OLS-Density in nb/mm^2) and the average degree of mineralization (Ca_{Mean} in weight% calcium) of cortex and spongiosa were analyzed in transiliac biopsy samples from healthy individuals under 30 (n=59) and over 30 years (n=50) (i.e., before and after the age of peak bone mass, respectively). We found several differences in OLS-characteristics: 1). Inter-individually between the age groups: OLS-Density and OLS-Porosity were reduced by about 20% in older individuals in spongiosa and in cortex versus younger probands (both, $p < 0.001$). 2). Intra-individually between bone compartments: OLS-Density was higher in the cortex, +18.4%, $p < 0.001$ for younger and +7.6%, $p < 0.05$ for older individuals. Strikingly, the most frequent OLS nearest-neighbor distance was about 30 µm in both age groups and at both bone sites revealing a preferential organization of osteocytes in clusters. OLS-Density was negatively correlated with Ca_{Mean} in both spongiosa and cortex (both, $p < 0.001$). Few mineralized OLS were found in young individuals along with an increase of md.OLS-Density with age. In summary, this transiliac bone sample analysis of 200000 OLS from 109 healthy individuals throughout lifespan reveals several age-related differences in OLS characteristics. Moreover, our study provides reference data from healthy individuals for different ages to be used for diagnosis of bone abnormalities in diseases.

STATEMENT OF SIGNIFICANCE: Osteocytes are bone cells embedded in lacunae within the mineralized bone matrix and have a key role in the bone metabolism and the mineral homeostasis. Not easily accessible, we used quantitative backscattered electron imaging to determine precisely number and shape descriptors of the osteocyte lacunae in 2D. We analyzed transiliac biopsy samples from 109 individuals with age distributed from 2 to 95 years. Compact cortical bone showed constantly higher lacunar density than cancellous bone but the lacunar density in both bone tissue decreased with age before the peak bone mass age at 30 years and stabilized or even increased after this age. This extensive study provides osteocyte lacunae reference data from healthy individuals usable for bone pathology diagnosis.

Acta Biomater 157:275-87 IF 10.633 (1711)

5.3 Reduced bone mass and increased osteocyte tartrate-resistant acid phosphatase (TRAP) activity, but not low mineralized matrix around osteocyte lacunae, are restored after recovery from exogenous hyperthyroidism in male mice

Hyperthyroidism causes secondary osteoporosis through favoring bone resorption over bone formation, leading to bone loss with elevated bone fragility. Osteocytes that reside within lacunae inside the mineralized bone matrix orchestrate the process of bone remodeling and can themselves actively resorb bone upon certain stimuli. Nevertheless, the interaction between thyroid hormones and osteocytes and the impact of hyperthyroidism on osteocyte cell function are still unknown. In a preliminary study, we analyzed bones from male C57BL/6 mice with drug-induced hyperthyroidism, which led to mild osteocytic osteolysis with 1.14-fold larger osteocyte lacunae and by 108.33% higher tartrate-resistant acid phosphatase (TRAP) activity in osteocytes of hyperthyroid mice compared to euthyroid mice. To test whether hyperthyroidism-induced bone changes are reversible, we rendered male mice hyperthyroid by adding levothyroxine into their drinking water for 4 weeks, followed by a weaning period of 4 weeks with access to normal drinking water. Hyperthyroid mice displayed cortical and trabecular bone loss due to high bone turnover, which recovered with weaning. Although canalicular number and osteocyte lacunar area were similar in euthyroid, hyperthyroid and weaned mice, the number of terminal deoxynucleotidyl transferase-mediated deoxyuridine triphosphate nick end labeling (TUNEL)-positive osteocytes was 100% lower in the weaning group compared to euthyroid mice and the osteocytic TRAP activity was eightfold higher in hyperthyroid animals. The latter, along with a 3.75% lower average mineralization around the osteocyte lacunae in trabecular bone, suggests osteocytic osteolysis activity that, however, did not result in significantly enlarged osteocyte lacunae. In conclusion, we show a recovery of bone microarchitecture and turnover after reversal of hyperthyroidism to a euthyroid state. In contrast, osteocytic osteolysis was initiated in hyperthyroidism, but its effects were not reversed after 4 weeks of weaning. Due to the vast number of osteocytes in bone, we speculate that even minor individual cell functions might contribute to altered bone quality and mineral homeostasis in the setting of hyperthyroidism-induced bone disease.

J Bone Miner Res 38:131-43 IF 6.390 (1712)

5.4 Subcanalicular nanochannel volume is inversely correlated with calcium content in human cortical bone

The spatial distribution of mineralization density is an important signature of bone growth and remodeling processes, and its alterations are often related to disease. The extracellular matrix of some vertebrate mineralized tissues is known to be perfused by a lacunocanalicular network (LCN), a fluid-filled unmineralized structure that harbors osteocytes and their fine processes and transports extracellular fluid and its constituents. The current report provides evidence for structural and compositional heterogeneity at an even smaller, subcanalicular scale. The work reveals an extensive unmineralized three-dimensional (3D) network of nanochannels (~30 nm in diameter)

penetrating the mineralized extracellular matrix of human femoral cortical bone and encompassing a greater volume fraction and surface area than these same parameters of the canaliculi comprising the LCN. The present study combines high-resolution focused ion beam-scanning electron microscopy (FIB-SEM) to investigate bone ultrastructure in 3D with quantitative backscattered electron imaging (qBEI) to estimate local bone mineral content. The presence of nanochannels has been found to impact qBEI measurements fundamentally, such that volume percentage (vol%) of nanochannels correlates inversely with weight percentage (wt%) of calcium. This mathematical relationship between nanochannel vol% and calcium wt% suggests that the nanochannels could potentially provide space for ion and small molecule transport throughout the bone matrix. Collectively, these data propose a reinterpretation of qBEI measurements, accounting for nanochannel presence in human bone tissue in addition to collagen and mineral. Further, the results yield insight into bone mineralization processes at the nanometer scale and present the possibility for a potential role of the nanochannel system in permitting ion and small molecule diffusion throughout the extracellular matrix. Such a possible function could thereby lead to the sequestration or occlusion of the ions and small molecules within the extracellular matrix.

J Bone Miner Res 38:313-25 IF 6.390 (1713)

5.5 Circulating miRNAs respond to denosumab rreatment after 2 years in postmenopausal women with osteoporosis-the MiDeTe study

Context: MicroRNAs (miRNAs)-short, single-stranded, noncoding RNAs-regulate several biological processes, including bone metabolism.

Objective: We investigated circulating miRNAs as promising biomarkers for treatment monitoring in women with postmenopausal osteoporosis on denosumab (DMAB) therapy.

Methods: In this prospective, observational, single-center study, 21 postmenopausal women treated with DMAB were included for a longitudinal follow-up of 2 years. Next-generation sequencing (NGS) was performed to screen for serological miRNAs at baseline, month 6, and month 24. Reverse transcription quantitative polymerase chain reaction (RT-qPCR) was used to confirm NGS findings in the entire cohort. Bone turnover markers (BTM) P1NP and CTX, and bone mineral density (BMD) by dual x-ray absorptiometry were assessed and correlated to miRNAs.

Results: BMD at the hip (5.5%, P = 0.0006) and lumbar spine significantly increased (11.4%, P = 0.017), and CTX (64.1%, P < 0.0001) and P1NP (69.3%, P < 0.0001) significantly decreased during treatment. NGS analysis revealed significant changes in miRNAs after 2 years of DMAB treatment but not after 6 months. Seven miRNAs were confirmed by RT-qPCR to be significantly changed during a 2-year course of DMAB treatment compared to baseline. Four of these were mainly transcribed in blood cells, including monocytes. Correlation analysis identified significant correlation between change in miRNA and change in BTMs as well as BMD. Based on effect size and correlation strength, miR-454-3p, miR-26b-5p, and miR-584-5p were defined as top biomarker candidates, with the strongest association to the sustained effect of denosumab on bone in osteoporotic patients.

Conclusion: Two years of DMAB treatment resulted in upregulation of 7 miRNAs, 4 of which are mainly transcribed in monocytes, indicating a potential impact of DMAB on circulating osteoclast precursor cells. These changes were associated to BMD gain and BTM suppression and could therefore be useful for monitoring DMAB treatment response.

J Clin Endocrinol Metab 108:1154-65 IF 6.134 (1714)

5.6 Comprehensive associations between acidosis and the skeleton in patients with kidney disease

Significance statement: Renal osteodystrophy (ROD) contributes substantially to morbidity in CKD, including increased fracture risk. Metabolic acidosis (MA) contributes to the development of ROD, but an up-to-date skeletal phenotype in CKD-associated acidosis has not been described. We comprehensively studied associations between acidosis and bone in patients with CKD using

advanced methods to image the skeleton and analyze bone-tissue, along with biochemical testing. Cross-sectionally, acidosis was associated with higher markers of bone remodeling and female-specific impairments in cortical and trabecular bone quality. Prospectively, acidosis was associated with cortical expansion and trabecular microarchitectural deterioration. At the bone-tissue level, acidosis was associated with deficits in bone mineral content. Future work investigating acidosis correction on bone quality is warranted.

Background: Renal osteodystrophy is a state of impaired bone quality and strength. Metabolic acidosis (MA) is associated with alterations in bone quality including remodeling, microarchitecture, and mineralization. No studies in patients with CKD have provided a comprehensive multimodal skeletal phenotype of MA. We aim to describe the structure and makeup of bone in patients with MA in the setting of CKD using biochemistry, noninvasive imaging, and histomorphometry.

Methods: The retrospective cross-sectional analyses included 180 patients with CKD. MA was defined as bicarbonate ≤22 mEq/L. We evaluated circulating bone turnover markers and skeletal imaging with dual energy x-ray absorptiometry and high-resolution peripheral computed tomography. A subset of 54 participants had follow-up. We assessed associations between baseline and change in bicarbonate with change in bone outcomes. Histomorphometry, microCT, and quantitative backscatter electron microscopy assessed bone biopsy outcomes in 22 participants.

Results: The mean age was 68±10 years, 54% of participants were male, and 55% were White. At baseline, acidotic subjects had higher markers of bone turnover, lower areal bone mineral density at the radius by dual energy x-ray absorptiometry, and lower cortical and trabecular volumetric bone mineral density and impaired trabecular microarchitecture. Over time, acidosis was associated with opposing cortical and trabecular effects: cortical expansion but trabecular deterioration. Bone-tissue analyses showed reduced tissue mineral density with increased heterogeneity of calcium distribution in acidotic participants.

Conclusions: MA is associated with multiple impairments in bone quality. Future work should examine whether correction of acidosis improves bone quality and strength in patients with CKD.

J Am Soc Nephrol 34:668-81 IF 14.978 (1715)

5.7 Bi-allelic mutation in SEC16B alters collagen trafficking and increases ER stress

Osteogenesis imperfecta (OI) is a genetically and clinically heterogeneous disorder characterized by bone fragility and reduced bone mass generally caused by defects in type I collagen structure or defects in proteins interacting with collagen processing. We identified a homozygous missense mutation in SEC16B in a child with vertebral fractures, leg bowing, short stature, muscular hypotonia, and bone densitometric and histomorphometric features in keeping with OI with distinct ultrastructural features. In line with the putative function of SEC16B as a regulator of trafficking between the ER and the Golgi complex, we showed that patient fibroblasts accumulated type I procollagen in the ER and exhibited a general trafficking defect at the level of the ER. Consequently, patient fibroblasts exhibited ER stress, enhanced autophagosome formation, and higher levels of apoptosis. Transfection of wild-type SEC16B into patient cells rescued the collagen trafficking. Mechanistically, we show that the defect is a consequence of reduced SEC16B expression, rather than due to alterations in protein function. These data suggest SEC16B as a recessive candidate gene for OI.

EMBO Mol Med 15(4):e16834 IF 12.137 (1716)

5.8 Breaking the gingival barrier in periodontitis

The break of the epithelial barrier of gingiva has been a subject of minor interest, albeit playing a key role in periodontal pathology, transitory bacteraemia, and subsequent systemic low-grade inflammation (LGI). The significance of mechanically induced bacterial translocation in gingiva (e.g., via mastication and teeth brushing) has been disregarded despite the accumulated

knowledge of mechanical force effects on tight junctions (TJs) and subsequent pathology in other epithelial tissues. Transitory bacteraemia is observed as a rule in gingival inflammation, but is rarely observed in clinically healthy gingiva. This implies that TJs of inflamed gingiva deteriorate, e.g., via a surplus of lipopolysaccharide (LPS), bacterial proteases, toxins, Oncostatin M (OSM), and neutrophil proteases. The inflammation-deteriorated gingival TJs rupture when exposed to physiological mechanical forces. This rupture is characterised by bacteraemia during and briefly after mastication and teeth brushing, i.e., it appears to be a dynamic process of short duration, endowed with quick repair mechanisms. In this review, we consider the bacterial, immune, and mechanical factors responsible for the increased permeability and break of the epithelial barrier of inflamed gingiva and the subsequent translocation of both viable bacteria and bacterial LPS during physiological mechanical forces, such as mastication and teeth brushing.

Int J Mol Sci 24:4544 IF 6.208 (1717)

5.9 Bone tissue evaluation indicates abnormal mineralization in patients with autoimmune polyendocrine syndrome type I: report on three cases

Autoimmune polyendocrine syndrome type-1 (APS1) is characterized by autoimmune manifestations affecting different organs from early childhood on. Immunological abnormalities, the resulting endocrinopathies, and their treatments may compromise bone health. For the first time in APS1, we analyzed transiliac bone biopsy samples by bone histomorphometry and quantitative backscattered electron imaging in three adult patients (female P1, 38 years; male P2, 47 years; male P3, 25 years). All had biallelic mutations in the autoimmune regulator gene and in addition to endocrinopathies, also significant bone fragility. Histomorphometry showed bone volume in the lower normal range for P1 (BV/TV, - 0.98 SD) and P3 (- 1.34 SD), mainly due to reduced trabecular thickness (TbTh, - 3.63 and - 2.87 SD). In P1, osteoid surface was low (OS/BS, - 0.96 SD); active osteoblasts and double labeling were seen only on cortical bone. P3 showed a largely increased bone turnover rate (BFR/BV, + 4.53 SD) and increased mineralization lag time (Mlt, + 3.40 SD). Increased osteoid surface (OS/BS, + 2.03 and + 4.71 SD for P2 and P3) together with a large proportion of lowly mineralized bone area (Trab CaLow, + 2.22 and + 9.81 SD for P2 and P3) and focal mineralization defects were consistent with abnormal mineralization. In all patients, the density and area of osteocyte lacunae in cortical and trabecular bone were similar to healthy adults. The bone tissue characteristics were variable and included decreased trabecular thickness, increased amount of osteoid, and abnormal mineralization which are likely to contribute to bone fragility in patients with APS1.

Calcif Tissue Int 112:675-82 IF 4.000 (1718)

5.10 Structural and functional heterogeneity of mineralized fibrocartilage at the Achilles tendon-bone insertion

A demanding task of the musculoskeletal system is the attachment of tendon to bone at entheses. This region often presents a thin layer of fibrocartilage (FC), mineralized close to the bone and unmineralized close to the tendon. Mineralized FC deserves increased attention, owing to its crucial anchoring task and involvement in enthesis pathologies. Here, we analyzed mineralized FC and subchondral bone at the Achilles tendon-bone insertion of rats. This location features enthesis FC anchoring tendon to bone and sustaining tensile loads, and periosteal FC facilitating bone-tendon sliding with accompanying compressive and shear forces. Using a correlative multimodal investigation, we evaluated potential specificities in mineral content, fiber organization and mechanical properties of enthesis and periosteal FC. Both tissues had a lower degree of mineralization than subchondral bone, yet used the available mineral very efficiently: for the same local mineral content, they had higher stiffness and hardness than bone. We found that enthesis FC was characterized by highly aligned mineralized collagen fibers even far away from the attachment region, whereas periosteal FC had a rich variety of fiber arrangements. Except for an initial steep spatial gradient between unmineralized and mineralized FC, local mechanical

properties were surprisingly uniform inside enthesis FC while a modulation in stiffness, independent from mineral content, was observed in periosteal FC. We interpreted these different structure-property relationships as a demonstration of the high versatility of FC, providing high strength at the insertion (to resist tensile loading) and a gradual compliance at the periosteal surface (to resist contact stresses). STATEMENT OF SIGNIFICANCE: Mineralized fibrocartilage (FC) at entheses facilitates the integration of tendon in bone, two strongly dissimilar tissues. We focus on the structure-function relationships of two types of mineralized FC, enthesis and periosteal, which have clearly distinct mechanical demands. By investigating them with multiple high-resolution methods in a correlative manner, we demonstrate differences in fiber architecture and mechanical properties between the two tissues, indicative of their mechanical roles. Our results are relevant both from a medical viewpoint, targeting a clinically relevant location, as well as from a material science perspective, identifying FC as high-performance versatile composite.

Acta Biomater 166:409-18 IF 10.633 (1719)

5.11 The ankle in XLH: Reduced motion, power and quality of life

Background: X-linked hypophosphatemia (OMIM 307800) is a rare bone disease caused by a phosphate-wasting condition with lifelong clinical consequences. Those affected suffer from bone pain, complex skeletal deformities, impaired mobility and a reduced quality of life. Early osteoarthritis and reduced range of motion of the lower limbs are known pathologies in XLH patients. However, XLH-specific data on the affected compartments such as the ankle joint through the evaluation of radiographic and gait analysis data is still lacking.

Patients and methods: In this cross-sectional study, patients with genetically verified XLH, age ≥ 16 - 50 years and a complete record of gait analysis and or radiographic analysis data were included. Clinical examination, radiological and gait analysis data were compared to norms using the dataset of our gait laboratory registry. Radiographic analysis included tibial deformity analysis and assessment of osteoarthritis and enthesopathies. Western Ontario and McMaster Universities Arthritis Index (WOMAC), SF36v2, American Orthopedic Foot and Ankle Society score (AOFAS) and the Foot and Ankle Outcome Score (FAOS) were used. Twentythree participants with 46 limbs were eligible for the study.

Results: A total of 23 patients (n=46 feet) met the inclusion criteria. Patients with XLH had significantly reduced gait quality, ankle power and plantar flexion ($p < 0.001$) compared to a historic gait laboratory control group. Ankle valgus deformity was detected in 22 % and ankle varus deformity in 30 % of the patients. The subtalar joint (59.1%) as well as the anterior tibiotalar joint (31.1%) were the main localizations of moderate to severe joint space narrowing. Ankle power was decreased in moderate and severe subtalar joint space narrowing ($p < 0.05$) compared to normal subtalar joint space narrowing. No lateral or medial ligament instability of the ankle joint was found in clinical examination. Tibial procurvatum deformity led to lower ankle power ($p < 0.05$).

Conclusions: This study showed structural and functional changes of the ankle in patients with XLH. Subtalar ankle osteoarthritis, patient reported outcome scores and clinical ankle restriction resulted in lower gait quality and ankle power.

Front Endocrinol (Lausanne) 14:1111104 IF 5.200 (1720)

5.12 Combined press-fit and extracortical fixation in patellar tendon anterior cruciate ligament reconstruction results in reliable graft fixation and early bone block incorporation

Background: Anterior cruciate ligament (ACL) reconstruction with bone-patellar-tendon-bone (BPTB) autograft has the potential biological advantage of direct bone-to-bone healing over soft tissue grafts. The primary aim of this study was to investigate possible graft slippage and therefore fixation strength in a modified BPTB autograft technique with suspensory fixation on both sides for primary ACL reconstruction until bony integration takes place.

Methods: Twenty-one patients undergoing primary ACL reconstruction with a modified BPTB autograft (bone-on-bone (BOB) technique) between August 2017 and August 2019 were included in this prospective study. A computed tomography (CT) scan of the affected knee was performed directly postoperatively, as well as 3 months postoperatively. Examiner-blinded parameters for graft slippage, early tunnel widening, bony incorporation, as well as remodeling of the autologous refilled patellar harvest site were investigated.
Results: A series of 21 patients treated with a BPTB autograft with this technique underwent two CT investigations. Comparison of CT scans showed no bone block displacement and therefore no graft slippage in the patient cohort. Only one patient showed signs of early tunnel enlargement. Radiological bone block incorporation took place showing bony bridging of the graft to the tunnel wall in 90% of all patients. Furthermore, 90% showed less than 1 mm bone resorption of the refilled harvest site at the patella.
Conclusions: Our findings suggest graft fixation stability and reliability of anatomic BPTB ACL reconstruction with a combined press-fit and suspensory fixation technique by absence of graft slippage within the first 3 months postoperatively.

Knee 43:18-27 IF 2.423 (1721)

5.13 Physical function of RA patients tapering treatment-a post hoc analysis of the randomized controlled RETRO trial

Several studies have shown that tapering or stopping disease-modifying anti-rheumatic drugs (DMARDs) in rheumatoid arthritis (RA) patients in sustained remission is feasible. However, tapering/stopping bears the risk of decline in physical function as some patients may relapse and face increased disease activity. Here, we analyzed the impact of tapering or stopping DMARD treatment on the physical function of RA patients. The study was a post hoc analysis of physical functional worsening for 282 patients with RA in sustained remission tapering and stopping DMARD treatment in the prospective randomized RETRO study. HAQ and DAS-28 scores were determined in baseline samples of patients continuing DMARD (arm 1), tapering their dose by 50% (arm 2), or stopping after tapering (arm 3). Patients were followed over 1 year, and HAQ and DAS-28 scores were evaluated every 3 months. The effect of treatment reduction strategy on functional worsening was assessed in a recurrent-event Cox regression model with a study-group (control, taper, and taper/stop) as the predictor. Two-hundred and eighty-two patients were analyzed. In 58 patients, functional worsening was observed. The incidences suggest a higher probability of functional worsening in patients tapering and/or stopping DMARDs, which is likely due to higher relapse rates in these individuals. At the end of the study, however, functional worsening was similar among the groups. Point estimates and survival curves show that the decline in functionality according to HAQ after tapering or discontinuation of DMARDs in RA patients with stable remission is associated with recurrence, but not with an overall functional decline.

J Clin Med 12:3723 IF 3.900 (1722)

5.14 Investigating the role of ASCC1 in the causation of bone fragility

Bi-allelic variants in ASCC1 cause the ultrarare bone fragility disorder ‘spinal muscular atrophy with congenital bone fractures-2’ (SMABF2). However, the mechanism by which ASCC1 dysfunction leads to this musculoskeletal condition and the nature of the associated bone defect are poorly understood. By exome sequencing, we identified a novel homozygous deletion in ASCC1 in a female infant. She was born with severe muscular hypotonia, inability to breathe and swallow, virtual absence of spontaneous movements, and showed progressive brain atrophy, gracile long bones, very slender ribs, and a femur fracture and died from respiratory failure aged 3 months. A transiliac bone sample taken post-mortem revealed a distinct microstructural bone phenotype with low trabecular bone volume, low bone remodeling, disordered collagen organization, and an abnormally high bone marrow adiposity. Proteomics, RNA sequencing, and qPCR in patient-derived skin fibroblasts confirmed that ASCC1 was hardly expressed on protein and RNA level

compared to healthy controls. Furthermore, we demonstrate that mutated ASCC1 is associated with a downregulation of RUNX2, the master regulator of osteoblastogenesis, and SERPINF1, which is involved in osteoblast and adipocyte differentiation. It also exerts an inhibitory effect on TGF-β/SMAD signaling which is important for bone development. Additionally, knockdown of ASCC1 in human mesenchymal stromal cells (hMSCs) suppressed their differentiation capacity into osteoblasts while increasing their differentiation into adipocytes. This resulted in reduced mineralization and elevated formation of lipid droplets. These findings shed light onto the pathophysiologic mechanisms underlying SMABF2 and assign a new biological role to ASCC1 acting as an important pro-osteoblastogenic and anti-adipogenic regulator.

Front Endocrinol (Lausanne) 14:1137573 IF 5.200 (1723)

5.15 Size variability and fitting of 30 gauge thin-wall needles and 3-piece intraocular lens haptics for flanged intrascleral fixation technique

Purpose: To assess the diameter of different 30 gauge (G) thin-wall needles and 3-piece intraocular lens (IOL) haptics readily used for the flanged-haptic intrascleral fixation technique.
Setting: Hanusch Hospital, Vienna, Austria Design: Laboratory Investigation.
Methods: Five 30G thin-wall needles and five 3-piece IOLs were assessed. An upright light microscopy was used for measurements. The inner and outer diameters of the needles and the end thickness of the haptics were analysed and compared for haptic fitting into the needle.
Results: Among the needles, the inner diameter of the T-lab needle was significantly wider compared to all the others (mean 209.3±8.0µm, p<.001), followed by TSK (194.8±5.0µm), MST (194.7±5.8µm), Sterimedix (187.5±9.0µm) and significantly narrower Meso-relle (mean 178.7±7.0µm, p<.05). The outer diameter of the T-lab needle was significantly larger of all (mean 316.0±2.0 µm, p<.001). Concerning the IOLs, the AvanseePreset Kowa's haptic was significantly thinner (mean 127.2±0.7µm) than all the others, such as the TecnisZA900 Johnson&Johnson (143.5±3.1µm), the CTLucia202 Zeiss (143.8±1.3µm), and the AcrysofMA60AC Alcon (143.9±1.4µm). The only haptic that was thicker than all the others assessed was that of SensarAR40 Johnson&Johnson (170.7±1.7µm, p<.001).
Conclusions: Most of the analysed haptics would fit into most of the measured needles, with the exception of the Sensar AR40 in combination with the Meso-relle or Sterimedix needles. The combination of a larger needle lumen and a thinner haptic could result in more ease of insertion during surgery. If the dimensions of the needle and IOL haptics used are unknown, we recommend trying insertion before beginning surgery.

J Cataract Refract Surg 49:874-8 IF 3.528 (1724)

5.16 Bone intrinsic material and compositional properties in postmenopausal women diagnosed with long-term type-1 diabetes

The incidence of diabetes mellitus and the associated complications are growing worldwide, affecting the patients' quality of life and exerting a considerable burden on health systems. Yet, the increase in fracture risk in type 1 diabetes (T1D) patients is not fully captured by bone mineral density (BMD), leading to the hypothesis that alterations in bone quality are responsible for the increased risk. Material/compositional properties are important aspects of bone quality, yet information on human bone material/compositional properties in T1D is rather sparse. The purpose of the present study is to measure both the intrinsic material behaviour by nanoindentation, and material compositional properties by Raman spectroscopy as a function of tissue age and microanatomical location (cement lines) in bone tissue from iliac crest biopsies from postmenopausal women diagnosed with long-term T1D (N = 8), and appropriate sex-, age-, BMD- and clinically-matched controls (postmenopausal women; N = 5). The results suggest elevation of advanced glycation endproducts (AGE) content in the T1D and show significant differences in mineral maturity / crystallinity (MMC) and glycosaminoglycan (GAG) content between the T1D and control groups. Furthermore, both hardness and modulus by nanoindentation are greater in T1D.

These data suggest a significant deterioration of material strength properties (toughness) and compositional properties in T1D compared with controls.

Bone 174:116832 IF 4.626 (1725)

5.17 Response to immunization against SARS-CoV-2 and risk of omicron infection in dialysis patients: a prospective cohort study

It is not well established to what extent previous immunizations offer protection against infections with the SARS-CoV-2 Omicron variant in dialysis patients. We aimed to define the relevant humoral response in dialysis patients using a SARS-CoV-2 IgG chemiluminescence microparticle immunoassay (CMIA) compared to the activity of neutralizing antibodies assessed by a virus neutralization test. Next, we aimed to determine differences in humoral and cellular response levels over time among patients infected or not infected by the Omicron variant of SARS-CoV-2. Immunological parameters of cellular and humoral response to SARS-CoV-2 were analyzed at baseline and after 3 (T3), 6 (T6) and 14 months (T14). In this monocentric cohort study, we followed 110 dialysis patients (mean age 68.4 ± 13.7 years, 60.9% male) for a median of 545 days. We determined an anti-SARS-CoV-2 IgG level of 56.7 BAU/mL as an ideal cut-off value with a J-index of 90.7. Patients infected during the Omicron era had significantly lower ($p < 0.001$) mean antibody levels at T0 (3.5 vs. 111.2 BAU/mL), T3 (269.8 vs. 699.8 BAU/mL) and T6 (260.2 vs. 513.9 BAU/mL) than patients without Omicron infection. Patients who developed higher antibody levels at the time of the basic immunizations were less likely to become infected with SARS-CoV-2 during the Omicron era. There is a need to adjust the cut-off values for anti-SARS-CoV-2 IgG levels in dialysis patients.

J Clin Med 12:4983 IF 3.900 (1726)

5.18 Identification of circulating microRNA patterns in patients in psoriasis and psoriatic arthritis

Objective: MicroRNAs (miRNAs) are small non-coding RNAs that control gene expression. Specific intra- and extracellular miRNA signatures have been identified in various diseases. Whether certain miRNA signatures are associated with psoriasis (PsO) and psoriatic arthritis (PsA) is currently unknown. We aimed to search for circulating miRNA signatures associated with PsO and PsA patients.

Methods: Expression of miRNAs was analyzed by RT-qPCR in the serum of PsA, PsO patients and healthy controls. Demographic and disease-specific characteristics and imaging data from hand MRI were recorded. In the discovery phase, 192 miRNA assays were analyzed in 48 samples (PsA, PsO, controls: each N = 16). For validation, 17 selected miRNAs were measured in the total population.

Results: 141 patients and controls were analyzed (51 PsA, 40 PsO, 50 controls). In the discovery phase 51 miRNAs in PsO and 64 miRNAs in PsA were down- or upregulated compared with controls, with 33 miRNAs being changed in both(adj. $p< 0.05$). 17 top candidates from discovery were assessed in the validation phase, 9 of them discriminated PsA and PsO from controls (AUC ≥0.70, all $p< 0.05$). Four miRNAs (miR-19b-3p, miR-21-5p, miR-92a-3p and let-7b-5p) were significantly different regulated between PsO and PsA. A combination of these miRNAs increased AUC to 0.92 in multivariate regression model to discriminate PsO and PsA.

Conclusion: miRNA signatures in PsA and PsO patients differ from controls. Nine miRNAs were differentially regulated in PsA and PsO patients, 5 of them previously reported to be involved in bone and cartilage metabolism, indicating intimate association of psoriatic inflammation and bone/cartilage changes.

Rheumatology (Oxford) 62:3448-58 IF 7.046 (1727)

5.19 Chondrosarcoma of the spine-a case report

Case: A 73-year-old male patient presented with a 3-month history of back pain. In bone scintigraphy and the FDG PET-CT scan (fluorodeoxyglucose positron-emission computed tomography), highly suspect uptake levels were found in TH12-L1. Accordingly, an osteodestructive process was found on MRI (magnetic resonance imaging). Following a successfully performed biopsy of TH12, histologic analysis of the bone material revealed a chondrosarcoma (G1; T4N2M0). Complete resection of the tumor was successfully performed, since chondrosarcoma are resistant to radiation and chemotherapy.
Conclusion: As chondrosarcoma is a rare bone neoplasm, it must be considered in the differential diagnosis of lower back pain to initiate adequate treatment.

Wien Med Wochenschr 173:334-8 IF 1.176 (1728)

5.20 Dissociation of clinical, laboratory, and bone biopsy findings in adult X-linked hypophosphatemia: a case report

X-linked hypophosphatemia (XLH) is a phosphate wasting disorder. Typical serum constellations include low serum phosphate as well as high alkaline phosphatase (ALP) and fibroblast growth factor 23 (FGF-23) levels. Adult XLH patients usually suffer from (pseudo)fractures, enthesopathies, impaired mobility, and osteoarthritis. We report the case of a middle-aged woman with clinically mild disease, relatively balanced laboratory values, but bone non-healing of the femur post-surgery. Transiliac bone biopsy revealed pronounced osteomalacia and severe deterioration of bone microstructure. Due to the lack of XLH-typical symptoms, the patient was not substituted with calcitriol and phosphate in adulthood. Thus, laboratory findings and radiological examinations do not necessarily reflect bone metabolism in XLH. Bone biopsies should be considered in unclear cases or prior to surgery in adults with XLH.

Wien Med Wochenschr 173:339-45 IF 1.176 (1729)

5.21 Vitamin C deficiency deteriorates bone microarchitecture and mineralization in a sex-specific manner in adult mice

Vitamin C (VitC) is essential for bone health, and low VitC serum levels increase the risk for skeletal fractures. If and how VitC affects bone mineralization is unclear. Using micro-computed tomography (µCT), histologic staining, as well as quantitative backscattered electron imaging (qBEI), we assessed the effects of VitC on femoral structure and microarchitecture, bone formation, and bone mineralization density distribution (BMDD) in the VitC incompetent Gulo$^{-/-}$ mouse model and wild-type mice. In particular, VitC-supplemented, 20-week-old mice were compared with age-matched counterparts where dietary VitC intake was excluded from week 15. VitC depletion in Gulo$^{-/-}$ mice severely reduced cortical thickness of the diaphyseal shaft and bone volume around the growth plate (eg, bone volume of the primary spongiosa -43%, $p < 0.001$). Loss of VitC also diminished the amount of newly formed bone tissue as visualized by histology and calcein labeling of the active mineralization front. BMDD analysis revealed a shift to higher calcium concentrations upon VitC supplementation, including higher average (~10% increase in female VitC deficient mice, $p < 0.001$) and peak calcium concentrations in the epiphyseal and metaphyseal spongiosa. These findings suggest higher bone tissue age. Importantly, loss of VitC had significantly more pronounced effects in female mice, indicating a higher sensitivity of their skeleton to VitC deficiency. Our results reveal that VitC plays a key role in bone formation rate, which directly affects mineralization. We propose that low VitC levels may contribute to the higher prevalence of bone-degenerative diseases in females and suggest leveraging this vitamin against these conditions.

J Bone Miner Res 38:1509-20 IF 6.390 (1730)

5.22 Combination of osteogenesis imperfecta and hypophosphatasia in three children with multiple fractures, low bone mass and severe osteomalacia, a challenge for therapeutic management

Osteogenesis imperfecta (OI) and hypophosphatasia (HPP) are rare skeletal disorders caused by mutations in the genes encoding collagen type I (COL1A, COL1A2) and tissue-non-specific isoenzyme of alkaline phosphatase (ALPL), respectively. Both conditions result in skeletal deformities and bone fragility although bone tissue abnormalities differ considerably. Children with OI have low bone mass and hypermineralized matrix, whereas HPP children develop rickets and osteomalacia. We report a family, father and three children, affected with growth retardation, low bone mass and recurrent fractures. None of them had rickets, blue sclera or dentinogenesis imperfecta. ALP serum levels were low and genetics revealed in the four probands heterozygous pathogenic mutations in COL1A2 c.838G > A (p.Gly280Ser) and in ALPL c.1333T > C (p.Ser445Pro). After multidisciplinary meeting, a diagnostic transiliac bone biopsy was indicated for each sibling for therapeutic decision. Bone histology and histomorphometry, as compared to reference values of children with OI type I as well as, to a control pediatric patient harboring the same COL1A2 mutation, revealed similarly decreased trabecular bone volume, increased osteocyte lacunae, but additionally severe osteomalacia. Quantitative backscattered electron imaging demonstrated that bone matrix mineralization was not as decreased as expected for osteomalacia. In summary, we observed within each biopsy samples classical features of OI and classical features of HPP. The apparent nearly normal bone mineralization density distribution results presumably from divergent effects of OI and HPP on matrix mineralization. A combination therapy was initiated with ALP enzyme-replacement and one month later with bisphosphonates. The ongoing treatment led to improved skeletal growth, increased BMD and markedly reduced fracture incidence.

Eur J Med Genet 66:104856 IF 1.900 (1731)

5.23 Cluster analysis to explore clinical subphenotypes of eosinophilic granulomatosis with polyangiitis

Objective: Previous studies suggested that distinct phenotypes of eosinophilic granulomatosis with polyangiitis (EGPA; formerly known as Churg-Strauss syndrome) could be determined by the presence or absence of antineutrophil cytoplasmic antibodies (ANCA), reflecting predominant vasculitic or eosinophilic processes, respectively. This study explored whether ANCA-based clusters or other clusters can be identified in EGPA.

Methods: This study used standardized data of 15 European centers for patients with EGPA fulfilling widely accepted classification criteria. We used multiple correspondence analysis, hierarchical cluster analysis, and a decision tree model. The main model included 10 clinical variables (musculoskeletal [MSK], mucocutaneous, ophthalmological, ENT, cardiovascular, pulmonary, gastrointestinal, renal, central, or peripheral neurological involvement); a second model also included ANCA results.

Results: The analyses included 489 patients diagnosed between 1984 and 2015. ANCA were detected in 37.2% of patients, mostly perinuclear ANCA (85.4%) and/or antimyeloperoxidase (87%). Compared with ANCA-negative patients, those with ANCA had more renal ($P < 0.001$) and peripheral neurological involvement ($P = 0.04$), fewer cardiovascular signs ($P < 0.001$), and fewer biopsies with eosinophilic tissue infiltrates ($P = 0.001$). The cluster analyses generated 4 (model without ANCA) and 5 clusters (model with ANCA). Both models identified 3 identical clusters of 34, 39, and 40 patients according to the presence or absence of ENT, central nervous system, and ophthalmological involvement. Peripheral neurological and cardiovascular involvement were not predictive characteristics.

Conclusion: Although reinforcing the known association of ANCA status with clinical manifestations, cluster analysis does not support a complete separation of EGPA in ANCA-positive

and -negative subsets. Collectively, these data indicate that EGPA should be regarded as a phenotypic spectrum rather than a dichotomous disease.

J Rheumatol 50:1446-53 IF 3.900 (1732)

5.24 Bone material properties in bone diseases affecting children

Purpose of Review: Metabolic and genetic bone disorders affect not only bone mass but often also the bone material, including degree of mineralization, matrix organization and lacunar porosity. The quality of juvenile bone is moreover highly influenced by skeletal growth. This review aims to provide a compact summary of the present knowledge on the complex interplay between bone modeling and remodeling during skeletal growth and to alert the reader to the complexity of bone tissue characteristics in children with bone disorders.

Recent Findings: We describe cellular events together with the characteristics of the different tissues (cartilage, woven and lamellar bone) occurring during linear growth. Subsequently, we present typical alterations thereof in disorders leading to overmineralized bone matrix compared to those associated with low or normal mineral content based on bone biopsy studies.

Summary: Growth spurts or growth retardation might amplify or mask disease-related alterations in bone material, which makes the interpretation of bone tissue findings in children complex and challenging

Curr Osteoporos Rep 21:787-805 IF 4.300 (1733)

5.25 Diagnosis and therapy of granulomatosis with polyangiitis and microscopic polyangiitis-2023: consensus of the Austrian society of nephrology (ÖGN) and Austrian society of rheumatology (ÖGR)

ANCA-associated vasculitides (AAV) are rare, complex systemic diseases that are often difficult to diagnose, because of unspecific clinical symptoms at presentation. However, the clinical course may be very dramatic and even life-threatening, necessitating prompt diagnosis and treatment.Therefore, it is important to increase disease awareness among physicians and support colleagues who are not confronted with these rare diseases on a regular basis. Here, the Austrian Society of Nephrology (ÖGN) and the Austrian Society of Rheumatology (ÖGR) provide a joint consensus on how to best diagnose and manage patients with granulomatosis with polyangiitis (GPA) and microscopic polyangiitis (MPA).

Wien Klin Wochenschr 135(Suppl 5):656-74 IF 2.600 (1734)

5.26 Surgical correction of lower limb deformities in X-linked hypophosphatemia

X-linked hypophosphatemia (XLH, OMIM # 307800) is a rare disorder of bone metabolism caused by loss-of-function of phosphate-regulating gene with homology to endopeptidases on the X chromosome (PHEX). A dysregulation of the main regulator of fibroblast growth factor 23 (FGF23) leads to chronic renal phosphate loss and to associated skeletal changes: rickets, osteomalacia, short stature and complex leg deformities. Conservative therapies such as treatment with phosphate salts or FGF23-inhibiting antibodies can improve the symptoms. However, recent studies showed disease-specific gait deviations, lower limb deformities and high burden of disease of children and adults with XLH. Therefore, physiological lower limb alignment needs to be the main treatment focus for orthopedic surgeons. This article describes the orthopedic treatment of lower limb deformities in children and adults in a multidisciplinary treatment setting.

Osteologie 32: 6-11 (1735)

5.27 Practical aspects of biochemical and molecular genetic diagnostics in rare bone diseases - from the Network of Rare Osteopathies (NetsOs)

Rare inherited skeletal disorders can result in abnormal bone length, density or shape. Based on the clinical, radiological and genetic phenotype, this group of disorders comprises more than 500 different and highly heterogeneous entities. Rapid and precise diagnoses are urgently needed for

patient care and are based on the combination of clinical, biochemical, radiological and genetic analysis. Novel genetic techniques have revolutionized diagnostics and have a huge impact on counseling of patients and families. Disease-specific long-term management in a multidisciplinary healthcare team in highly specialized centers is recommended to optimize care for these patients. This article provides a practice-relevant overview on biochemical analyses in childhood and adults and its implementation jointly with human genetic testing to identify, characterize and assess the course of these rare skeletal diseases.
Osteologie 32: 270-7 (1736)

6 Aktivitäten in Wissenschafts-Organisation und Administration

6.1 Kongressorganisation,Tagungsleitungen und Fortbildung

6.1.1 Fortbildung (von MA)

Martina Behanova nahm im Februar am *Expert Talk with Elke Guenther, Therese Lindahl and Daniel Spichtinger on Research Funding: The EU's Marie Skłodowska-Curie Programme* teil.

Cloe Jones und Varsha Margrette besuchten im Juni den PhD Trainingskurs der European Calcified Tissue Society (ECTS) in Sønderborg, Dänemark.

Sonja Jäger nahm im Oktober am Skills Training „Conflict Management & Negotiation" des LBG Career Centers teil.

6.1.2 Fortbildung (Angebot durch MA)

Im März hielten Judith Haschka, Daniel Kraus, Roland Kocijan und Elisabeth Zwettler einen Workshop für die Ärztekammer mit dem Titel *"Osteoporose und darüber hinaus". Häufige und seltene Störungen des Knochenstoffwechsels erkennen: Vom Erstkontakt über die Verdachtsdiagnose bis zur Therapie. FLS - was bedeutet diese Abkürzung? Motto des Tages: "Wenn du Hufschlag hörst, denk an Pferde UND Zebras".*

Roland Kocijan ist Vortragender von DVO-Kursen.

Nadja Fratzl-Zelman hielt im Rahmen der ICCBH Bone School in Annecy/Frankreich die Kurse „Bone sample analysis and bone ultrastructure" sowie „Bone mineralization and structure".

6.1.3 Kongressorganisation

Im Mai fand zum ersten Mal der so genannte Osteo-Circle statt. Dabei handelt es sich um ein von der PL3 organisiertes Treffen mit OsteologInnen aus ganz Wien, mit dem Ziel, Fallbeispiele zu diskutieren. Aufgrund des großen Erfolges soll dieses Treffen in Zukunft alle drei Monate stattfinden.

Judith Haschka war Mitorganisatorin der ÖGR Summerschool für JungRheumatologInnen, die 2023 vom 21. – 23. Juli in Saalfelden stattfand.

Judith Haschka hatte die wissenschaftliche Leitung des Osteoporose Tages inne, der am 24. Oktober im Wiener Rathaus stattfand.

Nadja Fratzl-Zelman ist Mitglied des Programm-Komitees der Osteogenesis Imperfecta Federation Europe (OIFE), das am 17. November online abgehalten wurde.

6.2 Aktivitäten in nationalen und internationalen wissenschaftlichen Gesellschaften

Jochen Zwerina und Judith Haschka sind Mitglieder der Österreichischen Gesellschaft für Rheumatologie & Rehabilitation (ÖGR).

Judith Haschka ist außerdem Vorstandsmitglied des Biologica-Registers für entzündliche rheumatische Erkrankungen e.V. (BioReg).

Judith Haschka ist Vorstandsmitglied der Österreichischen Gesellschaft für Knochen und Mineralstoffwechsel (ÖGKM), Roland Kocijan ist Mitglied des Wissenschaftlichen Beirates.

Roland Kocijan ist Mitglied der Arbeitsgruppe Osteologie der ÖGR, des Network of Rare Osteopathies (NetsOs), des International Hypophosphatemia Network (IHN) und der International Hypophosphatasia (HPP) Working Group.

Martina Behanova ist Mitglied der Österreichischen Gesellschaft für Public Health (ÖGPH) und der Slovak Public Health Association (SAVEZ), sowie der Österreichischen Gesellschaft für Knochen und Mineralstoffwechsel (ÖGKM).

Daniel Kraus ist Mitglied der ÖGKM.

Markus Hartmann ist Mitglied der Österreichischen Physikalischen Gesellschaft (ÖPG).

Sonja Jäger ist Mitglied der European Calcified Tissue Society (ECTS), der American Society for Bone and Mineral Research (ASBMR), der Österreichischen Physikalischen Gesellschaft (ÖPG), der Society for Applied Spectroscopy, der Vibrational Coblentz Society und co-chair in der "Communications Committee – Website & Social Media Action Group der ECTS.

Norbert Hassler ist Mitglied der European Calcified Tissue Society (ECTS), der ÖGKM, der Österreichische Gesellschaft für Endokrinologie und Stoffwechsel (ÖGES) und der Society for Applied Spectroscopy.

Peter Fratzl ist korrespondierendes Mitglied der Österreichischen Akademie der Wissenschaften und Mitglied der Berlin-Brandenburgischen Akademie der Wissenschaften.

6.3 Tagungsaktivitäten

Die MitarbeiterInnen des Instituts nahmen an zahlreichen nationalen und internationalen wissenschaftlichen Tagungen teil, wie zum Beispiel: Osteoporoseforum, Annual European Calcified Tissue Society (ECTS) Congress, Annual Meeting of the American Society for Bone and Mineral Research (ASMBR), International Conference on Children's Bone Health (ICCBH), OSTEOLOGIE 2023 der DVO und WCO-IOF-ESCEO Congress.

Details unter 7.1.2 Abstracts (1743 – 1776) und 7.1.3 Invited talks (V632 – V648)

6.4 Lehrtätigkeit

Jochen Zwerina bot die Vorlesungen „Osteoimmunologie: Experimentelle und klinische Aspekte“ (2 SSt) und „Vaskulitis“ (2 SSt) an der Universität Erlangen an.

Markus Hartmann hielt die Vorlesung und Übung „Werkstoffmodellierung auf atomarer Ebene“ an der Montanuniverstät Leoben (je 2 SSt., gemeinsam mit David Holec und Daniel Sopu).

Markus Hartmann und Roland Kocijan unterrichteten im Rahmen des Wahlfachs „Häufige & seltene Knochenerkrankungen“ (1 SSt) der Sigmund Freud Universität Wien.

Im Rahmen des Doktoratprogrammes N790 Musculoskeletal and Dental Research an der Medizinischen Universität Wien:

- Stéphane Blouin, Nadja Fratzl-Zelman und Barbara Misof hielten im Winter- und Sommersemester eine Basic Lecture (je 2 SSt).
- Stéphane Blouin und Barbara Misof hielten im Wintersemster einen Journal Club (SE, 1 SSt).
- Stéphane Blouin, Nadja Fratzl-Zelman, Judith Haschka und Barbara Misof hielten im Sommersemester ein Practical Seminar (2 SSt).
- Nadja Fratzl-Zelman und Judith Haschka hielten im Sommersemester einen Journal Club (SE, 1 SSt).

Roland Kocijan hielt an der Sigmund Freud Universität Wien sowohl im Winter- als auch im Sommersemester die Vorlesungen „Osteoporose“ (0,5 SSt), „Knochenerkrankungen“ (0,5 SSt) und „Seltene Knochenerkrankungen“ (0,5 SSt).

Thomas Dechat hielt im Rahmen des Masterstudiums „Molecular Biotechnologies“ am FH-Campus Wien im Sommersemester einen Stammzellenkurs (3 SSt).

Roland Kocijan betreute vier DiplomandInnen:

- Amadea Medibach (Complementary & Alternative Medicine in Bone Diseases)
- Lisa Bachfischer (Prävalenz von Enthesiopathien bei X-chromosomaler Hypo-phosphatämie)
- Annina Arens (Analysis of BMD, hip geometry and trabecular bone score in relation to body composition and biochemical markers in adult females with severe Anorexia Nervosa: The AN-BO study, a retrospective analysis)
- Aaron Pfender (Fracture Liaison Service (FLS) in Austria - Preliminary Results on Feasibility)

Thomas Dechat betreute drei MasterstudentInnen:

- Claudia Hufnagel, Molekulare Biologie, Universität Wien
- Lejla Mastalic, Genetik & Entwicklungsbiologie, Universität Wien
- Stefan Senk, Bioinformatik, FH-Campus Wien

sowie drei Bachelorstudentinnen:

- Zuaira Islam, Biomedical Engineering, FH Technikum Wien
- Zehra Ceyhan, Biomedical Engineering, FH Technikum Wien
- Michelle Schweiger, Biomedizinische Analytik, FH Campus Wien

In einer Kooperation mit Johannes Werzowa von der 1. Medizinischen Abteilung im Hanusch-KH betreute Barbara Misof den Masterstudenten Matthias Fuchs der MUW (Analysis of microCT images from different bone sites obtained from patients with chronic kidney disease)

Roland Kocijan hält den Lehrstuhl für Osteologie an der Sigmund Freud Privatuniversität Wien.

6.5 Reviewertätigkeit

Jochen Zwerina ist Mitglied des Editorial Board des Journals für Kochen- und Mineralstoffwechsel.

Roland Kocijan ist Mitglied des Editorial Board von *Osteologie*.

Thomas Dechat ist Academic Collection Editor für die Topical Collection "Lamins and Laminopathies" bei *Cells*.

Martina Behanova ist Mitglied des Editorial Board des *International Journal of Public Health*.

Eleftherios Paschalis ist Mitglied der Editorial Boards von *Calcified Tissue International* und *Bone* sowie Associate Editor des *Journal of Musculoskeletal and Neuronal Interactions*.

Jochen Zwerina und Eleftherios Paschalis begutachteten Abstracts im Rahmen des Review-Prozesses für die ECTS 2023, Eleftherios Paschalis zusätzlich auch für die ASBMR.

Die MitarbeiterInnen des LBIO erstellten Reviews für: Journal for Bone & Mineral Research, Journal of Dental Research, Journal of Orthopaedic Research, Osteoarthritis and Cartilage, Vibrational Spectroscopy, Journal of Biomechanics, Calcified Tissue International, Bone, Scientific Reports, Journal of Endocrinology, Frontiers in Endocrinology, Journal of Molecular Endocrinology, Journal of Clinical Medicine, Therapeutic Advances in Gastroenterology, Annals of the Rheumatic Diseases, Institutes of Health (grant applications), NASA Innovative Advanced Concepts (grant applications), Canada Council for the Arts (grant applications).

Jochen Zwerina war Gutachter für einen Habilitationsantrag an der Medizinischen Universität Innsbruck.

Sonja Jäger war Gutachterin für die Masterarbeit von Nicholas Posch (Further development and optimization of a software tool for evaluation of spectroscopic data using machine learning algorithms, FH Wr. Neustadt, Biotech Campus Tulln)

Markus Hartmann war Mitglied der Prüfungskommission für die Defensio der Dissertation von Alexandra Tits (Attaching soft to hard: A multimodal correlative investigation of the tendon-bone interface, Université Liège).

Roland Kocijan und Jochen Zwerina waren Mitglieder der Prüfungskommission für die Defensio der Masterarbeit von Theresa Stockinger (Osteoporosis in the era of COVID-19, SFU).

6.6 Beteiligung an Projekten

- Occult Bone Disease in Sudden Childhood Death: a Post-Mortem Study
  Kooperation mit Birmingham Women's & Children's NHS Foundation Trust
  Projektleitung: Wolfgang Högler
  Projektkoordination LBIO: Nadja Fratzl-Zelman
  01.01.2018 – 31.12.2023
- Enzymatic and non-enzymatic cross-links in collagen
  FWF-Projekt P 35715-N
  Projektleitung: Markus Hartmann
  01.07.2022 – 30.06.2026

- Skeletal Effects of Type 1 Diabetes
  NIH-Projekt R5R01DK122558
  Projektleitung: Robert Recker
  Projektkoordination LBIO: Eleftherios Paschalis
  12 2022 - 2024
- Identifying how cortical bone microstructure deteriorates with age
  Australian Research Council
  2023 - 2026
  Projektleitung: Natalie Sims
  Projektkoordination LBIO: Markus Hartmann
- End-to-end multidisciplinary optimal design for improved personalized bioactive glass/ceramic bone substitute implants (REBONE)
  HORIZON-MSCA-2022-DN-01, Project 101119884
  Projektleitung: Pasquale Vena
  Projektkoordination LBIO: Barbara Misof
  07 2024 – 12 2027
- Reproduzierbare markierungsfreie oberflächenverstärkte Raman Spektroskopie, SERS, für Diagnostik von Melanomzellen (Ra-Dia-M)
  FTI-Projekte 2021 Grundlagenforschung – Public Health
  Kooperation mit FH Wiener Neustadt, FH Krems und Universität Salzburg
  Projektleitung: Katerina Prohaska (FHWN)
  Projektkoordination LBIO: Sonja Jäger
  08 2022 – 07 2025

<u>Beantragt:</u>

- Bone fragility & organic matrix
  FWF
  2 Jahre
  Projektleitung: Eleftherios Paschalis
- The role of KIF5B in the emergence of a skeletal dysplasia
  FWF
  3 Jahre
  Projektleitung: Hannes Steinkellner/Franco Laccone
  Projektkoordination LBIO: Thomas Dechat
- OPTOBONE: Noninvasive optical monitoring of bone health
  HORIZON-MSCA-2023-DN-01-01
  4 Jahre
  Projektleitung: Rekha Gautam
  Projektkoordination LBIO: Sonja Jäger

6.7 Preise und Nominierungen

Projektpreis der österreichischen Gesellschaft für Knochen und Mineralstoffwechsel an Thomas Dechat für das Projekt: Der Einfluss von Bisphosphonaten auf die Lamin A Prozessierung und osteogene Differenzierung.

Young Investigator Award der österreichischen Gesellschaft für Knochen und Mineralstoffwechsel (2. Preis) für Daniel Kraus für den abstract: Kraus DA, Medibach A, Behanova M, Kocijan A, Haschka J, Zwerina J, Kocijan R 2023 Nutritional Behavior in Patients with Bone Disease: a cross sectional study from Austria.

Young Investigator Award der österreichischen Gesellschaft für Knochen und Mineralstoffwechsel (3. Preis) an Thomas Dechat für den abstract: Dechat T, Rath L, Spitzer S, Hassler N 2023 Osteoporosis and nuclear lamins – is there a connection?

FLS Best Poster Award der Schweizerischen Vereinigung gegen die Osteoporose (SVGO) an Daniel Kraus für den abstract: Kraus DA, Behanova M, Haschka J, Zwerina J, Kocijan R 2023 Fracture Liaison Service (FLS) in Vienna.

6.8 Personelle Daten

6.8.1 Neueintritte

Mit März verstärkte Lukas Rath, BSc, der seine Bachelorarbeit bereits am LBIO erstellt hat, die Support Facility Cell Biology.

Mitte März Gruppe begann Dr. Viktoriia Donchyk ihre Arbeit im Team der klinischen Gruppe.

Dr. Anton Sokhan trat mit Juli die Nachfolge von Dr. Donchyk in der klinischen Gruppe an.

6.8.2 Austritte

Mit Ende Februar beendete Dr. Alexander Nader seine Arbeit am LBIO.

Dr. Viktoriia Donchyk verließ das LBIO Mitte Juni, da sie noch ein praktisches Jahr an einem Spital absolvieren muss, damit ihr Studium anerkannt wird.

6.8.3 Diverses

Im Rahmen der „Berufspraktischen Tage“ absolvierte der Schüler Jonas Müllebner vom 31.1. bis 2.2. ein Praktikum am LBIO.

Fabien Le Morzadec, ein Student der Ecole supérieure d'ingénieurs de Rennes (ESIR), Frankreich war von Juni bis August im Rahmen eines Praktikums im Labor im UKH Meidling beschäftigt.

Als Vorbereitung auf das EU-Projekt REBONE, das nächstes Jahr startet, absolvierte Vittoria Ghidotti, eine Studentin des Politecnico di Milano von September bis Oktober ein Praktikum im Labor im UKH Meidling.

Im November absolvierte Laura Müller, eine Studentin der University of Liege, ein dreiwöchiges Praktikum im Labor im UKH Meidling.

7 Publications and oral presentations

7.1 Publications of the year 2023

7.1.1 Original papers, reviews

1710. Misof BM, Roschger P, Mähr M, Fratzl-Zelman N, Glorieux FH, Hartmann MA, Rauch F, Blouin S 2023 Accelerated mineralization kinetics in children with osteogenesis imperfecta type 1. Bone 166:116580
IF 4.626

1711. Blouin S, Misof BM, Mähr M, Fratzl-Zelman N, Roschger P, Lueger S, Messmer P, Keplinger P, Rauch F, Glorieux FH, Berzlanovich A, Gruber GM, Brugger PC, Shane E, Recker RR, Zwerina J, Hartmann MA 2023 Osteocyte lacunae in transiliac bone biopsy samples across life span. Acta Biomater 157:275-87
IF 10.633

1712. Wölfel EM, Lademann F, Hemmatian H, Blouin S, Messmer P, Hofbauer LC, Busse B, Rauner M, Jähn-Rickert K, Tsourdi E 2023 Reduced bone mass and increased osteocyte tartrate-resistant acid phosphatase (TRAP) activity, but not low mineralized matrix around osteocyte lacunae, are restored after recovery from exogenous hyperthyroidism in male mice. J Bone Miner Res 38:131-43
IF 6.390

1713. Tang T, Landis W, Blouin S, Bertinetti L, Hartmann M, Berzlanovich A, Weinkamer R, Wagermaier W, Fratzl P 2023 Subcanalicular nanochannel volume is inversely correlated with calcium content in human cortical bone. J Bone Miner Res 38:313-25
IF 6.390

1714. Messner Z, Carro-Vazquez D, Haschka J, Grillari J, Resch H, Muschitz C, Pietschmann P, Zwerina J, Hackl M, Kocijan R 2023 Circulating miRNAs respond to Denosumab treatment after two years in postmenopausal women with osteoporosis - the MiDeTe study. J Clin Endocrinol Metab 108:1154-65
IF 6.134

1715. Levy RV, McMahon DJ, Agarwal S, Dempster D, Zhou H, Misof BM, Guo XE, Kamanda-Kosseh M, Aponte MA, Reidy K, Kumar J, Fusaro M, Brown DD, Melamed ML, Nickolas TL 2023 Comprehensive associations between acidosis and the skeleton in patients with kidney disease. J Am Soc Nephrol 34:668-81
IF 14.978

1716. El-Gazzar A, Voraberger B, Rauch F, Mairhofer M, Schmidt K, Guillemyn B, Mitulović G, Reiterer V, Haun M, Mayr M, Mayr J, Kimeswenger S, Drews O, Saraff V, Shaw N, Fratzl-Zelman N, Symoens S, Farhan H, Högler W 2023 Bi-allelic mutation in SEC16B alters collagen trafficking and increases ER stress. EMBO Mol Med 15:e16834
IF 12.137

1717. Vitkov L, Singh J, Schauer C, Minnich B, Krunić J, Oberthaler H, Gamsjaeger S, Herrmann M, Knopf J, Hannig M 2023 Breaking the gingival barrier in periodontitis. Int J Mol Sci 24:4544
IF 6.208

1718. Laakso S, Xiaoyu T, Blouin S, Keplinger P, Välimäki V-V, Kröger H, Mäkitie O, Hartmann MA 2023 Bone tissue evaluation indicates abnormal mineralization in patients with autoimmune polyendocrine syndrome type-report on three cases. Calcif Tissue Int 112:675-82
IF 4.000

1719. Tits A, Blouin S, Rummler M, Kaux JF, Drion P, van Lenthe GH, Weinkamer R, Hartmann MA, Ruffoni D 2023 Structural and functional heterogeneity of mineralized fibrocartilage at the Achilles tendon-bone insertion. Acta Biomater 166:409-18
IF 10.633

1720. Akta C, Wenzel-Schwarz F, Stauffer A, Kranzl A, Raimann A, Kocijan R, Ganger R, Mindler GT 2023 The ankle in XLH: Reduced motion, power and quality of life. Front Endocrinol (Lausanne) 14:1111104.
IF 5.200

1721. Feichtinger X, Muji E, Domej MA, Pauzenberger L, Baierl A, Kocijan R, Loho G, Brandl G 2023 Combined press-fit and extracortical fixation in patellar tendon anterior cruciate ligament reconstruction results in reliable graft fixation and early bone block incorporation. Knee 43:18-27
IF 2.423

1722. Stephan M, Tascilar K, Yalcin-Mutlu M, Hagen M, Haschka J, Reiser M, Hartmann F, Kleyer A, Hueber AJ, Manger B, Figueiredo C, Cobra JF, Tony HP, Finzel S, Kleinert S, Wendler J, Schuch F, Ronneberger M, Feuchtenberger M, Fleck M, Manger K, Ochs W, Schmitt-Haendle M, Lorenz HM, Nüsslein H, Alten R, Henes J, Krüger K, Schett G, Rech J 2023 Physical function of RA patients tapering treatment-a post hoc analysis of the randomized controlled RETRO trial. J Clin Med 12:3723
IF 3.900

1723. Voraberger B, Mayr JA, Fratzl-Zelman N, Blouin S, Uday S, Kopajtich R, Koedam M, Hödlmayr H, Wortmann SB, Csillag B, Prokisch H, van der Eerden BJC, El-Gazzar A, Högler W 2023 Investigating the role of ASCC1 in the causation of bone fragility. Front Endocrinol (Lausanne) 14:1137573
IF 5.200

1724. Pukl SS, Kronschläger M, Ruiss M, Blouin S, Findl O 2023 Size variability and fitting of 30 gauge thin-wall needles and 3-piece intraocular lens haptics for flanged intrascleral fixation technique. J Cataract Refract Surg 49:874-8
IF 3.528

1725. Qian W, Gamsjaeger S, Paschalis EP, Graeff-Armas LA, Bare SP, Turner JA, Lappe JM, Recker RR, Akhter MP 2023 Bone intrinsic material and compositional properties in postmenopausal women diagnosed with long-term type-1 diabetes. Bone 174:116832
IF 4.626

1726. Werzowa J, Behanova M, Handisurya A, Heger F, Indra A, Holzer B, Dechat T, Spitzer S, Lederer S, Kraus DA, Zwerina J, Fritsch-Stork RDE 2023 Response to immunization against SARS-CoV-2 and risk of omicron infection in dialysis patients: a prospective cohort study. J Clin Med 12:4983
IF 3.900

1727. Haschka J, Simon D, Bayat S, Messner Z, Kampylafka E, Fagni F, Skalicky S, Hackl M, Resch H, Zwerina J, Kleyer A, Cavallaro A, Sticherling M, Schett G, Kocijan R, Rech J 2023 Identification of circulating microRNA patterns in patients in psoriasis and psoriatic arthritis. Rheumatology (Oxford) 62:3448-58
IF 7.046

1728. Simon S, Resch H, Lomoschitz F, Frank BJH, Kocijan R 2023 Chondrosarcoma of the spine - a case report. Wien Med Wochenschr 173:334-8
IF 1.176

1729. Kocijan R, Mindler GT, Hartmann MA, Kraus DA, Raimann A, Zwerina J 2023 Dissociation of clinical, laboratory and bone biopsy findings in adult X-inked hypophosphatemia: a case report. Wien Med Wochenschr 173:339-45
IF 1.176

1730. Blouin S, Khani F, Messmer P, Roschger P, Hartmann M, van Wijnen A, Thaler R, Misof B 2023 Vitamin C deficiency deteriorates bone microarchitecture and mineralization in a sex-specific manner in adult mice. J Bone Miner Res 38:1509-20
IF 6.390

1731. Fratzl-Zelman N, Linglart A, Bin K, Rauch F, Blouin S, Coutant R, Donzeau A 2023 Combination of Osteogenesis imperfecta and Hypophosphatasia in three children with multiple fractures, low bone mass and severe osteomalacia, a challenge for therapeutic management. Eur J Med Genet 66:104856
IF 1.900

1732. Rubenstein E, Maldini C, Vaglio A, Bello F, Bremer JP, Moosig F, Bottero P, Pesci A, Sinico RA, Grosskreutz J, Feder C, Saadoun D, Trivioli G, Maritati F, Rewerska B, Szczeklik W, Fraticelli P, Guida G, Gregorini G, Moroncini G, Hellmich B, Zwerina J, Resche-Rigon M, Emmi G, Neumann T, Mahr A 2023 Cluster analysis to explore clinical subphenotypes of eosinophilic granulomatosis with polyangiitis. J Rheumatol 50:1446-53
IF 3.900

1733. Raimann A, Misof BM, Fratzl P, Fratzl-Zelman N 2023 Bone material properties in bone diseases affecting children. Curr Osteoporos Rep 21:787-805 Review
IF 4.300

1734. Odler B, Windpessl M, Eller K, Säemann MD, Lhotta K, Neumann I, Öberseder G, Duftner C, Dejaco C, Rudnicki M, Gauckler P, Hintenberger R, Zwerina J, Thiel J, Kronbichler A 2023 Diagnosis and therapy of granulomatosis with polyangiitis and microscopic polyangiitis-2023: consensus of the Austrian society of nephrology (ÖGN) and Austrian society of rheumatology (ÖGR). Wien Klin Wochenschr 135(Suppl 5):656-74
IF 2.600

1735. Mindler GT, Ganger R; Stauffer A, Raimann A, Kocijan R, Radler C 2023 Operative Korrektur der Beinachse bei X-chromosomaler Hypophosphatämie. Osteologie 32:6-11

1736. Grasemann C, Barvencik F, Siggelkow H, Kocijan R, Tsourdi E, Högler W, Kornak U 2023 Praxisrelevante Aspekte zur biochemischen und molekulargenetischen Diagnostik bei seltenen Knochenerkrankungen – vom Netzwerk Seltene Osteopathien (NetsOs). Osteologie 32:270-7

1737. Egger J, Mindler G, Raimann A, Zwerina J, Kocijan R 2023 Die Herausforderung der Transition von PatientInnen mit Phosphatdiabetes: ein Fallbericht. J Miner Stoffwechs Muskuloskelet Erkrank 30:2-5

1738. Egger J, Mindler G, Raimann A, Zwerina J, Kocijan R 2023 Die Herausforderung der Transition von PatientInnen mit Phosphatdiabetes: ein Fallbericht. rheuma plus https://doi.org/10.1007/s12688-023-00599-7

1739. Kocijan R, Rintelen B 2023 2 osteologische Fallberichte. Universum Innere Medizin 1/23

1740. Raimann A, Hartmann G, Kocijan R, Ganger R, Mindler G 2023 X-chromosomale Hypophosphatämie/Phosphatdiabetes: Eine multidisziplinäre Herausforderung. Universum Innere Medizin 4/23

1741. Resch H, Kocijan R, Gasser R 2023 Arzneimittel-induzierte Osteoporose. Österreichische Ärztezeitung

1742. Todt M, Hartmann MA, Rammerstorfer FG 2023 Continuum Mechanics Applied for Studying Instabilities in Nanoparticles. In: Altenbach H, Irschik H, Porubov AV (eds) Progress in Continuum Mechanics. Advanced Structured Materials, vol 196, Springer Nature, Switzerland, pp 429-56

Publications in print

Schlatter A, Kronschlaeger M, Ruiss M, Bayer N, Blouin S, Findl O 2023 Attaining the optimal flange technique for trans-scleral capsular bag stabilization using iris hooks. J Cataract Refract Surg Nov 23. doi: 10.1097/j.jcrs.0000000000001367. Online ahead of print
IF 2.800

Khan AA, Brandi ML, Rush ET, Ali DS, Al-Alwani H, Almonaei K, Alsarraf F, Bacrot S, Dahir KM, Dandurand K, Deal C, Ferrari SL, Giusti F, Guyatt G, Hatcher E, Ing SW, Javaid MK, Khan S, Kocijan R, Linglart A, M'Hiri I, Marini F, Nunes ME, Rockman-Greenberg C, Roux C, Seefried L, Simmons JH, Starling SR, Ward LM, Yao L, Brignardello-Petersen R, Lewiecki EM 2023 Hypophosphatasia diagnosis: current state of the art and proposed diagnostic criteria for children and adults. Osteoporos Int Nov 20. doi: 10.1007/s00198-023-06844-1. Online ahead of print Review
IF 4.000

Brandi ML, Khan AA, Rush ET, Ali DS, Al-Alwani H, Almonaei K, Alsarraf F, Bacrot S, Dahir KM, Dandurand K, Deal C, Ferrari SL, Giusti F, Guyatt G, Hatcher E, Ing SW, Javaid MK, Khan S, Kocijan R, Lewiecki EM, Linglart A, M'Hiri I, Marini F, Nunes ME, Rockman-Greenberg C, Seefried L, Simmons JH, Starling SR, Ward LM, Yao L, Brignardello-Petersen R, Roux C 2023 The challenge of hypophosphatasia diagnosis in adults: results from the HPP International Working Group Literature Surveillance. Osteoporos Int. Nov 20. doi: 10.1007/s00198-023-06859-8. Online ahead of print Review
IF 4.000

Rush E, Brandi ML, Khan A, Ali DS, Al-Alwani H, Almonaei K, Alsarraf F, Bacrot S, Dahir KM, Dandurand K, Deal C, Ferrari SL, Giusti F, Guyatt G, Hatcher E, Ing SW, Javaid MK, Khan S, Kocijan R, Lewiecki EM, Linglart A, M'Hiri I, Marini F, Nunes ME, Rockman-Greenberg C, Roux C, Seefried L, Starling SR, Ward L, Yao L, Brignardello-Petersen R, Simmons JH 2023 Proposed diagnostic criteria for the diagnosis of hypophosphatasia in children and adolescents: results from the HPP International Working Group. Osteoporos Int Nov 20. doi: 10.1007/s00198-023-06843-2. Online ahead of print Review
IF 4.000

Theses from students who were (co)-supervised at LBIO

Michelle Schweiger, Der Einfluss von KIF5B-Mutanten und KIF5B-Defizienz auf Säugetierzellen. FH Campus Wien, Biomedizinische Analytik, Bachelor Thesis

Zuaira Islam, Investigating the osteogenic differentiation potential of lamin A/C-deficient cell clones. University of Applied Sciences Technikum Vienna, Biomedical Engineering, Bachelor Thesis

Zehra Ceyhan, The influence of KIF5B-deficiency in osteogenic differentiation. University of Applied Sciences Technikum Vienna, Biomedical Engineering, Bachelor Thesis

Stefan Senk, Differential gene expression – a comparison between long and short read technologies. University of Applied Sciences FH Campus Wien, Bioinformatics, Master Thesis

Amadea Medibach, Complementary and alternative medicine in bone diseases. Sigmund Freud University Vienna, Medical Sciences, Master Thesis

Annina Helena Arens, Bone score in relation to body composition and biochemical markers in adult females with severe anorexia nervosa: a retrospective analysis. Sigmund Freud University Vienna, Medical Sciences, Master Thesis

7.1.2 Abstracts

1743. Rath L, Spitzer S, Hassler N, Dechat T 2023 Osteoporosis and nuclear lamins – is there a connection? Osteoporose Forum, 13 – 15 April, St. Wolfgang, Austria, abstract and oral presentation

1744. Kraus DA 2023 Nutritional Behavior in Patients with Bone Disease: a cross sectional study from Austria. Osteoporose Forum, 13 – 15 April, St. Wolfgang, Austria, abstract and oral presentation

1745. Behanova M, Haschka J, Reichardt B, Zwerina J, Kocijan R 2023 Patients with osteoporosis have high mortality and risk of fracture after COVID-19 hospitalisation. ECTS, April 15 – 18, Liverpool, UK, abstract P266 and poster presentation

1746. Haschka J, Behanova M, Arens A, Muschitz C, Hans D, Dzirlo L, Zwerina J, Kocijan R, Resch H 2023 A detailed analysis of bone mineral density, bone texture and body composition in adult females with severe Anorexia Nervosa – The AN-BO Study. ECTS, April 15 – 18, Liverpool, UK, abstract P244 and poster presentation

1747. Hartmann MA, Blouin S, Takolander S, Mäkitie O, Fratzl-Zelman N, Utriainen P 2023 Hypomineralization of bone in young patients with acute lymphoblastic leukemia. ECTS, April 15 – 18, Liverpool, UK, abstract P119 and poster presentation

1748. Jones C, Hartmann MA, Blouin S, Contento BM, Besio R, Fratzl-Zelman N, Forlino A 2023 Hypermineralisation and higher osteocyte lacunae density in a murine model of osteogenesis imperfecta type XIV. ECTS, April 15 – 18, Liverpool, UK, abstract P317 and poster presentation

1749. Jones C, Hartmann MA, Blouin S, Contento BM, Besio R, Fratzl-Zelman N, Forlino A 2023 Hypermineralisation and higher osteocyte lacunae density in a murine model of osteogenesis imperfecta type XIV. ECTS) pre-meeting workshop, 14 April, Liverpool, UK, abstract XY and oral presentation

1750. Akhter MP, Graeff-Armas LA, Bare SP, Gamsjaeger S, Lappe JM, Paschalis EP, Qian W, Recker RR, Turner JA 2023 Alterations in bone intrinsic and compositional properties at the cement lines in interstitial bone of postmenopausal women diagnosed with long-term Type-1 Diabetes. ECTS, April 15 – 18, Liverpool, UK, abstract P085 and poster presentation

1751. Margrette V, Blouin S, Hartmann MA 2023 Stiffness increase in rat tail tendon after crosslinking measured by scanning acoustic microscopy. ECTS, April 15 – 18, Liverpool, UK, abstract P089 and poster presentation

1752. Rummler M, van Tol A, Schemenz V, Hartmann MA, Blouin S, Willie B, Weinkamer R 2023 Mapping structural heterogeneities of the osteocyte lacunocanalicular network in whole cross sections of the mouse tibia. ECTS, April 15 – 18, Liverpool, UK, abstract P233 and poster presentation

1753. Blouin S, Messmer P, Roschger P, Hartmann MA, Thaler R, Misof BM 2023 Vitamin C controls bone mechanical performance, microarchitecture and matrix mineralization in a sex specific manner. ECTS, April 15 – 18, Liverpool, UK, abstract P083 and poster presentation

1754. Behanova M, Medibach A, Kraus DA, Kocijan A, Haschka J, Zwerina J, Kocijan R 2023 Nutritional behavior in patients with bone disease: a cross sectional study from Austria.

WCO-IOF-ESCEO congress, May 4 – 7, Barcelona, Spain, abstract P739 and poster presentation

1755. Behanova M, Medibach A, Haschka J, Kraus DA, Zwerina J, Kocijan R 2023 Health-related quality of life and fatigue in rare bone disease patients: cross-sectional study from Austria. WCO-IOF-ESCEO congress, May 4 – 7, Barcelona, Spain, abstract P607 and poster presentation

1756. Blouin S, Hartmann M, Strandgren C, Eriksson M, Dechat T 2023 Bone phenotype of the LmnaG609G/G609G-mouse model. 4th International Meeting on Laminopathies, May 9 - 12, Madrid, Spain, abstract and poster presentation

1757. Hufnagel C, Spitzer S, Hassler N, Senk S, Schamberger B, Roschger A, Dechat T 2023 A-type Lamins and the Establishment of a Bone Matrix. European Meeting on Intermediate Filaments, June 4 - 7, Noordwijkerhout, The Netherlands, abstract and poster presentation

1758. Haschka J 2023 microRNA Signature in Adult Patients with Hypophosphatasia. OSTEOLOGIE 2023, June 22 – 24, Salzburg, Austria, abstract and oral presentation

1759. Kraus DA 2023 Heath-related quality of life and fatigue in rare bone disease patients: cross-sectional study from Austria. OSTEOLOGIE 2023, 22 – 24 June, Salzburg, Austria, abstract and oral presentation

1760. Hadzimuratovic B 2023 Longitudinal course of circulating miRNAs in a patient with hypophosphatasia. OSTEOLOGIE 2023, 22 – 24 June, Salzburg, Austria, abstract and poster presentation

1761. Kraus DA 2023 Nutritional Behavior in Patients with Bone Disease: a cross-sectional study from Austria. OSTEOLOGIE 2023, 22 – 24 June, Salzburg, Austria, abstract and poster presentation

1762. Tits A, Blouin S, Rummler M, Kaux JF, Drion P, Van Lenthe HG, Weinkamer R, Hartmann MA, Ruffoni D 2023 Bone-fibrocartilage crosstalk and osteocyte lacuno-canalicular network at the bone insertion. European Society of Biomechanics (ESB), 9 – 12 July, Maastricht, The Netherlands, abstract 593 and oral presentation

1763. Cantamessa A, Blouin S, Amini S, Rummler M, Berzlanovich A, Weinkamer R, Hartmann M, Ruffoni D 2023 Mineral content and mechanical properties of cement lines in human osteonal bone. European Society of Biomechanics (ESB), 9 – 12 July, Maastricht, The Netherlands, abstract 273 and oral presentation

1764. Paschalis EP, Armas LAG, Gamsjaeger S, Recker RR, Akhther MP 2023 Are enzymatic collagen cross-links the real culprit in fracture occurrence in type 1 diabetes patients? ASBMR, October 13 – 16, Vancouver, BC, Canada, abstract SAT-027 and poster presentation

1765. McConnell M, Qian W, Turner JA, Paschalis EP, Bare SP, Graeff-Armas LA, Lappe JM, Recker RR, Akhter MP 2023 Nanoscale material properties of bone tissue near lacunae in type-1 diabetics. ASBMR, October 13 – 16, Vancouver, BC, Canada, abstract SUN-041 and poster presentation

1766. Rummler M, Schemenz V, Wagermaier W, Hartmann MA, Blouin S, Willie BM, Weinkamer R 2023 Differences in the architecture of the osteocyte lacunocanalicular network between mouse strains. ASBMR, October 13 – 16, Vancouver, BC, Canada, abstract A23025834 and poster presentation

1767. Blouin S, Khani F, Messmer P, Roschger P, Hartmann M, van Wijnen A, Thaler R, Misof B 2023 Vitamin C deficiency deteriorates bone microarchitecture and mineralization in a sex-

specific manner in adult mice. ASBMR, October 13 – 16, Vancouver, BC, Canada, abstract A23026038 and poster presentation

1768. Cantamessa A, Blouin S, Amini S, Rummler M, Berzlanovich A, Weinkamer R, Hartmann MA, Ruffoni D 2023 A multimodal analysis of cement lines in human osteonal bone. ASBMR, October 13 – 16, Vancouver, BC, Canada, abstract A23025519 and poster presentation

1769. Kraus DA, Behanova M, Haschka J, Zandieh S, Redl H, Zwerina J, Kocijan R 2023 Opportunistic vertebral fracture detection from computed tomography studies by artificial intelligence - preliminary results. ASBMR, October 13 – 16, Vancouver, BC, Canada, abstract SUN-385 and poster presentation

1770. Kocijan R, Messner Z, Hadzimuratovic B, Feurstein J, Zwerina J, Diendorfer AB, Hackl M, Resch H, Haschka J 2023 Micro-RNA signature in adult patients with hypophosphatasia. ASBMR, October 13 – 16, Vancouver, BC, Canada, abstract SUN-490 and poster presentation

1771. Haschka J, Behanova M, Hans D, Arens A, Muschitz C, Dzirlo L, Binder J, Kapiotis S, Zwerina J, Resch H, Kocijan R 2023 Assessment of trabecular bone score using updated TBS_{TT} on top of bone mineral density, body composition and bone turnover markers in anorexia nervosa – the AN-BO study. ASBMR, October 13 – 16, Vancouver, BC, Canada, abstract SUN-379 and poster presentation

1772. Fratzl-Zelman N, Linglart A, Bin K, Rauch F, Blouin S, Coutant R, Donzeau A 2023 Alterations in bone matrix mineralization caused by the coexistence of osteogenesis imperfecta and hypophosphatasia. International Conference on the Chemistry and Biology of Mineralized Tissues (ICCBMT), 22 – 27 October, Oosterbeek, The Netherlands, abstract and oral presentation

1773. Rummler M, Jones C, Hartmann M, Blouin S, Berzlanovich A, Weinkamer R 2023 The patchiness of the osteocyte lacunocanalicular network in trabecular bone of human vertebrae. International Conference on the Chemistry and Biology of Mineralized Tissues (ICCBMT), 22 – 27 October, Oosterbeek, The Netherlands, abstract and poster presentation

1774. Kraus DA, Behanova M, Haschka J, Zwerina J, Kocijan R 2023 Fracture Liaison Service (FLS) in Vienna. Swiss/Alps Network Meeting, 3 November, Luzern, Switzerland, abstract and poster presentation

1775. Rummler M, Schemenz V, Wagermaier W, Hartmann MA, Blouin S, Willie B, Weinkamer R 2023 The mechanobiological function of the osteocyte lacunocanalicular network in mouse bones. International Conference on Mechanics of Biomaterials and Tissues (ICMOBT), December 16 – 20, Waikoloa Beach, Hawaii, USA, abstract O15.2 and oral presentation

1776. Cantamessa A, Volders T, Blouin S. Zorzetto L, Amini S, Rummler M, Razi H, Weinkamer R, Hartmann MA, Ruffoni D 2023 Properties of cement lines in osteonal bone and damage behavior of osteon-inspired composites. International Conference on Mechanics of Biomaterials and Tissues (ICMOBT), December 16 – 20, Waikoloa Beach, Hawaii, USA, abstract O10.4 and oral presentation

7.1.3 Invited talks

V632 Hartmann MA 2023 Bone tissue characteristics in normal and pathological conditions. Liège Université, 15 February, Liège, Belgium

V633 Haschka J 2023 DXA Knochendichtemessung. Osteoporose Forum, 13 – 15 April, St. Wolfgang, Austria

V634 Gamsjäger S 2023 Assessment of organic bone matrix component. ECTS Pre-Congress Day, 14 April, Liverpool, UK

V635 Zwerina J 2023 Clinical and experimental research at the LBI of Osteology. Cluster for Tissue Regeneration, 2 May, Linz, Austria

V636 Haschka J 2023 Osteogenesis imperfecta – Behandlung und Management im Erwachsenenalter. Österreichischer Kongress für Orthopädie & Traumatologie, 4 – 6 May, Vienna, Austria

V637 Fratzl-Zelman N 2023 Bone mineralisation and structure. ICCBH Bone School, 29 - 31 May, Annecy, France

V638 Fratzl-Zelman N 2023 Bone sample analysis and ultrastructure. ICCBH Bone School, 29 - 31 May, Annecy, France

V639 Haschka J 2023 Knochenstoffwechsel bei Anorexie. OSTEOLOGIE 2023, 22 – 24 June, Salzburg, Austria

V640 Kocijan R 2023 Grundlagen der Diagnostik und des Risikoassessments auf der Basis der DXA. Grundkurs II Osteologie DVO, Diagnostik der Osteoporose, 24 – 25 June, Salzburg, Austria

V641 Kocijan R 2023 Fallstudien zur Densitometrie mittels DXA. Grundkurs II Osteologie DVO, Diagnostik der Osteoporose, 24 – 25 June, Salzburg, Austria

V642 Haschka J 2023 Innovative Diagnostik in der Osteologie. Gesellschaft der Ärzte in Wien, Meet our expert: Neue Perspektiven in der Osteologie, 28 June, Vienna, Austria

V643 Kocijan R 2023 Knochenerkrankungen jenseits der Osteoporose. Gesellschaft der Ärzte in Wien, Meet our expert: Neue Perspektiven in der Osteologie, 28 June, Vienna, Austria

V644 Paschalis EP 2023 Imaging at the interface between physics and biology/ with a specific emphasis on skeletal tissues and how tissue material properties are important for bone strength. Annual Meeting of the French Microscopy Society, 3 – 7 July, Rouen, France

V645 Hartmann MA 2023 Materials for health from biophysics to biomedicine. Summerschool, Université Strasbourg, 6 July, Strasbourg, France

V646 Kocijan R 2023 Knochenbruch über 50 – wann und warum eine Osteoporoseabklärung und Therapie wichtig sind! Osteoporosetag, 24 October, Vienna, Austria

V647 Haschka J 2023 Was haben Diabetes Mellitus und COPD in Bezug auf den Knochen gemeinsam? Osteoporosetag, 24 October, Vienna, Austria

V648 Fratzl-Zelman N 2023 Rare Bone Diseases – From Gene to Material. Symposium honouring scientific contributions of Dr Joan Marini, 5 December, NIH, Bethesda, USA

8 Danksagung

Unser Dank gilt dem Vorstand und der Generaldirektion der Allgemeinen Unfallversicherungsanstalt und der Österreichischen Gesundheitskasse für die Bereitstellung und Erhaltung der Laborräume und die Finanzierung des Institutes sowie der Ludwig Boltzmann-Gesellschaft. Allen Mitgliedern des Kuratoriums möchten wir für ihr Verständnis und ihre Unterstützung danken. Unser besonderer Dank gilt allen Abteilungen und Kliniken für die gute Zusammenarbeit.