

# In vitro Simulation of Fracture Healing and Bone Remodelling – How far have we come and where do we want to go?

Fracture healing and bone remodeling are complex processes involving different cell types and matrix proteins which work hand in hand to restore and strengthen the bone tissue.

Research on the underlying mechanism is mainly performed in animal models. However, supporting valuable and human-based *in vitro* models are desperately needed in order to facilitate the translation of results to the human patient and to reduce stress/strain for the animals following the long-term goal to provide valid alternative methods to replace animal experiments.

**Therefore, we need to work intensively together with clinicians and basic researchers to optimize the current model strategy and to join forces towards a common goal.**

During this two-days workshop, we aim to run on day one a seminar focusing on the current knowledge about fracture healing and bone remodeling, new therapeutic and preclinical strategies as well as *in vitro* model approaches. On the second day, we will be offering a Hands-on-Workshop on our running model systems including scaffold-free bone-like constructs and *in vitro* fracture hematomas. The seminar and workshop will be available as webinar.

*Your Organization Team*

*Annemarie Lang, Timo Gaber & Frank Buttgereit*



*In cooperation with*



**Financially supported by**



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## Seminar – Network Event

**Thursday 19<sup>th</sup> of October 10:00 am – 4:00 pm**  
**Charité Campus Virchow, BCRT Auditorium**

- 10:00 **Welcome** – *Dr. Annemarie Lang & Prof. Frank Buttgereit*
- 10:15 **Clinical perspective** – *Dr. Paula Hoff, PD (Charité Berlin)*
- 10:45 **The current status on animal models in fracture healing research - Advantages and limitations**  
*Dr. Katharina Schmidt-Bleek (JWI, Charité Berlin)*
- 11:15 Coffee Break
- 11:30 **Application of different biomaterials with mesenchymal stem cells and stimulatory molecules for bone defect healing**  
*Prof. Martijn van Griensven (Technical University of Munich)*
- 12:10 **Alternatives to animal testing in bone research – Current status**  
*Dr. Annemarie Lang (Charité Berlin)*
- 12:30 Lunch Break
- 13:30 **Practical aspects and prospects of application of osteogenic scaffold-free constructs**  
*Dr. Igor Ponomarev (fzmb GmbH, Bad Langensalza)*
- 14:00 **3D in vitro fracture healing model**  
*Moritz Pfeiffenberger & Dr. Timo Gaber (Charité Berlin)*
- 14:30 Coffee Break
- 15:00 **Large scale production of compliant progenitor cell populations: from single cells to spheroids**  
*Dr. Ioannis Papantoniou (KU-Leuven, Belgium)*
- 15:45 **Discussion & Closing**
- 18:00 **Network Dinner (at one's own expense)**

# Meet the Speakers/Experts

## Charité Research Group – Dr. Paula Hoff (PD), Dr. Annemarie Lang & Dr. Timo Gaber

(Head: Prof. Frank Buttgereit)

*Department for Rheumatology & Clinical Immunology, Charité- Universitätsmedizin Berlin*



Our group is an interdisciplinary researcher team (human and veterinary medicine, biochemistry, biology, biotechnology) with wide experience in several research methods and techniques.

The research focusses on basic and clinical aspects of glucocorticoid actions, bioenergetics on cellular level that play a crucial role in inflammatory states (RA, fracture healing) and the development of *in vitro* models for musculoskeletal disorders to further implement the 3R. Paula Hoff, rheumatologist and specialist in osteology, published several studies on the characterization of the initial human fracture hematoma. Timo Gaber (biochemist) is an expert on HIF-pathway and cellular mechanisms to encounter restricted conditions. Annemarie Lang (vet) has a great interest in alternatives to animal testing and the implementation of the 3R-principle.

## Dr. Katharina Schmidt-Bleek

*Julius Wolff Institute and Center for Musculoskeletal Surgery Charité- Universitätsmedizin Berlin*



Katharina Schmidt-Bleek studied biology and did her PhD in molecular biology before she engaged in veterinary science with a specialization in animal experiments. She has been interested in regenerative science and especially in bone healing for more than 10 years. Using immune modulatory strategies to improve bone healing within projects ranging from basic research towards translational approaches describes her current research profile. Within this context bone healing models in mice, rats and also sheep as a large animal model have proven essential. The close context with the orthopaedic and trauma department enables the development of clinically relevant bone healing models for research aspects which are closely monitored with respect to the 3R principles.

## Prof. Martijn van Griensven

*University Hospital rechts der Isar, TU Munich*



Martijn van Griensven was trained as a general surgeon and as an orthopaedic trauma surgeon in Hannover (D). He was appointed as full professor for experimental trauma surgery in 2000. In 2005, he became co-director of the Ludwig Boltzmann Institute for Experimental and Clinical Traumatology in Vienna (A). In September 2011, he was appointed as director for the department of Experimental Trauma Surgery at the Technical University of Munich (D). His research areas are related to engineering methods for the musculoskeletal system using stem cells of different sources, biomaterials, gene therapy and mechanical loading. His most recent grants deal with engineering the enthesis (ligament-to-bone transition), oxygen measurement in scaffolds and also with miRNA usage for diagnostics and therapeutics. He has published 259 peer reviewed original papers, 20 book chapters and he has edited 4 books. His h-factor is 48 (Google Scholar). He has received several awards for his work, among others the young scientist award from the World Biomaterials Society.

## Dr. Ioannis Papantoniou

*KU-Leuven, Belgium*



Dr. Ioannis Papantoniou is currently active as a research coordinator at Prometheus, the division of Skeletal Tissue Engineering in the Skeletal Biology and Engineering Research Centre of KU Leuven, Belgium. He has a first degree in Chemical Engineering (University of Patras, Greece) while his doctoral studies were funded by the Greek national scholarship foundation, in Biochemical Engineering at University College London (UCL). He carried out his postdoctoral research activities first at UCL and subsequently at KU Leuven working on the development of novel bioprocesses for the translation of skeletal tissue engineered products to the clinic. His research aim is to produce compliant single and 3D cell-based products – living implants - with built-in arranged quality attributes. To achieve this, the development of novel, well-characterized bioreactor setups is currently necessary.



### Dr. Igor Ponomarev

Research Center of Medical Technology and Biotechnology  
fzmb GmbH, Bad Langensalza

Igor Ponomarev is a great experienced cell biologist with a strong interest in cartilage tissue engineering and research. He developed the patented scaffold-free cartilage transplants (SFCT)-technology to produce macrotissues consisting exclusively of cells and their extracellular matrix. SFCT show high amounts of extracellular matrix and strong synthesis activity (30% of native tissue). The technology was invented to produce cartilage constructs and was during the last year successfully used to produce bone-like constructs.

## Hands-on-Workshop

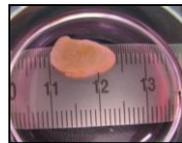
Friday 20<sup>th</sup> of October 9.00 am – 4:00 pm  
Charité Campus Mitte, RFL, Seminar room & Lab

Get to know our running model systems including scaffold-free bone-like constructs and *in vitro* fracture hematomas! We will show you established methods within our lab and you will be able to produce and characterize *in vitro* fracture hematomas by yourself.

The number of participants per workshop is restricted to 10. We will provide two independent workshops at one day (morning and afternoon) with an approximate duration of 2-3 hours. Details and schedule will be sent to the participants in advance.

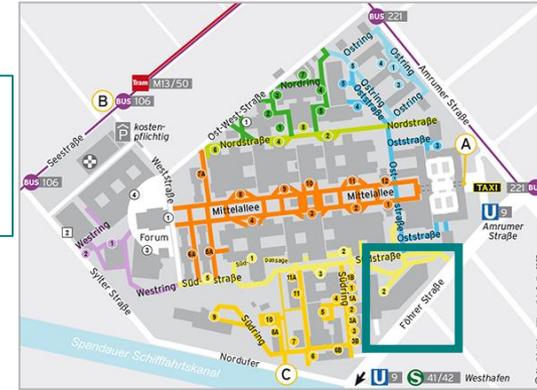
### Coaches:

Moritz Pfeiffenberger,  
Alexandra Damerau, Annemarie Lang,  
Timo Gaber, Igor Ponomarev

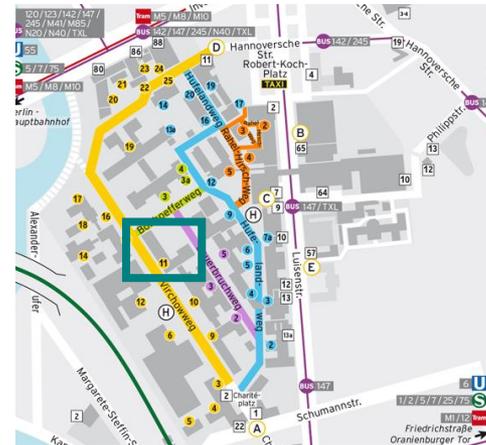


## Venue

Seminar & Network  
Event  
BCRT Auditorium  
Föhler Str. 15



## Charité Campus Mitte



Workshop  
RFL, Seminar room & Lab  
Virchowweg 11, 5<sup>th</sup> Level

## Registration

Please register under the following link:

<http://bit.ly/2h7E7RM>

If you have further questions,  
please do not hesitate to contact us:

Annemarie.lang@charite.de & Timo.gaber@charite.de