

## **Barriers and motivations for non-invasive drug delivery**

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In general, barriers are an ageless, always current topic. By their nature, they maintain an imbalance. A barrier can fulfill a crucial function and its disturbance is detrimental. Other barriers are imaginary, and excursions beyond are rewarding. “Biological barriers” is the long-term theme of our periodic conference, meaning that we aim to gather experts working on attempts to characterize the physiological barriers of the outer epithelia and to develop strategies or carrier systems to overcome them. The complexity of these barriers is enormous reflecting their importance. The challenge to efficiently deliver actives across such a barrier without a considerable damage is huge. This will probably keep the topic actual for a time period we cannot oversee now. However, every increase in the understanding of barrier- and transport mechanisms and the tolerability of barrier interference is an important step. In addition, local delivery treating inflammations caused by an imbalanced barrier function is a valuable strategy for effective therapy of autoimmune diseases. While a certain level of understanding in physical and biochemical barriers for the healthy situation is available nowadays, there is much less understanding for various pathophysiological situations. At the same time, many novel drug molecules pose enormous challenges for effective delivery systems by their low solubility, high molecular weight or low stability. Nano-technological approaches for crossing biological barriers holds promises for some problems like solubility and stability improvement. At the same time however, such an approach increases the level of system complexity, which needs to be controlled. Appropriate analytical methods are required to secure the quality of nanomedicines, thus entailing plenty of room for investigations and developments for further generations of researchers.

This meeting series once started as a course teaching cell culture models to PhD students. In the meanwhile 11th edition of the conference in 2016, the motivation remained the initial one: Providing young scientists an opportunity to meet their peers as well as experts in various fields related to drug delivery. Crossing borders of scientific disciplines, networking and cooperation are important for opening minds and developing careers. Several funding schemes aim to foster such exchange and cooperation programs. Consequently, two EU-funded ITN-programs (PathChooser<sup>1</sup> and NABBA<sup>2</sup>) contributed to the BioBarriers conference 2016. To allow creating such a stimulating atmosphere we also involved the IMI project COMPACT<sup>3</sup> for trans-sectorial aspects. The importance and relevance of this kind of meetings is further supported as the Local Chapter Germany<sup>4</sup> of the Controlled Release Society took the chance to celebrate its 20<sup>th</sup> anniversary. In this context, the Galenus Foundation<sup>5</sup> should also be mentioned as a network specifically providing support for young scientists and the academic teachers of tomorrow.

The present special issue reflects different aspects of which were discussed at the Biological Barriers-Meeting. The special issue addresses topics from non-invasive drug delivery, over advanced nanocarriers to analytical tools and models to investigate the bio-nano-interface. In this context review articles summarizing certain topics and research articles are combined allowing deeper insight in current research topics.

We hope you will enjoy reading this issue as much as we did and thank all contributors to this special issue. Last but not least, we thank all the participants and supporters of the conference. The next BioBarriers conference is scheduled for April 2018 and we are looking forward to welcome you in Saarbrücken, Germany.

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1 FP7-PEOPLE-2013-ITN - Marie-Curie Project PathChooser: Innovative, mechanistic-based strategies for delivery of therapeutic macromolecules across cellular and biological barriers. Project ID: 608373; <https://www.pathchooser.eu/>

2 H2020 ITN-2014-ETN EU Project ID: 642028 Design and Development of advanced **NA**nomedicines to overcome **B**iological **BA**rriers and to treat severe diseases; <http://nabbaproject.eu/>

3 Innovative Medicines Initiative (IMI) project COMPACT, Collaboration on the **O**ptimization of **M**acromolecular **P**harmaceutical **A**ccess to **C**ellular **T**argets, grant agreement n°115363; <http://www.compact-research.org/>

4 The Controlled Release Society Germany Local Chapter; <http://www.controlledreleasesociety.de/>

5 The Galenus Privatstiftung; <http://www.galenusprivatstiftung.at/16.0.html?&L=1>