ESMI Study Group on Image-Guided Drug Delivery - IGDD

Scope - Imaging can be used to support and improve various different aspects of drug delivery and drug therapy. It can e.g. be employed to visualize and quantify the biodistribution and target site accumulation of drugs and drug delivery systems, and to non-invasively assess their efficacy. In addition, molecular imaging techniques can be used to assess drug delivery across biological barriers (by monitoring its temporal and spatial parameters), and to evaluate strategies that aim to improve this process. Furthermore, image-guidance is highly useful for triggering and quantifying drug release from stimuli-responsive carrier materials, such temperature-sensitive liposomes and ultrasound-responsive microbubbles. Finally, by rationally combining drug targeting and imaging, patients can be pre-selected, and treatment protocols can be individualized and optimized, thereby paving the way for personalized (nano-) medicine.

The IGDD field includes, but is not limited to:

- Targeted drug delivery
- Triggered drug release (endogenous and exogenous stimuli)
- Biodistribution, drug release and drug efficacy monitoring
- Imaging and overcoming biological barriers (BBB, cellular membranes, etc)
- Trans-catheter delivery devices for local antitumor treatment (TACE and SIRT)
- Radio-immunotherapy
- Nucleic acid-based and cellular therapies
- Photo-activatable systems and strategies

Relevance - The “magic bullet” is the dream of pharmacologists and pharmaceutical scientists, and it is at the heart of Big-Pharma’s business model. However, it has become increasingly evident that developing magic bullets is extremely difficult, requiring not only in-depth information on deregulated molecular pathways and drugs to specifically interfere with these pathways, but also drug delivery systems (to get the drug to the target) and molecular imaging strategies (to monitor target site localization and therapeutic efficacy). Many different drug delivery systems (DDS) have been evaluated over the years. However, as in case of ‘standard’ magic bullets, their clinical performance has been suboptimal: in the vast majority of cases, DDS are potently able to reduce the side effects of systemic (chemo-) therapeutic interventions, but they generally fail to really improve therapeutic efficacy. By co-incorporating contrast agents in DDS, a number of these shortcomings can be overcome, and the clinical translation of targeted and/or triggerable DDS can be facilitated. In addition, image-guidance can be employed to enable and optimize drug delivery across the BBB, to further efforts on nucleic acid delivery and embolization therapy, and to boost the efficacy of photodynamic therapy, radio-immunotherapy and regenerative medicine.

Goals - The goal of this study group is to promote the IGDD field within the ESMI and to strengthen the links to related communities. This will be done by organising plenary lectures, scientific sessions, workshops and face-to-face meetings at ESMI/WMIS meetings. In addition, contacts with sister societies, such as the Controlled Release Society (CRS) and the European Society for Controlled Drug Delivery (ESCDD) will be established. Furthermore, the Study Group will associate with European scientific communities, e.g. within the framework of EU-COST Action TD1004, focused on IGDD and nanotheranostics. Finally, contacts shall be established with small, medium-sized and large pharma and contrast agent companies.