2 Postdoctoral Scientists

Robotics for Comprehensive Physiological Pharmaceutical Performance

Project summary

Understanding the *in vivo* gastrointestinal behavior of oral formulations is instrumental for their efficient and successful development. While biopharmaceutical assessments are needed to create this understanding and predict the *in vivo* behavior, currently available tools are resource intensive and lack some of physiological parameters and outputs that are critical to allow a comprehensive assessment. Moreover, the focus of available tools is mainly directed towards immediate release formulation platforms typically for small molecules while the need for local or controlled release delivery platforms is increasing rapidly.

Critical gaps will be addressed to enable biopharmaceutical support on multiple formulation platforms. The potential of emerging high throughput technologies will be investigated to allow systematic and more comprehensive biopharmaceutical assessments with minimal compound/formulation requirements starting at the drug discovery stage and progressing towards clinical development. In parallel, a customized *in silico* platform will be developed allowing fast and straight-forward in vitro data translation and interpretation.

General objective post doc 1: Investigate new ways to understand and simulate gastrointestinal drug and formulation behaviour in vitro

Bio-predictive in vitro tests are a crucial part of any biopharmaceutical evaluation. The bio-predictive power heavily depends on implementing physiologically relevant processes in the in vitro setup. It is the objective of this project to develop novel functional in vitro tools that offer new ways to understand and simulate the gastrointestinal behaviour of APIs and different formulation platforms. Efforts will be directed towards 3 key areas:
- Evaluating biochemical and physical stability along the GI tract
- Assessing the impact of physiologically relevant dynamic changes during dissolution
- Measuring drug flux during in vitro dissolution testing

General objectives post doc 2:

1. **Assessment of the potential of Terahertz technology in miniaturized high-throughput applications**
   While critical, information on solid-state during biopharmaceutical assessments today is often lacking because of limited sample quantities, complexity of sample pre-treatment or extensive measurement time. This applies in particular for high throughput applications which are the scope of the proposal. The ability to perform routine Terahertz measurements in an industrial context has become reality only very recently. The potential of Terahertz/Raman technology will therefore be explored to determine solid state in media used during biopharmaceutical assessments. In addition, the feasibility for innovative dissolution quantification of weak or non-chromophores using Terahertz Raman measurements will be assessed.

2. **Feasibility of downscaling and automation into high throughput workflows with integration of Raman/Terahertz based applications**
   To enable systematic and comprehensive biopharmaceutical support in an industrial context across the development trajectory:

- The integration of Terahertz based applications in envisioned novel biopharmaceutical tools resulting in more comprehensive biopharmaceutical workflows will be assessed.
- The feasibility of miniaturization and automation using state-of-the-art robotic platforms will be evaluated.

There will be a close collaboration between both post docs.

Location

Post-doc 1:

The multidisciplinary post doc 1 project will be developed at the Drug Delivery and Disposition lab (KU Leuven, Belgium) and at the Small Molecules Pharmaceutical Development - Biopharmaceutics Department (Janssen Pharmaceutica, Beerse, Belgium).

Post-doc 2:

The multidisciplinary post doc 2 project will be developed at the Laboratory of Pharmaceutical Process Analytics & Technology (Ghent University, Faculty of Pharmaceutical Sciences, Belgium) and at the Small Molecules Pharmaceutical Development - Biopharmaceutics Department (Janssen Pharmaceutica, Beerse, Belgium).

Duration

2-year period for both post-doctoral positions.

Your function (post doc 1)

- Development and implementation of novel in vitro workflows to understand and predict the gastrointestinal absorption potential of new compounds across stages of development.
- Design, coordinate, execute and report experimental work related to Biopharmaceutics and Physiology Based Pharmacokinetic (PBPK) modeling in support of drug product development.
- Implement automation where possible to increase the output/throughput of workflows using available robotic platforms
- Continuously improve existing workflows based on in silico needs and in vivo performance.
- Participate in the evaluation of new analytical techniques in the area of biorelevant testing and keep up to date with scientific innovations.
- Build and maintain strong relationship with key stakeholders including Discovery Sciences, Clinical Pharmacology, Drug Product Development and Analytical Development.
- Work in a multidisciplinary team of researchers, internally as well as externally.

Your function (post doc 2)

- To develop a high-throughput solid state analysis protocol for miniaturized screening procedures based on Thz-Raman Spectroscopy. Focus will be set to the evaluation of the added value of THz-Raman for its solid-state determination capabilities (over the traditional methods) and the determination of its optimal measurement conditions for identifying different solid-state forms (e.g. salt forms, co-crystals, solvates and hydrates) in a biopharmaceutical context.
- To develop time-dependent protocols to qualitatively detect solid state transformation and changes of the solid material during biopharmaceutical evaluations (e.g. solubility, dissolution or stability studies).
- To apply data analytical tools to cope with background interferences in multi-component systems.
- To develop proof-of-concept for dissolution quantification of non-chromophores
- To evaluate the feasibility of downscaling and automation into high throughput workflows with integration of Raman/Terahertz based applications.
- Participate in the evaluation of new analytical techniques in the area of biorelevant testing and keep up to date with scientific innovations.
- Build and maintain strong relationship with key stakeholders including Discovery Sciences, Clinical Pharmacology, Drug Product Development and Analytical Development.
- Work in a multidisciplinary team of researchers, internally as well as externally.

Your profile (post doc 1)

- Doctorate (Ph.D.) in Biopharmaceutics, Pharmaceutical Sciences, Biology, Engineering or related science with relevant experience in biopharmaceutics.
- Hands-on experience with biopharmacy-related in vitro techniques (e.g. solubility, dissolution, precipitation, solid state characterization, permeability…).
- Lab oriented person with a can-do mentality.
- Knowledge and experience in working with down scaled and automated high-throughput experimentation and characterization platforms.
- Knowledge of and strong interest in API physicochemistry, solid state, drug absorption principles, formulation optimization, pharmacokinetics and mechanistic design.
- Understanding of the concepts behind PBPK modelling (Gastroplus/Simcyp) and in vitro biopharmaceutics (e.g. solubility, biorelevant dissolution, particle characterization, solid state characteristics…).
- Like to work in the lab and able to perform experiments in state-of-the-art laboratories including using automated platforms.
- Highly motivated, with excellent organizational, interpersonal, communication, and collaborative skills.
- Fluent English (both spoken and written) with excellent scientific writing skills.
- Team player, dynamic, stress resistant, innovative and flexible.

Your profile (post doc 2)

- Doctorate (Ph.D.) in Pharmaceutical Sciences, Biopharmaceutics, Chemistry, Biology, Engineering or related science with relevant experience in spectroscopy and/or multivariate data-analysis, preferably for biopharmaceutical applications.
- Lab oriented person with a can-do mentality.
- Knowledge of or interest in API physicochemistry, solid state, drug absorption principles, formulation optimization and pharmacokinetics.
- Like to work in the lab and able to perform experiments in state-of-the-art laboratories including using automated platforms.
- Highly motivated, with excellent organizational, interpersonal, communication, and collaborative skills.
- Fluent English (both spoken and written) with excellent scientific writing skills.
- Team player, dynamic, stress resistant, innovative and flexible.

Contact

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