



PHD PROGRAM IN PHARMACY
FACULDADE DE FARMÁCIA, UNIVERSIDADE DE LISBOA

PhD Advanced Course

ADVANCED DRUG DELIVERY
(2020-2021)

ECTS: 6

Classes: 22.5 hours

Course Coordinator: António J. Almeida / Helena Florindo

Short Introduction

Advanced Drug Delivery is part of the PhD Programme in Pharmacy, trains students in the development of advanced medicinal products, covering crucial aspects that determine the fate of drugs in the human or animal body, from their fundamentals to the advanced strategies to overcome the physiological barriers, including innovative technological and therapeutic applications.

The course will be held at the Research Institute for Medicines (iMed.U LISBOA), Faculdade de Farmácia, Universidade de Lisboa, in Lisbon. The training program is aimed at PhD students, but welcomes the participation of external academic and scientific community members. Registration is free but mandatory.

Goals and Learning Outcomes

Modulation of transport across biological barriers, including the intracellular ones, is one of the major challenges in drug delivery. Frequently therapeutic molecules, irrespective of molecular weight or origin, do not possess the required physicochemical properties to reach the target site or enter diseased cells, needing delivery and targeting systems that aim to overcome these limitations, reducing toxicity and improving drug performance. Students will be educated in comprehensive concepts needed to approach advanced drug delivery at cellular and molecular biology levels. They will have contact with relevant matters such as the physicochemical and biological determinants of passively and actively targeted drug delivery, including the nanotechnological approaches to nanomedicine. At the end of the course students should demonstrate integrated knowledge of the scientific principles that support the multidisciplinary field of advanced drug delivery in its different components. For that purpose, the course will include the following main subjects: 1) Fundamentals of advanced drug delivery and targeting; 2) Rate control in drug delivery and targeting; 3) Approaches for overcoming biological barriers; 4) Routes of drug delivery; 5) Future directions of drug delivery and targeting.

PRELIMINARY TIMETABLE

From 15th -19th March 2021

ASSESSMENT

The evaluation of PhD students attending the *Advanced Drug Delivery* course consists of the preparation and submission of a small research project (10000 characters, including spaces). This project should propose a potential solution for a delivery/therapeutic problem using an advanced drug delivery approach. The document to be submitted is expected to adhere to the following general guidelines:

- 1) Project description should address a relevant research question in advanced drug delivery.
- 2) Contents, including title, delivery/therapeutic problem and innovative solution to be tested, plan of research and methods, and relevance of the project (scientific and social impact).
- 3) The students will be distributed in groups. Each group is asked to choose a research topic and is expected to propose a specific project that will be evaluated according to the following criteria: novelty and relevance (30%); clear description of the proposed approach (40%); interdisciplinarity of the research plan (30%).

PRELIMINARY PROGRAMME

Monday - 15/03/2021

Drug Delivery - Fundamentals

09:00h - *New advanced cancer models for nanomedicines: from cancer to Covid-19*
Ronit, Satchi-Fainaro, University of Tel Aviv, Israel

09:50h - Discussion

10:00h - *Advanced Drug Delivery: a practical PK approach*

Paulo Paixão, Research Institute for Medicines (iMed.Ulisboa), Faculty of Pharmacy, Universidade de Lisboa, Portugal

10:50h - Discussion

11:00h - Coffee break

11:30h - *Innovative strategies for the oral delivery of peptides*

Ana Beloqui, Université Catholique de Louvain, Belgium

12:20h - Discussion

12:30h - Lunch Break

Overcoming Biological Barriers

14:30h - *Lipid nanoparticles for drug targeting to the brain*

Carla Vitorino, Faculty of Pharmacy, University of Coimbra, Portugal

15:20h - Discussion

15:30h - *Overcoming the skin barrier*

Sandra Simões, Research Institute for Medicines (iMed.Ulisboa), Faculty of Pharmacy, Universidade de Lisboa, Portugal

16:20h - Discussion

Tuesday - 16/03/2021

Therapeutic Proteins

09:30h - Stabilization of therapeutic proteins for advanced drug delivery

Ana Paula Leandro, Research Institute for Medicines (iMed.Ulisboa), Faculty of Pharmacy, Universidade de Lisboa

10:20h - Discussion

10:30h - Coffee break

11:00h - *Challenges in the development of drug delivery systems for proteins*

Luísa Corvo, Research Institute for Medicines (iMed.Ulisboa), Faculty of Pharmacy, Universidade de Lisboa

11:50h - Discussion

12:00h - Lunch Break

Delivery Strategies

14:00h - *3D Printing for drug delivery*

Joana Marto, Research Institute for Medicines (iMed.Ulisboa), Faculty of Pharmacy, Universidade de Lisboa

14:50h - Discussion

15:00h - *Advanced local delivery systems*

Ana Francisca, Research Institute for Medicines (iMed.Ulisboa), Faculty of Pharmacy, Universidade de Lisboa

15:50h - Discussion

16:00h - Coffee break

16:30h - *Successes and failures in the Design of Oral Protein Delivery Systems*

Nicholas Peppas, The University of Texas at Austin

17:20h - Discussion

17:30h - *Immuno-engineering: nanodelivery systems as tools for immune modulation in cancer*

Liane Moura, Research Institute for Medicines (iMed.Ulisboa), Faculty of Pharmacy, Universidade de Lisboa

18:20h - Discussion

Wednesday - 17/03/2021

Delivery Systems in Theranostics

09:30h – *Biodistribution of nanoparticulate drug delivery systems*
António Rocha Paulo, Instituto Superior Técnico, Campus Tecnológico e Nuclear, Universidade de Lisboa

10:20 h – Discussion

10:30h – Coffee break

11h00h – *Gold medley - gold nanoparticles in combinatory anti-cancer strategies*
Pedro Viana Baptista, UCIBIO (Applied Biomolecular Sciences Unit), Dept. Ciências da Vida, FCT-NOVA, Lisboa

11h50h – Discussion

12h00h - *Biotherapeutics below the freezing temperature, unveiling thermostability and accelerating formulation by cold*
Miguel Ângelo Rodrigues, Centro de Química Estrutural, Instituto Superior Técnico, Universidade de Lisboa

12h50h – Discussion

13:00h - Lunch Break

Innovative Applications

14:30h - *Molecular interactions probed by AFM-based force microscopy*
Nuno Santos, Instituto de Medicina Molecular (IMM), Faculty of Medicine, Universidade de Lisboa

15:20h – Discussion

15:30h – *Biopolymer-based nanomaterials for gene and drug delivery, and antibacterial control*
Francisco Goycoolea, School of Food Science and Nutrition, University of Leeds, UK

16:20h – Discussion

Thursday - 18/03/2021

Innovative Applications

09:30h - *Microfluidics*
João Pedro Conde, INESC-IST

10:20h – Discussion

10:30h – Coffee break

11:00h - *Organs in a Chip*
Peter Loski, Fraunhofer Institute, Stuttgart, Germany

11:50h – Discussion

12:00h - Lunch Break

14:00h – *PAT tools towards translational advanced drug delivery*

João Almeida Lopes, Research Institute for Medicines (iMed.Ulisboa),
Faculty of Pharmacy, Universidade de Lisboa

14:50h – Discussion

15:00h – *Recent Studies on siRNA and mRNA Delivery*

Nicholas Peppas, The University of Texas at Austin

16:00h – Discussion

Friday – 19/03/2021

09:30h – *Scaffolds, growth factors and cells for bone regeneration*

Carmen Évora, University of La Laguna, Tenerife, Spain

10:20h – Discussion

10:30h – Coffee break

12:00h - *Nanotechnology in pharmaceutical environment*

Ana Cadete, Moderna Therapeutics, Inc., USA.

12:50h – Discussion

13:00h – End of Course