PhD in Chemical Sciences *Department of Chemistry “Ugo Schiff” University of Florence*

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PhD course “**The research in the industrial pharma world**”

**SYLLABUS**

**1 Lecturer A, information**

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**2 Title of the seminar A**

The research in the industrial pharma world

**1 Lecturer B, information**

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**2 Title of the seminar B**

Serpin A1 peptides as collagen turnover modulators of cosmeceutical interest: a story of technology transfer and translational research, from bench to... perfumery

**1 Lecturer C, information**

**Name and Surname**: Luisa Poggi

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**2 Title of the seminar C**

Innovation in a Pharma Company: the role of researchers in Bracco Imaging SpA

**1 Lecturer D, information**

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**2 Title of the seminar D**

Vaccine technology platforms

**3 Course program**

The course, consisting of a cycle of 4 seminars of 2 hours each, brings doctoral students an insight into applied research developed by the pharmaceutical industry, through the direct testimony of industrial researchers. Different cases will be presented, in order to have a broader overview: the research developed at Bracco will be presented, which essentially concerns the part of diagnostics through imaging, both as classical contrast media and as contrast media for the most innovative optical techniques. There will then be a description of how, in a multinational company (GSK), a vaccine platform is developed and how, in a race against time, this platform leads to the development of up-to-date vaccines for multiple pathologies. Then it will be the turn of research carried out in a small pharmaceutical company (Galileo Research) with the aim of obtaining active ingredients or components of original drugs, highlighting the difficulties that a small industry encounters in this sector. It will close with the successful case of an academic spin-off from UniFi (Peptlab), which, although based in the pharmaceutical sector of peptides, has brought a product with an active ingredient developed by them onto the cosmetics market.

**4 Course content detailed per lesson of two hours (possibly with dates and room real and virtual)**

* **Lesson 1** – aula 186 Zvi Jolles and online, 18-11-2024 - from 11:00 to 13:00

The development of a new drug to treat an illness is long, costly, highly risky and uncertain.

Pharmaceutical R&D demands a wide range of expertise: science, regulations, business, economics.

On average, it takes 10-15 years and costs $2.6 billion to develop one new medicine, including the cost of the many failures, depending on the therapeutic area, treatment modality and disease complexity. Only 10% of new molecular entities that enter clinical trials eventually receive marketing approval. Major reasons for drug failure are lack of clinical efficacy, toxicity, poor drugability, lack of medical needs.

The lecture will be focused on the entire process of drug discovery and development, from target identification and validation to marketing approval, with references to major international guidelines.

* **Lesson 2** – aula 186 Zvi Jolles and online, 19-11-2024 - from 14:00 to 16:00

The lesson titled "Serpin A1 peptides as collagen turnover modulators of cosmeceutical interest: a story of technology transfer and translational research, from bench to… perfumery" deals with technology transfer and valorisation of academic research results in the field of bioactive peptides of cosmetic interest.

The research group of University of Firenze that developed this research is active for many years in the field of peptide medicinal chemistry and, studying the collagen turnover cycle, discovered a family of short peptides derived from Serpin A1, the physiological inhibitor of elastase, which is effective both in vitro and in vivo to slow-down collagen degradation, thus acting as anti-ageing active ingredients of cosmeceutical interest.

They recently succeeded in having one of these peptides launched on the market as the main component of a cosmetic product, so the story is concerning a success case of transfer of knowledge form Lab to Fab.

* **Lesson 3** – aula 186 Zvi Jolles and online, 02-12-2024 - from 11:00 to 13:00

How can a Pharma company, that is focused on productivity, manage disruptive innovation in both processes and products?

This lecture will be focused on the approach followed by Bracco Imaging, a family-owned Italian pharmaceutical company that has become an international leader in the field of contrast media for imaging applications. This leadership has been achieved thanks to continuous internal improvements and tenths of collaborations with academic partners. Practical examples will be presented on both process and product innovation, and the role of researchers will be discussed, focusing on the know-how that is required for a modern pharmaceutical company.

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* **Lesson 4** – aula 186 Zvi Jolles and online, 03-12-2024 - from 14:00 to 16:00

This lesson will focus on innovative platforms currently in use for the development of vaccines. Examples will be provided in the comparison of novel technologies and traditional ones (conjugation, GMMA, MAPS, bioconjugate, RNA). Particular focus will be put on bacterial targets (Salmonella, Shigella, Klebsiella) and antimicrobial resistance, one of the most critical threats to global public health in the 21st century, causing a large number of deaths every year in both high-income and low- and middle-income countries. The main advantages and current limitations of the different emerging technologies will be discussed, together with thoughts and on their possible combination and on the selection of the most appropriate platform to fight a specific pathogen.

**5 Suggested reading**

Suggestions for readings and deepening of the treated arguments are present in the slides, that are available to the doctoral students.

**6 Learning Objectives**

The aim is therefore for the doctoral student to become aware of the approaches that companies of different sizes and product targets, in the field of the pharmaceutical market, apply to develop their research and the main difficulties encountered, as well as to gain a small insight into the types of work that are on offer in the pharma sector.

**7 Knowledge and Skills to be acquired**

In general, in this series of lessons, the student is expected to learn how research is carried out in the industries of different market sectors, whether small, medium-sized or multinational and compare it with how academic research is carried out. Hence, a comparison between basic and applied research and the interconnections present and necessary between these. In particular, in this course, the students will receive information on the difficulties present in the field of the pharmaceutical industry to develop innovation. The very high costs and the very long time usually required reduce the possibility to move from the research laboratories, to market. Different strategies adopted by different companies will be described. The student, therefore, will be acquinted on different strategies for performing the research applied to the human health and understand the difficulties of working in this sector but also all the opportunities present.

**8 Prerequisites**

General bases of chemistry, pharmaceutical chemistry, biology or materials science and technology.

**9 Teaching Methods**

 MODE 1 - Pre-recorded lessons uploaded on the moodle platform (a meeting must be organized with PhD students in order to clarify eventual doubts)

**x** MODE 2 (preferred) - Lessons delivered in-person and in remotely with simultaneous recording by the Google Meet platform.

**10 Further information**

**11 Type of Assessment**

Written examination at the end of the classes with open and closed questions.

**12 Period**

18-11-2024 – From 11:00 to 13:00

19-11-2024 – From 14:00 to 16:00

02-12-2024 – From 11:00 to 13:00

03-12-2024 – From 14:00 to 16:00

Exam: TBD