

The **Ph.D program in Pharmaceutical Sciences** is part of the efforts that the Department of Pharmaceutical Sciences constantly pursues and devotes to promote Ph.D. students. It offers rigorous grounding in a broad range of disciplines related to drug discovery and nutraceuticals, that are critical to **shaping successful next-generation scientists**. Four *curricula* of choice are currently structured in the program: (i) Medicinal Chemistry and Pharmacoinformatics, (ii) Organic and Bioorganic Chemistry, (iii) Pharmaceutical Technology, and (iv) Nutraceuticals. Talented Italian and foreign students are trained in a highly collaborative atmosphere using multidisciplinary and interdisciplinary approaches to develop expertise and gain skills that will enable them to excel in later career paths of choice, including academic, industrial and regulatory sectors. Features of the Ph.D program in Pharmaceutical Sciences include a close collaboration with international Universities and pharmaceutical companies, and a special emphasis on enhancing communication and leadership skills. Doctoral students actively participate in research stages abroad and deliver seminars. They also benefit from regular workshops and thematic courses, which facilitate exchange of information and building of knowledge. Collectively, these activities provide them with the opportunity to address their research topic from different perspectives. Several research projects of the Ph.D program in Pharmaceutical Sciences are currently supported by European, National, and private funding organizations. **Applications to the following open positions are welcome for the Academic Year 2017/2018!**

Research Topic 1: Accelerating lead compound discovery and development: design and assessment of integrated flow systems for library building and scale-up processes.

Abstract: The proposed research activity is focused on the development of innovative solutions for speeding early phases of drug discovery. In particular, the project will be directed towards the development of integrated flow systems designed to improve compounds throughput for hit identification and hit-to-lead optimization, as well as to facilitate process optimization for the synthesis of lead compounds and chemical probes. Chemical libraries designed on the base of predetermined physicochemical properties and computational analysis, will be synthesized under continuous flow conditions with the aim to accelerate and maximize the covering of the chemical space, and then readily screened against selected biological targets. The candidate will learn how to set-up and integrate flow devices for reaction, process control and in-line purification, as well as to improve chemical synthesis by modern experimental screening technologies. The candidate will have the opportunity to interact with supervisor coworkers also from neighboring areas of chemistry facilitating a multidisciplinary approach and environment.

Curriculum: Medicinal Chemistry and Pharmacoinformatics.

Supervisor: Prof. Antimo Gioiello (antimo.gioiello@unipg.it)

Research Topic 2: Design and development of a fragment-like library to improve success rates and reduce risk in lead compound discovery.

Abstract: The proposed research activity is focused on the computational collection of fragment-like compounds from available small molecule databases. These fragment-like compounds would feature a wide coverage of the chemical space, while at the same time be endowed with optimal physicochemical properties and versatile building block properties for flow chemistry reactions. The graduate student will learn how to realistically collect/design such library, characterize key physicochemical properties, and use the library for screening studies against selected biological targets. The student will have the opportunity to interact with supervisor experimental coworkers in a synergistic approach where the computational work would provide information useful for the lab preparation (e.g. flow chemistry) and characterization (e.g. microscale thermophoresis analysis and pKa/LogP determination) of the designed library. The suitable candidate should be interested in acquiring a deep knowledge of molecular modelling with an emphasis on molecular descriptors, principal component analysis and on bioanalytical techniques.

Curriculum: Medicinal Chemistry and Pharmacoinformatics.

Supervisor: Prof. Antonio Macchiarulo (antonio.macchiarulo@unipg.it)

Research Topic 3: Fighting (re)emerging viruses: hit discovery and hit-to-lead optimization.

Abstract: Over recent years, many RNA viruses were “re-discovered”, including life-threatening flaviviruses such as Dengue and Zika as well as Chikungunya virus. Global warming, migration, and international travelling facilitate the spreading of these vector borne viruses. Thus, there is a pressing need for new therapeutics, since those currently available are scarcely effective. In this context, the present project will focus on the identification of new hit compounds using several medicinal chemistry approaches and starting from a viral (e.g. proteins of replicative complex) and/or host targets (e.g. kinases) selection. Furthermore, the doctoral project will be oriented to the hit-to-lead process exploiting in silico computational approaches and chemical/biophysical assays to drive the optimization process. During this research project many synthetic procedures will be pursued including microwave assisted synthesis, parallel synthesis, heterocyclic chemistry and metal transition catalyzed synthesis. The optimization process will be guided by the biological results obtained for the compounds.

Curriculum: Medicinal Chemistry and Pharmacoinformatics.

Supervisor: Prof. Maria Letizia Barreca (maria.barreca@unipg.it)

Supervisor: Prof. Giuseppe Manfroni (giuseppe.manfroni@unipg.it)

Research Topic 4 (Application Reserved to Employees of ITEL TELECOMUNICAZIONI S.r.l.): Automation of Synthetic Procedures for 6-Fluoro-L-DOPA.

Abstract: The proposed research activity is focused on the development of an automated process for the synthesis of 6-Fluoro-L-DOPA, a widely used radiotracer compound for Parkinson disease and neuroendocrine cancers. Specifically, this will be carried out using an automatic instrument that will enable programming and performing multi-step synthesis to obtain the target compound with high purity. Analytical methods will also be developed to verify physicochemical and microbiological parameters on the target compound.

Curriculum: Pharmaceutical Technology

Supervisor: Prof. Luana Perioli (luana.perioli@unipg.it)

Research Topic 5: Re-Food: Food innovation and reformulation of Umbrian DOP/IGP for a healthier life/environment.

Abstract: The doctoral project should deal with the characterization of Umbrian DOP/IGP (PDO, Protected Designation of Origin; PGI, Protected Geographical Indication) agricultural products (i.e., Fagiolina del Trasimeno, Lenticchia di Castelluccio, Farro di Monteleone, Patata Rossa di Colfiorito). These agricultural products possess specific nutritional particularities that are attributable to the soil and climate conditions and the qualities of the cultivar grown in the production area.

The aim of the project is improving nutritional and organoleptic quality of these agricultural products (the project includes a collaboration with farmers).

Phase 1 – Nutritional characterization of the agricultural products for their proximate composition in terms of biologically active micronutrients. Analyses will comprise in vitro biological assays and chemical determinations, such as total phenolic/flavonoids content; antioxidant activity; etc.

Phase 2 – The same analyses will be performed after a series of field best practice activities, aimed at maintaining/increase the concentration of biologically active micronutrients, will be adopted by the DOP/IGP producers.

Curriculum: Nutraceuticals

Supervisor: Prof. Massimo Moretti (massimo.moretti@unipg.it)

Research Topic 6: Synthesis of Selenium and Sulphur derivatives: insights the mechanism of selenoproteins and their mimics.

Abstract: Recent developments in organoselenium research evidenced a growing interest toward the synthesis of new organochalcogens having specific biological activities as antioxidants, antimicrobials, anticancer and selective enzymes inhibitors. These aspects, the role of non-bonding interactions and the chalcogen bond on effecting the activities of the selenoproteins and of the small organoselenium and organosulfur derivatives are currently strongly investigated by the international scientific network SeSRedCat in which the group of Perugia actively collaborates with the Universidad Federal de Pelotas (Brazil) and the Selenium Therapeutics company in Australia.

Curriculum: Organic and Bioorganic Chemistry

Supervisor: Prof. Claudio Santi (claudio.santi@unipg.it)

Supervisor: Prof. Francesca Marini (francesca.marini@unipg.it)

Research Topic 7: Functionalized layered materials for drug technology and biomedical applications.

Abstract: The project should be focused on the design and preparation of biocompatible reactive materials, able to immobilize bioactive molecules and/or suitably engineered nanoparticles. The combination of lamellar inorganic materials, as zirconium phosphates and phosphonates, or hydrotalcite-like compounds (HTlc), and bioactive molecules yields inorganic-organic hybrid materials in which bioactive species are stored in the interlayer space, often protected from light and oxygen, and are potentially released after a chemical signal. The final aim is to develop systems for sustained release of drugs, for improving solubility and bioavailability of poorly soluble drugs and with significantly high efficiency in terms of anti-infective performance.

Curriculum: Pharmaceutical Technology

Supervisor: Prof. Riccardo Vivani (riccardo.vivani@unipg.it)

On how to apply, please visit the following URL:

<http://www.unipg.it/didattica/dottorati-di-ricerca/bandi-avvisi-e-modulistica>

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