

## DESCRIPTION OF THE PHD COURSE IN CLINICAL AND EXPERIMENTAL PHARMACOLOGY

### Description of the project

The PhD course in Clinical and Experimental Pharmacology is based on a close interaction between advanced cultural preparation and practical research experience, to which is given the greater emphasis. The course program is part of the Mario Negri Institute's training course in the field of Pharmacology, Toxicology and Clinical Research. PhD projects mainly focus on the following research areas: oncology, neuroscience, cardiovascular system, renal medicine and organ transplantation, rare diseases, and public health. Other research areas are: environmental toxicology, bioengineering, molecular medicine, biochemistry and molecular pharmacology. The main methodological characteristic of the courses consists in the fact that PhD students will be actively trained by participating full time, in research programs of high scientific value. The use of the most modern tools and technologies in the field of biomedicine and the attention of the PhD students training through a strict relationship with their tutors are the characteristic of the course. All research activities will take place at the Mario Negri Institute in Milan, Bergamo and Ranica.

Each PhD student will be included in a research group, actively involved in ongoing projects, participate in the planning and conduction of studies, and in the critical evaluation of the results under the guidance of the tutor. The tutors are staff senior researchers working at the Institute. The tutors must have at least 10 publications in scientific journals indexed on pubmed. The variety of research fields and the competence of the teaching staff of the Mario Negri Institute favor and complete the multidisciplinary training path of PhD students through participation in seminars held by the Institute's researchers and by external researchers.

The training course lasts 3 years and is organized in laboratory activities, monographic courses, institute seminars, and laboratory meetings. During the course, the PhD student participates in the drafting of articles in English for publication in international scientific journals and in the drafting of research proposals for public and private, Italian and international organizations. PhD students are expected to present the results of their research in Institute seminars and at national and international congresses. It is also possible to spend part of the PhD course in foreign research centers to favor the internationalization of the training path. In addition, the training includes the possibility to deepen statistical-epidemiological topics preparatory to the design and conduction of clinical studies undergoing in the Clinical Research Center of the Mario Negri Institute, as well as the analysis of data.

### Course objectives

The objective of the Clinical and Experimental Pharmacology PhD Course is to train researchers who by end of the course will possibly achieve scientific autonomy in designing and conducting biomedical research projects, critically analyze and present the results achieved in national and international scientific contexts, transmit scientific culture, acquired rigorous research methodologies and be able to check the sources of scientific information. In the experimental field, the specific objectives of the course include the acquisition of methods for the study of physiological processes whose alterations can cause disease and are useful for the identification of new therapeutic strategies, the development of biological markers and bioinformatics methods to fill the

gap between laboratory activities and clinical trials, between scientific breakthroughs and their transformation to patients' benefits. At the clinical-epidemiological level, PhD students will learn how to correctly apply statistical and epidemiological methodology for the design and analysis of clinical studies (randomized; case-control, longitudinal, etc.). Further objectives of the course are: i) the development/acquisition of skills on environmental and nutritional topics that influence human health through the use of sophisticated and specific methodologies for the detection of environmental pollutants including medications, drugs, chemical and biological substances harmful to humans; ii) the ability to use *ad hoc* developed tools to classify chemicals at risk of toxicity with "animal-free" methods and iii) epidemiological methods to study the relationship between environment and health in the population.

The PhD course pays great attention to the multidisciplinary training of students. During the institute and department seminars, the students will have the opportunity to come across with topics that normally go beyond their specific field of interest, expanding their cultural background. The monographic courses aim to consolidate basic knowledge and provide the student with an update on specific research topics. Finally, the multidisciplinary environment of the Institute will allow the students to be in contact with very heterogeneous topics and research groups, dealing with issues ranging from molecular biology to pathology models, clinical trials, epidemiology and public health.

### **Occupational and professional opportunities envisaged**

The course aims to train young professionals with a solid cultural and methodological background in the field of clinical and experimental pharmacology who will be able to meet the needs of highly specialized personnel and researchers in various reference areas of the biomedical sector including: oncology, neuroscience, cardiovascular medicine, renal medicine and organ transplantation, environmental toxicology, bioengineering, molecular medicine, rare diseases, biochemistry, molecular pharmacology and public health. The professional skills acquired with the PhD course in Clinical and Experimental Pharmacology will allow future researchers to translate the theoretical skills acquired into effective professional and managerial skills with job opportunities in public and private research laboratories, national and foreign, structures of the National Health System, centers for the development of pharmaceutical and diagnostic products, pharmaceutical-, agro-food- and diagnostics- (in biomedicine, research and quality control) industries.