

PhD course in:
Medical and Surgery Biotechnologies and Translational Medicine
(coordinator Prof. Massimo De Felici)

The PhD program of our course is widely interdisciplinary and gives the opportunity to our PhD students to learn a variety of methods and protocols using both in basic and clinical researches. Moreover, it offers the unique possibility to work in groups involved in national and international research projects and supported by industrial and biotechnologies Companies with prospect of working experience in abroad laboratories and future employment.

XXXIII-XXXIV-XXXV cycles

According to their choice about each research field, the PhD students rely on a tutor who follow them during the duration of the course. A specific research project was assigned to the students of the first year of course, after a training period devoted to learning the basic laboratory methods and get acquainted in the specific research topics of the group in which they work. All other students continued the researches pursued the previous years.

General methodologies that all students were learning in the field of the basic research include working with *in vitro* primary and cell line cultures, morphological methods (e. g use of various type of microscopes, histological procedures and software of image analyses), micromanipulation such as the isolation or injection of single cells under a microscope using a micromanipulator, immunolocalization, biochemistry and molecular biology techniques (e. g DNA and RNA extraction and analyses, chromatin analyses such as CHIP, Chp-seq, Chip-qPCR, RT-PCR and q-RT-PCR, protein electrophoresis, Western blotting).

Concerning the clinical areas, in the field of the prenatal medicine, students learned or began to learn monitoring the main developmental phases of the embryo through tridimensional ultrasound approaches, doppler ultrasound and the study of vascular calorimetric/colorimetric indexes. In the area of biopathology and innovative therapies they were focused on learning advanced techniques to identify biomarkers characterizing some hematologic diseases (including leukemia, lymphoma, and myeloproliferative syndromes) as well as solid tumors in various organs and congenital genetic diseases. These include flow cytometry analysis, mutational screening, phenotypic expression studies and Next Generation Sequencing (NGS). Moreover, in such fields they were taught theory and practice of some of the the most advanced therapeutic strategies using stem cell transplant in hematological therapies and regenerative medicine, immunotherapy, and small molecule inhibitors. In the area of diagnostic imaging, the students had the opportunity to begin to learn or to see the use of the most advanced computerized diagnostic imaging

techniques applied to the field of radiology (e. g plain radiography, computed tomography (CT), magnetic resonance imaging (MRI), radionuclide scanning and ultrasonography) to study morphological and functional aspects of various pathologies with special relation to cerebral district and interventional radiology. Students in the area of advanced treatment strategies in pelvic surgery included techniques in mini-invasive surgery applied to treatment of diseases of female genital apparatus and those of the urinary districts. In this context, they experienced the use of innovative approaches include endoscopic surgery focused on diagnostics and treatment of several pelvic diseases as well robotic/laparoscopic surgery. Finally, with regard to the locomotor apparatus, PhD students had the opportunity to deal with multimodal analysis of skeletal and muscle tissues integrating clinical, biological, and imaging information in osteoarticular diseases (osteoarthritis and osteoporosis). The possibility to follow clinical trials was an integrant part of all these experiences.

Most of students had the possibility to attend to national and international workshops and congresses. Moreover they attended to monthly seminars gave by subject matter experts. Some of them participate to a statistical and bioinformatics courses online or given by experts in the field.

The progress of the students was verified by periodic journal and data clubs taken in each research areas. The PhD students of the last years prepared their thesis in English that was evaluated and approved by the external experts before defending it before a committee of the course's teachers.

XXXIV-XXXV-XXXVI cycles

PhD students will begin or continue all research and theoretical activities provided by the course.

Moreover, they will be encouraged to spend a period of their course in abroad laboratories and to participate to national and international workshops and congresses.

Beside to attend the statistical and bioinformatics course by which that did not yet attended, students of the last year will be trained by their tutors or advised to participate to online course for writing a scientific paper to be published on international Journals and to apply to competitive research grants.

In order to implement the the interdisciplinarity of the course, at the end of the year a meeting of the PhD students of all areas will be organized by the coordinator to give them the opportunity to outline their research project and to discuss their results.