

**Educational Activities**  
**PhD in “Translational Medicine”**  
**XXXVIII Cycle: 2022/2023**

List of PhD courses

<b>Course</b>	<b>Language</b>	<b>Lead Instructor</b>	<b>CFU</b>	<b>Course Description</b>
Advanced scientific english	English	CLA	3	The course aims to improve language skills, including speaking, pronunciation, writing and vocabulary in the field of the PhD Program. The teaching approach is communicative and learner-centered. The lessons will be dynamic and will include the use of videos and group works. Furthermore, participants will have the opportunity to conduct short oral presentations during the lessons, in order to share cultural and research experiences.
Research and innovation	English	Liason Office	3	The training program PhD 3.0 is addressed to stimulate the valorisation of PhD Student research results through a path aimed at identifying and managing European Union funds (i.e. Marie Skłodowska Curie Actions), the protection of Intellectual Property and the main methods of technology transfer (Enterprise Creation).
Evidenced-based medicine: basic principles and goals		Prof. Ines Barone	1	The present course aims to provide the concept and principles of Evidence-based Medicine (EBM), as a means to improving the quality of healthcare. The program develops the knowledge and skills necessary for using scientific evidence in the clinical decision-making process and in translational research. Particular attention will be paid to systematic reviews, and meta-analyses, having a high level of evidence as

				represented by the evidence-based pyramid. The step EBM model will be also introduced.
Preclinical and clinical evidence for drug development		Prof. Giacinto Bagetta Dott.ssa Damiana Scuteri	2	The process of developing a novel drug is time consuming and costly. To increase the chances of successfully completing a clinical trial leading to the approval of a new drug, the choice of appropriate preclinical models is of extreme importance to better mimic the complexity of human disease mechanisms. The course aims to provide the principles of preclinical and clinical evidence for drug development, encompassing the activities that link drug discovery in the laboratory to initiation of human clinical trials.
R&D strategies for drug development: the value of meta-analysis and randomized confirmatory trials in preclinical research		Prof. Diana Amantea	1	Rigorously conducted meta-analysis and randomized confirmatory trials are useful tools in preclinical research for drug development. The course will focus on the importance of validating experimental data through rigorous (e.g., inclusion/exclusion criteria, placebo/control, blinding, randomization, etc.) and widely applicable (e.g., multicenter studies, etc.) evidence. Attention will be drawn on recently approved protocols for preclinical research of neuroprotective strategies in ischemic stroke.
Regulatory, ethical and scientific aspects for the use of animals in research		Dr. Rocco Malivindi	2	The course is aimed to give a general knowledge on the regulatory, ethical and scientific aspects for the use of animals in research. In particular, the following topics will be discussed: anatomy, physiology and ethology of animals used for scientific purposes; national regulations on animal research; management of animals used for scientific purposes; genetically modified animals; guidelines for the ethical use of animals in research; the 3 Rs and alternative methods to the use of animals for scientific purposes.
Biotechnologies for translational medicine		Dr. Pietro Rizza	2	The main objective of the course is to provide a deep knowledge on the major technologies and innovative approaches concerning the development of recombinant

				<p>molecules with therapeutic activity, such as recombinant antibodies, vaccines, peptides, biosensors etc. Moreover, methods for protein isolation and purification from tissue or cells will be discussed. After attending the course, the students will be able to discuss critical points, experimental designs and interpretation of the results about the topics presented.</p>
Nanomaterials for medicine	English	Prof. Gerardo F Goya	1	<p>Nanomaterials have been widely used in medicine and pharmaceuticals because of their specific mechanical, optical and electrical behaviours. Nanomaterials are applied for the detection of biological molecules, imaging of diseased tissues and innovative therapeutics. The course aims to give a general introduction into the nanomaterials for medicine. In particular, the following topics will be discussed: introduction on nanomaterials and nanoparticles; the bio-nano interaction; biomedical applications of magnetic nanoparticles: possibilities and limitations; questions, open prospects, conclusions.</p>
Innovative technologies for drug delivery		Dr. Giuseppe Cirillo Prof. Francesca Iemma	2	<p>The course aims to explore recent developments in the synthesis and supply of nanomaterials for the controlled release of anticancer drugs with a special focus on targeted systems and systems sensitive to external stimuli systems. It will be highlighted how knowledge of the physio-pathological conditions of the tumor site may allow the design of intelligent systems capable of maximizing therapeutic performance. Particular emphasis will be given to the most suitable formulation techniques for the translation of intelligent nanomaterials into clinical practice.</p>
Nanotechnologies and drug delivery: physicochemical properties of nanomaterials		Prof. Fiore Nicoletta Dr Manuela Curcio	2	<p>The course aims to highlight the chemical-physical parameters (morphology, size distribution, surface charge) that may influence the performance of nanoparticle systems. This characterization is crucial to establish how the formulation can modify the pharmacokinetic profile of the drug, but also the</p>

				degree of response of the carrier to external (application of magnetic and electric fields, hyperthermia) or internal (pH variation, redox state) stimuli at the tumor site. Furthermore, the empirical models useful for the description of the release kinetics will be discussed.
Photodynamic therapy		Dr. Gloria Mazzone	1	The present course aims to provide a general introduction into the Photodynamic Therapy, as an effective and valuable clinical procedure for the treatment of a broad range of diseases. In particular, the following topics will be proposed and deeply discussed: i) the origins of the phototherapy; ii) the light, oxygen, and chromophores; iii) photophysics and photochemistry of the photodynamic therapy; iv) type I and type II photoreactions; v) the effects of the reactive oxygen species (ROS) generated by photodynamics.
Metal-based compounds in light-activated cancer therapy		Dr. Marta Erminia Alberto	1	The course will provide an overview of the new anticancer approaches that make use of light irradiation to trigger the toxicity of a drug in a spatially and time -resolved manner. In particular, the increasing importance of transition metal complexes in photodynamic therapy (PDT) and photochemotherapy (PCT) will be discussed, with a particular focus on their photochemistry and photophysical properties.
Bio optical properties of human skin and uses of electromagnetic radiation in medical science		Dr. Marta Erminia Alberto	1	The electromagnetic spectrum and the associated types of light are especially useful in the field of medicine. Outlined are the way in which each type of electromagnetic radiation interacts with biological tissues, firstly analysing the main bio optical properties of human skin and the endogenous and exogenous factors affecting its complex optics, then examining particular applications they're used in, with a focus on both diagnosis and emerging therapies.
Extracellular vesicles in translational medicine		Prof. Cinzia Giordano	1	Extracellular vesicles are small lipid bilayer particles released by all cell types that have been reported to regulate the complex intracellular communication pathways in both

				physiological and pathological conditions. In recent decades, the study of extracellular vesicles biology has gained growing interest, representing an active area of cancer research with many potential clinical applications. The course aims to provide an overview of the extracellular vesicles in translational medicine. Thus, during the course, the following topics will be discussed: extracellular vesicles biology; experimental approaches to study extracellular vesicles; extracellular vesicles as potential biomarkers and therapeutic tools.
Translational cancer research	English	Prof. Regine Schneider-Stock	1	The present course aims to give a general introduction into the Translational Cancer Research. In particular, the following topics will be discussed: i) oncogenes and tumor suppressors; ii) colorectal cancer drivers; iii) the chorioallantoic membrane assay and other alternative '3 R' test models.
<p>Molecular Cell Biology:</p> <ol style="list-style-type: none"> <li>1. Cancer cell metabolism: the role of nutrients</li> <li>2. Serine and one carbon metabolism in cancer</li> <li>3. Targeting cholesterol for anti-cancer therapy</li> <li>4. Estrogen receptors-mediated apoptosis in hormone-dependent cancers</li> <li>5. Steroid hormones in cancer progression</li> </ol>		<ol style="list-style-type: none"> <li>1. Prof. Vincenzo Pezzi</li> <li>2. Dr. Ivan Casaburi</li> <li>3. Prof. Rosa Sirianni</li> <li>4. Dr. Adele Chimento</li> <li>5. Prof. Francesca De Amicis</li> </ol>	5	The present course aims to provide an overview of the molecular mechanisms related to cancer cell biology. In particular, the following topics will be discussed: i) cancer cell metabolism, with a special focus on the role of nutrients; ii) serine and one carbon metabolism as a crucial process for cancer growth and progression; iii) targeting cholesterol metabolism as a promising potential anti-cancer drug therapy; iv) Estrogen receptors-mediated apoptosis in hormone-dependent cancers; v) steroid hormones in cancer initiation and progression.

Flow cytometry and 'in vivo' imaging		Prof. Rosamaria Lappano	1	The course aims to give an overview of basic principles and applications of flow cytometry, a sophisticated technique used to analyze cells for a variety of purposes in translational research. The objective of the course is also to provide a thorough and updated knowledge of the rapidly evolving high-resolution 'in vivo' imaging technologies as a unique opportunity for studying biological processes of living organisms in real time on a molecular level. In particular, the following topics will be discussed: concepts, sample preparation, applications and recent advances of flow cytometry; fluorescence microscopy basics; probes and optimized approaches for fluorescence live cell imaging.
Transcriptomic analysis		Prof. Erika Cione	1	After completing the Human Genome Project and beginning the post-genomic era, global transcriptome analysis has become indispensable in basic research, translational, and clinical studies. This approach is feasible and practical for analyzing gene expression profiles in different spatial or temporal samples and identifying essential genes. Prosigna and EndoPrectict IVD diagnostic tests are examples of transcriptomic-based analysis. The present course aims to provide the concept and principles of the biochemical-molecular techniques for global transcriptome analysis focusing on real data coming from Prosigna and EndoPrectict transcriptomic-based analysis.
How to write a scientific paper and present research data successfully		Prof. Paola Tucci		Dissemination and communication of research results are important aspects of the research process, in order to be accessible to other scientists and have an impact on the greater scientific community, as well as, represent an invaluable skill. The main formats for reporting research to an academic or scientific community are written papers and oral presentations. Thus, the course will aim to enhance the student's skills who need to publish their biomedical research

				and/or present them to an international audience. The course will raise students' awareness of the qualities of good scientific writing and speaking while at the same time giving them some suggestions that can help them to improve scientific written and oral communication skills.
Advanced mass spectrometry for food safety and quality		Prof. Leonardo Di Donna	2	The present course will provide the basic knowledge of mass spectrometry, the ionizing sources (atmospheric pressure chemical ionization, electrospray ionization, and ambient mass spectrometry), and analyzers (quadrupole, time of flight, Orbitrap, tandem mass spectrometry, hybrid mass spectrometer). Particular emphasis will be given on the analysis of phenols in extra virgin olive oil using advanced mass spectrometry techniques and on the profiling of the triacylglycerols component of vegetable oils using ambient mass spectrometry methods.
Natural bioactive compounds: extraction and characterization by advanced methodologies		Dr. Lucia Bartella	2	The main objectives of the present course is to provide fundamental knowledge on the structure and properties of the most important natural bioactive compounds, holding a broad range of biological activities. The course also aims to discuss the relative methods used for the extraction, isolation and purification of these molecules from plant and food matrices. Particular attention will be paid to the characterization and quantification analysis using the most recent and innovative chemical methodologies.
The role of proteomics in cancer		Dr. Luca Gelsomino	1	Proteomics, the primary tool for proteome research, is a relatively new and extremely dynamic branch of science focused on evaluating protein expression. This science, therefore, aims at the identification of proteins, the quantification, the characterization of post-translational modifications, the elucidation of the structure and function and the description of possible interactions. Cells, serum and tissues can represent possible biological samples from which

				important information can be extracted in order to identify new prognostic and predictive biomarkers in the oncology field. Overall, proteomics could become a powerful tool in translational cancer research. This course aims to provide the knowledge related to the main proteomic techniques and their application in basic and translational research.
Translational Research	Cancer	Dr Bruno Simoes	1	The course aims to highlight the different hallmarks of cancer, describing the strategies by which a cell may acquire the hallmark, explaining why each hallmark is beneficial/needed and listing examples of hallmarks functional importance in cancer. A particular attention will be paid on cancer stem cells, and the following topics will be discussed: i) cancer initiation in tissue-specific stem and progenitor cells; ii) the cancer stem cell hypothesis; iii) evidence for and against cancer stem cells; iv) resistance of cancer stems cells to current therapies; v) s.tem cell signalling pathways as potential targets for cancer therapy
microRNA: biology, function and analysis tools.		Prof Adele Vivacqua	1	The course attempts to provide knowledge on the biology and functions of the microRNAs, short sequences of noncoding RNAs that, binding to and suppressing the expression of target mRNAs, are involved in different patho-physiological conditions. In addition, the course will show the main methods for the study of miRNA expression, including the bionformatic tools for the 'in silico' analysis of the target mRNAs
Mitochondrial dysfunctions in neuromuscular diseases: biochemical implications, diagnosis and treatment		Dr Rosita Curcio	1	The specific causes of all neuromuscular diseases (NMDs) are not well known, but genetic mutations underlie most of them. Many NMDs have been associated with mutations found in genes implicated in mitochondrial biogenesis, and in those involved in various mitochondrial metabolic pathways. This is not surprising, as mitochondria are involved in muscle metabolism and cellular homeostasis. Mitochondrial dysfunctions were found in the Krebs cycle, oxidative



				phosphorylation and $\beta$ -oxidation, moreover mutations can impair the activity of different mitochondrial carriers. They transport metabolites between the cytosol and mitochondrial matrix, thus playing a key role in cellular bioenergetics. The aim of this course is to review these metabolic alterations by highlighting their biochemical implications, diagnostic strategies and possible therapies.
Strategies for the identification of new diagnostic targets in molecular medicine		Dr Graziantonio Lauria	1	<p>Carnitine plays a vital role in energy production and fatty acid metabolism. Carnitine deficiency occurs in aberrations of carnitine regulation in disorders such as diabetes, sepsis, cardiomyopathy, malnutrition, cirrhosis, endocrine disorders and with aging.</p> <p>Clinical application of carnitine holds much promise in a range of neural disorders such as Alzheimer's disease, hepatic encephalopathy and other painful neuropathies. Carnitine supplementation may be beneficial in treating cardiovascular disease, obesity, improving glucose intolerance and total energy expenditure.</p> <p>SOLUTE CARRIER FAMILY 25 (CARNITINE/ACYLCARNITINE TRANSLOCASE), MEMBER 20; SLC25A20</p> <p>The enzyme carnitine-acylcarnitine translocase (CACT) is involved in the transport of long-chain fatty acids into mitochondria. CACT deficiency is a life-threatening, recessively inherited disorder of lipid <math>\beta</math>-oxidation which manifests in early infancy with hypoketotic hypoglycemia, cardiomyopathy, liver failure, and muscle weakness.</p> <p>We will describe the clinical, biochemical, and molecular features of six Caucasian patients from Italy, Spain, and North America.</p>
Biochemical tools to unmask metabolic targets for cancer therapy		Dr Luca Frattaruolo	1	In recent decades, oncology research has increasingly focused on studying the metabolism of cancer cells, which are able to rewire the biochemical pathways associated with energy

			<p>production in order to favor their survival in the complex environment that surrounds them. This marked metabolic reprogramming, in addition to promoting tumor proliferation and dissemination, can confer tumor cells particularly aggressive phenotypes resistant to conventional therapies. For this reason, cancer research is focusing on understanding the different metabolic phenotypes that tumors can acquire, in order to set up new therapeutic strategies capable of eradicating them. This course aims to introduce the tools and strategies useful for the study of tumor energy metabolism, as well as the biochemical mechanisms underlying new pharmacological agents which target several metabolic pathways. In particular, some biochemical approaches able to monitor the cellular glycolytic flux will be highlighted, such as the measurement of extracellular acidification rate (Seahorse technology) and the expression level and activity of key glycolytic enzymes. In addition, some methods useful for the study of mitochondrial integrity and functionality will be analyzed, emphasizing those that allow the evaluation of pivotal mitochondrial processes in energy homeostasis and redox state.</p>
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