

Research options available for topic A

Research topics a) and b) offered by every Doctoral Course involved in UNIPH_D are frameworks within which every applicant has to present an original research project in collaboration with a Supervisor at the University of Padua.

Potential Supervisors at Unipd have proposed the following detailed research options, which are related to the research topic. They are offered as a guideline and should facilitate your contact with potential Supervisors. Supervisors' e-mail is specified in every research option table. You are welcome to contact them directly.

Note that this research option list is not at all exhaustive and, within the topic you have chosen, you are free to propose a different research project.

Doctoral Course	PHARMACOLOGICAL SCIENCES
Macro-area	Medical and Biomedical Sciences
Department name	Department of Pharmaceutical and Pharmacological Sciences
Webpage	https://www.dsfarm.unipd.it/ricerca/phd-graduate-programs/phd-degree-program-pharmacological-sciences
Research topic A	<p>Pharmacologic and environmental modulation of biological aging</p> <p>Biological aging is a complex process not necessarily correlated with chronological age at individual level. Early senescence markers may be reversible and modulated by pharmacological treatment or environmental factors. The senolytic therapies is an emerging research area for the treatment of many diseases, including cancer and atherosclerosis. Here we aim to pharmacologically modulate human senescence markers and to study senescence phenomenon associated to age-related diseases.</p>
Link to the UNIPH_D Call (Academic Year 2022/2023)	https://www.unipd.it/en/uniphd
Latest Update	12.01.2022
#Number of available Research Options	3 <i>Scroll down to see all the Research Options</i>

#1 Research Option Description

Doctoral Course	Pharmacological Sciences
Department name	Department of Pharmaceutical and Pharmacological Sciences
Research topic A	Pharmacologic and environmental modulation of biological aging
Research option	Systemic role of the testicular hormone INSL3 on energy and skeletal-muscle metabolism: a pharmacologic approach for the modulation of aging in males.
Supervisor	<p>Supervisor: Dr Luca DE TONI, luca.detoni@unipd.it</p> <p>Research group: Prof Alberto FERLIN (alberto.ferlin@unipd.it), Dr Andrea DI NISIO (andrea.dinisio@unipd.it), Dr Maria Santa ROCCA (mariasanta.rocca@aopd.veneto.it), Dr. Stefania SUT (stefania.sut@studenti.unipd.it).</p>
Webpage	linkedin.com/in/luca-de-toni-81207336
Context of the research activity and objectives	<p><i>Background</i> Insulin-like peptide 3 (INSL3) is a peptide hormone produced by Leydig cells in the testis. Acting through to its receptor RXFP2, INSL3 mediates the transabdominal phase of testicular descent during embryonic life. However, INSL3 is released also in adult males under the control of luteinizing hormone (LH), in parallel with testosterone and anticipating its reduction during aging. Moreover, RXFP2 is expressed in many tissues in addition to gubernaculum, including kidney, liver, skeletal muscle, bone, thyroid gland, pituitary gland, brain and the bone marrow, suggesting other possible endocrine and paracrine effects for INSL3. We recently showed that the alteration of the INSL3/RXFP2 hormonal axis, observed both in humans and in animal models, has a pathogenic role in bone metabolism, providing evidence for a new genetic cause of osteoporosis.</p> <p><i>Objectives</i> The research aims to investigate the physiological effects, to date not known, of INSL3 at systemic level, focusing on both energy metabolism and muscle bone/bone function. The possible anabolic effect of exogenous INSL3 administration will also be assessed.</p> <p><i>Description:</i> Effect of INSL3 stimulation on energy and muscle-skeletal metabolism will be assessed in murine animal models through a “gain of function”/loss of function approach. Considering the of C57Bl/6 mice as the genetic background of the wild type-phenotype, the “gain of function”-phenotype will be achieved by chronic administration of supra-physiological dosage of INSL3, by the use of subcutaneous osmotic pumps. The loss of function-phenotype will be obtained by genetic ablation of <i>Rxfp2</i> gene. In each experimental condition, the energetic, muscle and bone phenotypes, together with body composition, will be evaluated. Specific effects of INSL3 on target tissues will be confirmed by <i>in vitro</i> experiments on cell cultures. The study has already been approved by the local Animal Welfare Committee.</p> <p><i>Expected results:</i> INSL3 is expected to exert an overall anabolic activity, protecting from the development of metabolic derangements such as increased body adiposity, insulin resistance, glucose intolerance and altered lipid profile. Moreover, exogenous INSL3 is expected to display a protective effect on both age-related osteoporosis as well as sarcopenia, either related to age or obesity.</p>

Infrastructures	Cell culture and cell biology laboratory. Molecular biology and histology laboratory. Animal enclosure facility. Analytical chemistry laboratory. Micro sensors and structural chemistry laboratory. Database access.
Skills and competencies for the development of the activity	Any experience in the use of cellular and/or animal experimental models. Any experience in the use of molecular biology techniques (real time-PCR, western blot analysis, ELISA assay). Any experience in cellular/histological analysis (flow cytometry, immunohistochemistry, immunofluorescence). Experience in informatics (spreadsheet, image analysis, basal statistics)
Training offer	<p><i>First year</i></p> <ul style="list-style-type: none"> - Course on "Information Literacy in Pharmacological Sciences" - Course on "Bio-Statistics" <p><i>Second year</i></p> <ul style="list-style-type: none"> - Course on "Academic English for PhD Students", at Centro Linguistico di Ateneo - "Advanced Pharmacology" course consisting of 5 modules each: 1) Pharmacokinetics 2) Clinical biochemistry 3) Methods in Molecular Pharmacology 4) Application aspects of clinical research methodology 5) Neuropharmacology. <p><i>Third year</i></p> <ul style="list-style-type: none"> - Teaching of "Communicating Science Effectively". <p>Several seminars (approximately once a month) will also be organized and held by English-speaking scientists.</p>
Possible Secondments	European Center for Living Technology - Department of Molecular Sciences and Nanosystems – Ca' Foscari University, Venice (Italy). Tutor: Prof. Alessandro Angelini. Fondazione Foresta ONLUS for Biomedical Research, Padova (Italy). Tutor: Prof. Carlo Foresta

#2 Research Option Description

Doctoral Course	Pharmacological Sciences
Department name	Department of Medicine
Research topic A	Pharmacologic and environmental modulation of biological aging
Research option	Pharmacological modulation of age-related vascular pathologies
Supervisor	Supervisor: Nicola FERRI, nicola.ferri@unipd.it Research group: Maria Giovanna LUPO, mariagiovanna.lupo@unipd.it
Webpage	https://www.linkedin.com/in/nicola-ferri-653910128/
Context of the research activity and objectives	Age represent one of the main risk factors for cardiovascular diseases, including atherosclerosis and vascular calcification. New interesting pharmacological targets have been recently identified for controlling hypercholesterolemia and dyslipidaemia associated to vascular pathologies, such as PCSK9, ANGPTL3 and Lp(a). During the three year of research, the PhD student will be involved in exploring the pathophysiological role of these circulating proteins in order to predict any potential pleiotropic effects, including anti-inflammatory and anti-proliferative properties. In addition, he will investigate the effect of monoclonal antibodies and siRNA directed to each target to define their pharmacological properties. All the activities will involve <i>in vitro</i> study in culture cell lines (human vascular smooth muscle cells, hepatocytes, and macrophages) and molecular (PCR and cloning vectors) and cellular biology experiments (real-time PCR, ELISA, western blot, immunocytochemistry). In addition, <i>in vivo</i> experimental studies will be performed by using genetically modified mice (PCSK9 knock-out mice) and models of vascular calcification (adenine-induced). Additional analysis from human samples will be also performed in collaboration of our clinic. The PhD students will be then involved in the design of the experiments, in writing reports and scientific manuscript (reviews and research papers). The final goal is to end with at least 3-5 publications in peer-review journals.
Infrastructures	Cell culture and cell biology laboratory. Molecular biology and histology laboratory. Animal facility. Flowcytometry and cell sorter. Confocal microscopy. Real time PCR.
Skills and competencies for the development of the activity	Cell culture and/or animal handling. Genotyping. Molecular biology techniques (real time-PCR, western blot analysis, ELISA assay, flow cytometry, immunohistochemistry, immunofluorescence).
Training offer	Courses in Biostatistics, Advanced Pharmacology, Communicating science, and scientific seminars.
Possible Secondments	Lipoprotein Research Stockholm AB Org.nr: 559217-0830 Karlbergsvägen 41 SE-113 37 Stockholm Sweden CEO: Paolo Parini Vice CEO: Mats Eriksson web: lipoproteinresearch.com email: info@lipoproteinresearch.com University of Antwerp, Belgium, Department of Pharmaceutical Sciences, Prof. Wim Martinet.

#3 Research Option Description

Doctoral Course	Pharmacological Sciences
Department name	Department of Pharmaceutical and Pharmacological Sciences-DPPS
Research topic A	Pharmacologic and environmental modulation of biological aging
Research option	Epigenetic basis for low body mass at birth and sarcopenia in old age
Supervisor	<p><u>Supervisor</u>: Sofia Pavanello, Department of Cardiac Thoracic Vascular and Public Health Sciences (sofia.pavanello@unipd.it)</p> <p><u>Supervisory team</u>: Marco Narici, Giuseppe De Vito, Department of Biomedical Sciences, CIR-MYO Myology Centre University of Padova; Prof. Colin Boreham, UCD Institute for Sport and Health, Dublin, Ireland</p>
Webpage	<p>https://scholar.google.com/citations?hl=it&user=w1RjdtYAAAAJ&view_op=list_works&sortby=pubdate</p> <p>https://www.biomed.unipd.it/research-areas/muscle-physiology-in-health-and-disease/muscle-contractility-and-neuromuscular-plasticity/overview/</p>
Context of the research activity and objectives	<p>The project will focus on the effect of low body mass at birth on sarcopenia in adults and premature aging. Individuals born small shall be used to investigate the reduced muscle mass and strength (sarcopenia) in older adults. Human based studies will involve young and older participants in which birth weight <3.0 kg will be associated with an acceleration of biological aging and sarcopenia. People will be evaluated including parameters of Body Composition Analysis, Muscle Strength Testing, Sarcopenia diagnosis and classification (non-sarcopenic, pre-sarcopenic, sarcopenic and severely sarcopenic). Sarcopenia will be identified in accordance with the EWGSOP2 criteria and using the latest ultrasound sarcopenia index published by our group, together with biomarkers of neuromuscular degeneration. Biological aging will be evaluated by exploring epigenetic age (DNAmAge), and the nuclear-mitochondrial axis, including the cellular mitotic leukocyte TL (LTL), p53 expression and mtDNA copy number (mtDNAcn). Subjects will be further characterized using the 15 susceptibility loci, identified in the genome-wide meta-analysis, in order to explore the genetic susceptibility of muscle weakness. By monitoring early molecular markers of cellular aging and sarcopenia conditions at different periods of a person's life, we will be able to determine how soon these aging effects can arise.</p>
Infrastructures	<p>Academic: University of Padova, Environmental Mutagenesis and Genomics Laboratory (ISO 9001: 2015 certificated) holds the entire workflow for telomere dysfunction and DNA methylation analyses is available including an automated procedure from extraction of genomic material, PCR setup, liquid handling and sequencing analyses. Neuromuscular Physiology Lab facilities: Sarcopenia assessment by i) ultrasound imaging, ii) body composition analysis by dual x-ray absorptiometry (DEXA), iii) muscle strength by dynamometry, iv) short-term performance battery testing (SPBB), v) neuromuscular function, vi) motor control (EMG), vii) neuromuscular junction damage assessment (from serum biomarkers), denervation biomarkers (muscle biomarkers), and axonal damage assessment (from plasma biomarkers). UCD Institute for Sport and Health, Dublin, Ireland, Prof. Colin Boreham;</p> <p>Non-academic: BMR Genomics Srl, Padova, Italy.</p>

<p>Skills and competencies for the development of the activity</p>	<p>DNA extraction, real-time and sequencing techniques. Sarcopenia assessment, muscle mass by DEXA, ultrasound assessment of muscle structure, muscle function, functional performance, general lipid profile, fasting glucose, neuromuscular degeneration biomarkers</p>
<p>Training offer</p>	<p>Courses: 1) Neuromuscular plasticity with use, disuse and ageing, 2) Biostatistics, Advanced Pharmacology, Communicating science, and scientific seminars.</p>
<p>Possible Secondments</p>	<p>Academic (8-12 months): UCD Institute for Sport and Health, Dublin, Ireland, Prof. Colin Boreham Non-academic (3 months): BMR Genomics Srl, Padova, Italy.</p>