

Scheda di dottorato 37 ° ciclo – Bando PON “Ricerca e Innovazione” 2014 – 2020



UNIONE EUROPEA
Fondo Sociale Europeo



PROGRAMME'S NAME	CARDIO NEPHRO TORACIC SCIENCES
DURATION	3 years
PROGRAMME START DATE	01/01/2022
LANGUAGE	Italian, English
COORDINATOR	Gaetano Domenico Gargiulo (gaetano.gargiulo@unibo.it)
CURRICULA	1. Cardiology/Cardiac Surgery 2. Nephrology/Urology 3. Pulmonary Diseases/Thoracic Surgery
RESEARCH TOPICS	Detailed list at the bottom of the present document
PhD POSITIONS	2
ADMISSION PROCEDURE	Qualifications and research proposal evaluation

Available Positions and Scholarships

Actions	Position n.	Financial Support	Research Topic
Action IV.5 – “PhDs on green topics”	1	PhD Scholarship	Hyperspectral imaging of the cardiac regeneration process
Action IV.4 “PhDs on innovation topics”	2	PhD Scholarship	Applications of new sequencing technologies in heart / lung transplants through the analysis of cell-free DNA

Required and Supporting Documents to be attached to the application

(only documents in Italian, English, French, German and Spanish shall be considered as valid and be assessed by the Admission Board)

Only qualifications obtained during the last 5 calendar years shall be taken into consideration, except for the University Degree. **The Admission Board will assess the relevance of the supporting documents to the criteria listed in Art. 3 of the Ministerial Decree 1061/2021 (see also Art. 4 of the Call for applications).**

REQUIRED DOCUMENTS	
Identity document	Valid identity document with photo (i.e. identity card, passport)
Curriculum Vitae	No specific CV format is required
Degrees	Documents attesting the awarding of the first and second cycle degrees (see Art. 3 of the Call for Applications)
Research proposal	Multi-annual research proposal, with special emphasis on the activities to be completed during the first-year course. The proposal must meet the following requirements: <ul style="list-style-type: none"> - it cannot exceed 20,000 characters, including spaces and formulas, if present. This figure does not include: the title, the outline, references and images (such as graphs, diagrams, tables etc. - where present); - it must be written following the templates provided for Action IV.4 – “PhDs on Innovation topics” and Action IV.5 “PhDs on Green topics”. The templates are attached to the Call for Application and available for download on the University website.

SUPPORTING DOCUMENTS	
Publications	Lists of publications (i.e. monographs, articles on scientific journals), minor publications (conference papers, etc.), abstracts and posters presented during national and international conferences, etc.

Evaluation criteria

The **results of the admission exams** will be available from 03/11/2021 on [Studenti Online](#) (select “summary of the requests in progress” > “see detail” and open the .pdf file at the bottom of the page). **No personal written communication will be sent to applicants concerning the examinations results.**

Scores will be expressed in points out of 100, as follows.

Minimum score for eligibility: 60 points, Maximum score: 100 points

Qualifications evaluation	University degree final mark.	10 points max: - 10 points for 110 and Lode - 8 points for 109 to 110 included - 6 points for 105 to 108 included - 4 points for 101 to 104 included - 3 points for 95 to 100 included
	Publications and other documents	10 points max (only qualifications related to the topics of the Doctorate will be evaluated with the following maximum scores): - 3 points for each publication in ISI / Scopus and class A journals; - up to a maximum of 1 point for participation at conference proceedings, conferences posters or other publications
Research proposal evaluation	Scientific value and innovative nature of the proposal	20 points max.
	Ability of the project to foster the synergy between research and the productive world	20 points max.
	Identification of parameters allowing the measurability of expected results	20 points max.
	Adherence of the proposal to the objectives of the Action PON R&I 2014-21	20 points max.

Research Topics

n. 1 - GREEN

Thematic area SNSI 2014-20	Thematic Area: Health, nutrition, quality of life Development trajectory: Regenerative, predictive and personalised medicine
PNR 2021-2027*	Research field: 5.1 Health Area of application: 5.1.3 Biotechnologies Section 2 Regenerative medicine, organ transplants and tissue engineering
Project title	Hyperspectral imaging of the cardiac regeneration process
Project description	Damages to the heart, such as that resulting from heart attack, are in fact permanent due to the very poor renewal capacity of the heart muscle cells. In mammals, humans included, the proliferative and regenerative capacity of muscle cells of the heart are drastically reduced after the early postnatal period. Hyperspectral imaging is an innovative technique capable of capturing all information in an electromagnetic spectrum, from ultraviolet to infrared rays. In this project we will use hyperspectral imaging technology to record vibrational waves of heart muscle cells in neonatal and adult phases, under physiological conditions and after damages as well. The potential pro-proliferative and pro-regenerative effect of the frequencies detected during the cardiac regeneration process recorded in the neonatal phase will then be evaluated in damaged cardiac tissue in an adult mouse model.
Mandatory traineeship	Min. 6 months max. 12 months
Company type	Data and analytics
Stay abroad	6 months

n. 2 - INNOVATION

Thematic area SNSI 2014-20	Thematic area: Health, nutrition, quality of life Development trajectories: Regenerative, predictive and personalised medicine Biotechnology, bioinformatics and pharmaceutical development
PNR 2021-2027*	Research field: 5.1 Health Area of application: 5.1.3 Biotechnologies Section 6 develop precision and personalized medicine solutions
Project title	Applications of new sequencing technologies in heart / lung transplants through the analysis of cell-free DNA
Project description	Recent developments in new sequencing technologies have made it possible to expand genetic and genomic analyzes, giving a strong development to personalized medicine. It is now possible to obtain sequencing of the entire human genome in terms of days. Furthermore, the possibility of analyzing circulating nucleic acids in a specific and sensitive way has allowed the concept of liquid biopsy to evolve, with the development of ad hoc genetic analyzes. The analysis of circulating DNA (cell-free DNA, cfDNA) can also be evaluated in the context of organ transplantation. In particular, it was found that, albeit with variable percentages, the quantity of cfDNA in transplanted patients is greater than in controls, and therefore it is possible, through the massive sequencing of certain genomic polymorphisms, to evaluate the relationship between the presence of circulating donor DNA, compared to recipient patient as an index of rejection. A preliminary test using the CareDX kit with about 250 polymorphisms and analysis on Illumina instrumentation (available in various laboratories of the S. Orsola Policlinico) allowed to evaluate the feasibility of this protocol, starting from frozen plasma of the transplanted patient (in particular as far as concerns the heart). The primary objective of the research project will therefore be the evaluation in a standardized way the presence of cfDNA of donors in transplanted patients (both adult and pediatric), with regard to the heart and in patients who have received lung transplantation (adults), to verify the threshold values for the different organs in the first 2 years of research, and then implement these analyzes in the follow-up of the patient (3 years). Secondary objective is to develop cfDNA extraction kits and analyzing increasingly

	<p>specific and optimized markers (the material is highly degradable and in the literature it is known that different methods can affect yield and quality, in order to optimize the yield of cfDNA from blood and the specific analysis of the percentage of donor DNA. We will collaborate with CareDx, an American company that is opening European branches in this period (collaboration with Dr. F. Tondat and Dr S. Casas).</p> <p>The peculiarity of these analyzes is the simplicity with which the sample can be found (blood sampling) with the consequent low invasiveness and the speed of sample processing (1-2 days) unlike the invasive and risky biopsy (ex. myo -cardiac or trans-bronchial) to be performed every two weeks after transplantation. This line of research will contribute to an improvement in patient management, to replace tissue biopsy (which involves a much greater invasiveness than a blood sample) with liquid biopsy, with the possibility of carrying out investigations at shorter times and with an advantage also on costs and analysis times.</p>
Mandatory traineeship	Min. 6 months max. 12 months
Company type	Transplant innovation
Stay abroad	6 months

*The translation of PNR 2021-2027 references has been carried out by the PhD Unit.