RELAZIONE SULLE ATTIVITÀ SVOLTE NEL CORSO DI DOTTORATO / REPORT ON ACTIVITIES CARRIED OUT DURING THE PHD PROGRAMME

DOTTORANDO / PHD STUDENT	
COGNOME NOME / SURNAME NAME	**MATRICOLA / MATRICULATION N.**
Santos de Oliveira Glenda	875694
CORSO DI DOTTORATO / PHD PROGRAMME	**CICLO / CYCLE**
DIMET	**36**
TUTOR (COGNOME NOME) / TUTOR (SURNAME NAME)	
Fulvio Magni and Paola Campagnolo (Surrey University)	

BREVE RELAZIONE SULL'ATTIVITÀ DI RICERCA / SHORT REPORT ON RESEARCH ACTIVITIES
(max. 2500 caratteri, spazi esclusi/ maximum 2500 characters excluding spaces)

The decision to pursue this PhD is driven by the compelling research topic. This project represents a cutting-edge application of a novel porcine organotypic model as a platform for pharmacological assays integrated with advanced MS-based approaches to unravel the molecular mechanisms of novel drugs targeting the proliferation of progenitor cardiac cells. To achieve the project's aims, all the activities, courses, seminars and training listed below were essential for its development. Moreover, teaching, demonstrating, and presenting posters at conferences was vital for my development. These activities improved my communication skills and deepened my understanding of my research. Interacting with experts provided valuable feedback and critical thinking for my research development.

The courses "Introduction to Statistics with R" (Part I and II) at the University of Milan-Bicocca provided a strong foundation in data description, basic inference, linear, and logistic regression models, which are crucial for analysing complex proteomic data sets. The "Productivity for Young Researchers" course enhanced my time management and productivity skills, essential for efficiently managing multiple tasks involved in this project. The "Specific Course for Medium Risk Workers" ensured compliance with safety protocols when handling biological samples and operating mass spectrometry equipment. The "Bioinformatics with Mass Spectrometry" course from EUBIC-MS focused on workflows for identifying and validating post-translational modifications and analysing single-cell proteomics data, directly applicable to the proteomic

analysis of epicardial cells. The "4th School of Mass Spectrometry" and the "1st MS Biostatistics School" provided advanced knowledge in ionisation and separation techniques, sample preparation, data processing, and biostatistics applied to mass spectrometry, crucial for effective use of MALDI-MSI and nLC-MS/MS. The "7th Mass Spectrometry Imaging School" covered theoretical aspects, instrumentation, protocols, and statistical analysis of MS-Imaging, essential for acquiring, processing, and interpreting spatial proteomic data.

Training in confocal microscopy, cryogenics gas safety, and cryostat use at the University of Surrey ensured proficiency in imaging tissue samples and sample preparation. The "Good Practice for Image Acquisition with Optical Microscopy" course ensured high-quality imaging for correlating proteomic data with histological findings. Participation in seminars and workshops, such as "European Pharma Days," "DIMET – OPEN DAYS," and seminars on cardiovascular research and mass spectrometry, provided insights into the latest developments and methodologies, inspiring new approaches for this project. The "Fundamentals of Liquid Chromatography Applied to Pharmaceutical Industry" course provided essential knowledge for the nLC-MS/MS component of the project. Collectively, these activities enhanced my statistical analysis, bioinformatics, advanced mass spectrometry, safety protocols, scientific communication, and practical laboratory skills, crucial for the successful execution and dissemination of this research.

This work provides a significant step forward in cardiovascular research by combining advanced proteomic techniques with a clinically relevant model. The findings offer valuable insights into the epicardium's role in heart repair and open new avenues for developing targeted therapies by broadening the understanding of heart regeneration mechanisms driven by the epicardium. The integration of MALDI-MSI and nLC-MS/MS offered a powerful tool for investigating the proteomic responses, providing a comprehensive understanding of the molecular pathways involved in each treatment, reinforcing that the in-depth understanding of molecular responses is crucial for developing targeted therapies that can effectively enhance the regenerative potential of the epicardium.

In conclusion, by exploring the proteomic response to new pharmacological compounds, this research improves the development of novel therapeutic strategies aiming to mitigating disease progression.

PRINCIPALI ATTIVITÀ FORMATIVE / MAIN TRAINING ACTIVITIES (elencare tutte le principali attività svolte e, per ognuna, indicare i dati richiesti / list the main activities and specify for each of them the requested data)			
TIPO / TYPE [Corso/Seminario/Workshop/ Convegno/Stage/Altro (specificare) – Course/Seminar/Workshop/Conference/Other (specify)]	**TITOLO / TITLE**	**SEDE / LOCATION**	**ORE – GIORNI / HOURS - DAYS**
Course	**Introduction to statistics with R (part I):** data description and basic inference	University of Milan-Bicocca (Virtual)	*11/01/21 – 21/01/21 (2 FCU)*
Course	Productivity for Young Researchers	UNIVERSITY OF MILAN-BICOCCA	*24/11/21 – 22/12/21 (1.5 CFU)*
Course	**Introduction to statistics with R (part II):** linear and logic regression models	UNIVERSITY OF MILAN-BICOCCA	*01/02/22 – 03/02/22 (1.5 CFU)*
Course	Specific Course for Medium Risk Workers	UNIVERSITY OF MILAN-BICOCCA (Virtual)	*05/07/23 (8 hours)*
Course	**Bioinformatics with Mass Spectrometry:** *Workflow for Identification and Validation of PTMs; How to analyse single-cell proteomics data with the software "single-cell proteomics"*	Germany (EUBIC – MS) European Bioinformatics Mass Spectrometry Society	15th – 18th of January, 2024.
Course	**4th School of Mass Spectrometry**: *Ionisation and Separation Techniques Applied to Mass Spectrometry; Sample Preparation and Modern Tools for Data Processing*	Brazil (Brazilian Mass Spectrometry Society)	December 2023.
Course	**1st MS Biostatistics School:** *Introduction to Biostatistics using the R programming language, emphasising its application in mass spectrometry data analysis in biological research.*	UNIVERSITY OF MILAN-BICOCCA	May 2023.

1 Si ricorda l'obbligo di caricare le pubblicazioni in BOA/ Remember to upload your publications on BOA

Course	**7Th Mass Spectrometry Imaging school:** Theoretical aspects, instrumentation, and protocols used in MS-Imaging. Imaging of a tissue section. Processing and interpretation of acquired analytical data. Image construction. Statistical Analysis; correlation with histological imaging	UNIVERSITY OF MILAN-BICOCCA	23rd – 25th April 2023
Course	Introduction to Grant Writing	UNIVERSITY OF MILAN-BICOCCA	*06/06/23*
Course	RNA Biology	UNIVERSITY OF MILAN-BICOCCA	*15/23/23*
Course	Good Practice for image acquisition with optical microscopy	UNIVERSITY OF MILAN-BICOCCA	*15/23/23*
Course	Ethics in science publishing	UNIVERSITY OF MILAN-BICOCCA	*17-19/10/22*
Seminar	Malattie Mitocondriali: 20 anni di storia	UNIVERSITY OF MILAN-BICOCCA	*22/09/2021 – 24/09/2021*
Seminar	G Protein-coupled receptor kinase-2: A potential therapeutic target for cardiovascular diseases	UNIVERSITY OF MILAN-BICOCCA	*14/07/23*
Seminar	Mass Spectrometry Imaging Society – Seminar Sections	Virtual	*15-19/05/2021*
Seminar	The (not so) smooth muscle cell in atherosclerosis	Virtual	*19-21/09/22*
Seminar	Optimising Your Tissue Processing	Virtual	20th July, 2022
Workshop	European Pharma Days	Mannheim (Germany)	April 27th – 28th, 2022
Workshop	DIMET – OPEN DAYS	UNIVERSITY OF MILAN-BICOCCA	*28-29/09/21*
Workshop	DIMET – OPEN DAYS	UNIVERSITY OF MILAN-BICOCCA	*19-21/09/22*
Workshop	Renoir Opening Scientific Opening Meeting	Virtual	*14-15/12/21*
Seminar	Investigating mechanisms of biomolecular self-	UNIVERSITY OF MILAN-BICOCCA	*18/05/23*

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	organization by integrating physics-based simulations and AI		
Course	Presentation Skills	University of Surrey	February-April 2022.
Training	Confocal Microscope,	University of Surrey	May 24th, 2022.
Training	Cryogenics Gas Safety training	University of Surrey	June 22nd, 2022.
Training	Demonstration in laboratories and practical training,	University of Surrey	September 27th, 2022.
Workshop	Writing a Confirmation Report	University of Surrey	September 28th, 2022.
Course	Fundaments of Liquid Chromatography applied to Pharmaceutical Industry.	Online short-term course	April 9th – 13th, 2021.
Training	Using the Cryostat	University of Surrey	May 12th, 2022.
Course	Grammar for academic writing	University of Surrey	February – April 2022.

ATTIVITÀ DI DIDATTICA E DI RICERCA / TEACHING AND RESEARCH ACTIVITIES (elencare numerando tutte le attività svolte e, per ognuna, indicare i dati richiesti / list and enumerate all activities and specify for each of them the requested data)	
TIPO / TYPE	**TITOLO / TITLE**
ATTIVITÀ TUTORIALI E DIDATTICO INTEGRATIVE SVOLTE / TUTORSHIP ACTIVITIES (specificare / specify)	**Laboratory Demonstration and Practical Tutoring (University of Surrey)** **Discipline:** BIOCHEMISTRY: THE MOLECULES OF LIFE (BMS1049) **Professors:** Thumser AEA (Dr) and Sara Trinder **Practice:** Essential Lab skills - Pipetting, dilutions, use of spectrophotometer 04/10/22 10:00 – 12:00 04/10/22 14:00 – 16:00 **Practice:** Protein assay - Protein assays & standard curves 11/10/22 10:00 – 12:00 11/10/22 14:00 – 16:00 **Practice:** Caffeine assay - Caffeine assay & standard curves 18/10/22 10:00 – 12:00 18/10/22 14:00 – 16:00

	Practice: Amino acid titration - Use of pH meter, burette and preparation of solutions 31/10/22 10:00 – 14:00 **Practice: Statistics -** Graph Pad Prism statistics 10/11/22 10:00 – 14:00
SEMINARI TENUTI DAL DOTTORANDO / SEMINARS HELD BY THE PHD STUDENT	
PUBBLICAZIONI SCIENTIFICHE / SCIENTIFIC PUBLICATIONS **(riportare per esteso le pubblicazioni già registrate in BOA / quote in extenso the publications already registered in the BOA[1] catalog)**	- Bindi, G.; Smith, A.; **Oliveira, G.;** Eccher, A.; Vatrano, S.; Alberici, F.; Cazzaniga, G.; Capitoli, G.; Magni, F.; L'Imperio, V. "Spatial resolution of renal amyloid deposits through MALDI-MSI: a combined digital and molecular approach to monoclonal gammopathies". *Journal of Clinical Pathology*, 2023. Doi: 10.1136/jcp-2023-208790 - P. Previtali, *L.* Pagani, G. Risca, G. Capitoli, E. Bossi, **G. S. Oliveira**, I. Piga, A. Radice, B. Trezzi, R. A. Sinico, F. Magni, C. Chinello, "Towards the Definition of the Molecular Hallmarks of Idiopathic Membranous Nephropathy in Serum Proteome: A DIA-PASEF Approach," *Int. J. Mol. Sci.*, vol. 24, no. 14, 2023. Doi: 10.3390/ijms241411756
PRESENTAZIONI A CONGRESSI / PRESENTATION AT CONFERENCES **(indicare se la presentazione - poster, abstract, etc. - è stata anche pubblicata riportando la citazione bibliografica completa / indicate whether the work – posters, abstract etc - has already been published, quoting full bibliographic references)**	o **Oral Communication: 32nd "A. Castellani" Meeting of PhD students in biochemical sciences.** September 13th - 16th, 2021, Pavia, Italy o **Oral Communication: Doctoral College Conference.** June 22nd and 23rd, 2022, University of Surrey, UK. o **Poster: European Bioinformatics Community of Mass Spectrometry (EuBIC-MS) Winter School** January 14th – 19th, 2024, Winterberg (Germany). o **Poster: Annual PhD Conference in Biomedical Sciences** June 20th, 2023, Milan (Italy) o **Poster: Massa 2023** June 2023, Torino (Italy). o **Poster: Doctoral College Conference**. June 22nd and 23rd, 2022, University of Surrey (England). o **Poster: 3rd Iberoamerican Conference in Mass Spectrometry.** December 10th-15th, 2022, Rio de Janeiro (Brazil). o **Poster: DIMET Open Days, September** 19th – 21st, University of Milano-Bicocca, 2022, Monza

	(Italy).
ALTRE PUBBLICAZIONI / OTHER PUBLICATIONS **(indicare le opere che sono state pubblicate lavori sottomessi rapporti di ricerca, etc. - riportando la citazione bibliografica completa / indicate published works –submitted works, research reports - quoting full bibiografic references)**	

Data Compilazione/Date

31/05/2024

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Firma

Glenda Oliveira

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