



Luisa Ponticelli

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WORK EXPERIENCE

University of Florence – Florence, Italy

Investigator fellowship

[01/03/2024 – 31/10/2024]

•Department of Neuroscience, Psychology, Pharmaceuticals and Child Health (NEUROFARBA) - University of Florence; European Laboratory for Non-Linear Spectroscopy (LENS). •Supervisor: Prof. Benedetta Nacmias •Winner of the call n. 27977 (06/02/2024)

•Project: Title: 'Multifunctional optofluidic devices for early diagnosis of Alzheimer's disease by screening for biomarkers in cerebrospinal fluid' within the PNRR project "THE -TUSCANY HEALTH ECOSYSTEM".

The aim of the project is the development and optimization of an optofluidic platform for the optical analysis of cerebrospinal fluid (CSF) characterized by greater sensitivity, speed and lower costs than current diagnostic tools for Alzheimer's disease (AD). To this end, the gold nanoparticles (AuNPs) will be synthesized and engineered with biomolecules (antibodies) to increase their affinity towards the main biomarkers of AD (e.g. β -amyloid peptide 1-42) and with bioorthogonal Raman reporters (RRs) to exploit the high sensitivity and specificity of surface-enhanced Raman spectroscopy (SERS) for multiplexed detection. These AuNPs will be mixed with the CSF sample, which will be in turn loaded onto microfluidic devices interfaced with a highly compact optical readout set-up.

Technical University of Denmark – Kgs. Lyngby, Denmark

Traineeship

[13/02/2023 – 13/05/2023]

•Erasmus + Traineeship

•Project: Title: ALE (Adaptive Laboratory Evolution), screening and characterization of the halotolerant yeast *Debaryomyces hansenii*.

The traineeship work involved the characterization of the unconventional yeast *D. hansenii* for its use as an emerging microbial "cell factory" in salt-rich feedstocks and industrial by-products. The ALE experiments were performed by serial transfers of yeast cultures into fresh growth medium during the exponential phase of growth in order to improve yeast fitness. Different growth conditions were tested and the evaluation of growth and performance was carried out by means of high-performance microfermentation (BioLector).

University of Florence – Grenoble, France

Other activities

[07/12/2021 – 10/12/2021]

• SAXS analysis at the ID02 beamline of the ESRF (European Synchrotron Radiation Facility) in Grenoble for the project 'Lignin nanocapsules for the delivery of natural antimicrobial agents'.

The work experience involved the characterization, by means of SAXS (Small Angle X-ray Scattering) analysis, of the structure (size and shape) of lignin nanocapsules containing capsaicin; these nanoformulations could be applied to deliver natural pesticides to plant systems in a biocompatible and environmentally sustainable manner.

University of Florence; FEMS – Florence, Italy

Other activities

[20/08/2023 – 25/08/2023]

• member of the organising committee of the ICYGMB31 (International Conference on Yeast Genetics and Molecular Biology) held in Florence at the multifunctional space The Stellar. • recipient of an early career investigator fellowship for ICYGMB31 from FEMS.

EDUCATION AND TRAINING

Master degree in Molecular Biotechnologies (LM-8), date of title: 18/12/2023

University of Florence, School of Mathematical, Physical and Natural Sciences

City: Florence | Country: Italy | Website: <https://www.unifi.it/> | Final grade: 110/110 cum laude | Thesis: Identification and characterization of fungal strains from stool samples of pediatric patients affected by Crohn's disease.

- standard microbiological assays such as the preparation of culture media for fungi and bacteria.
- isolation of microorganisms from stool samples.
- tests for the phenotypic characterization of fungal strains (evaluation of characteristics usually associated with virulence in the literature).
- molecular biology experiments: DNA extraction and amplification of genes considered phylogenetic markers of bacteria (gene for 16S rRNA) and fungi (ribosomal non-coding intergenic region ITS). Scientific background: the thesis work was part of the RiskCrohnBiom (RCB) project coordinated by Prof. Paolo Lionetti (head of the SOC Gastroenterology and Nutrition at the Meyer University Hospital in Florence) together with Prof. Duccio Cavalieri as scientific head.

Bachelor degree in Biotechnologies (biomolecular Biotechnologies), date of title: 30/09/2021

University of Florence, School of Human Health Sciences

City: Florence | Country: Italy | Website: <https://www.unifi.it/> | Final grade: 110/110 cum laude | Thesis: Lignin nanocapsules engineered as pesticide agents

- synthesis of nanoformulations (lignin nanocapsules).
- chemical-physical characterization of nanocapsules: DLS (Dynamic Light Scattering), SEM (Scanning Electron Microscopy) and SAXS (Small Angle X-ray Scattering).
- experiments to test biocompatibility and possible anti-parasitic properties on plant systems: spray administration of diluted formulations and subsequent assessment of the general health status of the treated plants (e.g. calculation of the area of the aerial part by ImageJ application).

PhD student

LENS (European Laboratory for Non-Linear Spectroscopy), University of Florence [01/11/2024 – Current]

City: Sesto Fiorentino (Florence) | Country: Italy | Website: <https://lens.unifi.it/> | Thesis: Novel optical nanomaterials as advanced tools for the early-stage detection of diseases through molecular analysis of biological fluids

The aim of the project is to design innovative nanomaterials properly functionalized for the specific targeting and real-time optical revealing of highly diluted molecules (biomarkers) in the main biological fluids (e.g. blood, cerebrospinal fluid and saliva) for diagnostic purposes. The combination of spectroscopic techniques and novel nanomaterials for biosamples molecular screening aimed at the early-stage diagnosis must address specific requirements at once: i) sensitivity down to picomolar towards pathological hallmarks; ii) potentiality for multiplexing; iii) time- and cost-saving compact systems iv) affordable to every structure. To this end, multilayer gold nanoparticles (NPs) embedding three different bioorthogonal Raman reporters (RRs)[4] were synthesized and characterized in terms of their physical and chemical properties (plasmonic properties, morphology, dimensions and surface potential) and limit of detection (LOD) when operating as nanoprobe for Surface-enhanced Raman Spectroscopy (SERS). The multilayered NPs were further functionalized with antibodies targeting the main Alzheimer's disease (AD) biomarkers (beta-amyloids, tau proteins and brain-derived neurotrophic factors BDNF) in varied sandwich immunoassay configurations. As a proof of concept, the performance of these SERS nanoprobe was validated in both synthetic and real fluids (cerebrospinal fluid and plasma).

LANGUAGE SKILLS

Mother tongue(s): Italian

Other language(s):

English

LISTENING C1 READING C1 WRITING C1

SPOKEN PRODUCTION C1 SPOKEN INTERACTION C1

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

SKILLS

Microsoft: Microsoft Word, Microsoft PowerPoint, Microsoft Excel, Microsoft Outlook

CONFERENCES AND SEMINARS

[04/07/2024 – 05/07/2024] Florence

Italian Soft Days (IsoDays) 2024 I attended the conference to get informed about the most recent developments in nanosciences and to exchange ideas with other members of the scientific community.

[11/05/2025 – 14/05/2025] San Sebastian, Spain

Gold 2025

- Oral presentation
 - Title: Multilayered bioorthogonal gold nanoparticles for multiplexing SERS sensing of Alzheimer's Disease pathological biomarkers.
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Florence, 30/01/2026

Luca Ponticelli