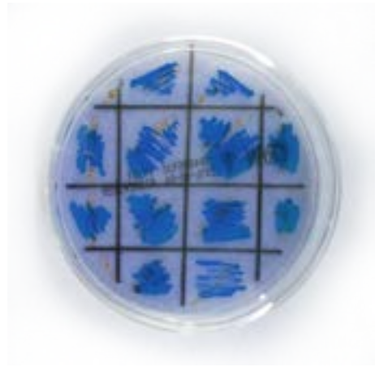
UCIBIO Activity Report 2022

2022



Website: https://ucibio.pt

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Foreword

"The 2022 Activity Report shows the continued strengthening of our scientific mission with impact at different levels as documented in the several sections.

The SPOTLIGHTS summarize highpoints from January to December 2022 that exemplify different aspects of our achievements, from EU successful funding, and positions granted in the FCT-funded CEEC competition to important PRIZES awarded. The great enthusiasm with Outreach activities is constant along the year with a notable highlight on the European Researchers Night.

After the pandemic, in 2022 life returned to normal but, some of the practices from those times did bring benefits as happens with on-line meetings that are now a current practice. And since 2021 we adopted the hybrid mode for our regular series of Seminars and Invited lectures, which has enabled a much wider participation of colleagues from Lisbon and Porto.

In 2022 our scientific productivity remained of high quality and impact and under "UCIBIO in Numbers" is worth mentioning an increase in total competitive funding obtained (5.0M€) and a substantial increase in the numbers of PhD and MSc theses.

By the end of 2022 took place the Kick-off meeting of the Associated Laboratory we integrate, i4HB (Institute for Health and Bioeconomy) and we are in the process of attracting and hiring exceptional researchers for UCIBIO to work in interdisciplinary and competitive areas under the Health and Bioeconomy flags.

In the last quarter of 2022 we received fantastic news on two successes obtained under the Widening Program of HORIZON EUROPE: (1) one TWINNING project coordinated by UCIBIO (co-coordination by Paula Videira, Filipa Marcelo and Angelina Palma) -"GLYCOTwinning: Building Networks to Excel in Glycoscience" and (2) one ERA Chair project with Hartmut Luecke as ERA Chair Holder - "CryoEM@NOVA: a cryo electron microscopy hub enabling drug discovery", that will establish the first cryo-EM Lab for research and training in Portugal.

This is taking shape in 2023 and these two programs will contribute to strengthen the UCIBIO high performance in Health and Biotechnology with impact in Training, in Translation to Industry and Health Institutions and in Outreach actions.

Since this is my last foreword as Director of UCIBIO, I must end with a brief message to all that accompanied the adventure of creating a New Research Unit in Applied Molecular Biosciences. In 2013-2014 a proposal was put together with a great "wonderful team". It was a lot of work but, above all, was great fun and highly stimulating to discuss science and to write in different (but very complementary) styles a successful proposal! And the years that followed proved we were in the right track as the yearly Activity Reports show.

Thank you all, researchers, students, technicians, and staff of UCIBIO for your continued support and enthusiasm!

It is now time to pass the leadership of UCIBIO to a fantastic colleague, who was among the first "wonderful team".

Prof Cecilia Roque, I wish you all the luck for the future challenges of UCIBIO!"

Maria João Romão
Director of UCIBIO

2022

Feb | Mar | May | Jul | Sep | Oct | Dec

UCIBIO IN THE NEWS

Cecília Roque receives an ERC Proof of Concept grant

Raquel Portela awarded an ESCMID Research Grant

UCIBIO researchers, Aldino Viegas, Carolina Madeira and Pedro Viana Baptista awarded funding for Bilateral Cooperation in Science

Five CEEC positions awarded to UCIBIO researchers

UCIBIO IN THE NEWS

New Twinning project coordinated by UCIBIO brings 1.5 M€ to drive innovation in Glycoscience

Institute for Health and Bioeconomy i4HB Kick off Meeting.
UCIBIO integrates this Associate Laboratory

Maria Reis and Filomena Freitas integrate a new Horizon project to convert plastic pollution into Eco-plastic prototypes

Luísa Peixe awarded Maratona da Saúde Prize

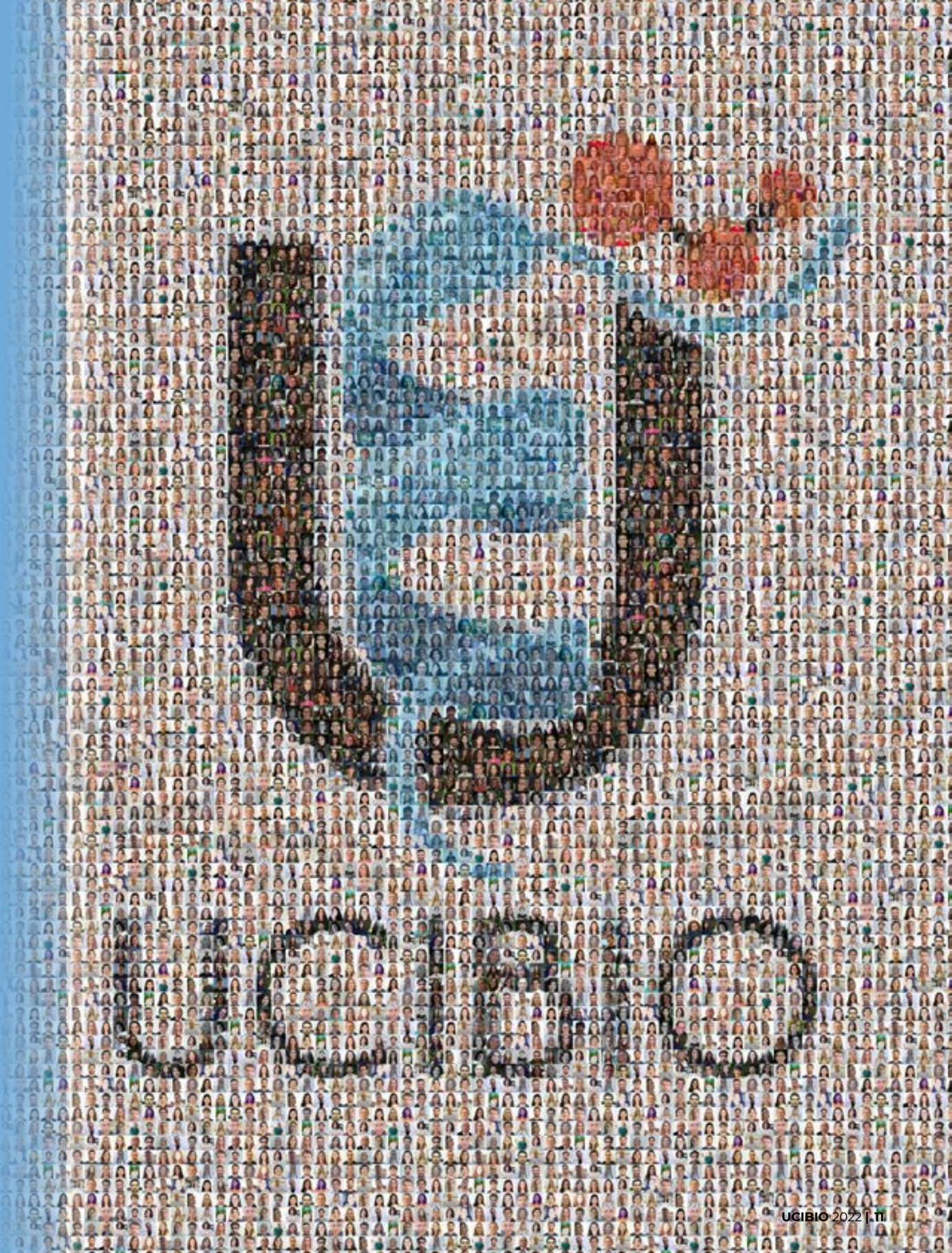
New Horizon project to extend the agricultural production value of two major players of the global bioeconomy

UCIBIO at the 2022 European Researchers' Night

The new UCIBIO facility, Culture Collection of Porto, launched

AquaInSilico is the winner of the "Entrepreneurship and Innovation 2022" Award

1. UCIBIO at a Glance



Description and Mission Statement

UCIBIO's key strength lies on a broad scope of fundamental and applied research, standing at the interface of Chemistry, Biology and Engineering to address pertinent questions at atomic, molecular, sub-cellular and cellular levels, including cell-to-cell interactions and population evolutionary dynamics.
The UCIBIO team of researchers gathers more than 130 chemists, biochemists, biologists, bioengineers, pharmacists and toxicologists from the Universities of Porto and NOVA of Lisbon. This diversity of researchers creates the perfect environment for collaborative research in Biomolecular Sciences to address important societal challenges in Health, Wellbeing and the Bioeconomy.

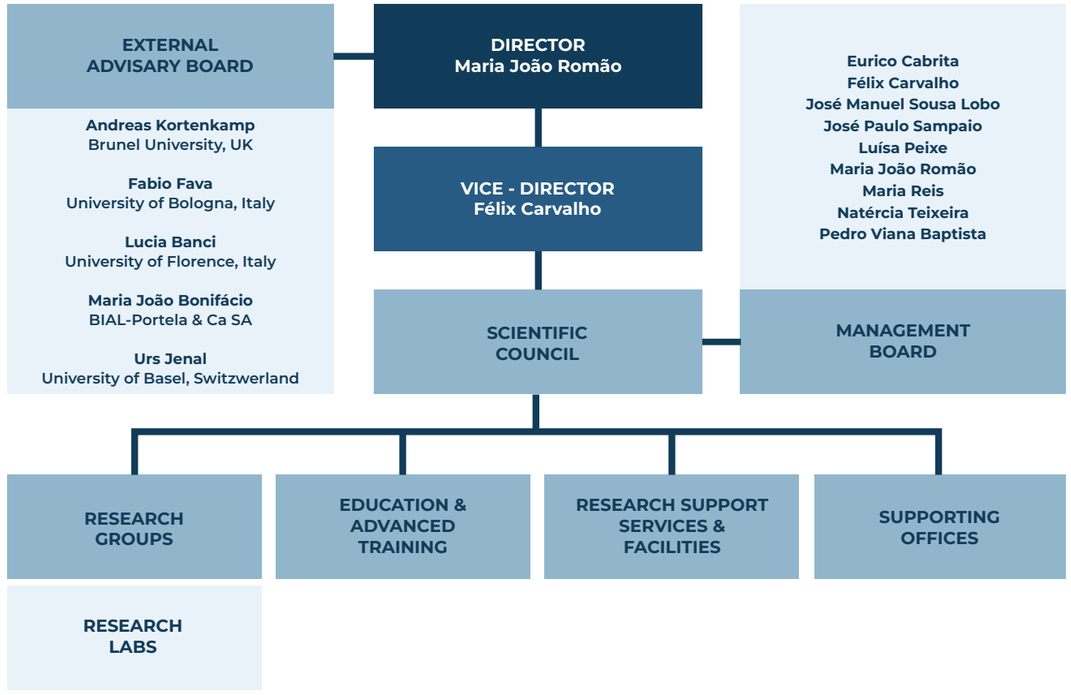
For this purpose UCIBIO's Strategic Scientific Plan is built around 6 general goals:
Goal 1 - Produce and disseminate high quality research;
Goal 2 - Increase the societal impact of the basic and applied research developed;
Goal 3 - Strengthen existing training programs and activities and offer new ones;
Goal 4 - Secure increased funding and internationalization;
Goal 5 - Fortify the translation of Biomolecular research to industry and society;
Goal 6 - Expand communication to the general public.

UCIBIO's main research achievements are at the cutting edge of Biomolecular Sciences, with high impact and knowledge transfer at different levels. Scientific areas that highlight UCIBIO's research potential are:
- (Novel) Drugs: from Biomolecular Function to Rational Design;
- Glycan Function for Diagnostics and Therapy
- Impacting the BioEconomy via Renewable Resources and Biotechnology;
- Bacterial Diversification and Fighting Microbial Virulence;
- (Nano)formulations for Smart Therapeutics.

Eight Research Groups (RGs) contribute to this research effort with complementary expertise and highly interdisciplinary and integrative research:
BENG - Bioengineering;
NIT - Nanoimmunotech;
SMB - Structural and Molecular Biology;
MMG - Molecular Microbiology and Genomics;
TCB - Theoretical and Computational Biology;
TOXI - Toxicology;
DTB - Drug Targets and Biomarkers;
MedTech - Medicines and Healthcare Products.

Governance

UCIBIO includes researchers from NOVA University of Lisbon and from the University of Porto. Its governance includes a Directive Board (DB), a Management Board (MB) and an External Advisory Board (AB).
The Directive Board comprises a Director (NOVA University of Lisbon) and a vice-Director (University of Porto). The Management Board is composed by 8 representatives from both Universities, elected for a 3-year period by the Scientific Council (SC).
The SC includes all integrated members and meets once a year to discuss the scientific strategy and plan of action proposed by the DB.
The External Advisory Board comprises 4 renowned specialists from core research areas and an Industry representative.
In our governance structure we maintain and reinforce our administrative human resources that support management, informatics and accounting.



Scientific Organization

UCIBIO comprises 29 Research Labs organized in 8 Research Groups: Structural Molecular Biology (SMB), Molecular Microbiology & Genomics (MMG), Theoretical & Computational Biosciences (TCB), Toxicology (TOXI), Disease Pathways & Biomarkers (DPB), Medicinal Technology (MEDTECH), NanoImmunoTech (NIT) and Bioengineering (BENG). Research Groups develop their research around 4 major Thematic Lines:

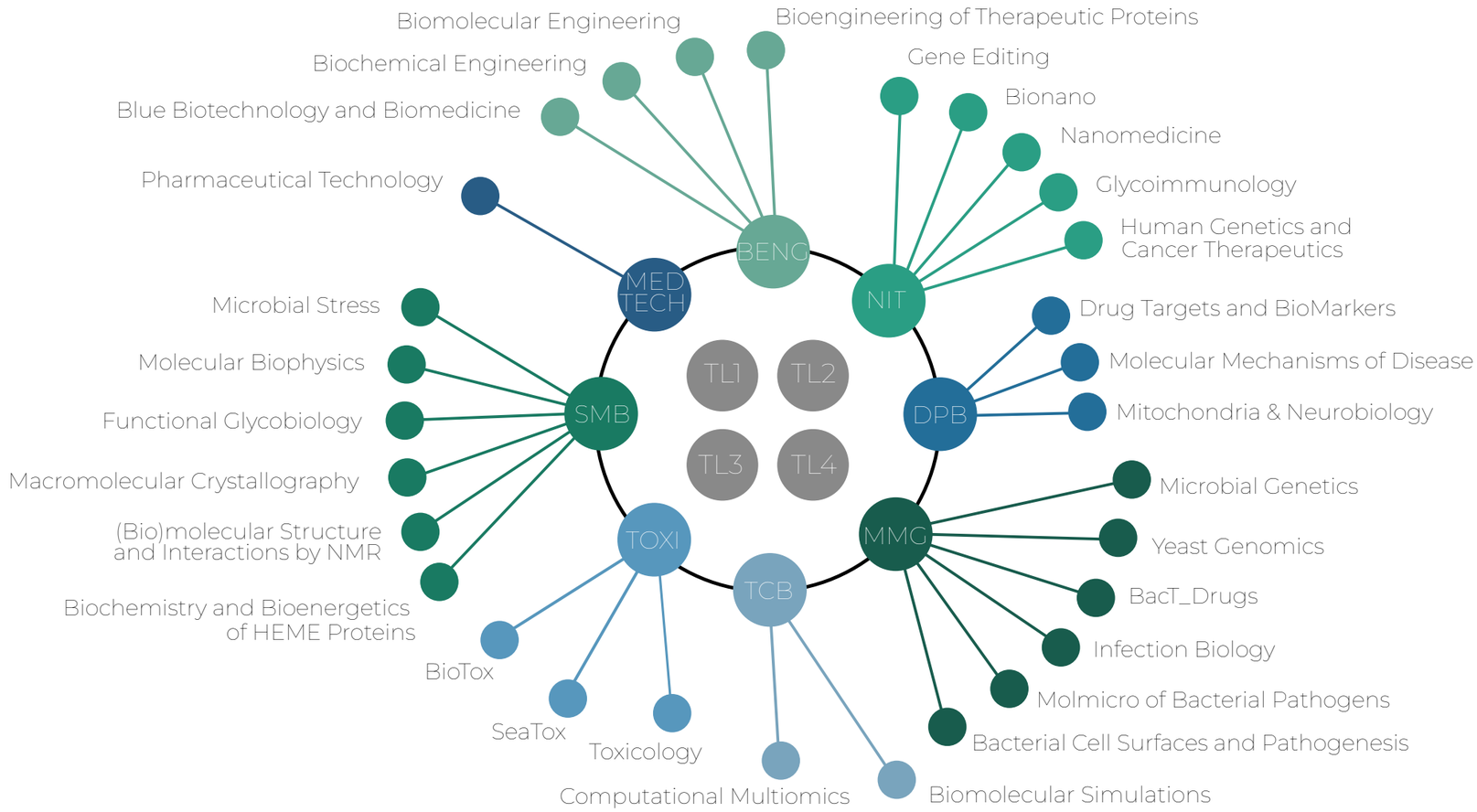
TL1 - Biological & Biomolecular Interactions (SMB, TCB, DPB, MMG, NIT BENG)

TL2 - Diagnostics, Drug Discovery & Development (SMB, TCB, DPB, MMG, MEDTECH, NIT, TOXI, BENG)

TL3 - Safety in Human & Environmental Health (TCB, DPB, MMG, MEDTECH, NIT, TOXI)

TL4 - Nanobioengineering (BENG, NIT, TCB, TOXI)

UCIBIO



TL1 Biological and biomolecular interactions

Coordinator: Eurico Cabrita

Understanding the relationship between biomolecular interactions, cellular functions, disease and applications in biomedicine needs an integrated vision and the combined effort of different Research Groups at UCIBIO. This Thematic Line joins 6 Research Groups that contribute to the understanding of molecular mechanisms and timing of cellular processes either from an experimental or a theoretical point of view.
The research conducted combines knowledge obtained from studies in the domains of Cellular Function and Molecular Mechanisms to address critical questions regarding: Protein Structure & Function; Inflammation & Oxidative Stress; Infection & Pathogenesis; Drug Resistance Mechanisms (antibiotic, anti-cancer); and Adaptation in Microbial Populations.

TL2 Diagnostics, drug discovery and development

Coordinator: Maria João Romão

The driving force of Drug Discovery programs is to bring innovative therapeutics to diseases lacking suitable medicinal drugs available. This thematic line is dedicated to finding new drugs that overcome present day problems, starting with diagnosing the condition; characterizing the target and its interactions with new biologically active molecules. It is a common-ground within UCIBIO, conglomerating the efforts of all 8 Research Groups.
Research conducted includes the discovery of new therapeutic targets/drugs and the identification of biomarkers mostly related to microbial pathogens and resistance mechanisms; the structural elucidation of drug targets and structure-activity relationships including computational studies; the toxicodynamics and toxicokinetics of the new leads. Additionally, innovative conjugates are developed with nano- and micro-technologies for diagnostics and therapy, while optimization of drug formulation for increased delivery and efficacy, closes the drug development pipeline.

Safety in human and environmental health TL3

Coordinator: Félix Carvalho

This Thematic Line encompasses the complementary and synergic expertise of 6 Research Groups dedicated to safety assessment, addressing human and environmental health perspectives.
In terms of human safety, the rationale of this Thematic Line is based on a natural (and desirable) workflow starting with in silico safety assessment, moving to experimental assays (in vitro and in vivo) and translation to clinical and epidemiological studies. Unquestionable is also the safety of the environment as proved by the universal effort to introduce in the market only compounds that are environmentally safe, requiring reliable methods for identification, risk assessment, and remediation of pollutants.
Focus is given to the rational identification of efficacious and safe human drugs and cosmetics, evaluation of mechanisms of xenobiotic toxicity, improvement of environmental conditions, as well as elimination of infectious microorganisms while increasing the knowledge on safe and health-supportive ones. Altogether, safety assessment, both from human and environmental health perspectives, constitutes a recognized challenge for Academia, Industry, Regulatory entities and consumers/patients.

Nanobioengineering TL4

Coordinator: Ana Cecília Roque

The Thematic Line (Nano)Bioengineering bridges efforts of UCIBIO research groups to develop basic and applied research in the fields of Bioengineering (Nanomedicine, Biomaterials & Biomedical Devices) and Biotechnology (Industrial and Environmental Biotechnology & Blue Biotechnology).
The focus of the Thematic Line (Nano)Bioengineering has a strong societal impact, and arises from interdisciplinary research teams. The strong patent portfolio, existing industrial collaborations, as well as established spin-off companies elicit new opportunities and support the goals of the Thematic Line and Research Unit.

2. Working & Learning at UCIBIO

Working & Learning at UCIBIO

Being one of the research units evaluated by Fundação para a Ciência e Tecnologia as Excellent in 2020, UCIBIO offers fantastic opportunities for advanced study, work and career building. In fact, during the next three years it is expected that 25% of UCIBIO's budget will be attributed to finance junior and senior researchers, while 18% is attributed to postgraduate scholarships. Indeed, the ratio of postgraduate students to junior and senior researchers (1.1) is an excellent testimony of the attractiveness of our research area and activities. Of singular importance are these international programs directly coordinated by UCIBIO's researchers.

PTNMRPhD - International PhD Program on Nuclear Magnetic Resonance Applied to Chemistry, Materials and Biosciences *involving UCIBIO at FCT-NOVA as coordinators, ITQB-NOVA, IST - Universidade de Lisboa (IST-UL), Universidade de Aveiro (UA), Universidade de Coimbra (UC), Universidade do Porto (UP), Universidade da Beira Interior (UBI), Universidade do Minho (UM), Universidade da Madeira (UMa) and Universitat Autónoma de Barcelona (UAB), Spain, The Magnetic Resonance Center (CERM), Italy and The Bijvoet Center for Biomolecular Research from the University of Utrecht, Netherlands (Bijvoet Center).*

The Radiation Biology and Biophysics Doctoral Training Programme *is hosted by UCIBIO and CEFITEC at FCT NOVA. International in nature, involves collaborations with CSIC (ES), Queen's University Belfast (UK), University of Innsbruck (AT) and The Open University (UK).*

UCIBIO is also involved in the coordination of the PhD Programmes in Biochemistry, Biology, Biotechnology and Chemical and Biochemical Engineering, offered at FCT-NOVA. Moreover, UCIBIO research labs at University of Porto host students from the International Doctoral Program in Molecular and Cellular Biotechnology applied to Health Sciences (BiotechHealth) and other PhD programs, such as in Pharmaceutical Sciences, in Metabolism - Clinical and Experimental, in Experimental and clinical Pharmacology and Toxicology, in Forensic Sciences and from the PhD program in Medicines and Pharmaceutical innovation (i3DU).

UCIBIO has been contributing to the success of other well establish and important graduate programs such as MIT-Portugal PhD program in BioEngineering Systems, an international PhD program offered jointly by 4 Portuguese universities, NOVA University of Lisbon, Technical University of Lisbon (UTL), the University of Minho (UMinho), and the University of Coimbra (FCTUC), and the Centre for Neuroscience and Cell Biology (CNC), with collaboration from MIT.

Undergraduate students training is also done at UCIBIO research laboratories and infrastructures, with our researchers actively supervising MSc and BSc Final Year Project Students. UCIBIO is also highly committed to offer specialized postgraduate courses for academia and industry. Courses on structural and analytical advanced techniques are organized periodically and include theoretical and hands-on components, giving an opportunity to all researchers and other interested professionals to work with the state-of-art instruments and improve/develop new skills.

3. UCIBIO in Numbers

People

320 TOTAL People

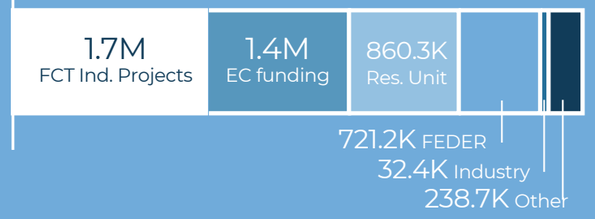
UCIBIO Countries of team members

15

Brazil
Canada
Colombia
Germany
Greece
Iraq
Ireland
Italy
Poland
Romania
São Tomé e Príncipe
Spain
Switzerland
USA
Venezuela

Funding

€5.0M TOTAL Funding



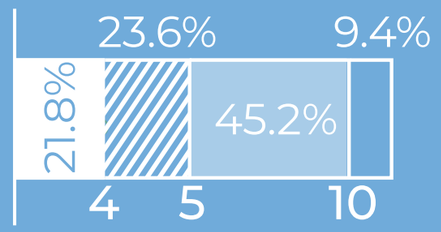
Advanced Training

30 PhD Theses • **111** MSc Theses • **9** Courses & Workshops

Publications

348 TOTAL Publications

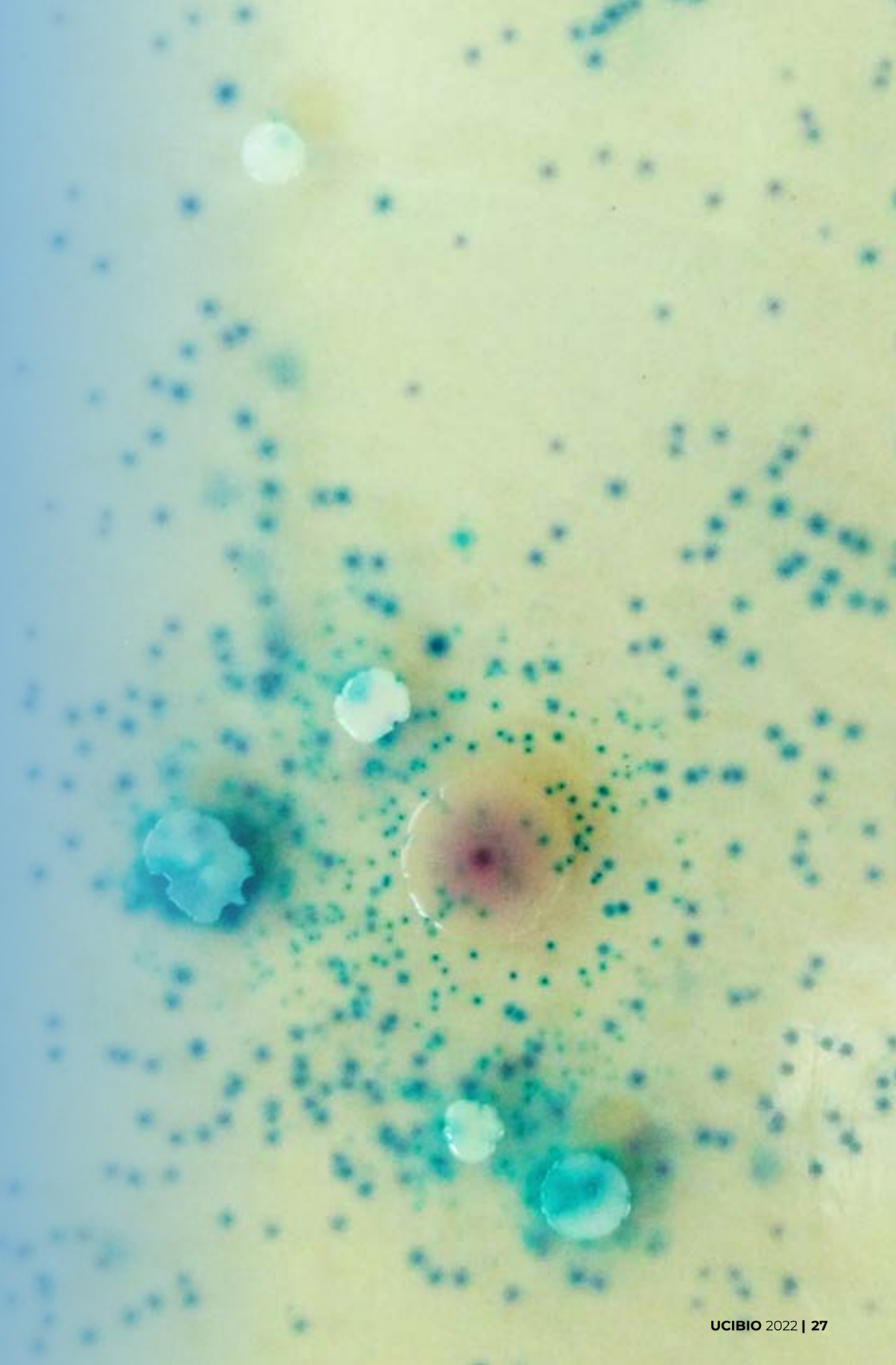
Impact Factor IF



77% Publications | **Q1** Quartile 1

8 Books & Book Chapters

4. Internationalization

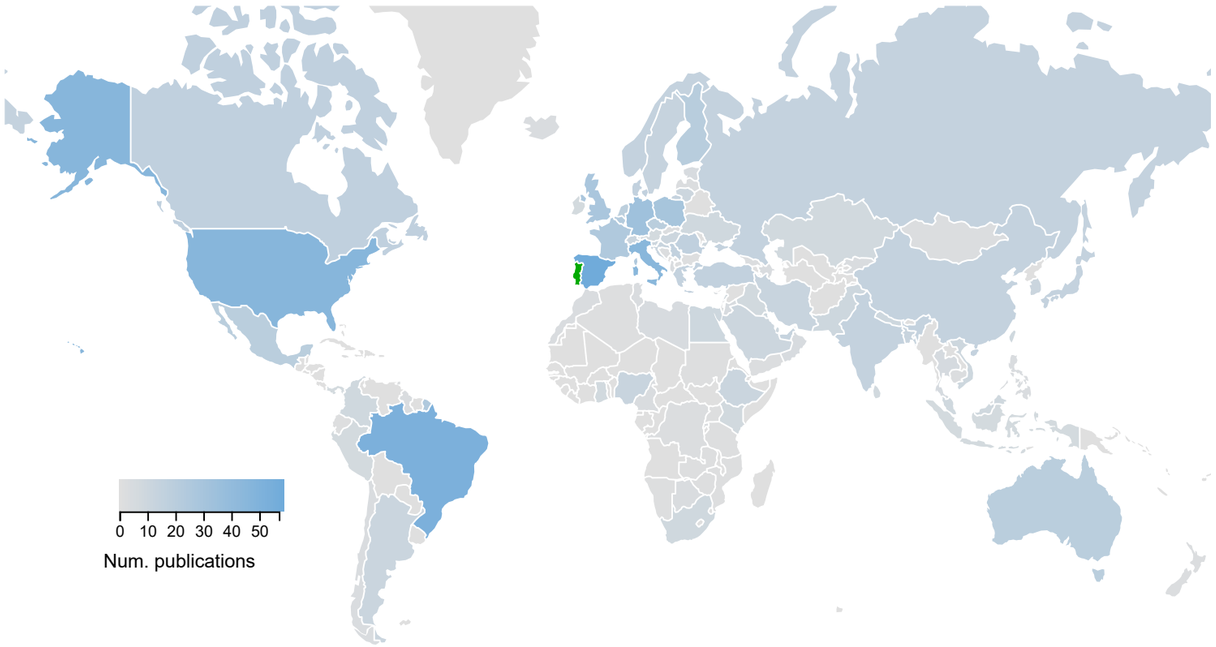


Internationalization

Since its inception UCIBIO has fostered internationalization efforts through the establishment of collaborations with research groups, specialized facilities/infrastructures and well reputed research institutes and higher education institutions. The length of these efforts is materialized in the number of international research teams and co-authored articles, international research grants and awards, participation on advisory and/or regulatory boards and, last but not least, advertising and hiring talented researchers at international level.

In 2022, 49% of the published peer-reviewed articles were done in collaboration with researchers from 110 different countries. UCIBIO researchers participated in a collaborative research study of the Global Burden of Disease consortium which published several articles in The Lancet family of journals. Other examples of successful international networking resulted in publications in other high impact journals such as Nature Communications, Nature Metabolism, ACS Catalysis, Allergy and PNAS.

Publications | 2022



Number of UCIBIO publications resulting from international collaborations by country.

High impact publications from international collaborations

LANCET	Haakenstad, A et al. 2022. Measuring the availability of human resources for health and its relationship to universal health coverage for 204 countries and territories from 1990 to 2019: a systematic analysis for the Global Burden of Disease Study 2019. LANCET, 399, 2129-2154. DOI: 10.1016/S0140-6736(22)00532-3
LANCET ONCOL	Alvarez, EM et al. 2022. The global burden of adolescent and young adult cancer in 2019: a systematic analysis for the Global Burden of Disease Study 2019. LANCET ONCOL, 23, 27-52. DOI: 10.1016/S1470-2045(21)00581-7
LANCET GLOB HEALTH	Frostad, JJ et al. 2022. Mapping development and health effects of cooking with solid fuels in low-income and middle-income countries, 2000-18: a geo-spatial modelling study. LANCET GLOB HEALTH, 10, E1395-E1411. DOI: 10.1016/S2214-109X(22)00332-1
LANCET INFECT DIS	Ledesma, JR et al. 2022. Global, regional, and national sex differences in the global burden of tuberculosis by HIV status, 1990-2019: results from the Global Burden of Disease Study 2019. LANCET INFECT DIS, 22, 222-241. DOI: 10.1016/S1473-3099(21)00449-7
LANCET PUB HEALTH	Nichols, E et al. 2022. Estimation of the global prevalence of dementia in 2019 and forecasted prevalence in 2050: an analysis for the Global Burden of Disease 2019. LANCET PUBLIC HEALTH, 7, E105-E125. DOI: 10.1016/S2468-2667(21)00249-8
LANCET PUB HEALTH	Peden, AE et al. 2022. Adolescent transport and unintentional injuries: a systematic analysis using the Global Burden of Disease Study 2019. LANCET PUBLIC HEALTH, 7, E657-E669. DOI: 10.1016/S2468-2667(22)00134-7
LANCET GASTRO-ENTEROL	Sharma, R et al. 2022. Global, regional, and national burden of colorectal cancer and its risk factors, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. LANCET GASTROENTEROL, 7, 627-647. DOI: 10.1016/S2468-1253(22)00044-9
NAT COMMUN	Radler, P, Baranova, N, Caldas, P, Sommer, C, Lopez-Pelegrin, M, Michalik, D, Loose, M. 2022. In vitro reconstitution of *Escherichia coli* divisome activation. NAT COMMUN, 13 DOI: 10.1038/s41467-022-30301-y
NAT COMMUN	Gonzalez-Ramirez, AM, Grosso, AS, Yang, Z, Companon, I, Coelho, H, Narimatsu, Y, Clausen, H, Marcelo, F, Corzana, F, Hurtado-Guerrero, R. 2022. Structural basis for the synthesis of the core 1 structure by C1GalT1. NAT COMMUN, 13. DOI: 10.1038/s41467-022-29833-0
NAT COMMUN	Roberts, NLS et al. 2022. Global mortality of snakebite envenoming between 1990 and 2019. NAT COMMUN, 13. DOI: 10.1038/s41467-022-33627-9

In 2022, there were 23 ongoing international projects funded by the European Union (1.4 M€), of which 5 Horizon Europe projects started this year and 4 are coordinated by UCIBIO researchers: one Horizon Europe Twinning awarded in 2022 (GLYCOTwinning: Building Networks to Excel in Glycosciences), one ERC Proof of Concept (ENSURE: Non-invasive follow-up of urinary tract cancers), one FET - Future and Emerging Technologies (PURE - Precisely Patterned Nanofibers for High Performance Bioseparations), and one ERC Starting Grant (Scent: Hybrid Gels For Rapid Microbial Detection). UCIBIO is involved in three Erasmus + Programme (TESS Techno-Economic-Societal Sustainable Development Training In Sri Lanka; OEMONOM - Open access Educational Materials On Naturally OccurringMolecules - sources, biological activity and use; INES - Innovative teaching and learning paths for the prevention of new drugs abuse). European Commission funds come from diversified sources namely Horizon Europe, Horizon2020, and Marie Skłodowska-Curie Actions (MSCA).

UCIBIO researchers participated in several COST Actions (9 ongoing in 2022), in the European Infrastructure networks (Instruct-ERIC) and served as expert members in governmental/european or private institutions such as the World Bank, European Food Science Authority (EFSA), the Joint Programming Initiative on Antimicrobial Resistance (JPIAMR), the ALBA Synchrotron, European Medicines Agency (EMA), Committee on Drug Dependence (ECDD) of the World Health Organization (WHO), European Chemicals Agency (ECHA), European Monitoring Centre for Drugs and Drug Addiction (EMCDDA).

Also, 23 UCIBIO members served as experts in international calls from 21 funding bodies such as the European Commission (HORIZON Europe), Research Foundation – Flanders (FWO), Wellcome Trust (UK), Biotechnology and Biological Sciences Research Council (UK), Austrian Science Fund, NWO - Dutch Research Council, National Science Center Poland, the SNSF - Swiss National Science Foundation or the Research Council of Norway.

Our researchers hold prominent roles in European Research Infrastructures, such as the European Synchrotron Radiation Facility and in international scientific societies such as the International Water Association, European Federation of Biotechnology, E-Mit (European Society for Mitochondrial Research and Medicine), EMPHASIS, EUPLMG – European Union of Pharmacist Specialists in Laboratory Medicine, Society of Toxicology, World Federation of Scientific Workers (WFSW), Royal Society of Biology, International Commission on Yeasts.

UCIBIO members international recognition makes it a leading Unit in Portugal and a pivotal international partner. Our researchers are currently involved in various active collaborations with 158 research institutions from 33 countries. As a research institution on biomolecular sciences in 2022 we provided consultancy services, made research & licensing agreements, and collaborated on research projects with health institutes from e.g., France, Greece, Italy, Spain, UK, and USA. Additionally, there are 18 collaborations ongoing with international industry partners, namely BIOCOAT, Kraft Heinz, Perkin Elmer, PFIZER, PROTERRIS, Sanofi R&D.

In 2022, 35 foreign researchers came to UCIBIO for stays longer than 1 month, an increase of 10% compared with 2019, a pre-pandemic year.

Researchers and students, supported by ERASMUS, exchange programs under COST actions and H2020 projects, went on scientific missions to several EU and non-EU countries (Austria, Croatia, Cyprus, Germany, Spain, Sweden, UK, USA).

UCIBIO was involved in the organization of 18 international meetings and achieved a total of 368 communications in international scientific events.

5. Publications

PUBLICATIONS

Top 20 original research papers led by UCIBIO

(by impact factor)

1. Esteves, C, Palma, SICJ, Costa, HMA, Alves, C, Santos, GMC, Ramou, E, Carvalho, AL, Alves, V, Roque, ACA. 2022. Tackling Humidity with Designer Ionic Liquid-Based Gas Sensing Soft Materials. ADV MATER, 34. DOI: 10.1002/adma.202107205
2. Rocha, JF, Sousa, SF, Cerqueira, NMFSA. 2022. Computational Studies Devoted to the Catalytic Mechanism of Threonine Aldolase, a Critical Enzyme in the Pharmaceutical Industry to Synthesize beta-Hydroxy-alpha-amino Acids. ACS CATAL. DOI: 10.1021/acscatal.1c05567
3. Silva, PJ, Cheng, Q. 2022. An Alternative Proposal for the Reaction Mechanism of Light-Dependent Protochlorophyllide Oxidoreductase. ACS CATAL, 12, 2589-2605. DOI: 10.1021/acscatal.1c05351
4. Almeida, LM, Pinho, BR, Duchen, MR, Oliveira, JMA. 2022. The PERKs of mitochondria protection during stress: insights for PERK modulation in neurodegenerative and metabolic diseases. BIOL REV, 97, 1737-1748. DOI: 10.1111/brv.12860
5. Monteiro, T, Moreira, M, Gaspar, SBR, Almeida, MG. 2022. Bilirubin oxidase as a single enzymatic oxygen scavenger for the development of reductase-based biosensors in the open air and its application on a nitrite biosensor. BIOSENS BIOELECTRON, 217. DOI: 10.1016/j.bios.2022.114720
6. Malheiro, RF, Carmo, H, Carvalho, F, Silva, JP. 2022. Cannabinoid-mediated targeting of mitochondria on the modulation of mitochondrial function and dynamics. PHARMACOL RES, 187. DOI: 10.1016/j.phrs.2022.106603
7. Ramou, E, Palma, SICJ, Roque, ACA. 2022. Nanoscale Events on Cyanobiphenyl-Based Self-Assembled Droplets Triggered by Gas Analytes. ACS APPL MATER INTER, 14, 6261-6273. DOI: 10.1021/acsami.1c24721
8. Daza, MVB, Almeida-Santos, AC, Novais, C, Read, A, Alves, V, Cocconcelli, PS, Freitas, AR, Peixe, L. 2022. Distinction between *Enterococcus faecium* and *Enterococcus lactis* by a *gluP* PCR-Based Assay for Accurate Identification and Diagnostics. MICROBIOL SPECTR. DOI: 10.1128/spectrum.03268-22
9. Portela, R, Faria, NA, Mwangi, M, Miragaia, M, de Lencastre, H, Tomasz, A, Sobral, RG. 2022. Analysis of a Cell Wall Mutant Highlights Rho-Dependent Genome Amplification Events in *Staphylococcus aureus*. MICROBIOL SPECTR. DOI: 10.1128/spectrum.02483-21
10. Pereira, AP, Antunes, P, Willems, R, Corander, J, Coque, TM, Peixe, L, Freitas, AR, Novais, C. 2022. Evolution of Chlorhexidine Susceptibility and of the EfrEF Operon among *Enterococcus faecalis* from Diverse Environments, Clones, and Time Spans. MICROBIOL SPECTR. DOI: 10.1128/spectrum.01176-22
11. Perovic, SU, Ksiezarek, M, Rocha, J, Cappelli, EA, Sousa, M, Ribeiro, TG, Grosso, F, Peixe, L. 2022. Urinary Microbiome of Reproductive-Age Asymptomatic European Women. MICROBIOL SPECTR. DOI: 10.1128/spectrum.01308-22
12. Concordio-Reis, P, Ferreira, SS, Alves, VD, Moppert, X, Guezennec, J, Coimbra, MA, Reis, MAM, Freitas, F. 2022. Rheological characterization of the exopolysaccharide produced by *Alteromonas macleodii Mo* 169. INT J BIOL MACROMOL, 227, 619-629. DOI: 10.1016/j.ijbiomac.2022.12.117
13. Moreira, IP, Esteves, C, Palma, SICJ, Ramou, E, Carvalho, ALM, Roque, ACA. 2022. Synergy between silk fibroin and ionic liquids for active gas-sensing materials. MATER TODAY BIO, 15. DOI: 10.1016/j.mtbio.2022.100290
14. Valerio, R, Torres, CAV, Brazinha, C, da Silva, MG, Coelhoso, IM, Crespo, JG. 2022. Purification of ferulic acid from corn fibre alkaline extracts for bio-vanillin production using an adsorption process. SEP PURIF TECHNOL, 298. DOI: 10.1016/j.seppur.2022.121570
15. Silva, RFO, Pinho, BR, Santos, MM, Oliveira, JMA. 2022. Disruptions of circadian rhythms, sleep, and stress responses in zebrafish: New infrared-based activity monitoring assays for toxicity assessment. CHEMOSPHERE, 305. DOI: 10.1016/j.chemosphere.2022.135449
16. Figueiredo, J, Henriques, MX, Catalao, MJ, Pinheiro, S, Narciso, AR, Mesquita, F, Saraiva, BM, Carido, M, Cabanes, D, Pinho, MG, Filipe, SR. 2022. Encapsulation of the septal cell wall protects *Streptococcus pneumoniae* from its major peptidoglycan hydrolase and host defenses. PLOS PATHOG, 18. DOI: 10.1371/journal.ppat.1010516
17. Kubasova, N, Alves-Pereira, CF, Gupta, S, Vinogradova, S, Gimelbrant, A, Barreto, VM. 2022. In Vivo Clonal Analysis Reveals Random Monoallelic Expression in Lymphocytes That Traces Back to Hematopoietic Stem Cells. FRONT CELL DEV BIOL, 10. DOI: 10.3389/fcell.2022.827774
18. Silva, M, Pontes, A, Franco-Duarte, R, Soares, P, Sampaio, JP, Sousa, MJ, Brito, PH. 2022. A glimpse at an early stage of microbe domestication revealed in the variable genome of *Torulaspora delbrueckii*, an emergent industrial yeast. MOL ECOL. DOI: 10.1111/mec.16428
19. Teixeira, MI, Lopes, CM, Goncalves, H, Catita, J, Silva, AM, Rodrigues, F, Amaral, MH, Costa, PC. 2022. Formulation, Characterization, and Cytotoxicity Evaluation of Lactoferrin Functionalized Lipid Nanoparticles for Riluzole Delivery to the Brain. PHARMACEUTICS, 14. DOI: 10.3390/pharmaceutics14010185
20. Sobral, D et al. 2022. Genetic and microenvironmental intra-tumor heterogeneity impacts colorectal cancer evolution and metastatic development. COMMUN BIOL, 5. DOI: 10.1038/s42003-022-03884-x

2022
Publications List

6. Dissemination & Social Impact

SCIENCE MANAGEMENT & COMMUNICATION OFFICE

Science Communication

We are responsible for dissemination of relevant discoveries and breakthroughs, prizes and achievements of UCIBIO research. We publish these, regularly, on the research unit website and social media to reach a broad audience. We liaise with the media by sending press releases, resulting in several media appearances. We aim to establish the bridge between researchers and the society. To engage the public with UCIBIO's research, we support researchers to be involved in outreach activities in the local/regional community including school visits, open days, science fairs, workshops, public talks and events. We collaborate with the national agency for scientific culture, Ciência Viva, to participate in national science outreach activities, through which, researchers ensure that their research work is understood by non-specialists and contribute to a better understanding of science by the general public. We organize and support researchers to organize workshops and conference cycles. We have launched, together with UCIBIO Researchers, Works4U, a workshop series on "Funding Applications & Career Development" that aims to encourage and support researchers, from late PhD students to young postdoctoral researchers and staff researchers, to build a solid and successful research career.

IT

We aim at providing automation tools that facilitate and speed up management processes. We are continuously developing a responsive web-based application for management of data relevant to the Research Units. Researchers have an easy (and secure) access to their personal, institutional and scientific productivity data. This platform also provides managers with tools to extract statistics and key performance indicators. We manage and develop the UCIBIO public website.

Teresa Sequeira Carlos, PhD
Science Management and Communication

José Braga, PhD
IT Specialist

Cecília Bonifácio, Administrative support
Bárbara Costa, Administrative support

TECHNOLOGY TRANSFER & TRANSLATION TO INDUSTRY

UCIBIO aims to maximize the impact and quality of its research by advancing fundamental knowledge and translating research findings into society, clinics, and bioeconomy.

Support to Researchers

Researchers at UCIBIO have a wide range of support and advice when seeking partnerships, funding opportunities, application assistance, information and mentor schemes:

-A Science Management and Communication Office (SMCO) at UCIBIO that works in close collaboration with the Innovation Research and Impact Strategy (IRIS) office at FCT NOVA, to increase funding, promote joint applications and translating ongoing collaborations with international partners into competitive proposals. Furthermore, the SMCO works in improving connections with program managers and funding agencies;

-Career Development Programs that includes workshops towards career development, funding options, and boosting young researchers' skills to unleash their full potential and to improve networking, EU partnerships, grant writing and successful funding ("Works4U");

- Funding opportunities Newsletter sent by email and at website;

- Interdisciplinary webinars meant to society - to diffuse science and technology, aimed to create innovative synergies that inspire the creation of knowledge in the most varied areas. Sci & Tech for Society;

- Intellectual Property & Technology Transfer Department- for the knowledge valorization, interface between Industry and Academy, and secure Industrial Property protection and Technology Transfer;

- Active participation in the **matchmaking platforms IN-PART to foster partnerships** between universities and companies and technology transfer.

Translation to Industry

UCIBIO currently collaborates with Industry/SMEs/Patient Associations for services and focused research projects.

UCIBIO team founded four spin-offs (73100, Nano4 Global Lda, Aqua in Silico and CellmAbs SA), obtained five patents.

Nano4 Global, Lda is a nanodiagnostic company that translated the core nanodiagnostics research to provide innovative solutions for one step molecular identification of DNA/RNA at point-of-care. It was awarded EU SME Instrument Phase 1 and 2 and has been signaled by the World Health Organization as an innovative and promising technology to follow in diagnostics.

Aqua in Silico develops software tools and model-based solutions to optimise wastewater treatment across many different industries aiming to increase efficiency and saving resources. It was awarded the UNDP Ocean Innovator and the prize "Os melhores do Portugal Tecnológico 2019".

73100 is a SME dedicated to the development of new biotechnology-based products and processes with applications in the pharmaceutical, food and cosmetics industry. It was awarded with the EU SME Instrument Phase 1 :07-2016-2017 - Stimulating the innovation potential of SMEs for sustainable and competitive agriculture, forestry, agri-food and bio-based sectors.

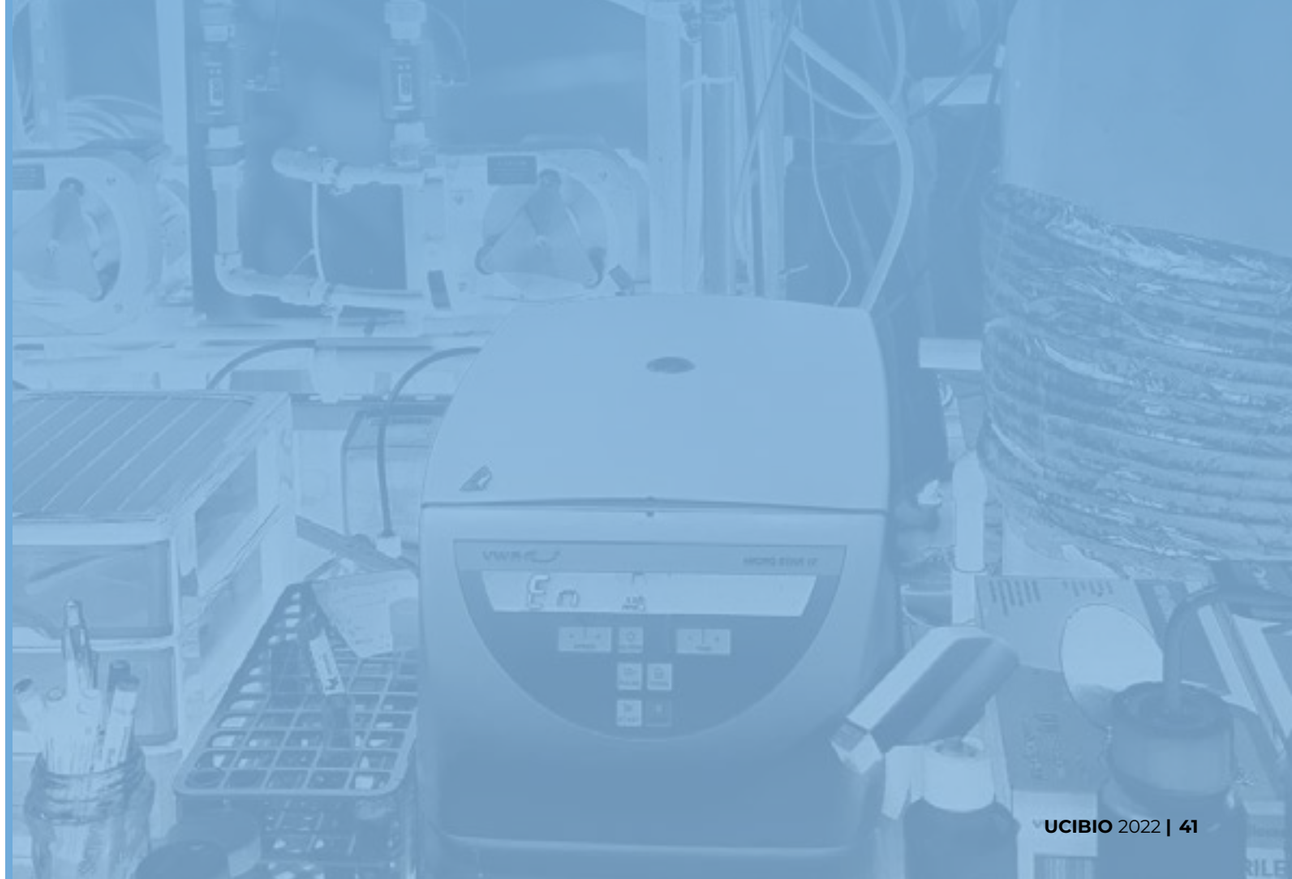
CellmAbs SA is a SME developing immuno-oncology agents that target tumour associated glycans.for therapies and diagnosis. CellmAbs was elected one of the top 30 Biotech Startups in 2019 by Biotecnika and featured by Labiotech and JPMorgan 2020. In 2022 CellmAbs, a UCIBIO spin-off, has been awarded H2020- Industrial Leadership - Innovation In SMEs Project (Innovation Associate for highly specific Tumour Associated Carbohydrate Antigens).

Ongoing translational projects with BIAL, BioMérieux , FUJIFILM-Cellular Dynamics, NAVIGATOR, PETROBRAS/PUCRGS, PFIZER, Sanofi, SUMOL-COMPAL and Unicer among a total of 18 collaborations with industry.

The UCIBIO services at the **BioLab** (Biological and Chemical Analysis Facility) provides specialized contract services to R&D units, SMEs, hospitals and industry.

The UCIBIO pilot plant (chapter 8) has been a key enabler and promoter of the successful collaborations with Industry/SME, enabling the upscale, demonstration and validation of technologies in the areas of biotechnology and biochemistry.

UCIBIO has been increasingly focusing on translation to Clinical setting through projects in collaboration with 28 key central hospitals, medical and veterinary institutes, including Aragon Health Sciences Institute, Hospital San Joan de Déu, Servicio Andaluz de Salud or Andalusian Health Service (Spain), Hospital de Santa Maria, Hospital Egas Moniz, Hospital Garcia da Orta, Mayo Clinics (USA), Psychology Unit, Instituti Clinici Scientifici Maugeri Spa - Società Benefit, Care and Research Institute (Italy).



Outreach and Dissemination

UCIBIO's researchers are aware of the benefits of outreach activities for a broader impact of their activity. Aiming to engage public with the research work developed at UCIBIO, researchers are involved in various outreach actions, including open days, school visits, workshops, public talks and events for local entities (schools, hospitals, science fairs, etc). UCIBIO researchers participate actively in the European Researchers Night. UCIBIO also participates in national science outreach activities by collaborating with the national agency for scientific culture, Ciência Viva. Through these activities, researchers ensure that their research work is understood by non-specialists and contribute to a better understanding of science by the general public.

UCIBIO's discoveries and breakthroughs are published on the research unit website to keep the community informed, as well as in the social media, LinkedIn, Facebook and Twitter.

The Science Communication Office interacts with the media by sending press releases of the most relevant discoveries, prizes and achievements, resulting in several references in the media.

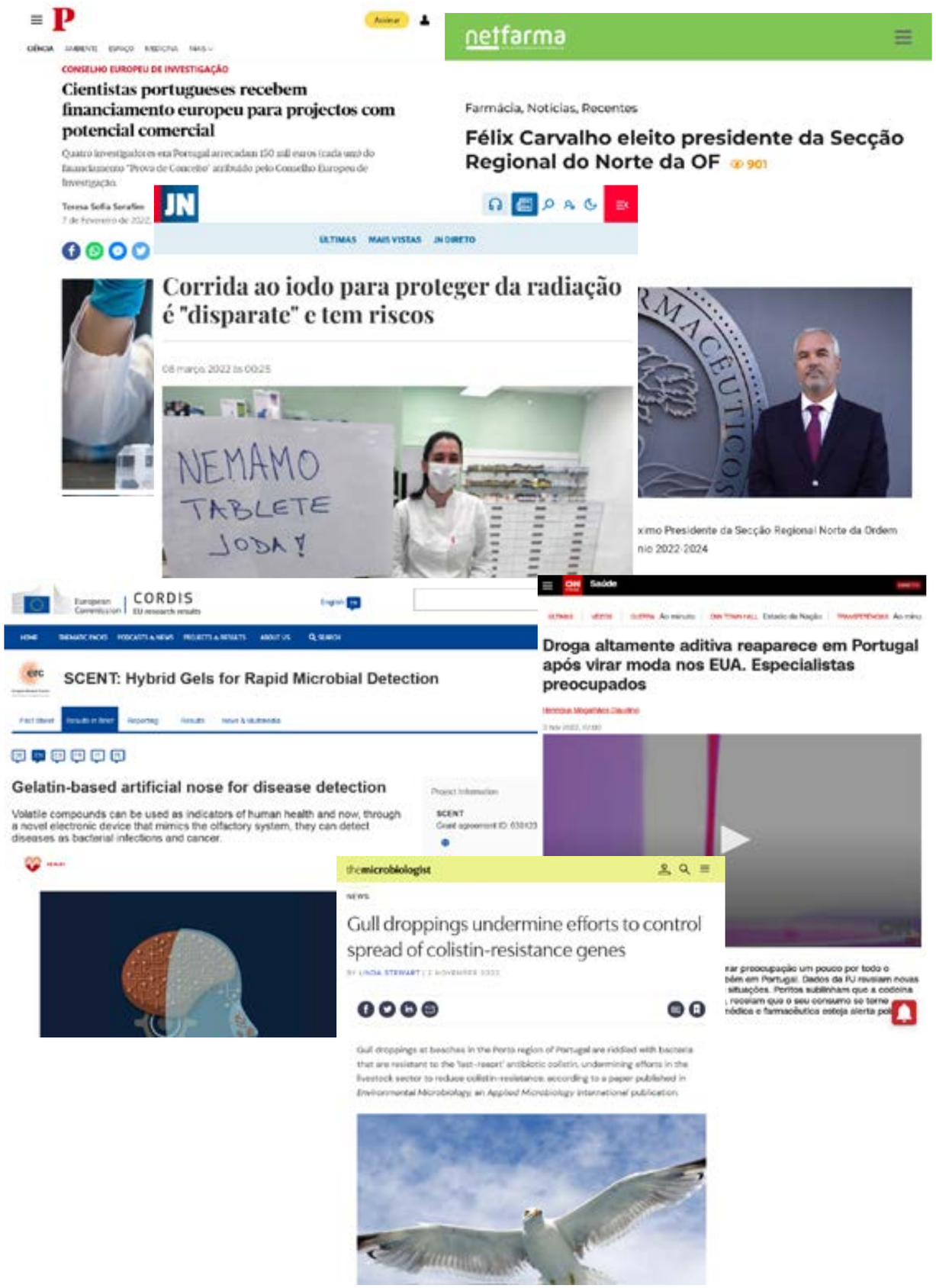
2022 European Researchers' Night

OUTREACH ACTIVITIES

Feb 01, 2022	Susana Gaudêncio. Workshop "Building repository of biotechnologically relevant organisms". Open Day University Zagreb, Croatia
Feb 01 - Mar 30, 2022	Alice S. Pereira. NOVA - Sci & Tech Volunteer: Vem experimentar Bioquímica Connosco
Feb 18-24, 2022	JorTec 2022: Alice Pereira (Chemistry, member of the round table), Carlota Pascoal (Biology, " Towards therapeutic approaches for Human Glycosylation Disorders through immunological characterization"), Irina Franco (Biology, Speed meeting)
Feb 24 - Mar 24, 2022	Carla Novais, Teresa G. Ribeiro, Ângela Novais, Filipa Grosso, Ana R. Freitas, Patricia Antunes. School visits (MicroMundo@UPorto)
Mar 12, 2022	Pedro M. Costa. Workshop "An introduction to R and bioinformatics"
Apr 21-22, 2022	Brígida R. Pinho, Sérgio F. Sousa and Teresa G. Ribeiro. "19th Science Fair" (University of Porto). Gondomar
Apr 27, 2022	ExpoFCT 2022: Several members from UCIBIO NOVA research labs (Biochemistry and Bioenegetics of HEME Proteins, Biomolecular Engineering, Human Genetics and Cancer Therapeutics, Functional Glycobiology, Macromolecular Crystallography)
May 02, 2022	Susana Gaudêncio. Hybrid Training School and workshop for COST ACTION 18238 WG3 and WG5. Limassol University, Cyprus
May 10, 2022	Margarida Dias. "Pint of Science": International science festival
May 16-19, 2022	Encontro Ciência 2022: Cristiana Torres, Mónica Carvalheira, Joana Fradinho, André Freches and Rita Bernardino. "Dissemination of the work developed in the research lab" Carina Esteves and Susana Palma. "Demonstration of a functional lab prototype of an e-nose"
May 24, 2022	Leonor Morgado. TIMB3 Workshop Metals and Life- Workshop for high school students. ITQB NOVA
May 31, 2022	Paula Videira and Mariana Barbosa. ProDGNE Lisbon Meeting - Events with patients
Jul 12-13, 2022	Ciência Viva program 2022. Infection Biology Lab (Visit of students from secondary school), Alice S. Pereira (Laboratory class on "Quantification of the proteic content in food gelatins"), Pedro M. Costa (Research internship for high-school students).
Aug 17, 2022	Susana Gaudêncio. Open day (5th COST Action 18238 MC meeting and WG workshops)
Sep 01, 2022	Jorge S. Dias, Irina Franco, Jaime Mota, Sofia Pauleta, Rita Sobral, Margarida Borges, Mário Diniz, Helena Vieira, Vera M. Costa, Luís Passarinha, Eurico Cabrita, Maria João Romão, Félix Carvalho, Cecília Roque. "Verão com Ciência"
Sep 5-8, 2022	Alice S. Pereira, Carlos Salgueiro, Vasco Barreto. *Universidade de Verão do NBq*
Sep 30, 2022	Sofia Pauleta, Susana Gaudêncio, Joana Sousa, Cristiana Torres, Mónica Carvalheira, Joana Fradinho, Susana Palma, Rita Sobral, Sara Cardoso, Viviana Correia, Raquel Costa, Angelina Palma, Benedita Pinheiro, Sofia Pauleta, Ana Luisa Carvalho, Márcia Correia, Guilherme Alves, Cristiano Mota, Teresa Santos-Silva, Benedita Pinheiro, Alicia Candeias, Raquel Costa. European Researchers Night 2022
Oct 01, 2022	Helena Vieira. "*Ser é a Questão*" (divulgation of science through empowerment and valorization of at-risk youth)
Oct 10-14, 2022	Andreia Garcia, Ana Santos, Marisa Almeida, Filipa Grosso, Sofia Pauleta, and members of the Biomolecular Engineering Lab. FIC.A – International Science Festival, Oeiras
Nov 15, 2022	Luísa Peixe. Webinar "*A Resistência a Antibióticos*", organized by *Núcleo de Estudantes de Ciências Farmacêuticas da Universidade do Algarve (NECiFarm UAlg)*
Nov 18, 2022	Luísa Peixe. European Day for Antibiotics (podcast about "Antibiotics")
Dec 15, 2022	Cecília Roque. Hands-on activity "Extraction of banana's DNA" (basic school visit)
Dec 21, 2022	Cecília Roque. Article "Why can't we replace sniffer dogs with electronic noses?" in CORDIS website
2022	Alice S. Pereira. Teaching laboratory classes for senior high school students (all year) Isabel Martins de Almeida. *Portal infocosméticos* (Coordinator of a website for the promotion of health literacy, all year)

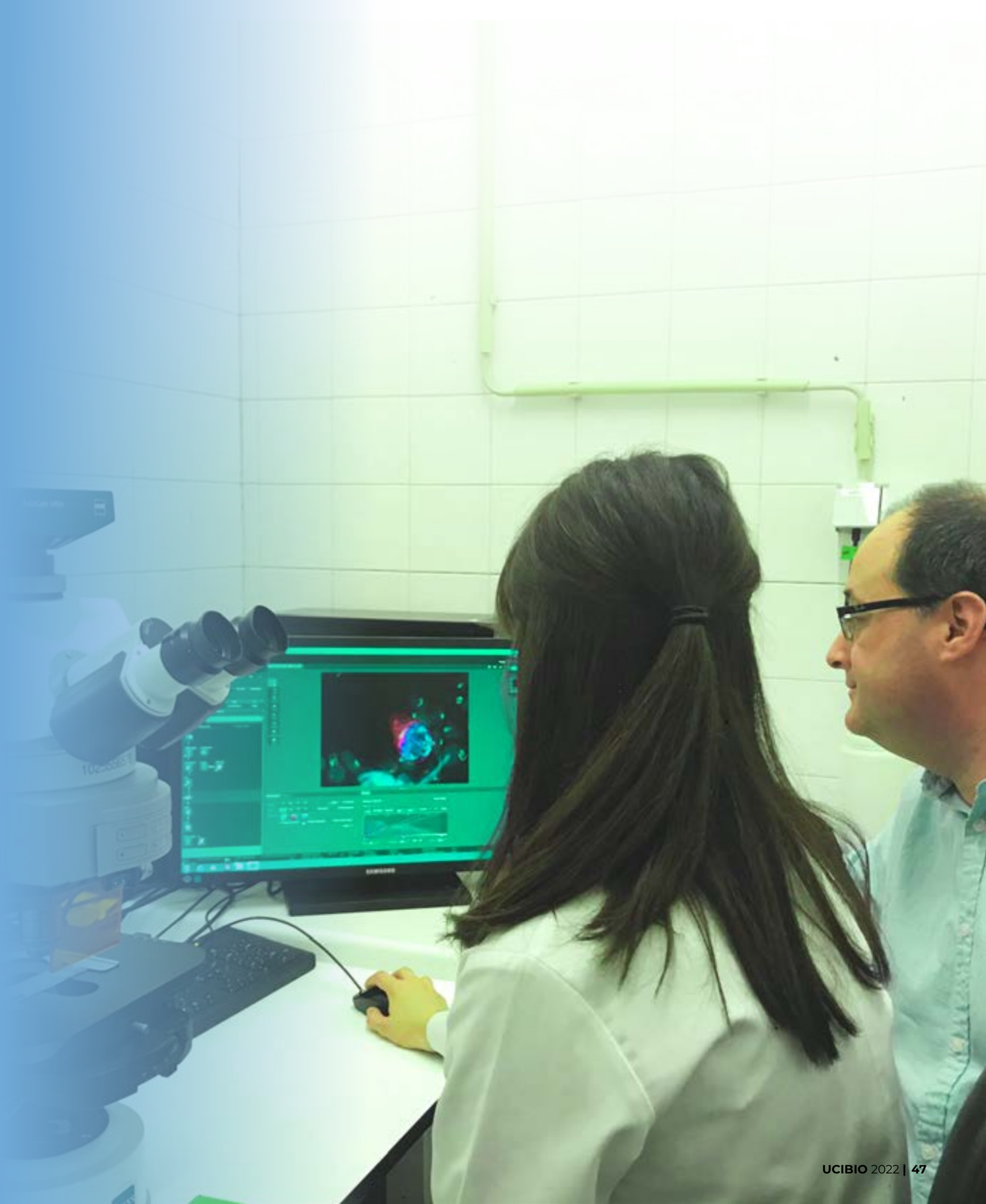
MEDIA APPEARANCES

Jan 17, 2022	Cecília Roque. New study places the electronic nose closer to "smell" illness in urine and breath **Público**
Jan 17, 2022	Félix Carvalho. Awareness campaign about the effects of Cannabis. **RTP Madeira**, **Jornal da Madeira**
Jan 30, 2022	Félix Carvalho. Announcement of application to the presidency of the North Section of the Order of Pharmacists **Jornal Notícias de Santo Tirso**, **NetFarma**
Jan 31, 2022	Félix Carvalho. Interview "Cannabis can lead to drug addiction". **Dependências**
Feb 06, 2022	Cecília Roque. Interview on Antena 2 "Ciência": program about electronic noses and presentation of SCENT results. **Antena 2**
Feb 07, 2022	Cecília Roque. Interview in RTP3 "Jornal das 12" about the Proof of Concept ERC award. **RTP3**
Feb 08, 2022	Félix Carvalho. "Félix Carvalho elected President of the North Section of the Order of Pharmacists" **Diário de Santo Tirso**, **Diário de Notícias**, **NetFarma**
Feb 10, 2022	Cecília Roque, Anouncement of the winners of the Proof of Concept ERC in 2022. **Público**, **Diário de Notícias**
Mar 02, 2022	Felix Carvalho. "Russia suspended from the European Federation of Toxicologists and European Society of Toxicology" **Jornal de Notícias**
Mar 08, 2022	Felix Carvalho. "Rushing to iodine to protect against radiation is "nonsense" and has risks.". **Jornal de Notícias**, **Sul Informação**, **Plataforma Media**
Mar 20, 2022	Felix Carvalho. "Pandemy brought new drugs" **Jornal da Madeira**
Apr 04, 2022	Ricardo Dinis. Interview "History of Legal Medicine at Porto". **ARTV-France**
Mar 20, 2022	Ricardo Dinis. "Forensic Investigations". **RTP2**
Jul 22, 2022	Felix Carvalho. "Inauguration at the National Union of Pharmacists." **OF Norte**
Jul 25, 2022	Felix Carvalho. "Pill doesn't cure hangover" **Zap AEIOU**, **MAGG**, **Público**
Oct 21, 2022	Ricardo Dinis. Interview "Chemsex". **RTP1**
Oct 28, 2022	Ricardo Dinis. Interview "Unravelling the mystery of autobrewery syndrome". **BBC**
Oct 31, 2022	Felix Carvalho. "Intestinal inflammation mediated by silver nanoparticles is prevented by dietary flavonoids". **Atlas of Science**
Nov 02, 2022	Patrícia Antunes. "Gull droppings undermine efforts to control spread of colistin-resistance genes". **The Microbiologist**
Nov 07, 2022	Cecília Roque. Article "SCENT: Hybrid Gels for Rapid Microbial Detection" in **CORDIS website**.
Nov 11, 2022	Ricardo Dinis. "Highly addictive drug reappears in Portugal". **CNN Portugal**
Nov 14, 2022	Luísa Peixe. Presentation of "Coleção de Culturas do Porto". **Notícia UP**
Dec 19, 2022	Félix Carvalho. Arouca Science Meeting. **Roda Viva**, **Discurso Directo**, **CM Arouca**



7. Research Groups

BENG	Bioengineering
NIT	Nanoimmunotech
SMB	Structural and Molecular Biology
MMG	Molecular Microbiology and Genomics
TCB	Theoretical and Computational Biosciences
TOXI	Toxicology
DPB	Drug Targets and Biomarkers
MEDTECH	Medicines and Healthcare Products



BENG
Bioengineering

Maria Ascenção Reis, Research Group Coordinator

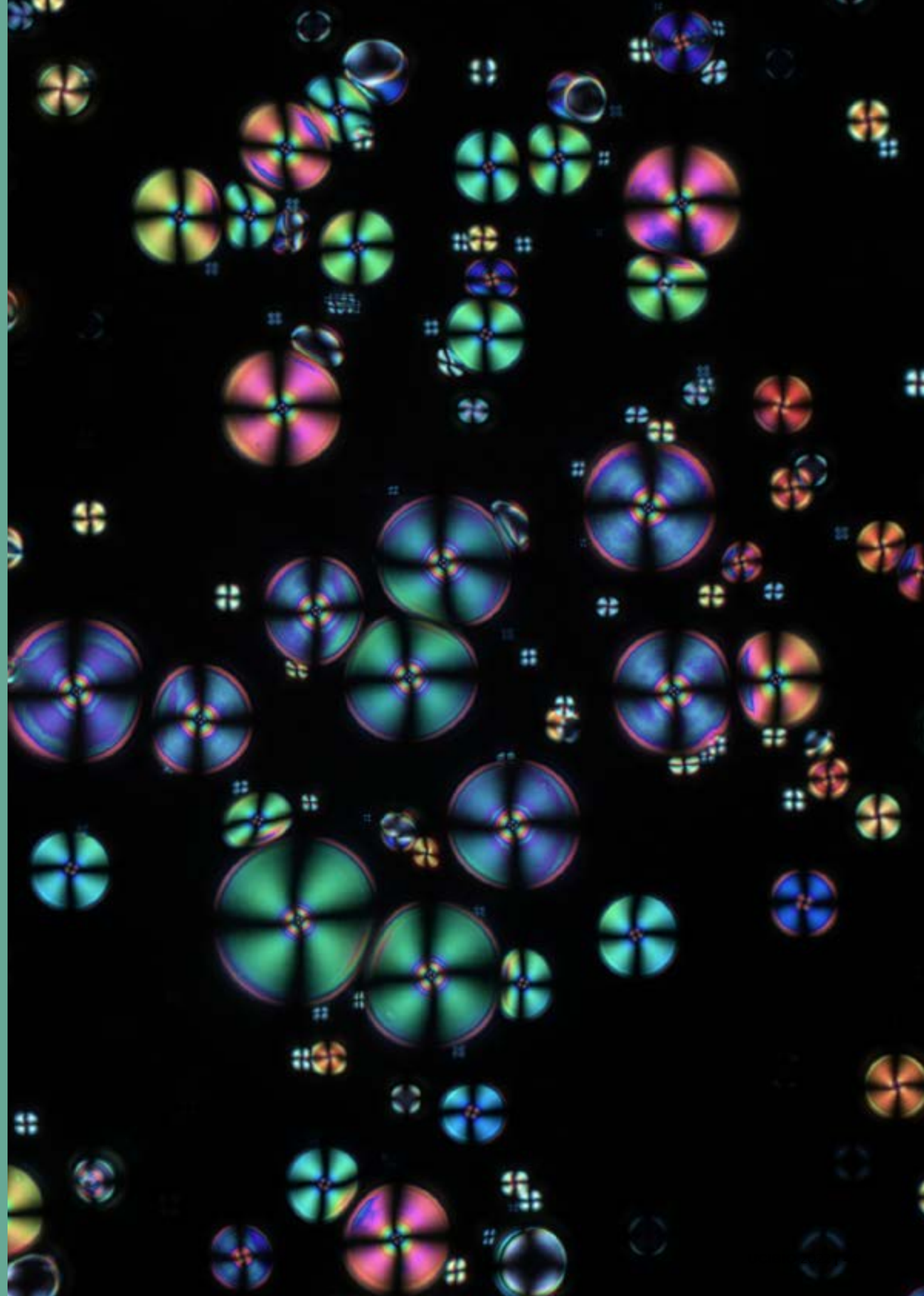
BENG develops research and innovation in the areas of Blue Biotechnology, Biomolecular Engineering and Industrial and Environmental Biotechnology and is composed by 4 labs.

The Blue Biotechnology Lab is focused on the discovery of new value-added bioactive compounds from marine-derived actinomycetes from unexplored Atlantic Ocean sites. The group has a collection of 1500 marine-derived actinomycetes, with biotechnological potential, for the development of industrial applications, such as wound dressing and antifouling paints and coatings.

The Biomolecular Engineering Lab is focused on the design and discovery of peptidomimetics with biological or synthetic backbones and on the development of self-assembled functional materials, with applications in Bioseparation, Biocatalysis, Sensing & Diagnostics. In the Bioseparation area, the group designed a purification adsorbent with unique selectivity towards antibody molecules and also showed how crystallization and precipitation can be allied to affinity technologies to improve purification processes.
In the sensing area, the group made important contributions in developing gas-sensitive materials for the distinction of volatiles from several sources, the quantification of ethanol in gasoline, and the analysis of food spoilage.

The Bioengineering of Therapeutic Proteins Lab develops new strategies in the upstream and downstream flowsheets to obtain human membrane proteins that are difficult to manipulate and stabilize. With these biotech platforms we are able to characterize the biochemical and biophysical properties of proteins with therapeutic relevance in neurodegenerative, oncological and ophthalmological human aging diseases.

The Biochemical Engineering Lab develops green and sustainable innovative technologies at lab and pilot scale for bioresource recovery through the production of biopolymers and fine chemicals and linking these processes with wastewater treatment based on a circular bioeconomy concept. Applications of the developed products in different sectors are also investigated. Processes have been successfully patented and technology transferred to the industry.



BENG | Biochemical Engineering Lab

Maria Ascensão Reis

Senior Researchers
Anouk Duque
Bruno Marreiros
Cristiana Torres
Filomena Freitas
Joana Fradinho
Monica Carvalheira
Nídia Lourenço

Junior Researchers
Mariana Matos

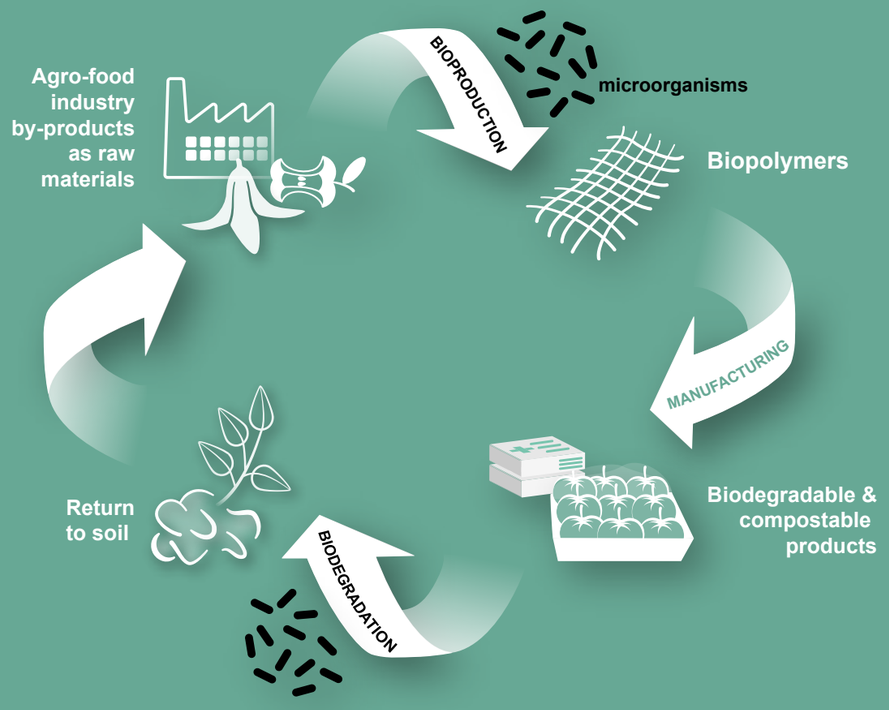
Science Managers
Bárbara Almeida

Technicians
Elisabete Freitas
Elsa Mestre

PhD Students
Ana Rodrigues
Ana Rebocho
André Freches
Asiyah Esmail
Bruno Guerreiro
Bruno Serafim
Catarina Rangel
Cátia Gil
Diana Araújo
Eliana Guarda
João Carvalho
João Pereira
Juliana Almeida
Mafalda Trovão
Miguel Palhas
Patrícia Reis
Rafaela Cruz
Rita Bernardino
Sílvia Baptista
Virgínia Carvalho

The Biochemical Engineering (BIOENG) lab is devoted to the areas of Industrial and Environmental Biotechnology with main focus on: Micropollutants, Biological Nutrient Removal and Recovery; Greenhouse Gas Emissions; Production and Characterization of Polyhydroxyalkanoates (PHAs), Microbial Polysaccharides and Bulk Chemicals. Learn more about our projects here.

KEYWORDS:
Bioproducts, Bioplastics, Exopolysaccharides, Circular economy, Sustainable processes



EcoPlastiC - Eco conversion of lower grade PET and mixed recalcitrant PET plastic waste into high performing biopolymers

EcoPlastiC aims to provide a seamless route to resolving pervasive PET plastic pollution, converting it to Eco-plastic prototypes. Conversion of unrecyclable post use PET into new, high performance bioplastics embodies the regenerative zero waste approaches found in nature, where post use materials become the ingredients for new products and with unlimited cyclical use of materials. It proposes a technological paradigm shift in recycling from the current zero to single digit circuits of recycling loops to a regeneration process providing a significant scientific step forward towards true circularity. Learn more about the project.

A Esmail et al., ***Bioconversion of terephthalic acid and ethylene glycol into bacterial cellulose by Komagataeibacter xylinus DSM 2004 and DSM 46604***, *Frontiers Bioeng Biotech (2022);*

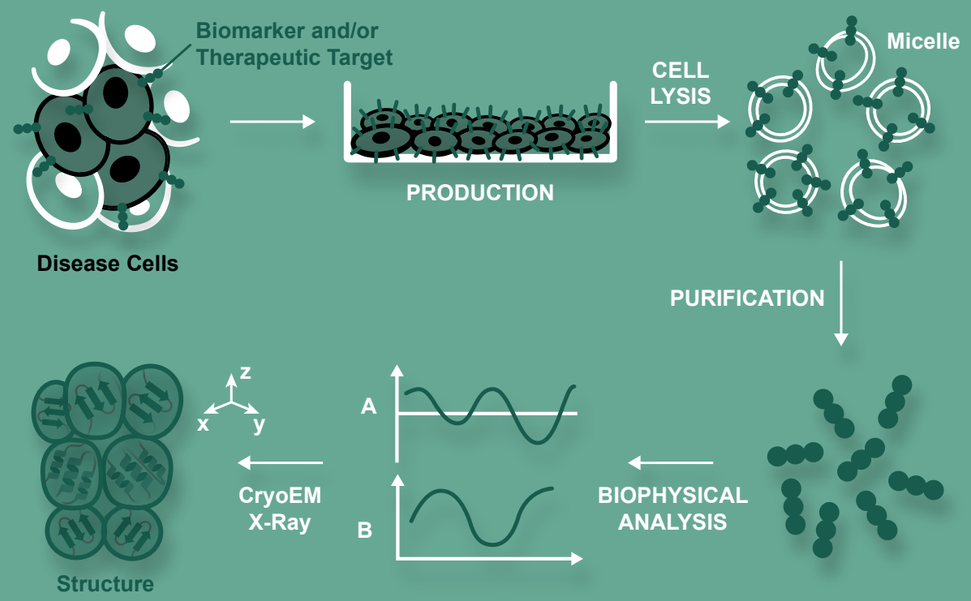
F Silva et al., ***An integrated process for mixed culture production of 3-hydroxyhexanoate-rich polyhydroxyalkanoates from fruit waste***, *Chem Eng J (2022);*

S Kolakovic et al. ***Diclofenac biotransformation in the enhanced biological phosphorus removal process,*** *Sci Total Env (2022).*

Find More

BENG

Bioengineering of Therapeutic Proteins Lab



Luís Passarinha

PhD Students
Ana Gonçalves
Diana Gomes
Jorge Barroca-Ferreira

The main topics of research involve:
1. Design of bioprocesses to obtain human therapeutic proteins, targeting dementias and cancer;
2. Biofunctionalization of exopolysaccharides for the recovery of biomolecules from crude cell extracts;
3. Development of biomedical analytical methods for the detection and assessment of clinical biomarkers.

KEYWORDS:
Biosynthesis, Purification, Biomolecules, Structural stability, Membrane proteins, Biomedical Analytical Methods

Does Taxifolin and Lucidin act as Potential E6 Protein Inhibitors and restore Apoptosis?

Human papillomavirus (HPV)-related cancers continue to be a major medical concern, and there exists an urgent need to improve the current therapeutic approaches by proposing new compounds to offer more specific and less invasive treatments. The aim of this work was to discover potential inhibitors of the E6/E6AP/p53 complex formation.

We found that lucidin and taxifolin were able to selectively decrease the viability of HPV-positive cells to re-establish p53 protein levels and to induce apoptosis.
These findings represent a promising starting point for the development of anti-HPV drugs.

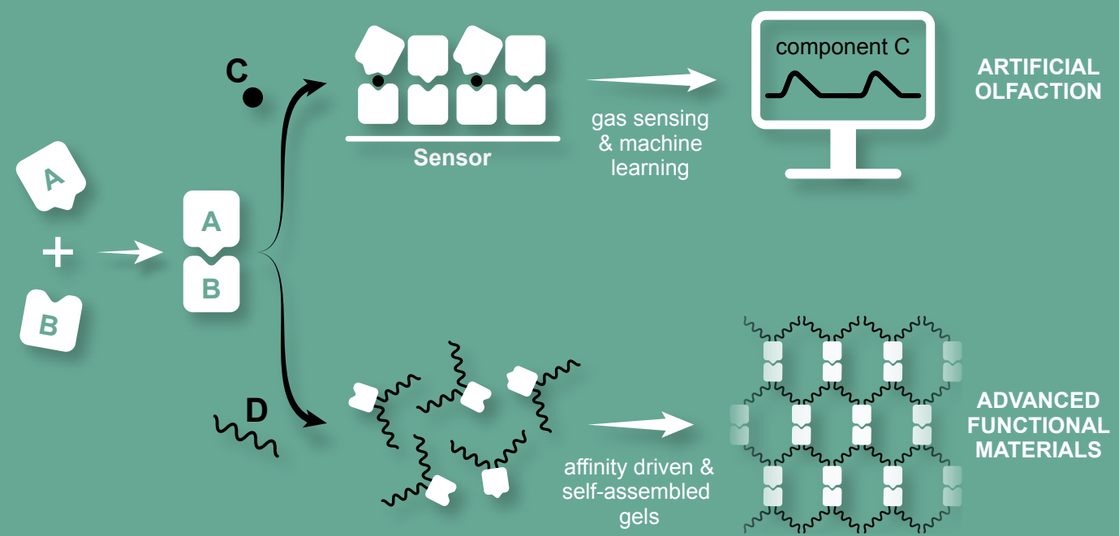
D Gomes et al., ***Taxifolin and Lucidin as Potential E6 Protein Inhibitors: p53 Function Re-Establishment and ApoptosisInduction in Cervical Cancer Cells****, Cancers (2022);*

C Ventura et al., ***Maximization of the Minicircle DNA Vaccine Production Expressing SARS-CoV-2 RBD****, Biomedicines (2022);*

AM Gonçalves et al., ***Advances in Membrane-Bound Catechol-O-Methyltransferase Stability Achieved Using a New Ionic Liquid-Based Storage Formulation****, Int J Mol Sci (2022).*

Find More

BENG | Biomolecular Engineering Lab



Cecília Roque

Senior Researchers
Arménio Barbosa
Efthymia Ramou
Margarida Dias
Susana Palma

Junior Researchers
Carina Esteves

PhD Students
Ana Oliveira
Carlos Costa
Cátia Soares
Gonçalo Teixeira
Henrique Costa
Iana Lychko
Inês Padrão
Manuel Matos

We are a multidisciplinary team dedicated to design and engineer minimal biomimetic systems, namely combining designed molecular recognition agents with functional biobased materials, which together find applications in Bioseparation, Sensing & Diagnostics.
The main topics of research involve:
1. Biobased functional materials in gas sensing & artificial olfaction;
2. Sustainable & biobased materials towards alternative purification processes of biological products;
3. Design & discovery of biological and synthetic affinity ligands for capture and release of biopharmaceuticals and biological markers.

KEYWORDS:
Affinity ligands, Peptide and protein engineering, Artificial olfaction, Peptide and protein-based materials, Affinity purification

Our lab is fascinated about learning from Nature and developing mimetic systems, using peptide and protein systems.

In 2022 we highlight our work related to the understanding and engineering of biobased materials using peptides and proteins as the main polymer building block. Interestingly, we found that gelatin-based films, used as gas sensors in artiifcial olfaction, yield controlled responses to humidity levels depending on the solvent/gelator employed for gelatin assembly. Fine-tuning the properties of the ionic liquid used to produce the gelatin materials, gave rise to excellent humidity sensors or humidity tolerant materials, that could detect different volatile organic compounds in both dry and humid conditions.

In our quest to employ biobased ionogels in artificial olfaction, we also studied in detail how the properties of the ionic liquid used to dissolve and gelate structural proteins, gives rise to distinct secondary structures in fibroin in a synergetic adaptation between the self-assembly of ionic liquids and fibroin polypeptide chains (Materials Today Bio, 2022, 15, 100290). Finally, an important highlight was the award of ENSURE, an ERC Proof-of-concept grant to our group, an important step to validate our gas sensing materials and electronic nose technology to help bladder cancer patients.

C Esteves et al., ***Tackling Humidity with Designer Ionic Liquid-Based Gas Sensing Soft Materials****, Advanced Materials (2022);*

AS Pina et al., ***Discovery of phosphotyrosine-binding oligopeptides with supramolecular target selectivity****, Chem Science (2022);*

I Moreira et al., ***Synergy between silk fibroin and ionic liquids for active gas-sensing materials****, Materials Today Bio (2022).*

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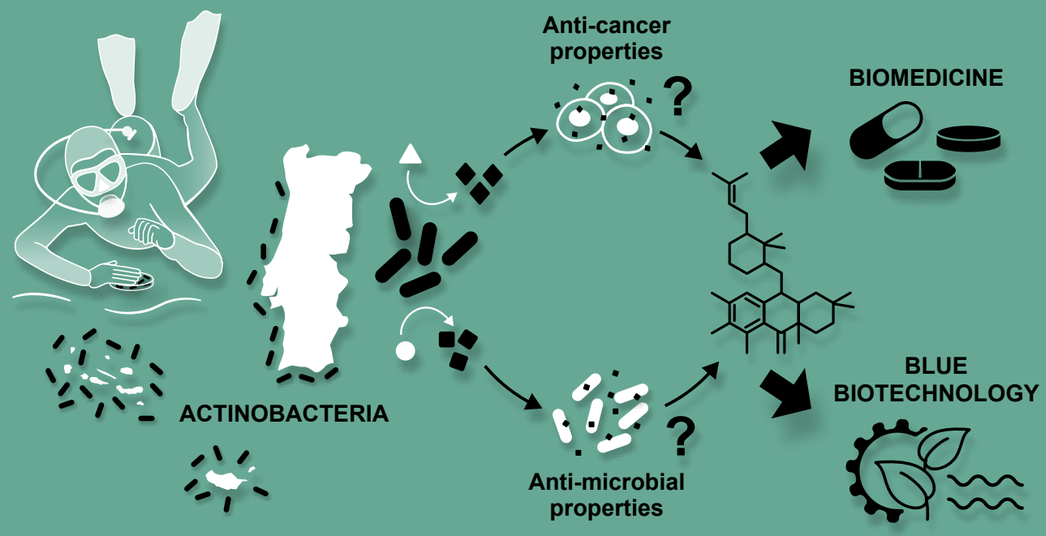
BENG

Blue Biotechnology Biomedicine Lab



Susana P. Gaudêncio

PhD Students
Joana Sousa
João Carvalho

Our research focuses on the discovery of natural products from marine-derived actinomycetes (Actinobacteria) as lead-like agents for drug discovery and biotechnological applications. We use several state-of-the-art techniques for the identification of new bioactive small molecules with antimicrobial, anti-biofilm, antifouling and anticancer activities from marine sediments collected off the Atlantic Macaronesia ecoregion. Our lab uses a multidisciplinary approach to Blue Biotechnology and Biomedical research combining Marine Natural Products Chemistry, Biochemistry, Molecular Biology, Microbiology, Metabolomics, Genomics, Chemo and Bioinformatics, Chemical Ecology, Pharmaceutical Sciences and Material Sciences. Recently, we started to get involved in aquaculture projects, screening microplastics and bacteria present in the aquacultures infratructure systems.

KEYWORDS:
Marine Natural Products; Structure Elucidation; Blue Biotechnology; Drug Discovery and Biotechnological Applications; Marine-derived Actinobacteria; Actinomycetes

Do you know the importance of marine-derived actinomycetes?

Our lab demonstrated that actinomycetes degrade commonly used plastics and use these as a carbon source to produce biodegradable bioplastics. Highlighting the importance of investigating actinomycetes from unique ecosystems. Moreover, in collaboration with COST ACTION 18238 Ocean4Biotech members, as WG1 leaders, we developed a Marine Natural Product International Ocean4 Biotech BioBank where all the strains from our Lab in-house actinomycete collection will be deposited. We hosted the COST Action 18238 meeting in May 2022, which included Blue Biotechnology representatives of 30 Countries. Project DigiAqua PTDC/EEI-EEE/0415/2021 "Digitizing Aquaculture: from predictive analytics to intelligent photonics platform" started. We were present at "The European Researchers Night" with the theme "Bacteria that kill Bacteria".

J Oliveira et al., ***Marine-Derived Actinomycetes: Biodegradation of Plastics and Formation of PHA Bioplastics - A Circular Bioeconomy Approach***, Mar Drugs (2022);

X Schneider et al., ***Responsible Research and Innovation Framework, the Nagoya Protocol and Other European Blue Biotechnology Strategies and Regulations: Gaps Analysis and Recommendations for Increased Knowledge in the Marine Biotechnology Community***, Mar Drugs (2022);

OT Eroldoğan et al., ***From the sea to aquafeed: A perspective overview***, Rev Aquaculture (2022).

Find More

NIT
Nanoimmunotech

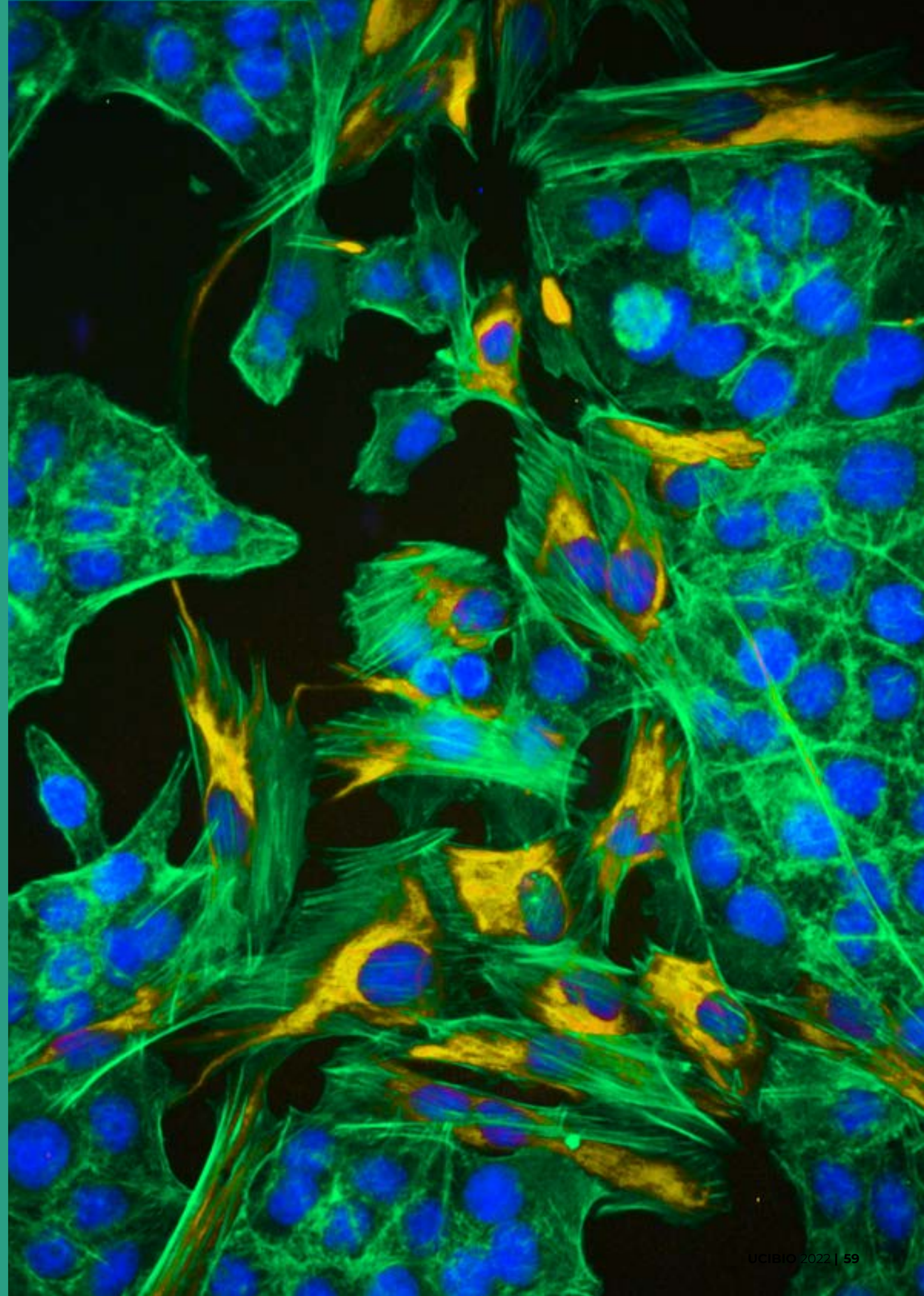
Pedro Viana Baptista, Research Group Coordinator

NIT is focused on the identification of biomarkers in cancer progression, angiogenesis and metastasis, biomarkers for malaria and other infectious diseases, and characterization of glycan-based recognition of molecular cues in oncogenesis. This fundamental knowledge assists the development of novel biosensors for diagnostics and on the design of better and innovative therapies to fight cancer.

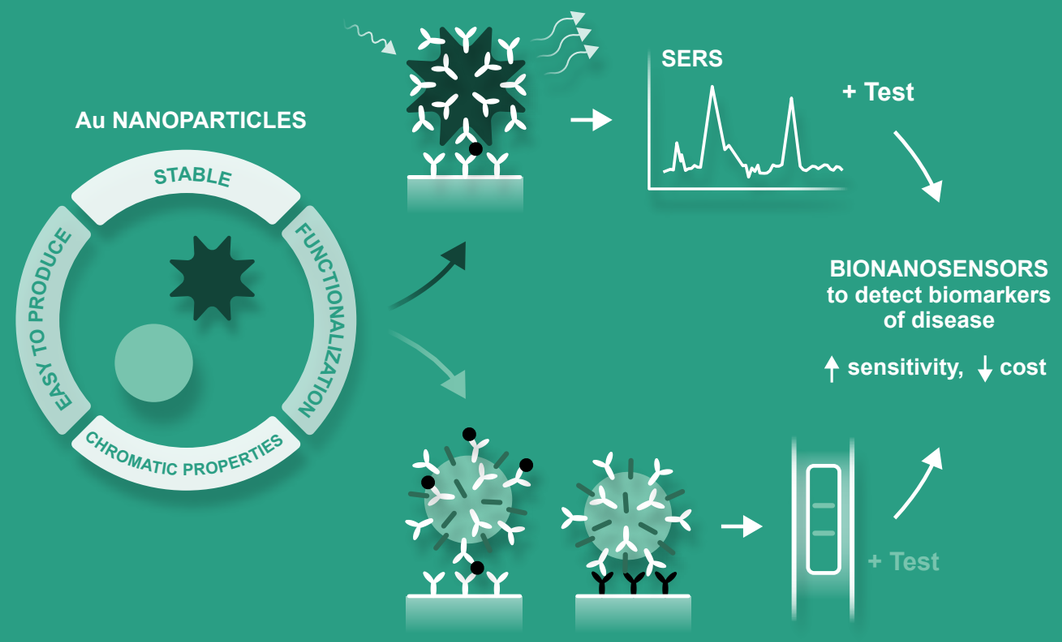
NIT outstanding contributions to elucidate exosome trafficking, modulation of the tumor microenvironment and angiogenesis and the role of glycans in cancer progression, metastasis and evasion of immune response, has paved the way to optimize novel immunotherapies (antibodies and dendritic cells; proprietary technology) and novel targeted nanomedicines against cancer (particularly colorectal, breast and lung carcinomas). Several molecular marks have been targeted:

i) gene silencing and controlling crucial genes;
ii) targeted drug delivery;
iii) controlling exosomes malignant transformation of normal cells;
iv) localized hyperthermia against cancer.
v) disease associated glycans

NIT is strongly committed to develop molecular biosensors towards portable devices for diagnostics. This work has allowed to integrate multidisciplinary international networks (MSCAITN-GlycoCan; ERA-Net; and M-ERA-Net, EJP-RD, Horizon Widera 2022) in prolific collaborations with biopharma.



NIT BioNanoSensors Lab



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Development of nanostructures and nanostructured materials functionalized with DNA, antibodies or proteins for application in nano-biodiagnostics and biosensors. Two different lines of Research:
1. Gold nanoparticle-based molecular detection of metabolic diseases. Presently working on an easy and rapid method for detecting single nucleotide polymorphisms (SNPs) related to lactose intolerance
2. Surface Enhanced Raman Spectroscopy (SERS) of plasmonic and nanostructured (bio) systems for the development of highly sensitive and disposable detection platforms. Presently working on a highly sensitive SERS-based immunosensor on a disposable platform

KEYWORDS:
Nanodiagnostics, Bionanotechnology, Bionanosensors, Gold nanoparticles, Surface Enhanced Raman Spectroscopy (SERS)

Development of bionanosensors for ultra-sensitive detection of biomarkers from important diseases

We are developing new efficient, quick, non-invasive and unexpensive biosensors for diagnosis and follow-up of important diseases. We use Gold Nanoparticles (AuNPs) due to their unique physical, chemical, and optical properties:

1) Star-shaped AuNPs are used in a Surface-Enhanced Raman Spectroscopy (SERS)-based immunoassay, for extremely sensitive detection of malaria antigens. It has been adapated to a simple and unexpensive microfluidics format for point-of-care application using a portable Raman system.

2) Large spherical AuNPs are used in the development of a bionanoassay to detect Single-Nucleotide Polymorphisms (SNPs) related lo lactose intolerance, opening the possibility of diagnosis of genetic-related diseases at point-of-care.

M Enea et al., ***Improved gold nanoprobes for detection of single nucleotide polymorphisms. The influence of size.*** *Part & Part Systems Charact (2022);*

M.J. Oliveira et al., ***Microfluidic SERS devices: brightening the future of bioanalysis****, Discover Materials (2022);*

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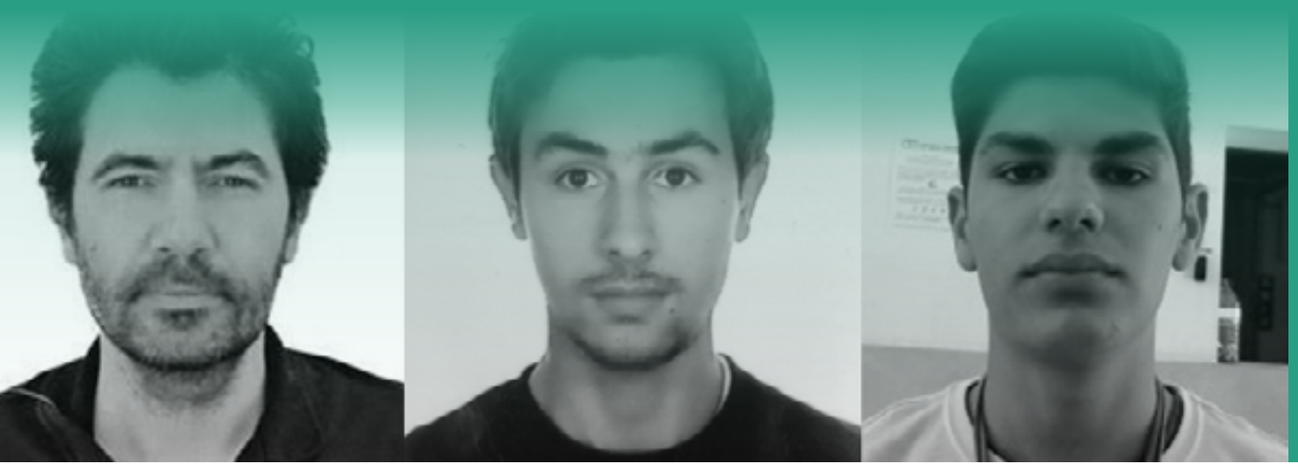
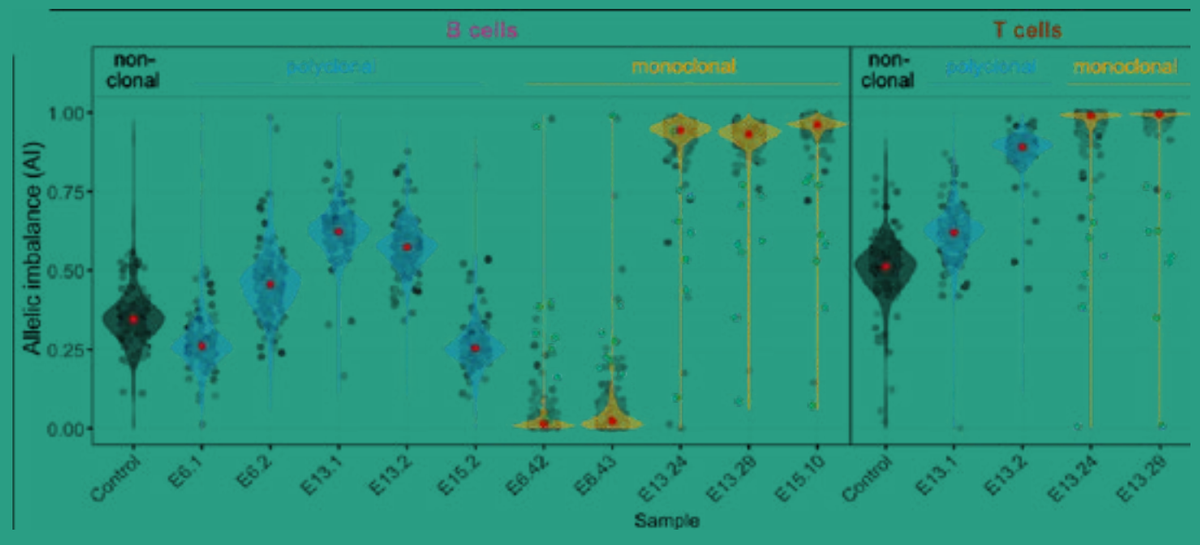
NIT Gene Editing Lab





Transcriptomics showing X-Chromosome inactivation

Vasco Barreto

Our lab is interested in understanding the molecular mechanisms of the natural processes of gene editing in lymphocytes, i.e., V(D)J recombination, somatic hypermutation, and class switch recombination, namely the interplay between the initiators of gene editing and the DNA Repair pathways. In parallel, we focus on developing new methods in the field of artificial gene editing by focusing on the applications of the CRISPR/Cas9 system in Mammalian cells.

KEYWORDS:
Gene editing, CRISPR, monoallelic expression, AID, V(D)J recombination

Gene Editing

Using a genome-wide transcriptomics approach in vivo, we evaluated the allelic expression imbalance in the progeny of single hematopoietic cells (HSCs) as a read-out of epigenetic marking. We made 3 key observations: 1) X-chromosome inactivation and random monoallelic expression (RME) in the autosomal chromosomes are driven by different mechanisms; 2) the previously reported high frequency of genes under RME in clones expanded in vitro is not found in clones undergoing multiple differentiation steps in vivo; 3) HSCs have stable patterns of autosomal RME. We propose that most RME patterns in autosomal chromosomes are erased and established de novo during cell lineage differentiation.

N Kubasova et al., ***In Vivo Clonal Analysis Reveals Random Monoallelic Expression in Lymphocytes That Traces Back to Hematopoietic Stem Cells****, Front Cell Dev Biol (2022);*

ML Oliveira et al., ***Mutant IL7R collaborates with MYC to induce T-cell acute lymphoblastic leukemia,*** *Leukemia (2022);*

M Alenquer et al., ***Saliva molecular testing bypassing RNA extraction is suitable for monitoring and diagnosing SARS-CoV-2 infection in children****, PLOS One (2022).*

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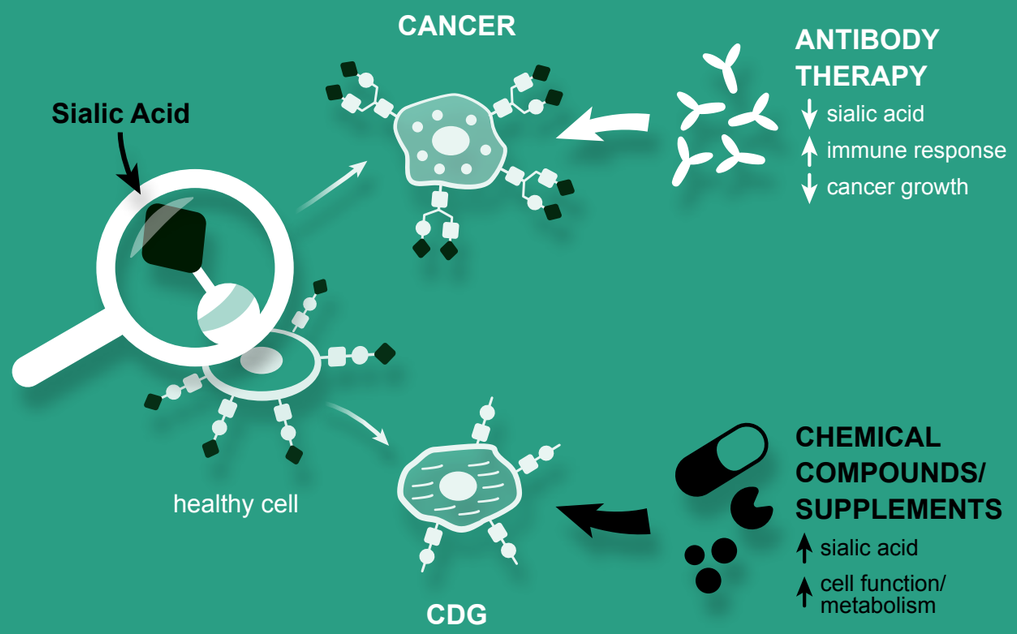
NIT Glycoimmunology Lab



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The Glycoimmunology research lab combines molecular and biological methods and patient-centric approaches to disentangle biological mechanisms modulated by glycosylation and obtain cues for novel glycan-based therapies. Our particular focus has been on sialylated glycans that affect the function of relevant cell surface molecules. We developed technologies to alter sialic acid contents and a multi-modular platform for the high-throughput development of anti-glycan antibodies, with potential clinical applications. We collaborate extensively with pharmaceuticals and patient associations to translate into therapies for cancer and congenital disorders of glycosylation (CDG).

KEYWORDS:
Glycosylation, Sialic acid, Congenital disorders of glycosylation, Immunotherapies, Immunooncology

Understanding the role of sialic acid containing glycans in cancer and congenital disorders of glycosylation to identify new therapeutic strategies

Our research interest has focused on the biological role of aberrant short O-glycans, expressed in cancer and on developing improved anti-sialyl Tn antibodies that selectively target cancer cells and reduce tumour burden, which will be further explored with a recently awarded Project (FCT Grant 2022.04067.PTDC), which aims to gather reliable insights into how STn impacts PC aggressiveness/carcinogenesis.

We were also awarded with European funding GLYCOTwining (GA 101079417) Building networks to excel in Glycoscience, which aims to provide a breakthrough in the research of the UCIBIO- NOVA, from chemistry to microbiology, immunology and biomedicine.

Between 30th May and 2nd June, we organized the ProDGNE meeting 2022 that included an introduction to the ProDGNE team and project, addressing scientific challenges in GNE Myopathy and ways to build patient partnership in research for rare diseases.

D Sobral et al., ***Concerted Regulation of Glycosylation Factors Sustains Tissue Identity and Function****, Biomedicines (2022);*

PA Videira et al., ***Biomarkers in Genitourinary Cancers,*** *Front Oncol (2022);*

R Francisco et al., ***A Community-Led Approach as a Guide to Overcome Challenges for Therapy Research in Congenital Disorders of Glycosylation****, Int J Environ Res Public Health (2022).*

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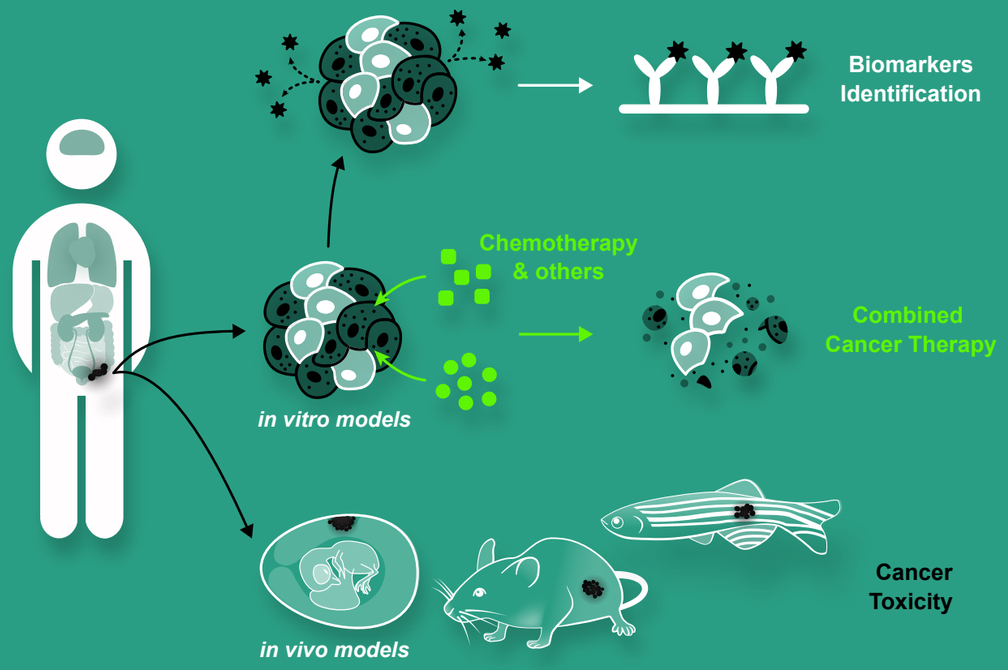
Human Genetics and Cancer Therapeutics Lab



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The major goals of Human Genetics and cancer therapeutics group are the identification and validation of cancer diagnostics biomarkers and the development of novel combinatorial cancer therapies. For the development of cancer combinatory therapeutics, it is used in vitro 2D (cell monocultures) and 3D (spheroids) cellular models that simulate tumor microenvironment, cancer patient´s derived tumor cells or peripheral blood, or even in vivo models such as chick embryos, zebrafish and murines. Cellular models that mimic drug multiresistance observed in oncological patients were also established. The identification of novel chemotherapeutic approaches, accomplished by screening of the biological targets of the most promising compounds, occurs with a high interaction with other international research groups.

KEYWORDS:
Cancer diagnostics, Cancer therapy, Cancer biomarkers, Human genetics

The biomarkers identification for cancer diagnostics and screening and validation of drugs for cancer therapeutics

The antiproliferative effect of counter-anion in Ruthenium(II) arene complexes, CF3SO3 anion in JHOR10 complex and PF6 in JHOR11 complex, was evaluated in ovarian carcinoma (A2780), colorectal carcinoma (HCT116), doxorubicin resistant HCT116 (HCT-Dox) and in normal human dermal fibroblasts. Both complexes presented higher selectivity towards A2780 and HCT116 cancer cells relative to normal cells, with complex JHOR11 also presenting antiproliferative activity in HCT-Dox cell line. The complex JHOR11 induced ROS in A2780 cell line that triggered autophagy and cellular senescence, but no apoptosis. The tumorigenicity of the complex was evaluated in a scratch-test and in an ex-ovo chorioallantoic membrane (CAM) assay, and the toxicity was accessed on chicken and zebrafish embryos. Results highlighted the possibility of counter-anion alterations to improve chemotherapy outcomes in cases of multidrug-resistance.See more here.

A Rudbari et al., ***Platinum(II) and Copper(II) complexes of asymmetric halogen-substituted [NN'O] ligands: Synthesis, characterization, structural investigations and antiproliferative activity***, Bioorg Chem (2022);

O Lenis-Rojas et al., ***In Vitro and In Vivo Biological Activity of Ruthenium 1,10-Phenanthroline-5,6-dione Arene Complexes***, Int J Mol Sciences (2022);

F Reigosa-Chamorro et al., ***In Vitro and In Vivo Effect of Palladacycles: Targeting A2780 Ovarian Carcinoma Cells and Modulation of Angiogenesis***, Inorg Chem (2021).

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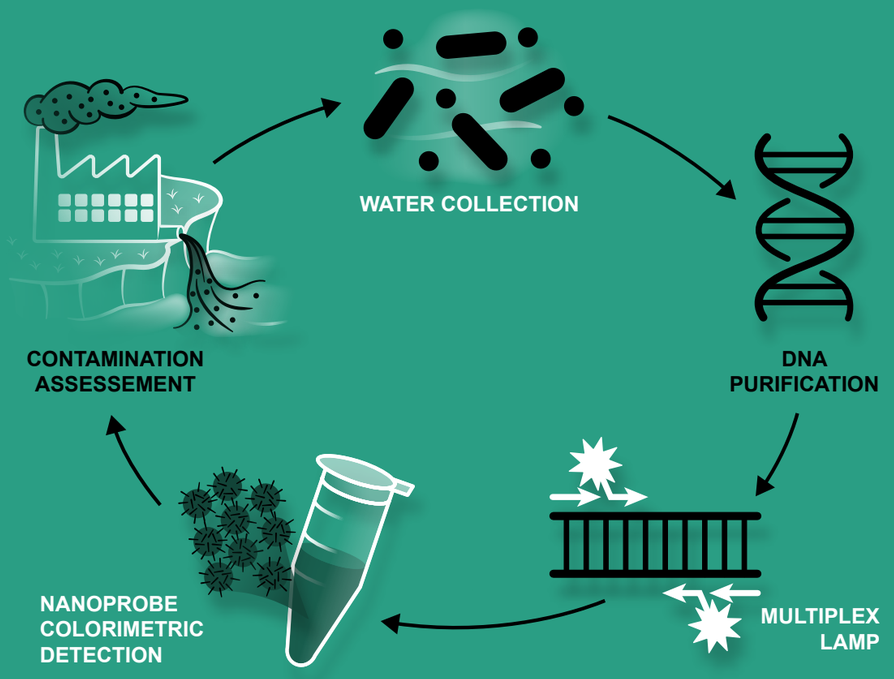
NIT | Nanomedicine Lab



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The group of Nanomedicine@FCT - created and developed by Dr. Pedro V Baptista in 2003 - in the field of biofunctionalization of nanoparticles with targeting and silencing moieties and their application in drug delivery and/or gene silencing, in the assessment of toxicology of nanoparticles in in vivo models, in the development of nanobiosensors and microfluidic devices for diagnostic applications, and DNA/RNA biomolecular recognition studies. At the intersection of Molecular Genetics and Nanotechnology, we have focused our research on the use of noble metal nanoparticles (mainly gold and silver) for new diagnostics and therapeutics platforms.

KEYWORDS:
Nanomedicine, Gold/silver nanoparticles, Cancer therapy, Targeted delivery

Biofunctionalization of nanoparticles for drug delivery and/or gene silencing

We presented a digital microfluidics (DMF) technology that is specifically made to amplify DNA using loop-mediated isothermal amplification (LAMP) and use it to real-time monitoring of the cancer biomarker c-Myc, which is linked to 40% of all human malignancies. It was shown complete sample and reagent manipulation on the DMF platform, and successful amplification of 90 pg of the target DNA (0.5 ng/L) in less than an hour. To know more see here.

BJ Coelho et al., ***Digital Microfluidics-Powered Real-Time Monitoring of Isothermal DNA Amplification of Cancer Biomarker****, Biosensors (2022);*

C Alves-Barroco et al., ***Light Triggered Enhancement of Antibiotic Efficacy in Biofilm Elimination Mediated by Gold-Silver Alloy Nanoparticles****, Front Microbiol (2022);*

P Pedrosa et al., ***Benchtop X-ray fluorescence imaging as a tool to study gold nanoparticle penetration in 3D cancer spheroids****, RSC Adv (2021).*

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SMB
Structural & Molecular Biology

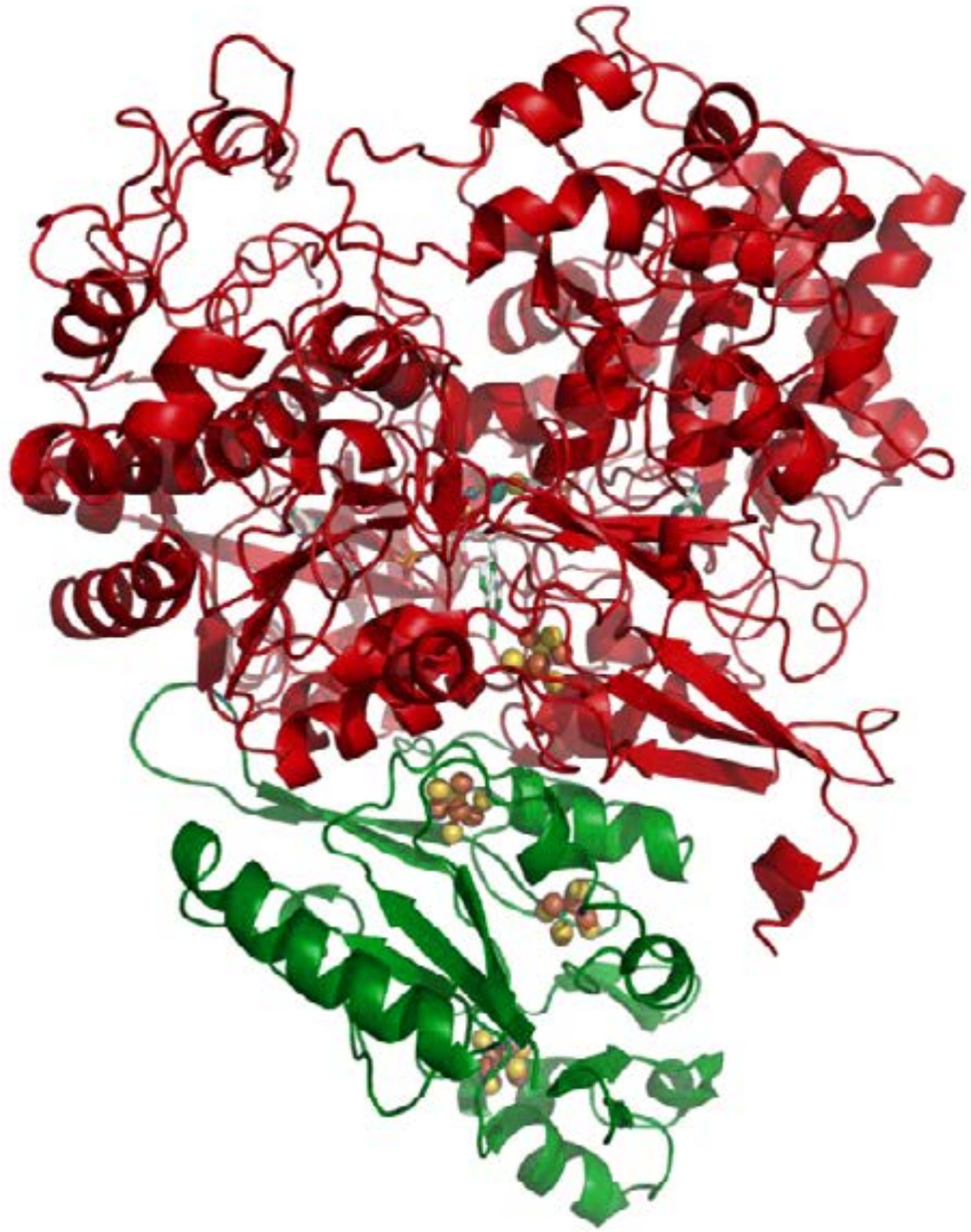
Maria João Romão, Research Group Coordinator

The STRUCTURAL AND MOLECULAR BIOLOGY group is developing research in structural biology and glycosciences with a long standing interest in a variety of topics that are focused in the areas of health, disease and the environment. The topics are addressed from a functional and structural point of view, relying on complementary expertise in molecular biology, protein production and biochemical, structural, and functional characterization (X ray crystallography, cryo EM, SAXS, EPR and Mössbauer spectroscopies, Glycoarrays, Enzyme Kinetics, Microcalorimetry). The optimization and development of new techniques in these fields is a fundamental and an active topic of research within the group.

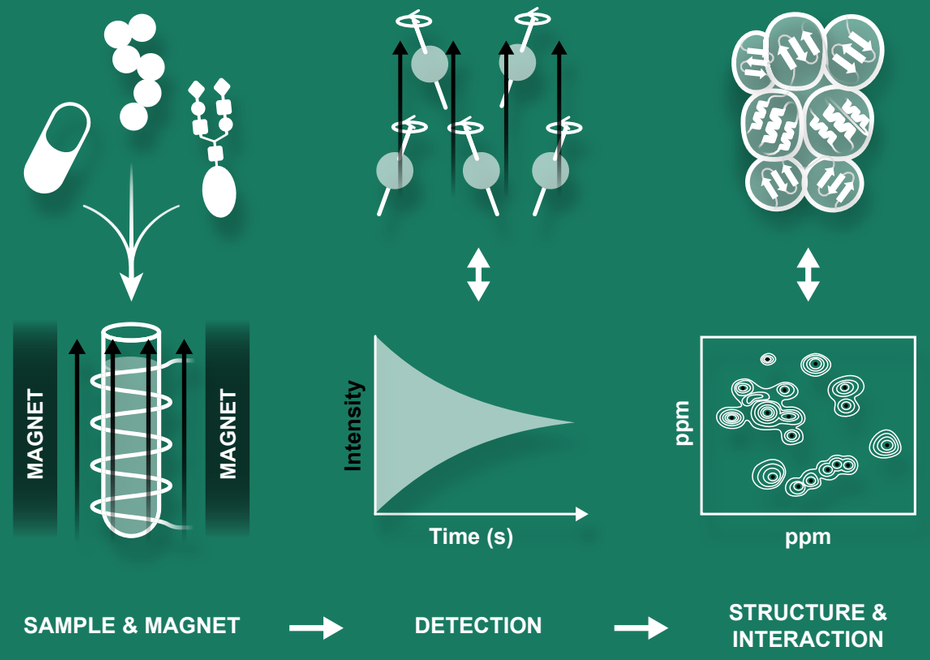
Most targets of our research are metalloenzymes and we have contributed to the structural and mechanistic elucidation of several enzymes relevant in human health disease (Aldehyde oxidases, Peroxidases, etc) as well as on the environment (formate dehydrogenase, N_2O reductase) and the results achieved have granted us international recognition.

Another relevant area is on glycan structure and recognition in host-microbial interactions and in immune function towards the development of cancer therapies.

Other areas of impact include molecular mechanisms for iron storage, metal tolerance and detoxification of ROS from pathogenic bacteria; mechanisms of protein aggregation in neurodegenerative diseases; and extracellular electron transfer mechanisms for sustainable bioremediation applications and conversion of renewable biomass into electricity by electroactive bacteria.



SMB | (Bio)molecular Structure and Interaction by NMR Lab



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Our research lab is focused in the study of intermolecular interactions in biological and chemical systems, at a molecular level, from the chemical perspective. Our main contributions are in the understanding of molecular recognition processes in different contexts: (i) protein structure, function and dynamics; (ii) protein-ligand interactions in drug discovery; (iii) glycan structure and recognition; (iv) solute-solvent interactions in alternative solvents.

The group mainly relies on the application, but also on the development, of NMR methods for studying the structural and dynamic properties of ligands and proteins and their interactions. In general the group employs a multidisciplinary approach, using a combination of molecular biology, biophysics, molecular modeling, and NMR, and a network of collaborations with specialists from other fields of knowledge.

KEYWORDS:
Nuclear magnetic resonance, Protein-ligand interactions, Ionic liquids, Protein structure, Drug discovery

Molecular interactions studies to disclose how nature works at the atomic level

a) Protein glycosylation - A precise NMR-based methodology, assisted with state-of-the-art molecular modelling protocols, to provide specific information with atomic resolution on the MUC1 O-glycosylation mechanism by different GalNAcTs, was developed. We have shown that the lectin domain of GalNAcTs defines the site, order, and orientation after the addition of the first GalNAc residue. This result paves the way to design precise chemoenzymatic methods to control GalNAcTs action and to generate MUC1 glycodomains targeting multiple lectins simultaneously. The NMR methodology can be extended to more complex mucin glycodomains.

b) Using state-of-the-art biophysical techniques (NMR, fluorescence microscopy, optical spectroscopies and calorimetry), we are investigating the molecular factors determining protein liquid-liquid phase separation (LLPS) of relevant disease-related proteins. Aberrant aggregated forms of fused in sarcoma (FUS) are a major component of the pathological inclusions found in 5% of all forms of amyotrophic lateral sclerosis (ALS) and in 8% of all cases of frontotemporal lobar degeneration. FUS undergoes LLPS under cold stress conditions. Using NMR spectroscopy, we revealed that the folded FUS RNA-recognition domain and the zinc-finger motif undergo cold denaturation. FUS cold denaturation might expose otherwise buried hydrophobic residues, promoting LLPS, and consequently aggregation, via additional hydrophobic interactions.

H Coelho et al, ***Atomic and Specificity Details of Mucin 1 O -Glycosylation Process by Multiple Polypeptide GalNAc-Transferase Isoforms Unveiled by NMR and Molecular Modeling****, JACS Au (2022);*

S Félix et al, ***Fused in sarcoma undergoes cold denaturation: Implications for phase separation****, Prot Science (2023);*

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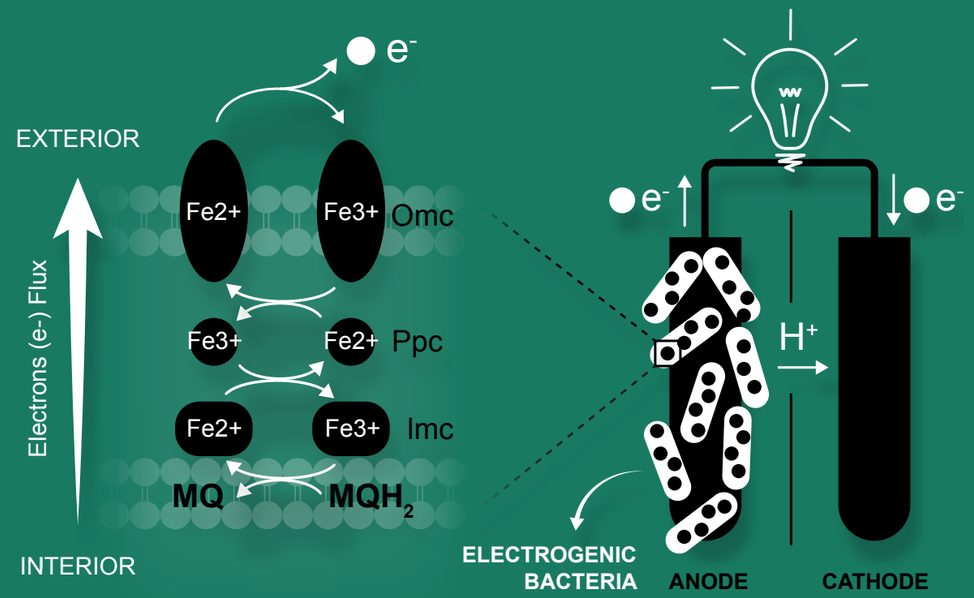
SMB | Biochemistry and Bioenergetics of HEME proteins Lab



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Pilar Portela
Tomás Fernandes

The research team uses complementary biochemical and biophysical methods to study the respiratory chain of electrogenic bacteria, which couple their oxidative metabolism to the reduction of extracellular electron acceptors such as toxic/radioactive metals or electrode surfaces. The structural and functional characterization of key electron transfer components, particularly multiheme cytochromes and bacterial conductive filaments, permits the elucidation of the bacteria's respiratory pathways and endows their rational engineering for optimization of Geobacter-based biotechnological (bioremediation, microbial electrosynthesis, bioenergy) and bioelectronic applications.

KEYWORDS:
Electrogenic bacteria, Cytochromes, Biomolecular interactions, Nuclear magnetic resonance

Exploring electron transfer proteins of electrogenic bacteria for sustainable biotechnological applications

Cytochromes establish highly efficient networks in various biological systems, particularly in electrogenic bacteria. The identification of these redox partners is fundamental. We developed a new method to monitor electron transfer between cytochromes. It explores the different NMR fingerprints of each cytochrome in each oxidation stage and was used to evaluate electron transfer between Geobacter sulfurreducens' *cytochromes. One example is the complex formed by the periplasmic cytochrome PpcA and the inner membrane quinone oxidoreductase CbcL that was characterized for the first time, showing how electrons are injected into the periplasm for extracellular electron transfer.*

JMA Antunes et al., ***Electron Flow From the Inner Membrane Towards the Cell Exterior in* Geobacter sulfurreducens*: Biochemical Characterization of Cytochrome CbcL****, Front Microbiol (2022);*

L Morgado et al., ***Elucidation of complex respiratory chains: a straightforward strategy to monitor electron transfer between cytochromes****, Metallomics (2022);*

LR Teixeira et al., ***Characterization of a Novel Cytochrome Involved in* Geobacter sulfurreducens' *Electron Harvesting Pathways****, Chem Eur J (2022).*

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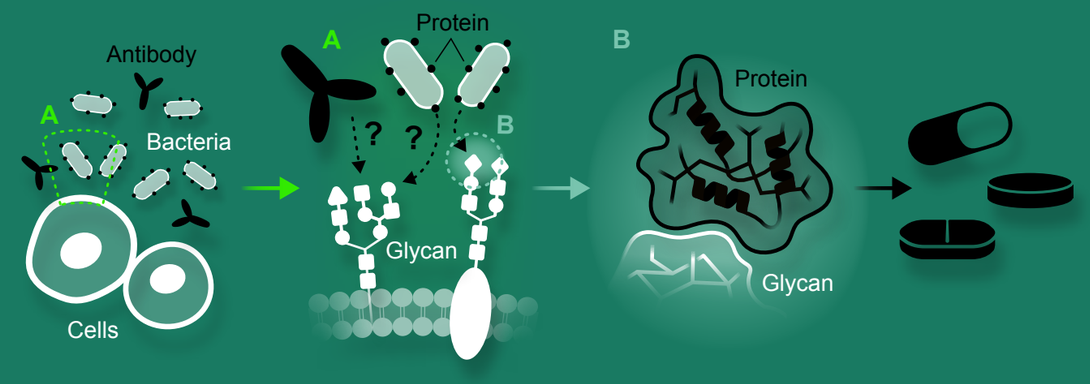
SMB | Functional Glycobiology Lab



Cell - Cell
Cell - Bacteria
Cell - Antibody

Screening of glycan - protein interactions

Molecular view of glycan - protein interactions

Biopharmaceutical Applications

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The Functional Glycobiology Lab focuses on understanding carbohydrate (glycan)-protein interactions for discovering novel biomarkers and developing glycan-based therapies and biotechnological applications. We exploit the power of high-throughput glycan microarray technologies to identify functional glycans for proteins at a glycomics scale. Through an integrative approach, we use structural biology to uncover the molecular determinants of glycan recognition by immune-lectins and glycan recognition systems of bacteria and in host-human microbiome interactions. We have a programme for the pre-clinical characterisation of anti-cancer antibodies, collaborating with biopharmaceutical companies.

KEYWORDS:
Glycan-microarrays, Glycan recognition, Glycan-binding proteins, Human microbiome, Host-microbial interactions

Unravelling glycan-protein interactions to understand biological recognition systems

Mucin-type O-glycosylation is a post-translational modification of cell-surface and secreted proteins, which is associated with tissue- and cell-specific activities, including cell-attachment of commensal and pathogenic microbes and development and progression of cancer. The GlycoLab has attracted competitive funding to study the molecular crosstalk of the human microbiota with tumour associated O-glycans and identify molecules with high potential for development of clinical biomarkers and innovative therapies in cancer (FCT-funded 2022.06104.PTDC GlycOSELECT & HORIZON-WIDERA-2021-101079417 GLYCOTwinning).

Y Akune et al., ***CarbArrayART: a new software tool for carbohydrate microarray data storage, processing, presentation, and reporting****, Glycobiology (2022);*

DO Ribeiro et al., ***Mapping Molecular Recognition of β1,3-1,4-Glucans by a Surface Glycan-Binding Protein from the Human Gut Symbiont Bacteroides ovatus****, Microbiol Spectrum (2021);*

C Li et al., ***Noncovalent microarrays from synthetic amino-terminating glycans: Implications in expanding glycan microarray diversity and platform comparison****, Glycobiology (2021).*

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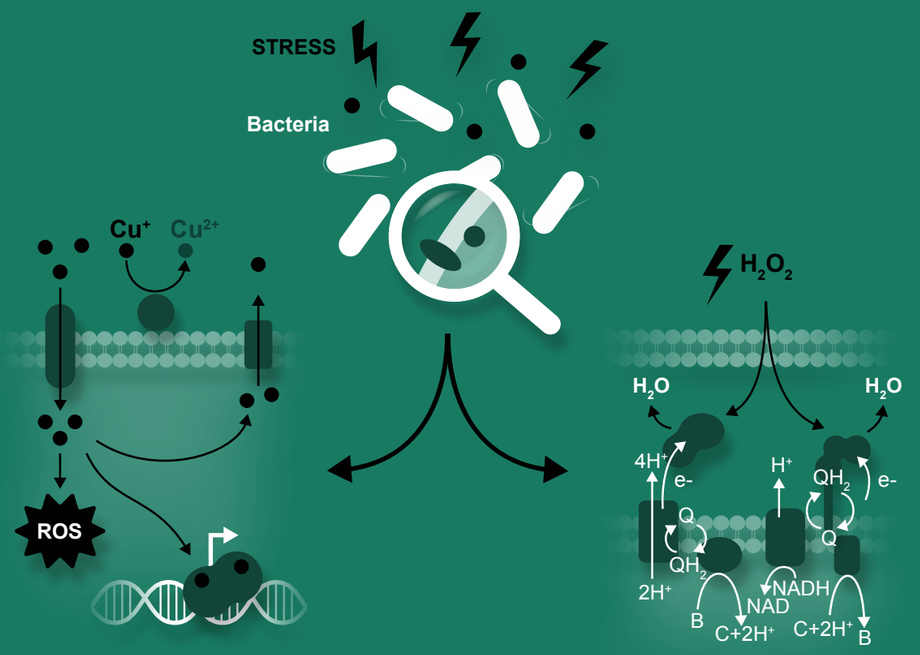
SMB | Microbial Stress Lab



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Neisseria gonorrhoeae, Escherichia coli and *Staphylococcus aureus* are considered by CDC to be urgent health threats and are classified by WHO as high priority pathogens for R&D of new antibiotics. Our lab aims to identify and characterize enzymes as new drug targets, which will have an impact on both the health care system and society.
Thus, we investigate molecular systems responsible for the detoxification of ROS and metal tolerance from pathogenic bacteria, which are a strategy used by these bacteria to evade the human immune system.
For that we use spectroscopic and biophysical techniques, steady-state kinetics, complemented by proteomics and transcriptomic analysis. Biomolecular NMR and molecular docking are used to structurally characterize the proteins and their complexes.

KEYWORDS:
Copper and hydrogen peroxide bacterial detoxification, Bacterial Peroxidases, Metalloenzymes, Protein Interactions, Electron transfer, Structural NMR, Biophysics

How pathogenic bacteria deal with ROS, RNS and metal stress?

Bacterial Peroxidases are periplasmic enzymes involved in the reduction of hydrogen peroxide in the periplasm of pathogenic bacteria, and are considered to be a first line of defence against hydrogen peroxide during infection. The di-heme bacterial peroxidase from N. gonorrhoeae *was spectroscopic and biochemically characterized, and shown to receive electrons from the lipid modified azurin from the same organism. Recently, we have isolated a small c-type cytochrome that can function as an alternative electron donor to this enzyme. The tri-heme bacterial peroxidase from* E. coli *was isolated and biochemically characterized for the first time. This enzyme is a quinol peroxidase that is expressed under anaerobic conditions, and is considered to be involved in a respiratory chain using hydrogen peroxide as terminal electron acceptor.*

A Fievet et al., ***OrpR is a sigma(54)-dependent activator using an iron-sulfur cluster for redox sensing in* Desulfovibrio vulgaris Hildenborough**, *Mol Microbiol (2021);*

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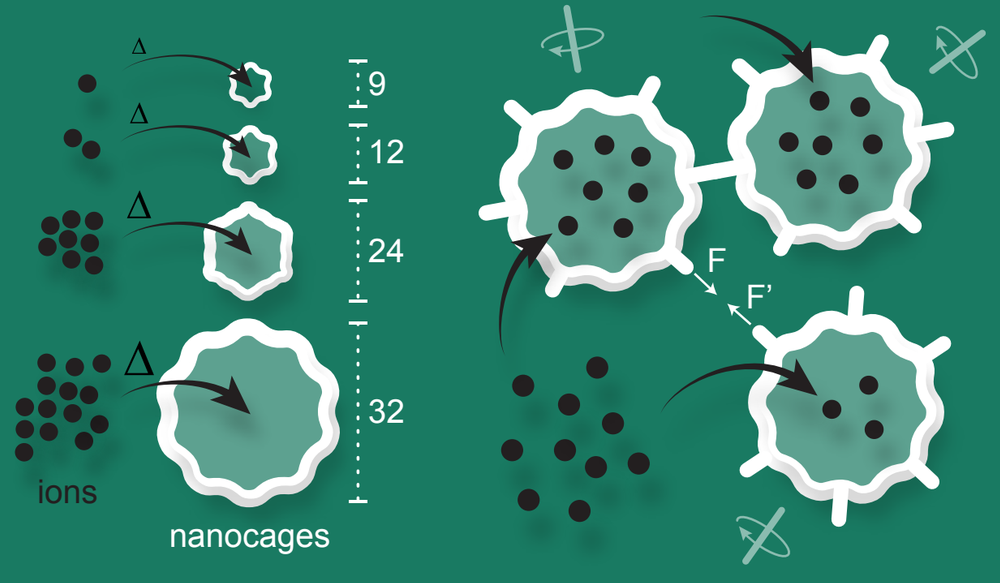
SMB | Molecular Biophysics Lab



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The Molecular Biophysics Lab uses a combination of biochemical and biophysical methods to study enzyme mechanisms and characterize active centers and reaction intermediates. Enzymes studied include iron storage and detoxification enzymes of the ferritin family as well as other carboxylate-bridged di-iron containing proteins and cage proteins. Additionally, the biological effect of ionizing radiation in macromolecules, particularly metalloenzymes, has been under study. Recently, collaborative efforts with industrial partners resulted in new applied research in *Moringa oleifera* plant system. The effect of biological molecules in consolidation and formulation of construction materials has also been investigated.

KEYWORDS:
DNA-binding protein from starved cells (Dps); encapsulin; iron homeostasis; DNA binding, condensation, and protection; conformational dynamics

Looking at architecture, dynamics & interactions of biologic molecules using biophysical methods

Protein cages are relatively symmetric, nanostructured biomaterials, variable in size, that serve many cellular functions, from catalysis to detoxification. DNA-binding proteins from starved cells (Dps) are homododecamers (ϕ = 9–10 nm) and one of the smallest protein cages belonging to the ferritin family. Each monomer presents N- and C-terminal tails variable in composition and length. They can protect the bacterial chromosome by binding and condensation and/or by consuming toxic Fe^{2+} ions and H_2O_2. Using biochemical and biophysical methods we have shown that the N-terminal tails of Deinoccocus grandis Dps *interconvert between an extended and a compact conformation depending on the ionic strength or by binding of divalent metals to the N-terminal binding site. On the other hand, encapsulins are larger icosahedral protein nanocages (24, 32, or 42 nm wide) found in prokaryotes, able to encapsulate different proteins/enzymes. We have described, for the first time, that encapsulin (empty or with a native cargo protein) is able to bind and condensate plasmid supercoiled DNA, protecting it from the deleterious ROS damages; a novel function for the class of proteins.*

JPL Guerra et al., ***The conformation of the N-Terminal tails of* Deinococcus grandis Dps *is modulated by the ionic strength****, Int J Mol Sci (2022);*

AV Almeida et al., ***Condensation and protection of DNA by the* Myxococcus xanthus *encapsulin: A novel function****, In J Mol Sci (2022);*

JPL Guerra et al, ***Small multifunctional protein cages****, Coord Chem Rev (2021);*

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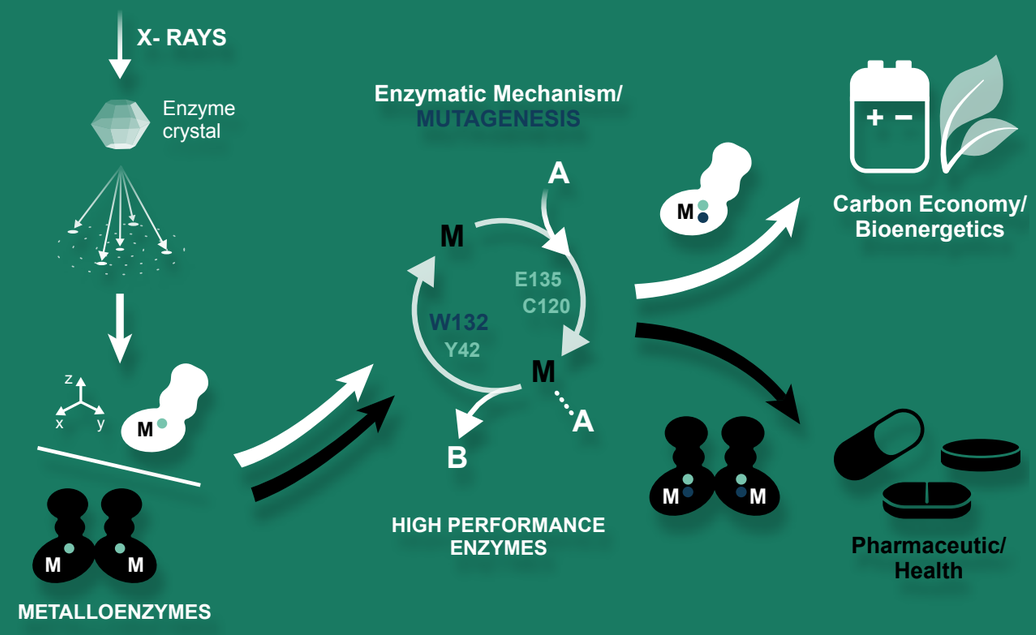
SMB | Macromolecular Crystallography Lab



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João Ferreira
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We use structural molecular biology tools to study proteins and protein-ligand complexes, using X-ray Crystallography, Small Angle X-ray Scattering (SAXS) and other biohysical methods. Our main research areas are: Mechanistic studies (metalloenzymes, in particular those containing Mo, W and Fe centers, with impact on health and on the environment); Drug metabolism and ligand discovery; Cellulosomes and protein-protein interactions; and Novel methods and strategies for improved protein crystallization.

KEYWORDS:
Xray Crystallography and SAXS; Protein Crystallization Methods; Mo, Fe and W enzymes; Drug Metabolism; Cellulosomal proteins and Enzymes

Integrated Structural Biology for Bacterial cellulose degradation

Cellulosomes are elaborate multi-enzyme structures secreted by many anaerobic microorganisms for the efficient degradation of lignocellulosic substrates.
Since our breakthrough work of 2007, when, in collaboration with CIISA-FMV-UL, we disclosed the dual binding mode mechanism of the cohesin-dockerin (Coh-Doc) complex in Clostridium thermocellum *[PNAS, 2007], exceptions to this archetypal cellulosomal assembly are being found as more systems are described.*
Recently, in the cellulosome of Bacteroides cellulosolvens *we reported a reversed role in the Coh-Doc recognition types, while in* Ruminococcus flavefaciens*, new types of interactions were revealed.*
The diversity of Coh-Doc interactions seems to be high and maybe new types are yet to be discovered of these highly efficient protein-protein assemblies, resultant of the microorganisms' adaptation to environmental niches. Our work shows that the Coh-Doc affinity determinants can be manipulated through rational design, enabling the creation of new multi-enzymatic assemblies capable of recognizing and degrading recalcitrant substrates and with potential applications.

M Duarte et al., ***Structure-function studies can improve binding affinity of cohesin-dockerin interactions for multi-protein assemblies***, *Int J Biol Macromol (2023);*

M Duarte et al., ***A dual cohesin-dockerin complex binding mode in* Bacteroides cellulosolvens *contributes to the size and complexity of its cellulosome***, *J Biol Chem (2021);*

AR Oliveira et al., ***Spectroscopic and Structural Characterization of Reduced* Desulfovibrio vulgaris Hildenborough *W-FdhAB Reveals Stable Metal Coordination during Catalysis***, *ACS Chem Biol (2022).*

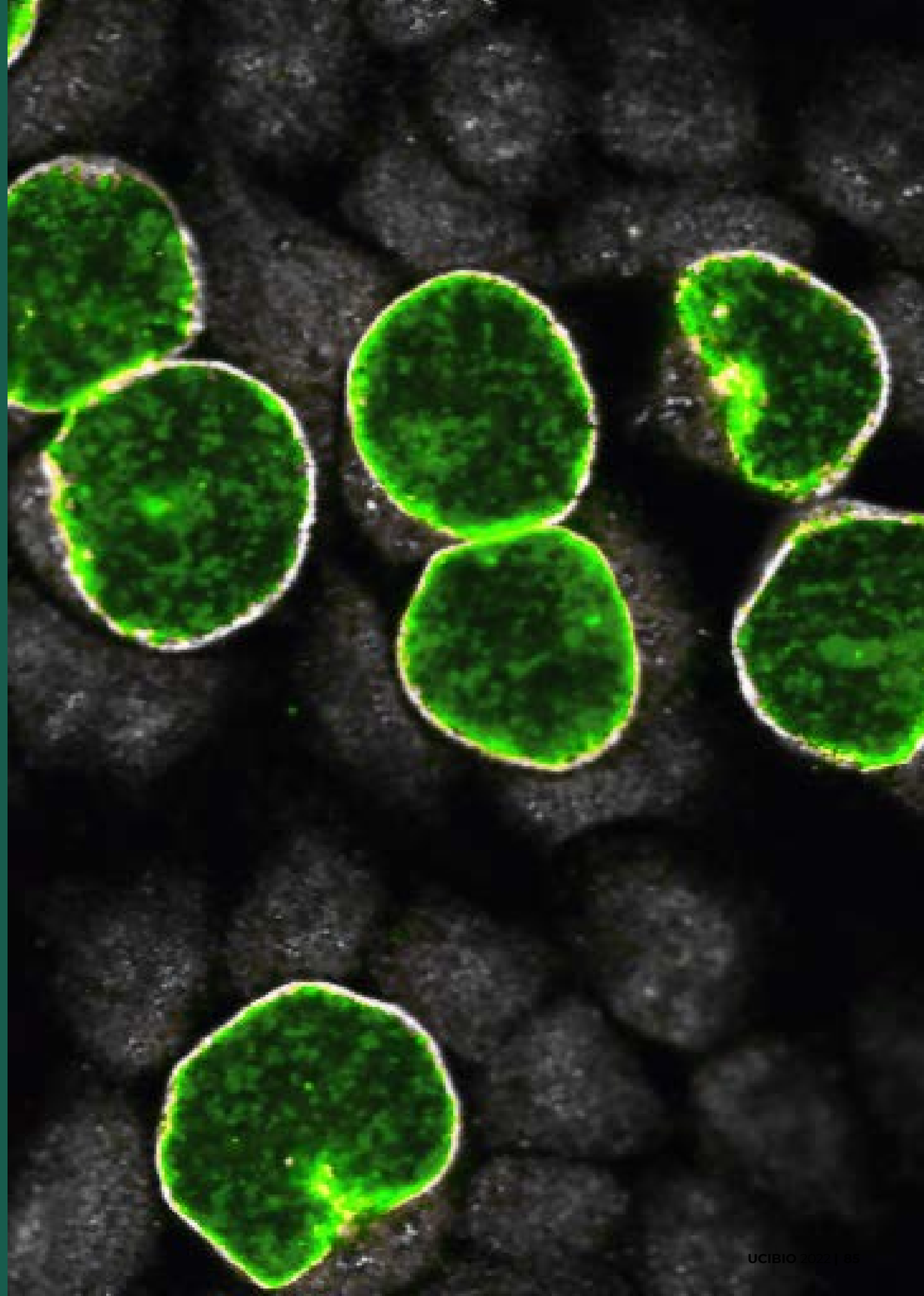
Find More

MMG
Molecular Microbiology & Genomics

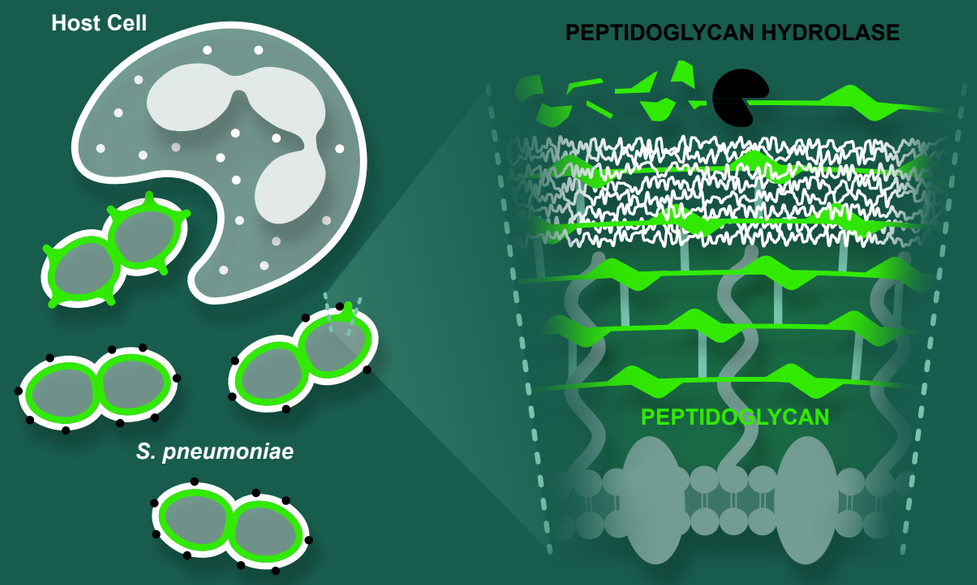
José Paulo Sampaio, Research Group Coordinator

The MMG Group uses different molecular microbiology approaches, which in some cases are combined with genomics to understand and fight pathogenesis and antibiotic resistance in bacteria, and to decipher the evolution of important physiological properties in yeasts. Recent achievements relate to the understanding of microbial pathogenicity and concern the role of bacterial peptidoglycan (PG) hydrolases in evading the immune response and the role of PG amidation in antibiotic resistance. Also, characterization of *Chlamydia* virulence proteins led to findings relevant for targeting virulence.

Applied research contributed to the development of a test for detection of carbapenemases (antimicrobial resistance) and also of a prototype of a biosensor for the detection of the pathogenic bacteria *Staphylococcus aureus*. Using yeasts as models, we uncovered events of horizontal gene transfer that re-shaped sugar fermentation in a yeast lineage.



MMG | Bacterial Cell Surfaces & Pathogenesis Lab



Sérgio Filipe

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Joana Figueiredo

We are focused on understanding how bacteria assemble their cell wall as it ensures bacterial resistance to intense osmotic pressures and the concealment of the peptidoglycan (PGN) molecule. PGN is a major component of any bacterial cell surface and a telltale molecule that flags bacteria to the host innate immune system.
Our current research will answer how *Streptococcus pneumoniae*, a clinically relevant bacterial pathogen, expresses its resistance to beta-lactam antibiotics; how its surface is decorated with capsular polysaccharides, a major pneumococcal virulence factor, and how this and other Gram-positive bacteria conceal and degrade their surface PGN.

KEYWORDS:
Bacterial pathogenesis, Bacterial cell wall, Antibiotic resistance, *Staphylococcus aureus*, *Streptococcus pneumoniae*

Identification of strategies used by bacteria to build a robust and disguised cell surface

Bacteria are surrounded by an envelope that includes different glycopolymers such as peptidoglycan and capsular polysaccharides. The clarification of how bacteria tune synthesis of these macromolecules, which act as defensive layers, ensuring efficient enclosing of bacteria and their protection from the host, will permit a better understanding of how bacteria propagate during an infection and the design of anti-infective strategies.
We have described how bacterial cell wall synthesis and capsular polysaccharide are regulated Streptococcus pneumoniae, a bacterial pathogen of clinical relevance, so that the bacterial envelope is synthesized fully encapsulated.

J Figueiredo et al., ***Encapsulation of the septal cell wall protects*** **Streptococcus pneumoniae** ***from its major peptidoglycan hydrolase and host defenses****, PLOS Pathogens (2022)*

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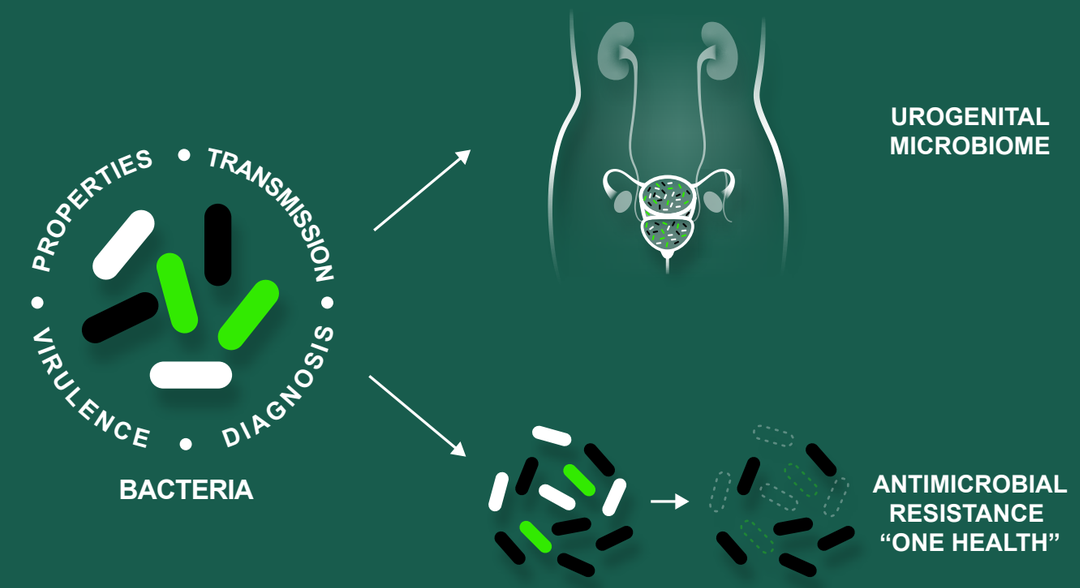
MMG | BacT_Drugs Lab



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Márcia Sousa
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Michele Loiodice

The BacTdrugs Lab uses a combination of phenotypic, molecular, biochemical, culturomic and (meta)genomic approaches to study bacterial populations. Our research is focused on the ecology, evolution and dynamics of antimicrobial resistant bacteria through different niches and in the role of the urinary microbiota in human health and disease. We aim at understanding key fundamental aspects related to the selection and adaptation of bacterial populations to different hosts using conventional and cutting edge methodologies. Applied research is dedicated to the design and production of quick and inexpensive tools for the diagnosis, treatment, and prevention of diseases.

KEYWORDS:
Antimicrobial resistance, Molecular epidemiology, One health, Urinary microbiota, Diagnostics

Unlocking the bacterial world in the female urinary microbiome

We disclosed an underestimated bacterial diversity in the healthy female urinary microbiome (~300 species identified, including several novel species) by using combined and optimized culture-dependent and independent approaches. The detailed FUM structure provided is critical to unveil the potential relationship between specific microbiome members and urinary diseases/disorders (see here).

Chlorhexidine susceptibility evolution of Enterococcus faecalis *from diverse origins and timespans*

We demonstrated that MDR E. faecalis *have diverse chlorhexidine (CHX) phenotypes, with more tolerant strains recovered in food chains and recent human infections. The increased CHX use, combined with concentration gradients potentially selecting MDR* E. faecalis *with variable CHX phenotypes in different environments, stresses the importance of monitoring CHX tolerance within a One Health approach (see here).The importance of a One Health approach to mitigate antimicrobial resistance was also discussed in a podcast by Luísa Peixe on the European Day of Antibiotics (2022-11-18, here).*

B Daza et al., ***Distinction between* Enterococcus faecium *and* Enterococcus lactis *by a* gluP *PCR-Based Assay for Accurate Identification and Diagnostics***, *Microbiol Spectr (2022);*

M Ribeiro-Almeida et al., ***High diversity of pathogenic* Escherichia coli *clones carrying* mcr-1 *among gulls underlines the need for strategies at the environment-livestock-human interface***, *Environ Microbiol (2022);*

JPR Furlan et al., ***High occurrence of colistin- and multidrug-resistant strains carrying* mcr-1 *or an underestimated* mcr-1.26 *allelic variant along a large Brazilian river***, *J Glob Antimicrob Resist (2022).*

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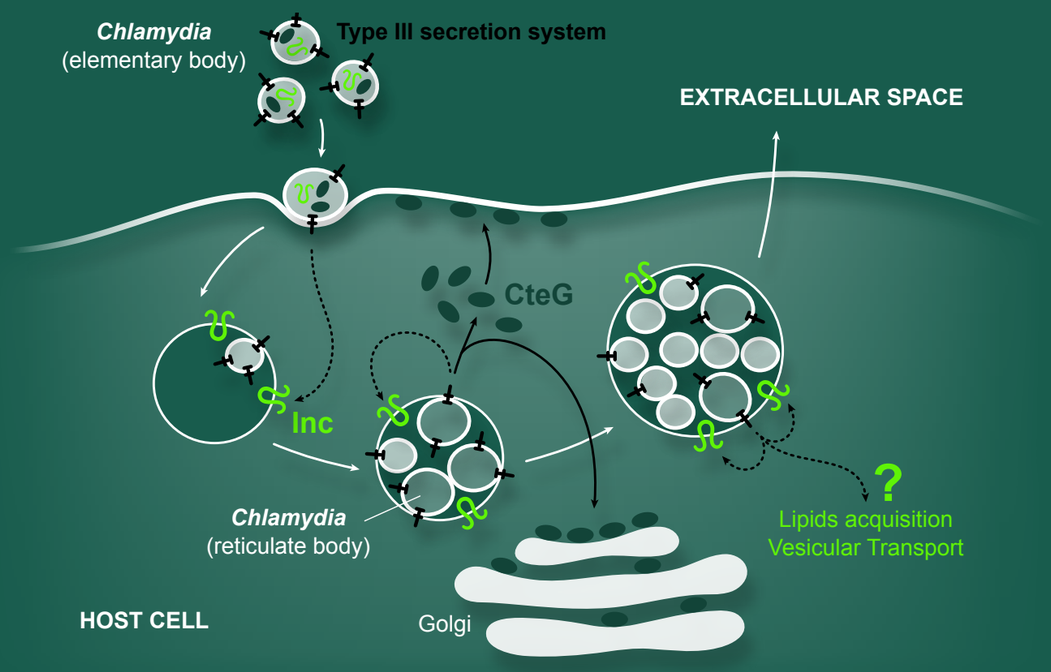
MMG | Infection Biology Lab



Jaime Mota

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Maria Luís

Our main interest is to understand molecular and cellular mechanisms underlying bacterial virulence. We study processes by which intracellular bacterial pathogens alter the normal functioning of eukaryotic host cells. We focus in a virulence mechanism consisting in the injection of bacterial effector proteins into host cells through specialized secretion systems. These effectors have been shown to act on a vast array of eukaryotic cell functions. Our main research focus has been to study the function of effectors from bacterial pathogens that cause relevant infections in humans (*Chlamydia* and *Legionella*) and which possess type III or type IV secretion systems essential for their virulence.

KEYWORDS:
Host-pathogen interactions, Bacterial pathogenesis, Protein secretion, *Chlamydia*, *Legionella*

How do bacterial proteins act on host eukaryotic cell processes to mediate virulence?

Chlamydia delivers > 70 effectors into host cells. We found that one of these effectors (CteG) mediates chlamydial lytic exit from infected cells, a crucial step in the infectious cycle of this pathogen.

In another line of research, among the > 300 *Legionella* effectors, in collaboration of the Portuguese National Institute of Health, we found a strain-specific nucleotropism for an effector of the *L. pneumophila* strains that in 2014 caused a major outbreak of Legionnaires' disease in Portugal.

IS Pereira et al, ***The Type III Secretion Effector CteG Mediates Host Cell Lytic Exit of*** **Chlamydia trachomatis**, *Front Cell Infect Microbiol (2022);*

IP Monteiro et al., ***A search for novel*** **Legionella pneumophila** ***effector proteins reveals a strain specific nucleotropic effector,*** *Front Cell Infect Microbiol (2022);*

JN Bugalhão et al., ***The*** **Chlamydia trachomatis** ***inclusion membrane protein CT006 associates with lipid droplets in eukaryotic cells,*** *PLOS One (2018).*

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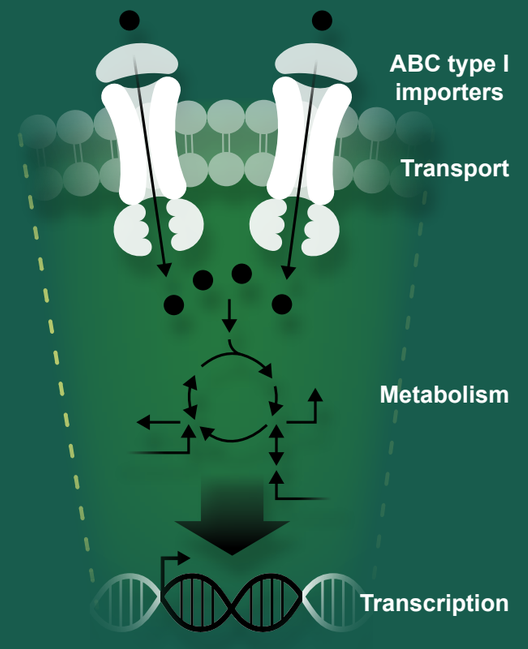
MMG | Microbial Genetics Lab



Isabel Sá-Nogueira

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Inês Gonçalves

Control gene expression of carbohydrate metabolism in bacteria. Analysis of the mechanisms through which the cell senses nutrient availability and transmits that information to the level of gene expression. The research also involves looking at the transcription and translation control, which govern the expression of genes involved in carbohydrate metabolism in the model organism *Bacillus subtilis*. Current subjects of interest include the use of *B. subtilis* as model for the study of multitask ATPases from ABC-type I sugar importers in pathogenic bacteria and the study of the antimicrobial activity of natural and new compounds/ materials.

KEYWORDS:
Molecular microbiology, Microbial genetics, Carbohydrate metabolism, Sugar transport, Antimicrobial activity

How transcriptional and translational gene regulatory networks interact with the metabolic system?

In bacterial ABC-type I importers although the EAA motif is canonically regarded as the contact point between the TMD and the NBD, we found that in the CUT-1 family the C-terminal tail of TMD2 is equally important in complex assembly and subsequent substrate transport.

SR Gavinho et al., ***Biocompatibility, Bioactivity, and Antibacterial Behaviour of Cerium-Containing Bioglass****, Nanomaterials (2022);*

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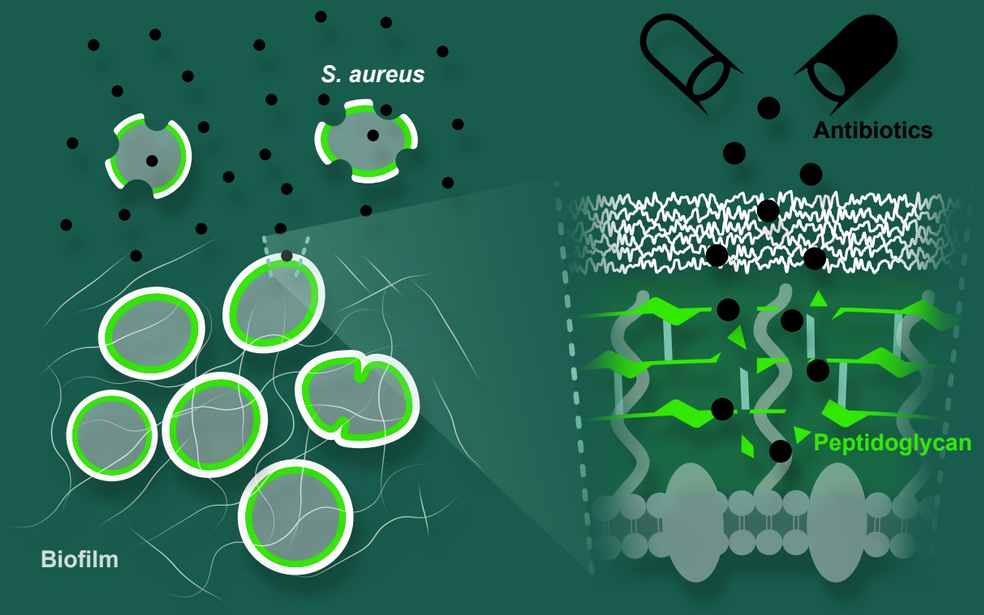
MMG | MolMicro of Bacterial Pathogens Lab



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Junior Researchers
Raquel Portela

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Bárbara Gonçalves
Gonçalo Cavaco

The number of antibiotics that remain efficient is alarmingly declining and new strategies are urgently needed to face this global crisis.
In our lab we study bacterial pathogens, namely Staphylococcus aureus, leading cause of hospital-acquired infections due to its ability to resist antibiotics. We use biochemical and genetic approaches to understand the molecular mechanisms of resistance and the mode of action of antimicrobial drugs. We are specifically interested in the bacterial cell wall, a complex and dynamic structure that provides a communication platform with the environment. Other interests focus on biofilm formation, host interactions and the search for new antimicrobial drugs.

KEYWORDS:
Antibiotic resistance, Bacterial cell wall, *Staphylococcus aureus*, Biofilms, Antimicrobial activity

Finding new strategies to fight human and plant pathogens

Pathogenic bacteria are a threat that is not limited to human health. In the search for new antimicrobial drugs, we have widened our studies and are analyzing the activity of cork extracts not only against human but also against plant pathogens that are a serious menace for crop health.
Another promising approach in the war against bacterial pathogens is the use of old antibiotics, such as β-lactams, against MRSA strains that are resistant in vitro, but become susceptible in host physiological conditions. We identified wall teichoic acids as key in such a differentiating behavior.
Also, using a cell wall mutant, we explored how genomic recombination drives antibiotic resistance.

SC Ersoy et al., ***Influence of Sodium Bicarbonate on Wall Teichoic Acid Synthesis and β-Lactam Sensitization in NaHCO3-Responsive and Nonresponsive Methicillin-Resistant* Staphylococcus aureus**, *Microbiol Spectrum (2022);*

RP Portela et al., ***Analysis of a Cell Wall Mutant Highlights Rho-Dependent Genome Amplification Events in* Staphylococcus aureus**, *Microbiol Spectrum (2022);*

C Pinheiro et al., ***Mediterranean woody agroecosystems in a warming and drier climate: the importance of knowledge-based management***, *Flora (2020).*

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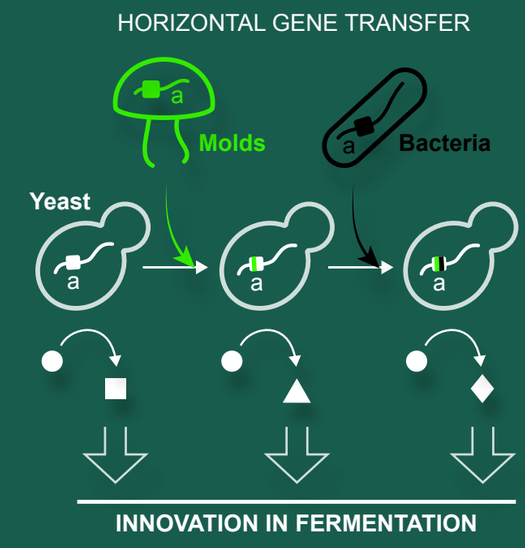
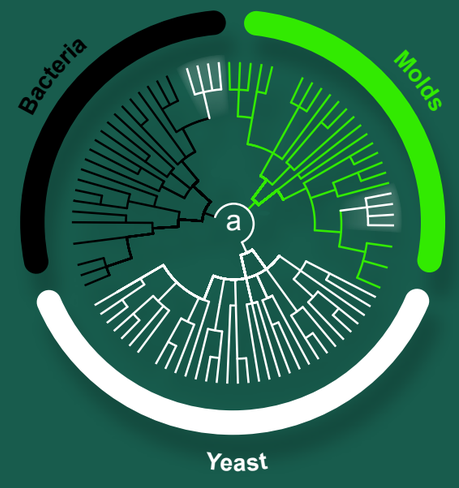
MMG | Yeast Genomics Lab





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Carla Gonçalves

PhD Students
Margarida Silva

We use yeasts to study basic and applied aspects of the evolution of genomes and of the emergence of key metabolic features. More specifically, we address questions related to the role of horizontal gene transfer in the evolution of metabolism, or to the distribution, ecology and phenotypes of wild and domesticated yeasts. To do so we combine the awesome power of whole-genome sequencing with in-depth physiological and ecological studies. Our work includes computational and experimental methods and integrates genomics, evolutionary genetics, ecology, microbial diversity and physiology. To learn more on what we do visit our lab website.

KEYWORDS:
Yeast, Evolution of metabolism, Horizontal gene transfer, Evolutionary ecology, Genomics

Harnessing the power of yeast genomics to understand yeast evolution and to foster innovation in fermentation

An important focus of our work was to boost a multi-omics approach to studying the evolution of metabolism in the Wickerhamiella *and* Starmerella *genera by incorporating RNAseq data into our analyses and by setting the stage to start improving our knowledge on the structure of key genomes using long read sequencing. A comprehensive study of the biotechnologically relevant yeast* Torulaspora delbruekii *put forward the first delimitation of populations and domestication signatures in this yeast.*

C Gonçalves et al, ***Contrasting strategies for sucrose utilization in a floral yeast clade****, mSphere (2022);*

P Gonçalves and C Gonçalves, ***Horizontal gene transfer in yeasts****, Curr Opin Genet Dev (2022);*

M Silva et al, ***A glimpse at an early stage of microbe domestication revealed in the variable genome of* Torulaspora delbrueckii*, an emergent industrial yeast,*** *Mol Ecology (2022);*

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TCB
Theoretical & Computational Biosciences

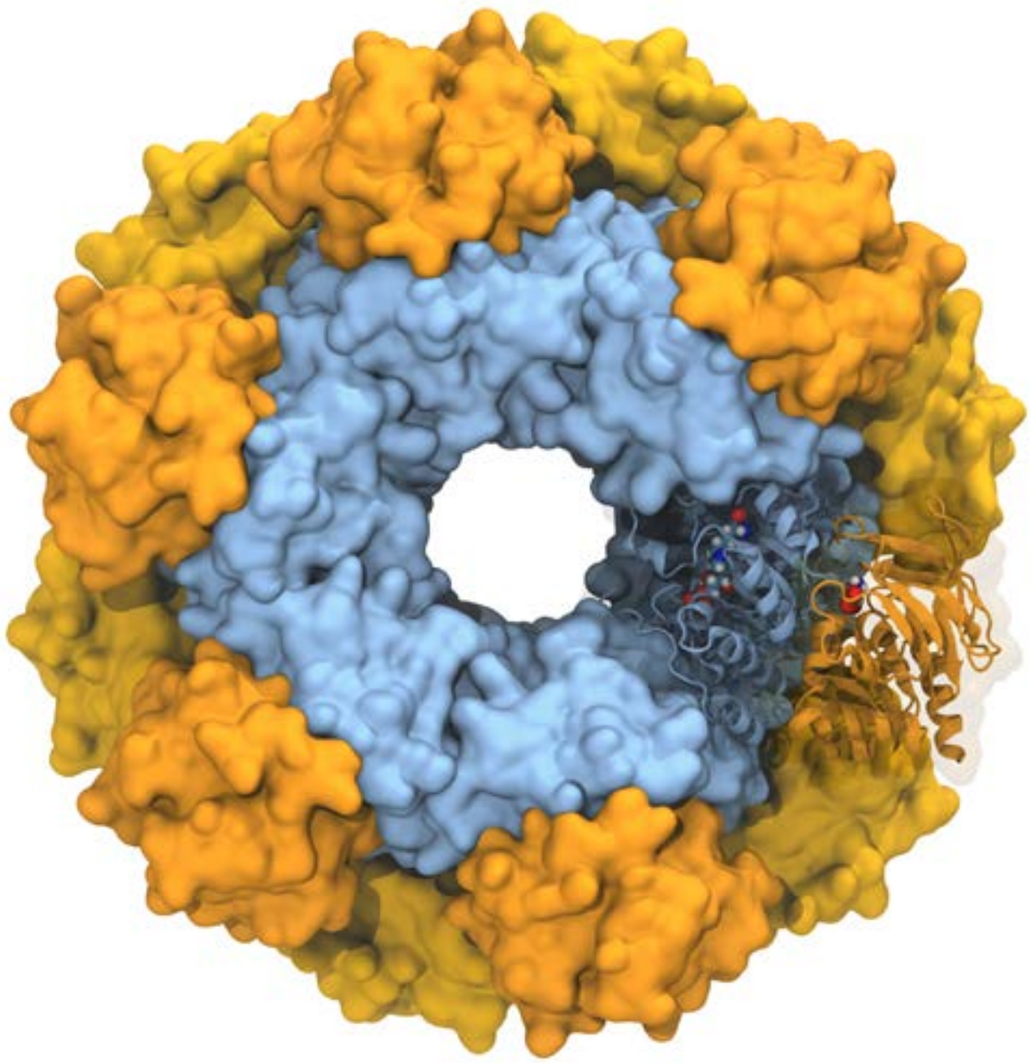
Ana Rita Grosso, Research Group Coordinator

The TCB Group develops research in computational sciences applied to human health. The group uses in silico approaches to decode multi-omics profiles and simulate biomolecular interactions, with the final goal of discovering new biomarkers and drugs.

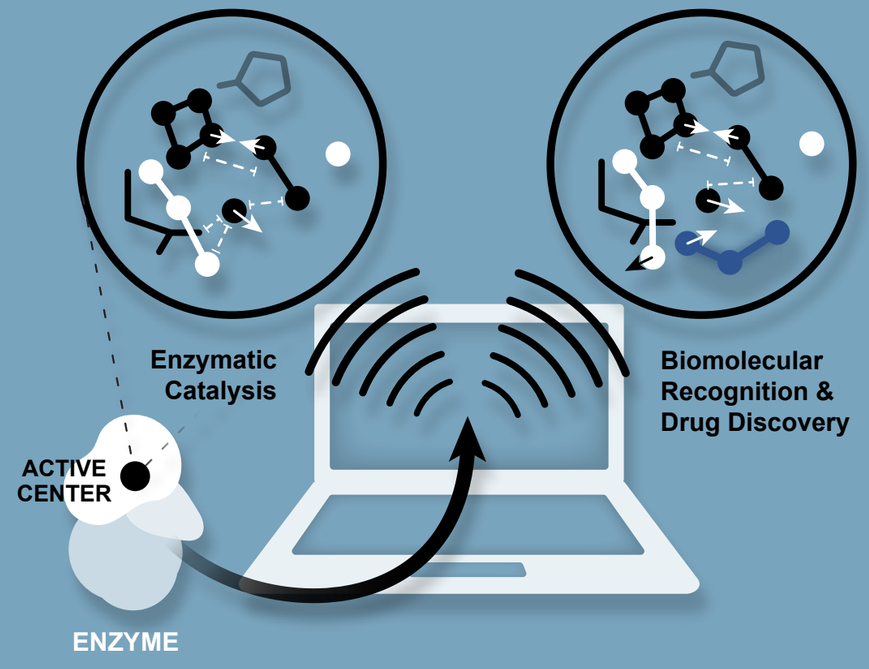
The BIOMOLECULAR SIMULATION LAB specializes in the development and application of computational methods for the study of enzymatic catalysis, drug discovery and molecular recognition problems. In particular, we aim to understand how enzymes catalyze their reactions and to use this knowledge to rationally develop new, more effective, and “greener” biocatalysts for the pharmaceutical, chemical and food industries. We are also involved in the development of computational drug development methodologies and have established strategic collaboration networks with several experimental research groups, bridging fundamental and applied research. We have been working in target-specific protocols for the identification of promising drug candidates for experimental testing and have been involved in the rationalization of experimental results, and in drug optimization. In addition, we currently maintain several open scientific databases of reference (www.biosim.pt).

The COMPUTATIONAL MULTI-OMICS LAB aims to unveil the complexity of cell biology and the mechanisms underlying diseases by deciphering big data. Hence, we combine genome-wide profiles of genome, epigenome, and transcriptome to unveil how molecular alterations can disrupt gene expression and cell homeostasis. Moreover, we use these approaches to explore the crosstalk between cancer cells and respective microenvironment to identify future prognostic biomarkers or therapeutic targets. This work has been developed within multidisciplinary networks, including hospitals, to foster precision medicine approaches into the biomedical research and healthcare. In parallel, we have contributed for the development of computational pipelines to assess transcription noise and intra-tumor heterogeneity (https://github.com/comicsfct).

In parallel, both labs are jointly creating High Performance Computing courses to provide advanced training to students and researchers.



TCB | Biomolecular Simulations Lab



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Rita Magalhães
Susana Fernandes
Tatiana Vieira
Vanda Peixoto

Our lab specializes in Biomolecular Simulations applied to Health and Bioeconomy. Research topics include Computational Enzymatic Catalysis, Computational Drug Discovery and the Study of Molecular Recognition in Biological Systems. For that we combine QM/MM Methods, Quantum Mechanics, Molecular Dynamics, Docking, Virtual Screening, and Free Energy Perturbation methods, always in close linking with experiment. Our lab is also involved in the development of software applications and scientific databases.

KEYWORDS:
Biocatalysis, Computational enzymology, Computer-aided drug discovery, Molecular dynamics, Virtual screening

Tailoring Computational Tools for Enzymatic Catalysis, Drug Discovery and Biomolecular Recognition

Threonine Aldolase (TA) is an enzyme capable of catalyzing the regioselective synthesis of β-hydroxy-α-amino acids (HAAs), important building blocks of several commercial drugs, including antibiotics and immunosuppressants. We have used computational methods to solve with atomic level detail the catalytic mechanism of this enzyme, providing a blueprint for the use of TA-based biocatalysts for the optimal synthesis of HAAs for the pharmaceutical industry.

We have developed and optimized an in silico protocol for the identification of specific DNA-based aptamers for the recognition of specific proteins. This method can be used for the development of biosensors or targeted drug delivery.

JF Rocha et al., ***Computational Studies Devoted to the Catalytic Mechanism of Threonine Aldolase, a Critical Enzyme in the Pharmaceutical Industry to Synthesize β-Hydroxy-α-amino Acids****, ACS Catal (2022);*

PJ Silva et al., ***An Alternative Proposal for the Reaction Mechanism of Light-Dependent Protochlorophyllide Oxidoreductase****, ACS Catal (2022);*

AC Pereira et al., ***Identification of novel aptamers targeting cathepsin B-overexpressing prostate cancer cells****, Mol Syst Design Eng (2022).*

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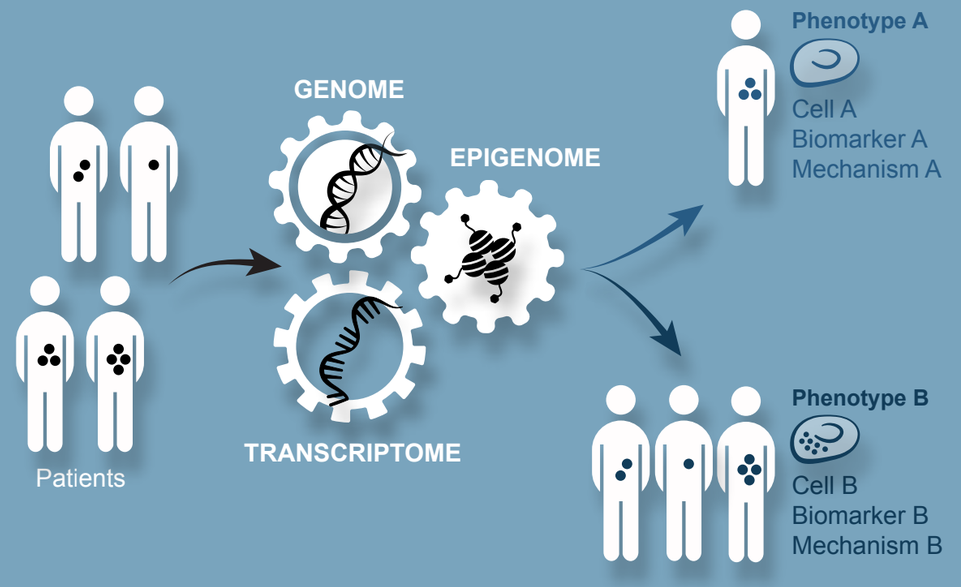
TCB | Computational Multi-Omics Lab



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Cátia Neves
Sílvia Carvalho

Our mission is to understand the (epi)genome biology and its impact on pathological conditions using computational multi-omics approaches. Such methods rely on the statistical analysis and integration of big data (high-throughput sequencing, microarrays, proteomics, high-throughput screening) and clinical/phenotypic data. The regulation of (epi)genome and transcriptome networks is a crucial component of a healthy cell, but it is relatively unknown the molecular mechanisms underlying its misregulation in diseases: from cancer to age-related disorders. We have been deciphering pathological conditions through multi-omics approaches, identifying molecular events to be further used as biomarkers and therapeutic targets.

KEYWORDS:
Multi-Omics approaches; disease heterogeneity

How tumor heterogeneity impacts tumor progression and metastasis development?

Through muti-omics profiling of a prospective cohort of 136 colorectal tumor biopsies we unveiled that mutational and chromosomal instability concertedly shape genetic and microenvironmental tumor heterogeneity (Sobral et al 2022, Communications Biology). Moreover, we demonstrated that tumor heterogeneity can be a prognostic marker of tumor relapse, where clonal diversity driven by large copy number alterations favors metastatic potential and multiple events of metastatic seeding. Overall, our findings unveiled that clonal diversity can influence microenvironment heterogeneity, differing across colorectal tumor subtypes and influencing tumor evolution and metastasis progression.

D Sobral et al., ***Genetic and microenvironmental intra-tumor heterogeneity impacts colorectal cancer evolution and metastatic development***, Commun Biol (2022);

D Sobral et al., ***Concerted Regulation of Glycosylation Factors Sustains Tissue Identity and Function***. Biomedicines (2022);

YT Ong et al., ***A YAP/TAZ-TEAD signalling module links endothelial nutrient acquisition to angiogenic growth***, Nat Metabol (2022).

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TOXI
Toxicology

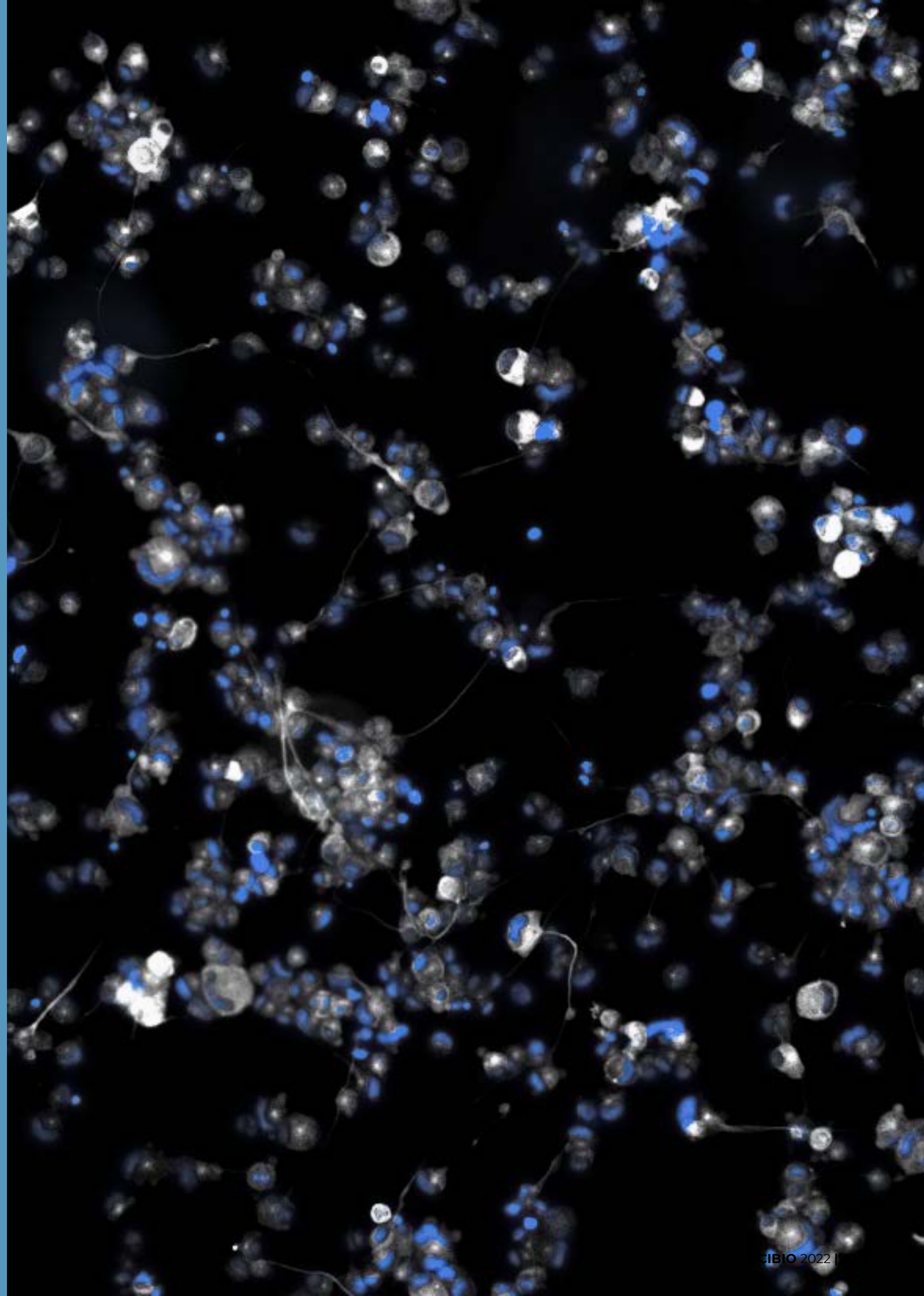
Félix Carvalho, Research Group Coordinator

The TOXI Group is developing research in toxicology applied to human disease, environment and marine biotechnology. The group consists of 3 complementary research laboratories (Toxicology, BioTox, and SeaTox Labs).

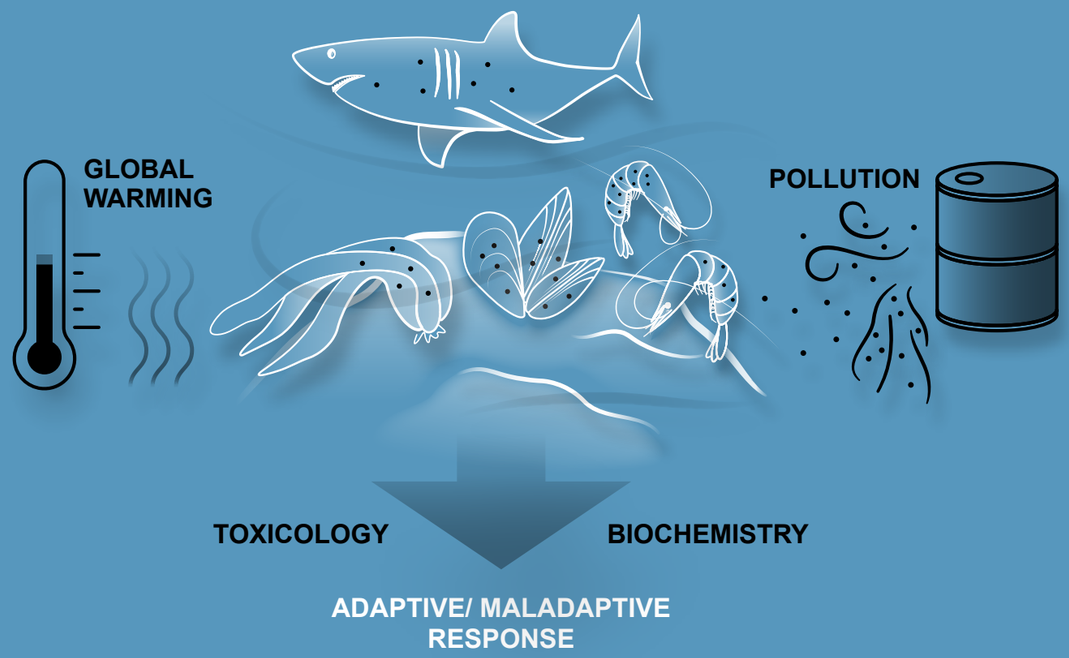
The Toxicology Lab aims at evaluating drug safety and the development of biomarkers. A broad range of methodologies are applied with a mindset towards the implementation of new advanced experimental systems and generation and interpretation of big data, in parallel to conventional toxicokinetic and toxicodinamic studies. The Adverse Outcome Pathways concept linking the biological cascade from the insult at the molecular initiating events to the adverse effects, has been enforced in practical strategies, and focused on translational outcomes.

The SeaTox Lab associates marine environment and human health. We merge Systems Toxicology, Stress Biology and Evolutionary Ecophysiology into pure and applied research related to resilience to ocean warming and other aspects of global change; monitoring carcinogens and emerging toxicants, plus the development of novel therapeutic agents from marine toxins and metabolites.

The Biotox Lab aims at developing studies on environmental toxicology (e.g. effects of nanomaterials, heavy metals, quantum dots and endocrine disruptors in organisms). We have also been studying the effects of climate change on marine biota. A recently implemented research line focuses on toxicology and food safety, namely seafood.



TOXI | BioTox Lab



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PhD Students
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Isa Gameiro
Sandra Copeto

The Biotox Lab is mainly focused on Environmental Biochemistry and Toxicology: organisms exposed to contaminants in aquatic environments (e.g. xenoestrogens, emerging compounds, metals and other elements). Environmental Proteomics. Biomarkers. Oxidative stress in organisms exposed to pollutants. Climate change effects on marine biota. Immunobiology; Nanotoxicology. Food Toxicology.

We use toxicity data to study the mechanisms and effects of contaminants and other environmental stressors on animals' physiology and cellular biochemical processes. Our main foci of research are: 1. Effects of xenoestrogens on organisms; 2. The use of biomarkers of response and effect (e.g. proteins, antioxidant enzymes); 3. Identification of proteins of interest, using proteomic methodologies, following exposure to environmental stressors; 4. Development of biosensors and immunoassays for food quality assessment.

KEYWORDS:
Environmental toxicology, Climate change, Oxidative stress, Food and health safety, Biomarkers

What are the effects of climate change combined with marine contamination on marine biota?

The Biotox Research Lab published several scientific articles in international journals, focused mostly on environmental toxicology and climate change. However, we also published works devoted to food sciences. We highlight the work where the toxicity of "Gadolinium is enhanced in a warmer and acidified changing ocean as shown by the surf clam Spisula solida *through a multibiomarker approach". In this study, the rare earth element (Gd) toxicity in* Spisula solida *was studied combined with temperature increase. Thus, it was shown that* Spisula solida *accumulated Gd after just one day; Climate change did not impact Gd accumulation and elimination; Gd was not proficiently eliminated in 7 days; Lipid peroxidation was greater in clams exposed to warming and Gd; Gd showed enhanced ecotoxicity in climate change conditions. Regarding research with seaweeds, several portuguese seaweed species were characterized chemical and biochemically. A Video was produced by the European Comission regarding ALGA4FOOD project, highlighting the uses of seaweeds in food.*

C Figueiredo et al., ***Gadolinium ecotoxicity is enhanced in a warmer and acidified changing ocean as shown by the surf clam* Spisula solida *through a multibiomarker approach****, Aquatic Toxicology (2022);*

BM Campos et al., **Proximate Composition, Physicochemical and Microbiological Characterization of Edible Seaweeds Available in the Portuguese Market***, Front Biosci (2022);*

I Ferreira et al., ***Assessment of deep eutectic solvents toxicity in zebrafish (Danio rerio)****, Chemosphere (2022)*

Find More

TOXI | SeaTox Lab

Pedro M. Costa

Junior Researchers
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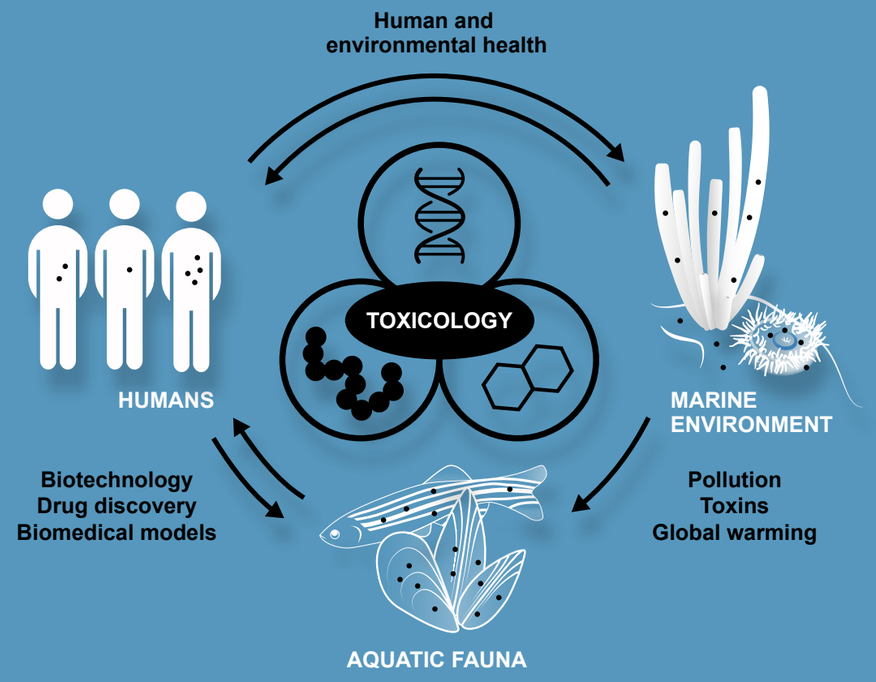
Our motto is to explore marine life as a resource to uphold sustainability and improve life quality of human populations. We combine Toxicology and Molecular Biology in 3 main areas:
1) drug discovery from novel marine bioactives, mainly animal toxins;
2) link aquatic and human health under the 'One Health Perspective', with focus on mutagenic and carcinogenic pollutants;
3) investigate how marine life adapts to global warming to promote bioconservation of marine resources.
We employ biological models spanning from marine animals to zebrafish and murines and specialize in stress biology, toxicopathology (highlighting genotoxicology and histopathology), 'omics' and bioinformatics.

KEYWORDS:
Toxicology; Marine Biotechnology; Venoms; Ocean Warming; Marine Environment



Can we turn the extraordinary biodiversity of our seas into a sustainable biotechnological asset?

One of our major breakthroughs in 2022 was the development of a pipeline to find target receptors of marine invertebrate toxins in the human druggable proteome. This challenging and frontier omics-based approach enables refining drug discovery for specific purposes, thus systematising the search for new bioactives from the immense biodiversity of marine organisms.

Two of our most promising young researchers, Cátia Gonçalves and Inês Moutinho Cabral (Ph.D. student and research fellow, respectively), created and co-chaired a session on Marine Biotechnology in the ICYMARE (International conference of for YOUNG Marine Researchers) meeting (Bremerhaven, Germany, September 2022). The event also counted with Ana P. Rodrigo as invited speaker.

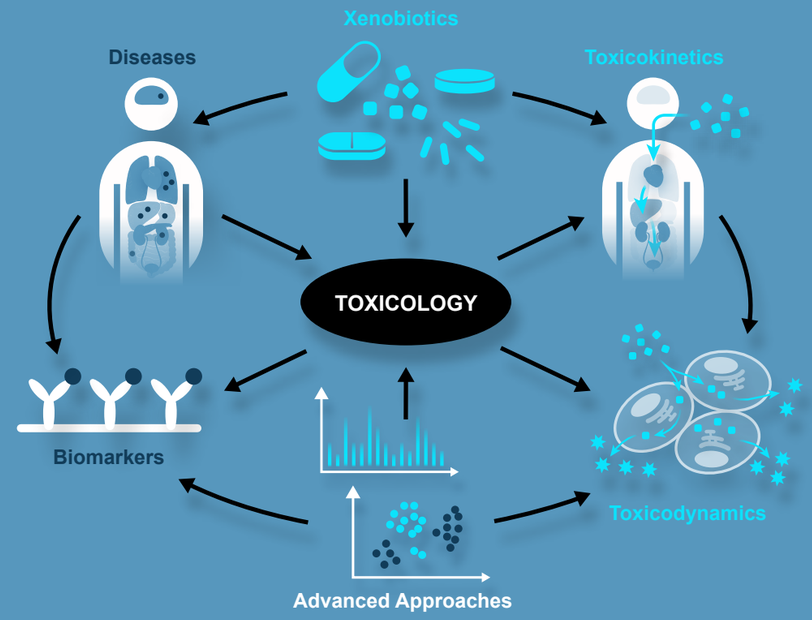
I Moutinho-Cabral et al., ***A drug discovery approach based on comparative transcriptomics between two toxin-secreting marine annelids:*** **Glycera alba** ***and*** **Hediste diversicolor,** *Molecular Omics (2022);*

AP Rodrigo et al., ***Endogenous fluorescent proteins in the mucus of an intertidal Polychaeta: Clues for biotechnology****, Marine Drugs (2022);*

PM Costa, ***Current aspects of DNA damage and repair in ecotoxicology: A mini-review****, Ecotoxicology (2022)*

Find More

TOXI | Toxicology Lab



TOXICOLOGICAL ASSESSMENT OF CHEMICALS TOWARDS A SAFER WORLD

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Lurdes Bastos

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Carolina Amorim
Cristina Ferrás
Diana Silva
Fernando Remião
Helena Carmo
Joana Pinto
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Eva Martins
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Rui Malheiro
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Vera Silva

Technicians
Cátia Faria
Ana M. Silva

The TOXICOLOGY group dwells in the safety assessment of chemicals, comprising toxicodynamic and toxicokinetic studies, and the development of biomarkers of exposure, effect and susceptibility. Examples of xenobiotics extensively studied within this group are pharmaceuticals, drugs of abuse, nanomaterials, and drug mixtures. For this purpose, we use a broad range of *in vitro*, and *in vivo* methods, with a mindset towards the implementation of new advanced methodologies (NAMs), and generation and interpretation of big data (OMICs), in parallel to conventional methods. The Adverse Outcome Pathways (AOPs) concept linking the biological cascade from the insult at the molecular initiating events (MIEs) to the adverse effects, has been enforced in practical strategies, and focused on translational outcomes.

KEYWORDS:
Toxicology, Kinetics, Biomarkers, Adverse outcome pathways, Molecular initiating events

Metabolomics in cancer research

1. Mood and cognitive adverse events (MCAEs) are often only detected during the later clinical trial phases (e.g., Phase III) of drug R&D or pharmacovigilance, posing serious safety concerns for patients and a challenge for pharmaceutical companies and clinicians. Within the NeuroDeRisk consortium, our lab has contributed to unraveling the molecular mechanisms underlying the onset of MCAEs. The identified putative candidate pathways and pathway elements involved in drug-induced MCAEs can be used thereafter to improve in silico/in vitro/in vivo tools able to predict MCAEs at a preclinical stage of drug R&D.
2. Mental health and cognitive deficits after cancer treatment is a major shortcoming for the full integration of cancer survivors. Our Lab has been working to unveil early biomarkers of neurotoxicity that triage susceptible patients and has described the different animal brain areas that are involved in doxorubicin neurotoxicity, with oxidative stress, inflammation, and apoptosis being triggered differently in the pre-frontal cortex or hippocampal formation areas. This data makes way for preventive or treatment perspectives, towards a more effective protective strategy against doxorubicin-induced "chemobrain". Moreover, our Lab is also involved in resilience strategies that mitigate or revert doxorubicin-induced neurotoxic damage. Our Lab integrates the National Cancer Hub and Expert Working Groups in the areas of paediatric cancer, cancer and ageing and survivorship of the 4.UNCAN.eu initiative to bring our research closer to decision-making regulators, and increase awareness of the daily struggle of cancer survivors to resume their active life.

A Dias-Carvalho et al., ***Chemobrain: mitoxantrone-induced oxidative stress, apoptotic and autophagic neuronal death in adult CD-1 mice***, Arch Toxicol (2022);

A Dias-Carvalho et al., ***Four decades of chemotherapy-induced cognitive dysfunction: comprehensive review of clinical, animal and in vitro studies, and insights of key initiating eventse,*** Arch Toxicol (2022);

J Garcia et al., ***Antidotal effect of cyclosporine A against α-amanitin toxicity in CD-1 mice, at clinical relevant doses***, Food Chem Toxicol (2022)

Find More

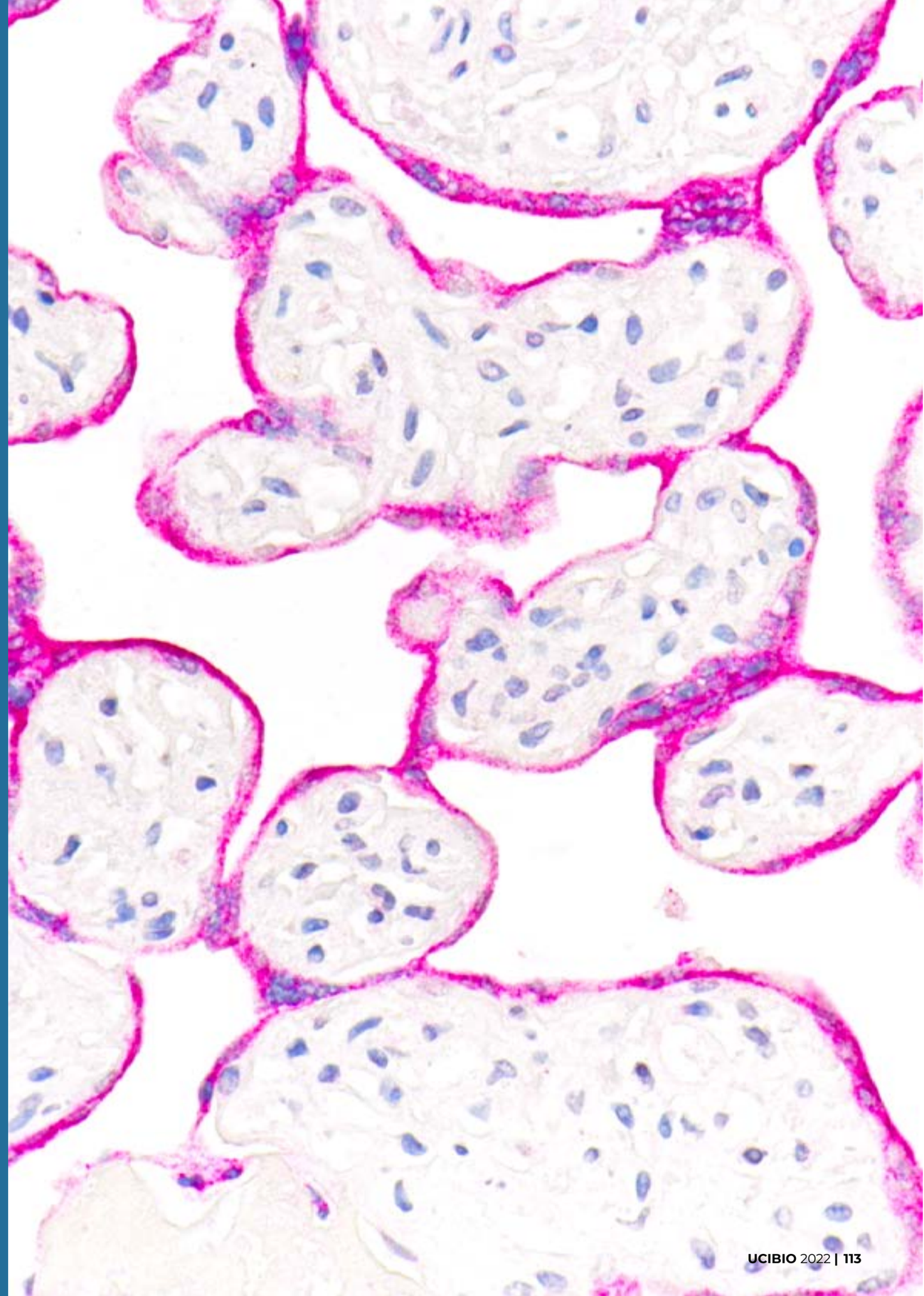
DPB
Disease Pathways & Biomarkers

Natércia Teixeira, Research Group Coordinator

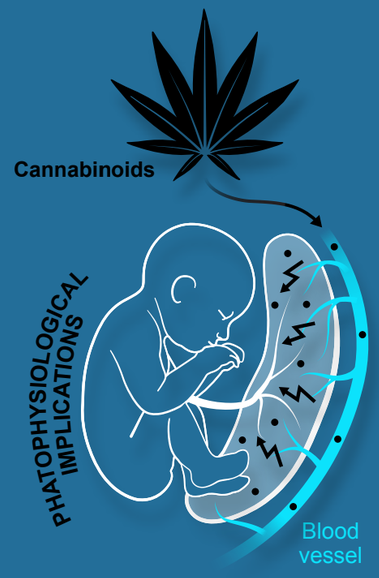
The DPB group is deeply committed to the elucidation of the underlying causes and mechanisms of health, aging and disease, as well as to the identification of biomarkers and discovery of new therapeutic targets/drugs.

In this context:
Molecular Mechanisms of Disease lab explores how endogenous mechanisms of defense protect cells against damage, in particular in the Central Nervous System against ischemic stroke. Two strategies are followed: (1) The use of carbon monoxide to prevent neuroinflammation and neuronal and glial cell death, to improve cell metabolism and maintain homeostasis. (2) In the second strategy we study the underlying mechanisms of remote ischemic conditioning, which is the ischemic conditioning (or hormesis) of non-vital organs (such as arms) that provide protection in another organ, such as brain against ischemic stroke. Still, identification of stroke biomarkers for stroke differential diagnosis is also a subject of research.
Drug Target and Biomarkers Lab explores the: i) importance of cannabinoid signaling and impact of exogenous cannabinoids in reproduction/infertility; ii) new targets/drugs to improve ER+ breast cancer therapy; iii) identification of biomarkers of initial renal damage, progression and mortality prediction; iv) role of antioxidant enzymes in the biology of non-immune hemolytic anemia, modulation of erythropoiesis and as potential therapeutic targets; v) immunological mechanisms underlying Toxoplasma gondii infection during pregnancy and new therapies and vaccines to prevent parasite infection and pathology; vi) educational programs and interventions for the elderly and health professionals to improve therapy adherence and prevent/mitigate frailty, and tools to evaluate implementation of technological solutions.

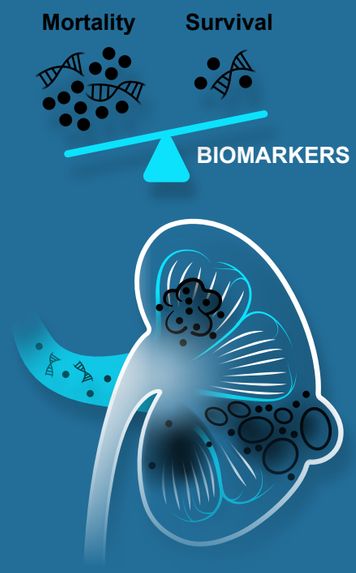
The Mitochondria and Neurobiology Lab investigates the pathophysiology and experimental treatment of neurodegenerative and mitochondrial disorders. We aim to identify mechanisms of selective neuronal vulnerability, and to validate the targets and mechanisms of action of small-molecule modulators of mitochondria, epigenetics and proteostasis. Our strategies include primarily cellular and in vivo models of Huntington's and Parkinson's diseases and a combination of behavioural, functional imaging, and molecular biology approaches to conduct pathophysiological and pharmacological studies.



DPB | Drug Targets & Biomarkers Lab



UTERINE AND PREGNANCY DISORDERS



CHRONIC KIDNEY DISEASE

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João Maia
Lia Costa
Luís Midão
Patrícia Alves
Thaise Martins
Tiago Augusto

In the Drug Target and Biomarkers Lab, we carry out applied and fundamental research in areas such as Clinical Biochemistry, Haematology, Immunology and Molecular and Cell Biology. We have been focusing on the study of the pathophysiological mechanisms underlying aging, pregnancy/fertility, chronic kidney disease, ER-dependent breast cancer, hereditary anaemias and Toxoplasma gondii infections. Human samples, *in vitro* and *in vivo* models are used to identify biomarkers of diagnostic/ prognostic value, new targets and/or new therapeutic strategies. The haematotoxicity of natural compounds and the effects of different compounds on placental development have also been under investigation.

KEYWORDS:
Chronic kidney disease biomarkers, Fertility/pregnancy, Breast cancer therapy, Aging

Biomarkers for diagnosis and staging chronic kidney disease

Inflammation is a common feature in the pathogenesis of chronic kidney disease (CKD). We are focused on the study of potential inflammatory biomarkers in CKD for early diagnosis and staging of the disease. We studied the association of several biomarkers of kidney function and kidney injury, namely, C-reactive protein (CRP), interleukin-6 (IL-6), tumor necrosis factor-alpha (TNF-α), tumor necrosis factor receptor 2 (TNFR2), pentraxin 3 (PTX3) and leptin. All inflammatory molecules, apart from PTX3, were negatively and significantly correlated with renal function as evaluated by estimated glomerular filtration rate (eGFR); TNFR2 showed a high potential for an early detection of CKD, as well as for disease staging/worsening.

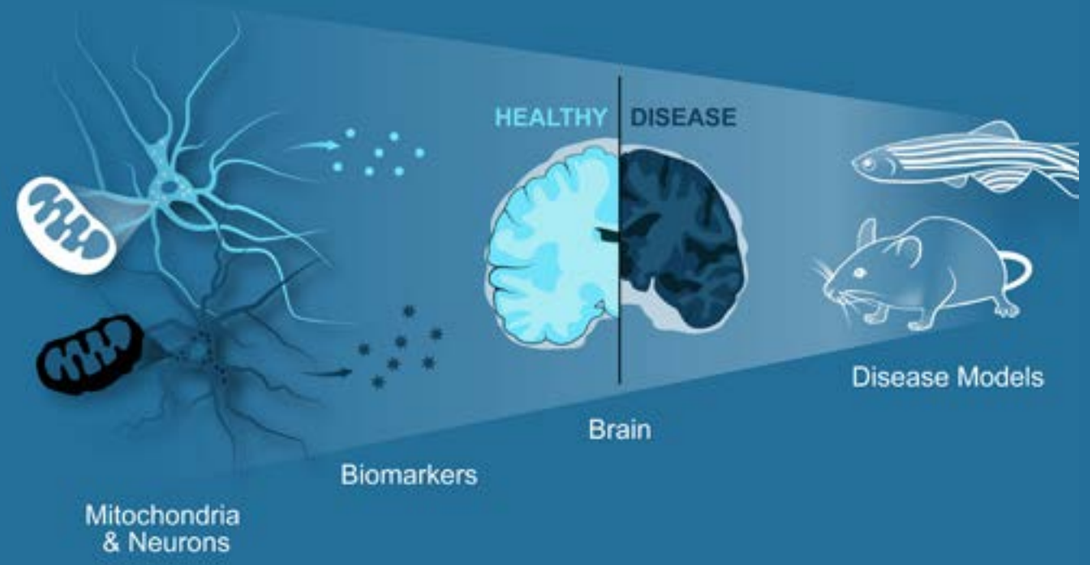
I Lousa et al., ***Inflammatory biomarkers in staging of chronic kidney disease: elevated TNFR2 levels accompanies renal function decline***, *Inflammation Res (2022);*

K Eirini et al., ***Pharmacological and Non-Pharmacological Agents versus Bovine Colostrum Supplementation for the Management of Bone Health Using an Osteoporosis-Induced Rat Model Nutrients***, *Nutrients (2022);*

S Coimbra et al., ***New insights into adiponectin and leptin roles in chronic kidney disease***, *Biomedicines (2022)*

Find More

DPB | Mitochondria and Neurobiology Lab



Jorge Oliveira

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Brígida Pinho

PhD Students
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Liliana Almeida
Giogia Babini

The Mitochondria and Neurobiology Lab investigates the pathophysiology and experimental treatment of mitochondrial and neurodegenerative disorders -Huntington's disease, Parkinson's disease and Amyotrophic Lateral Sclerosis. We aim to identify mechanisms of selective neuronal vulnerability, understand the role of mitochondria in cell homeostasis, and validate targets and mechanisms of action of small-molecule modulators of mitochondria, epigenetics and proteostasis. We use cellular and *in vivo* (mouse and zebrafish) models, and functional imaging by live fluorescence videomicroscopy, molecular biology techniques and behavioural assays to address our questions.

KEYWORDS:
Mitochondria, Neurobiology, Neurodegeneration, Huntington's disease, Proteostasis

Study of circadian rhythms and sleep in vivo to assess neuroactivity of drugs and pollutants

The ability to continuously monitor the effect of drugs, pollutants, or environmental changes on circadian rhythm and behaviour in model organisms over several days has high practical application. We developed a free and open source software (Rtivity) and validated the use of infrared-based activity monitors to study behaviour of the small vertebrate zebrafish - a leading model organism - over several days. Using this method, we characterized circadian and sleep disruptions, as well as, alterations to response to external stimuli of zebrafish larvae exposed to the neurotoxin MPP+. The procedures in this study have wide applicability and may yield standard methods for toxicity testing.

The study of animal behaviour is a sensitive and robust indicator of its health status. The Rtivity package together with infrared-based monitors can greatly enhance the efficiency on animal behaviour analysis, with practical application in the study of diseases and drugs in small model organisms, such as zebrafish and drosophila.

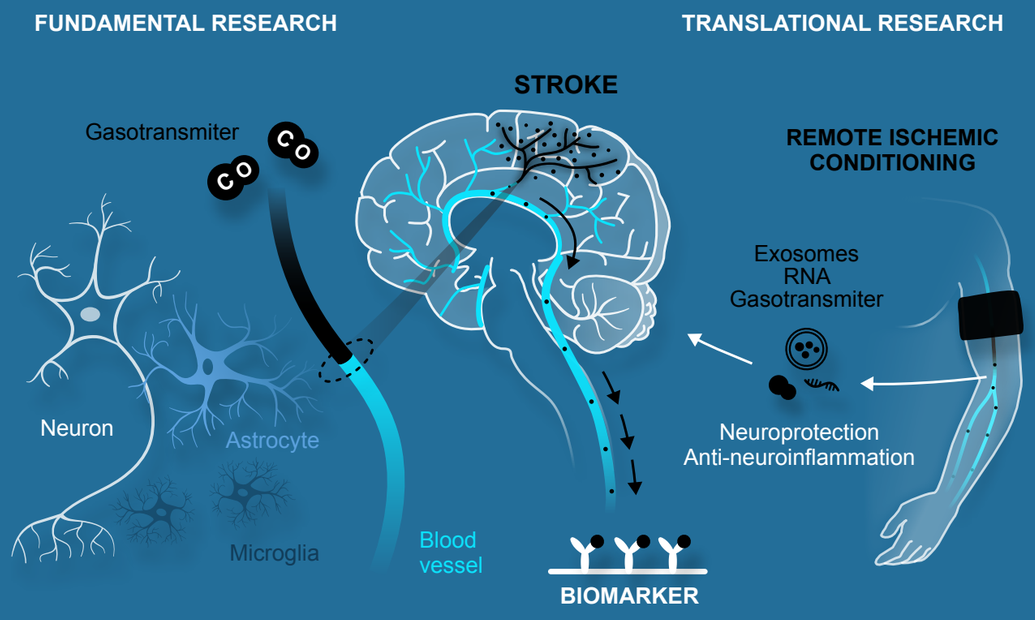
LM Almeida et al., ***The PERKs of mitochondria protection during stress: insights for PERK modulation in neurodegenerative and metabolic diseases****, Biological Reviews (2022);*

RFO Silva et al., ***Disruptions of circadian rhythms, sleep, and stress responses in zebrafish: new infrared-based activity monitoring assays for toxicity assessment****, Chemosphere (2022);*

BR Pinho et al., ***Allosteric activation of Hsp70 reduces mutant huntingtin levels, the clustering of N-terminal fragments, and their nuclear accumulation****, Life Sciences (2021)*

Find More

DPB | Molecular Mechanisms of Disease Lab



Helena L.A. Vieira

Senior Researchers
Inês Mollet

Our broader scientific question tackles the mechanisms underlying ischemia-reperfusion events in brain cells, namely in stroke. Two different arms of research have been developed:
(i) studying the cytoprotective role of carbon monoxide – in functions such as anti-neuroinflammatory, anti-apoptotic and cell metabolism modulation in astrocytes and microglia
(ii) studying the mechanisms underlying remote ischemic conditioning, in particular targeting circulating immune cells.

KEYWORDS:
Carbon monoxide; Mitochondria; Neuronflammation; Stroke; Remote-ischemic conditioning

How remote ischemic conditioning can protect brain against ischemia? Carbon monoxide modulation of glial cell function

The main scientific findings of 2022 concerns how CO modulates mitochondrial quality control and as a consequence is cytoprotective in astrocytes. Still, the anti-neuroinflammatory and neurotrophic role of carbon monoxide in microglia cells, which also plays with microglia-neuron communication.

Concerning remote ischemic conditioning, the signalling mechanisms related to circulating immune cells were described using human samples derived from healthy volunteers.

D Dias-Pedroso et al., ***Carbon monoxide-Neuroglobin axis targeting metabolism against inflammation in BV-2 microglial cells****, Mol Neurobiol (2022);*

C Figueiredo-Pereira et al., ***Carbon monoxide stimulates both mitophagy and mitochondrial biogenesis to mediate protection against oxidative stress in astrocytes****, Mol Neurobiol (2022);*

I. Mollet et al., ***Pilot study in human healthy volunteers on the mechanisms underlying remote ischemic conditioning (RIC) – targeting circulating immune cells and immune-related proteins****, J Neuroimmunology (2022).*

Find More

MedTech
Medicine & Healthcare Products

José Manuel Sousa Lobo, Research Group Coordinator

The main research objectives of MEDTECH are to develop new formulations for drug delivery. Two group members have a close relationship with pharmaceutical or cosmetic companies. MedTech joined UCIBIO in 2017 and its main interests are:

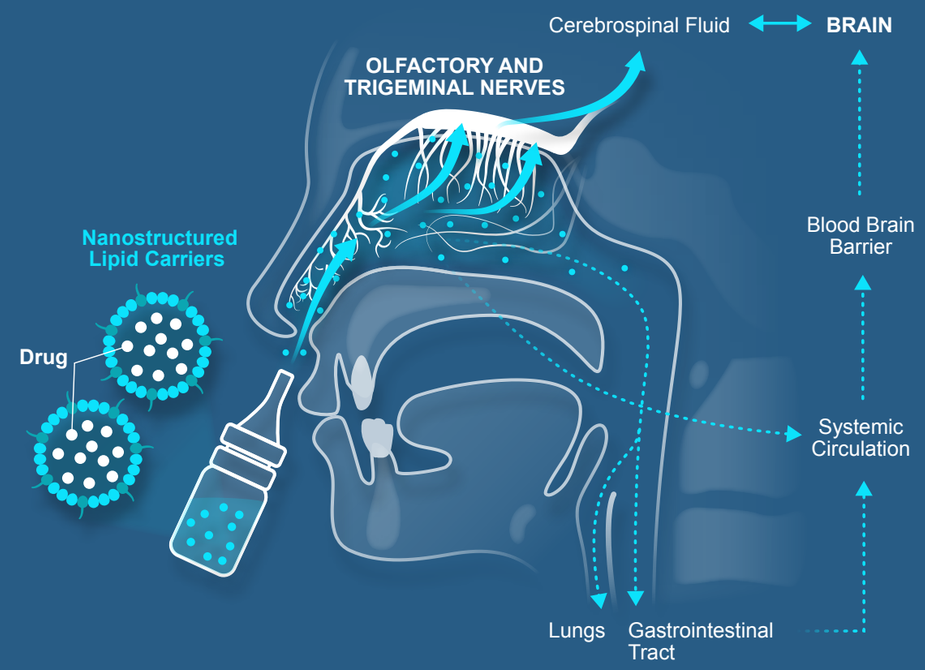
1 - Nanotechnology and is application in neurodegenerative disorders;
2 - Formulation and patient adherence; and
3 - New drugs and excipients form natural sources.

MEDTECH has focused on developing bold strategies to improve bioavailability and efficacy of drugs, mainly focusing on topic formulations for ophthalmic and dermic pathologies. Based on our experience in solid lipid nanoparticles for oral use, we started studying cutaneous and nasal administration, namely innovative nasal applications for treatment of neurodegenerative disorders. Also, we have been developing new ways to improve bioavailability of poor watersoluble drugs using cyclodextrins derivatives.

Our studies on cosmetics focus on design and safety concerns, namely by using plant extracts in the preparation of surfactant-free formulations and evaluating the photostability of UV filters. We have been pioneers in the application of geomaterials in dermocosmetics (creams, gels, pastes and soaps), using beach sands from Porto Santo, pumice and peloids from volcanic regions from Azores.

The research team includes most of the researchers of the Pharmaceutical Technology Lab from the Faculty of Pharmacy of Porto, and some researchers from University Fernando Pessoa and from CESPU (including a psychologist).

Med Tech | Pharmaceutical Technology Lab



Domingos Ferreira

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José Paulo Silva
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Liliana Rego
Márcia Martins
Maria Inês Teixeira
Marilene Estanqueiro
Marta Ferreira
Raquel Ana
Sandra Mota
Sara Cunha

The three main research areas are:
1. Pharmaceutical Technology
2. Modified Drug Delivery
3. Cosmetics: design, safety and efficacy

KEYWORDS:
Nanotechnology, Functionalization, Neurodegenerative diseases, Cancer, Sustainability

Our main concern is the patient, either trying to overcome the blood brain barrier in order to deliver active molecules for neurological disorders, cancer or to create, in real transdisciplinar studies, cutaneous formulations that are very well accepted by the patients.

Functionalized nanoparticles were prepared and optimized to facilitate riluzole uptake into the brain for Amyotrophic lateral sclerosis therapy, a fatal neurodegenerative disease.

The circular economy is an essential point of the sustainable development that supports the efficient use of resources, waste minimisation and long-term value retention, having a direct impact on the protection of the environmental and natural resources. Skin effects and safety of Passion fruits seeds oil, kiwiberry leaves extract, and other natural products were studied with the aim of developing cosmetic products with anti-wrinkle and depigmenting action.

MI Teixeira et al., ***Formulation, Characterization, and Cytotoxicity Evaluation of Lactoferrin Functionalized Lipid Nanoparticles for Riluzole Delivery to the Brain,*** *Pharmaceutics (2022);*

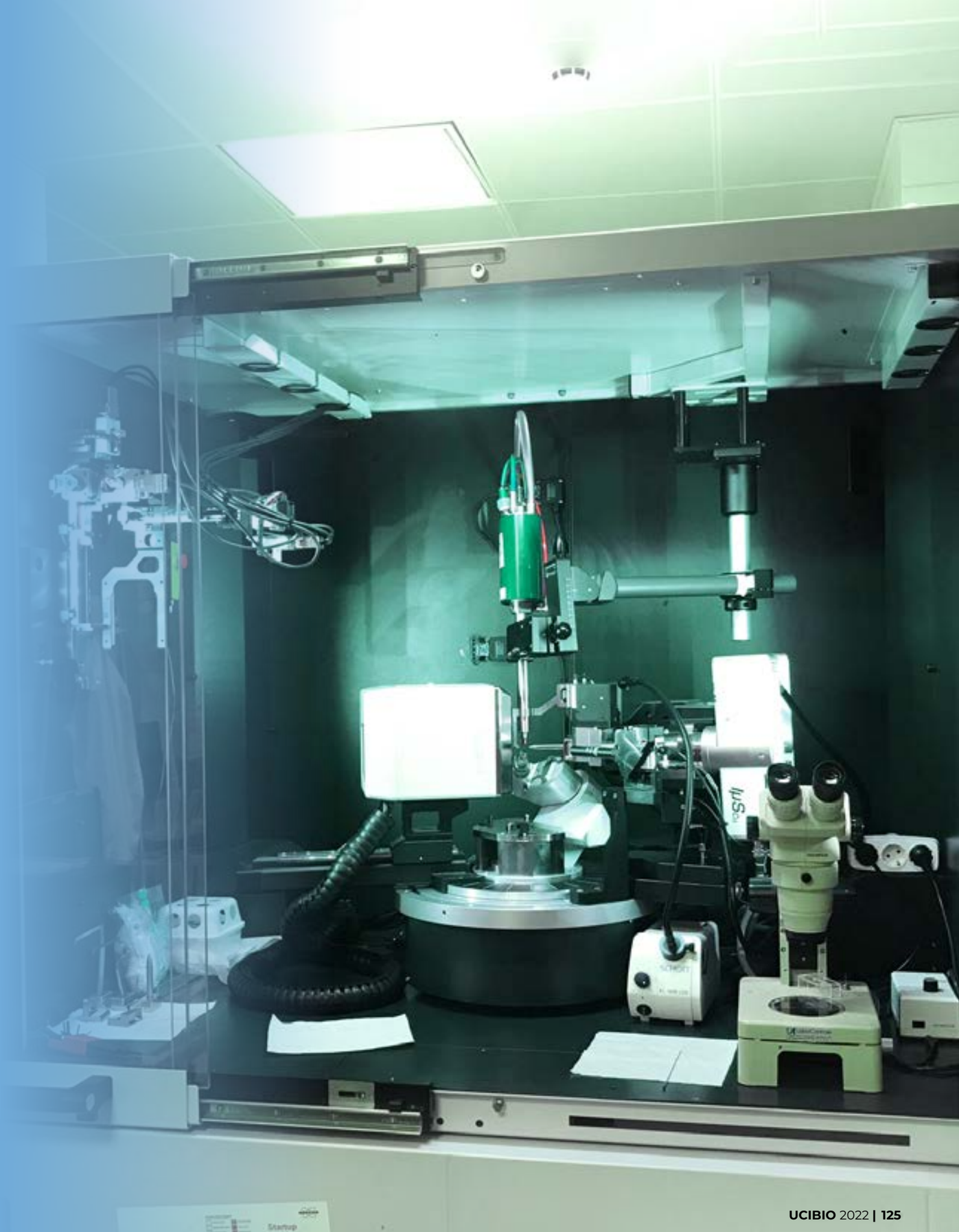
AM Silva et al., ***Eco-friendly insights on kiwiberry leaves valorization through in-vitro and in-vivo studies***, *Ind Crops and Products (2022);*

K Krambeck et al., ***Benefits of skin application of Piceatannol — A minireview***, *Australas J Dermatol (2022).*

Find More

8. Facilities & Infrastructures

Biological and Chemical Analysis Facility
Single-Crystal X-Ray Diffraction
Nuclear Magnetic Resonance
Pilot Installation
Portuguese Yeast Culture Collection
Culture Collection of Porto



Biological & Chemical Analysis Facility

RESPONSIBLES

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Associate Professor, FCT NOVA

STAFF

Elisabete Ferreira (Lab Technician)

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The BioLab is a Biological and Chemical Analysis Facility at FCT-NOVA. This facility is devoted to the comprehension of cellular and molecular mechanisms, from the *in vitro* characterization of molecular interactions to the *in vivo* validation in model animals.
The BioLab facility gathers in a single unit a unique set of state-of-the-art biophysical and biological technologies.

Available Technologies:

- **Circular Dichroism**
- **Multi Parametric Surface Plasmon Resonance**
- **Differential Scanning Calorimetry**
- **MicroScale Thermophoresis**
- **Flow Cytometry**
- **Confocal Laser Scanning Microscopy**

ANIMAL EXPERIMENTATION LABORATORY

The BioLab Animal Experimentation Laboratory will have two clean separate specialized rooms and equipment with closely-controlled environment and a separate room for unclean activities to reduce the potential for cross-contamination.

EQUIPMENT

- Applied Photophysics ChirascanTM qCD
- BionavisTM SPR Navi 200
- TATM Nano DSC
- Nano Temper TechnologiesTM Monolith NT.115
- AttuneTM Acoustic Focusing Cytometer
- Confocal Laser Scanning Microscope LSM710 Zeiss

Single-Crystal X-Ray Diffraction

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Habilitation in Biochemistry, 2001, FCT NOVA
Full Professor, FCT NOVA

Ana Luísa Carvalho
PhD in Biochemistry - Structural Biology, 2002, FCT NOVA
UCIBIO Senior Researcher, FCT NOVA

STAFF

Teresa Santos-Silva (Assistant Professor)
Cristiano Mota (Senior Researcher)

FUNDING

Fundação para a Ciência e Tecnologia
RECI/BBB-BEP/0124/2012
COST
BioStruct/iNEXT

WEBSITE

The X-Ray Diffraction facility provides the screening, testing and complete data collection from X-ray diffraction of single crystals, either from protein or small molecules. Data is obtained in the in-house X-ray diffractometer or through access to synchrotron macromolecular crystallography beamlines (ESRF, DIAMOND, SLS, SOLEIL, DESY, ALBA). Diffraction is performed using an X-ray diffractometer (with KAPPA four-circle goniometer), and complete data are collected according to experimental requirements. Dedicated software permits indexing, integration, scaling of data and 3D structure solution. Small-Angle X-ray Scattering (SAXS) experiments can be performed through access to synchrotron facilities.

EQUIPMENT

- X-ray diffractometer with KAPPA four-circle goniometer (Bruker D8 Venture)
- IμS 3.0 microfocus Mo-Kα and Cu-Kα X-ray sources (Bruker)
- Photon II CPAD detector
- Cryostream 600 (Oxford CryoSystems)
- ISX Stage for in-situ X-ray crystallography
- Xe chamber for crystal derivatization (Hampton Research)
- Automated nanodrop equipment for protein crystallization (Oryx8, Douglas Instruments)
- Cryo-preservation, storage and shipment of biological crystals

Nuclear Magnetic Resonance

RESPONSIBLES
UCIBIO-FCT NOVA

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FCT NOVA
Coordinator of the Portuguese Nuclear Magnetic Resonance Network (PTNMR)

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Ana Teresa Lopes (Lab Technician)

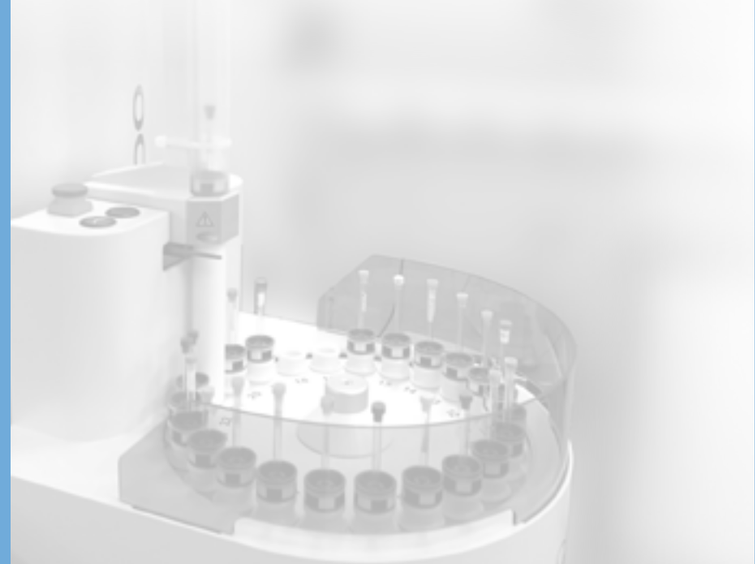
FUNDING
Rede Nacional de RMN (PTNMR), supported by Fundação para a Ciência e a Tecnologia (ROTEIRO/0031/2013 - PINFRA/22161/2016) (co-financed by FEDER through COMPETE 2020, POCI, and PORL and FCT through PIDDAC).

WEBSITE

The NMR Facility at UCIBIO (FCT NOVA and UPORTO) is integrated in the Portuguese Nuclear Magnetic Resonance Network (PTNMR). PTNMR is a distributed National Research Infrastructure that integrates the Portuguese Roadmap of Research Infrastructures. PTNMR provides coordinated access to a national platform of equipment, resources, services and skills in NMR for participating institutions and the scientific community, from both national and international R&D industry and academia. The main goal is the maintenance of a single platform that supports the technical integration, sharing of resources and a combined management of the national NMR infrastructure, enabling access to modern and fully operational NMR spectrometers and support of R&D initiatives.

The NMR facility of UCIBIO-FCT NOVA, hosted in the Chemistry Department, pioneered in Portugal in the use of NMR for the determination of protein structures. Currently, we still support many research projects focused on the determination of protein structure and dynamics but most of the research being conducted is related to the study of molecular interactions and molecular recognition in a wide range of chemical and biochemical systems. The facility is also strongly committed to providing NMR routine services to support in-house synthesis and chemical (bio) engineering research groups.

The NMR facility of UCIBIO-UPORTO is part of the Structural Analysis Laboratory of the University of Porto Materials Center (CEMUP). The three spectrometers available provide NMR routine services to support in-house researchers, graduate and post-graduate students as well as external users.



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Habilitation in Biomedical Sciences, 2011, UPorto
Full Professor, ICBAS UPorto

STAFF
Mariana Andrade (Lab Technician)

FUNDING
Fundação para a Ciência e Tecnologia

WEBSITE

UCIBIO - FCT NOVA

Equipment 1

MAGNET: Bruker Avance II+ 600 14.1 T, narrow bore 1H frequency: 600 MHz

CONSOLE: 4-channel digital AQS/2 Bruker Avance II+ Gradient: GREAT Z-Gradient Temperature controlled BCU-05

NMR PROBES: Cryoprobe TCI (1H, 13C, 15N); 5 mm QNP (1H, 19F, 13C, 31P)

Equipment 2

MAGNET: Bruker Avance II+ 400 9.4 T, narrow bore 1H frequency: 400 MHz

CONSOLE: 3-channel digital AQS/2 Bruker Avance II+ Gradient: GREAT Z-Gradient HR-MAS control unit Temperature controlled BCU-xtreme

NMR PROBES: 5 mm TXI (1H, 13C, 15N); 4 mm HR-MAS (1H, 13C, 15N)

Equipment 3

MAGNET: Bruker AvanceIII 400 9.4 T, narrow bore 1H frequency: 400 MHz

CONSOLE: Nanobay, 2-channel digital Automatic sampler NMR case

NMR PROBES: 5 mm QNP (1H, 19F, 13C, 31P)

AUTOMATIC SAMPLE CHANGER: Sample case with 24 positions and random acess for sequential or batch automation

Equipment 4

MAGNET: Bruker Ascend 500 11.76 T, narrow bore 1H frequency: 500 MHz

CONSOLE: 4-channel Bruker Avance Neo

Gradient: 10A GAB/2 Z-Gradient amplifier, Temperature control BCU II

NMR PROBES: Prodigy cryoprobe CRPN2-TR-1H&19F/13C/15N-5mm-EZ

AUTOMATIC SAMPLE CHANGER: Sample case with 24 positions and random acess for sequential or batch automation

UCIBIO - UPORTO

Equipment 1

MAGNET: Bruker Ascend 600 14.1 T, narrow bore 1H frequency: 600 MHz

CONSOLE: 3-channel digital AQS/2 Bruker Avance III Gradient: GREAT Z-Gradient,Temperature controlled BCU-Xtreme, with automatic sampler Sample Express

NMR PROBES: 5 mm TCI Prodigy BBO; 5 mm TXI (1H, 13C, 15N)

Equipment 2

MAGNET: Bruker AvanceIII 400 9.4 T, Ultrashielded 1H frequency: 400 MHz

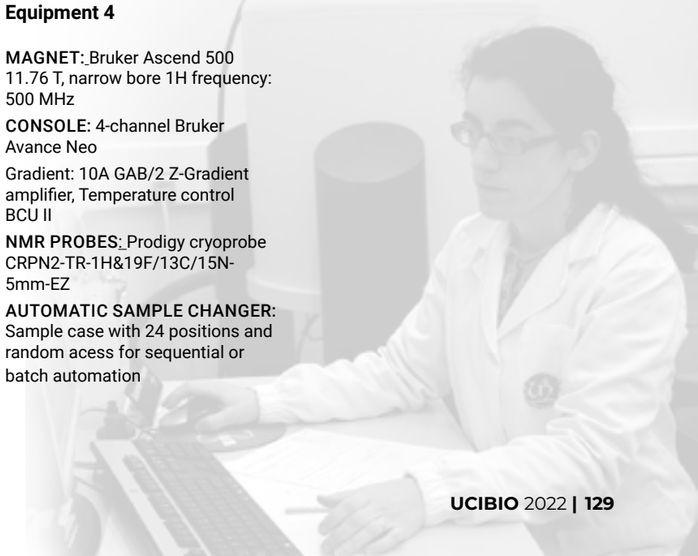
CONSOLE: Avance III 3-channel digital Gradient: GRASP IIP Temperature controlled BCU-Xtreme

Equipment 3

MAGNET: Bruker Ascend II+ 400 9.4 T, narrow bore 1H frequency: 400 MHz

CONSOLE: 3-channel digital AQS/2 Bruker Avance II+ Gradient: GREAT Z-Gradient HR-MAS control unit Temperature controlled BCU-xtreme

NMR PROBES: 5 mm broad band BB-1H-D 5 mm inverse detected triple resonance 1H-BB-D 5 mm dual DUAL



PILOT INSTALLATION

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Habilitation in Biochemical Engineering, 2003, FCT NOVA
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Cláudia Duarte

Research Assistants
Marisa Cardoso

FUNDING
Pacto da Bioeconomia Azul – Biomaterials vertical (Project N° C644915664-00000026) (2022-2026) Maria A.M. Reis (PI).

HORIZON-MISS-2022-OCEAN-01-04 -101112877 (UPSTREAM) Circular and Bio-Based Solutions for the Ultimate Prevention of Plastics in Rivers Integrated with Elimination And Monitoring Technologies (2023-2026).

HORIZON-CL6-2022-ZEROPOLLUTION-01-101082048-(MAR2PROTECT) Preventing groundwater contamination related to climate change through a holistic approach based on managed aquifer recharge (2022-2026).

WEBSITE

The UCIBIO pilot plant's mission is to be a key enabler of training and education to produce highly skilled graduate students in the field of Biotechnology/ Biochemical Engineering. To be responsible for conducting world-class research and innovation in key areas of bioprocess technology and providing state-of-the-art pilot plant facilities for conducting research, development and training.

The pilot plant enables biotechnological processes up to the 200L working volume and to obtain products (such as biopolymers) up to the kg-scale.

EQUIPMENT
- 1 batch reactor with up to 200L operating volume equipped with heating and stirring systems to perform hydrolysis.
- 2 up-flow anaerobic sludge blanket (UASB) reactors with up to 100L operating volume, to perform acidogenic fermentation;
- 1 anaerobic CSTR reactor with up to 150L operating volume equipped with heating and stirring systems to perform anaerobic digestion;
- 2 sequencing batch reactors (SBRs) with up to 200L operating volume equipped with aeration and stirring systems, to perform the microbial selection;
- 1 fed-batch reactor type with up to 50L operating volume equipped with aeration and stirring system, to perform the production of biopolymers;
- 1 feeding tank with up to 500L operating volume;
- 1 feeding tank with up to 200L operating volume;
- 2 buffer tank with up to 300L operating volume;
- 1 buffer tank with up to 200L operating volume;
- 4 water baths;
- Feeding and recirculation pumps to UASB reactors;
- Pressure transmitter for UASB reactor;
- Feeding and macronutrient pumps to SBRs;
- Feeding pump to biopolymer production reactor;
- Biomass purge pump to inoculate the biopolymer production reactor;
- Anti-foam system coupled to one of the SBRs.
- Air compressor for SBRs, production reactor and antifoam system;
- Accessories needed for pilot plant operation: pH dosing pumps, gas and liquid flowmeters, level controllers and sensors for online monitoring;
- 3 computers;
- Control hardware and software;
- CEPA® Z 41 High-Speed Tubular Centrifuge;
- ITYS PROv UPS Monofásica e Trifásica de 10 a 20 kVA.

PORTUGUESE YEAST CULTURE COLLECTION

RESPONSIBLE

José Paulo Sampaio
PhD in Microbiology, 1996, FCT NOVA
Habilitation in Biology, 2018, FCT NOVA
Full Professor, FCT NOVA

STAFF
Cláudia Carvalho
Andreia Aires

WEBSITE

The Portuguese Yeast Culture Collection (PYCC) serves as a repository of yeast biodiversity and genetic resources, with emphasis on Mediterranean foods, beverages and natural habitats.

Currently PYCC holds approximately 5000 cultures that can be assessed through the Collection's online catalog.

About 1500 cultures are unique to PYCC and were obtained in ecological studies carried out by researchers of the laboratories that house the collection.

Most of the current PYCC holdings have been authenticated through state-of-the-art molecular methods and all strains available in the Collection are cryopreserved at -145ºC.

PYCC is a founding member of the Portuguese microBiological Resource Center Network, that integrates the National Roadmap of Research Infrastructures. PYCC is currently implementing the ISO 9001 Quality Management System.

CULTURE COLLECTION OF PORTO

RESPONSIBLE

Luísa Peixe
PhD in Microbiology, 1996
Associate Professor, FFUP

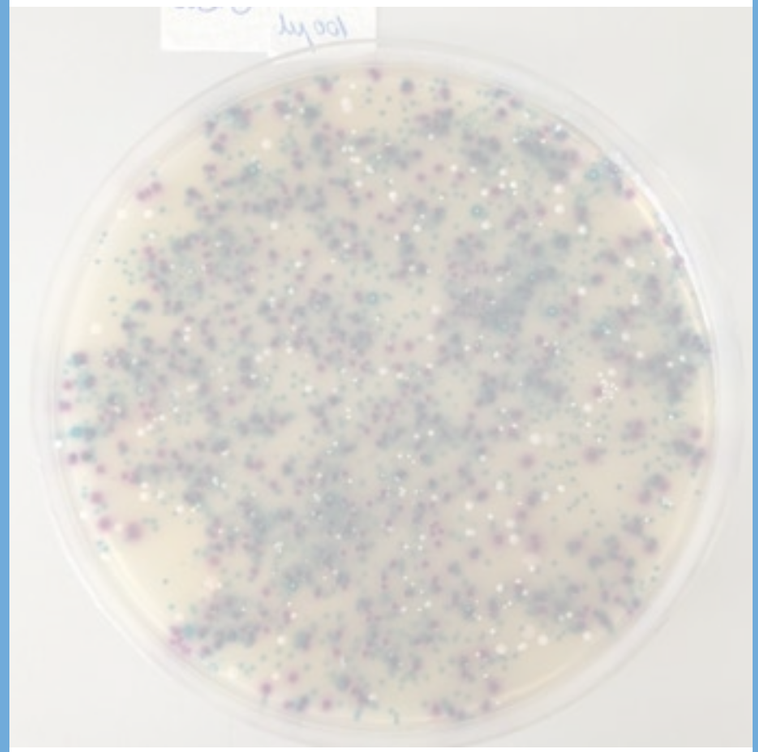
STAFF

Teresa Gonçalves Ribeiro
Bárbara Duarte

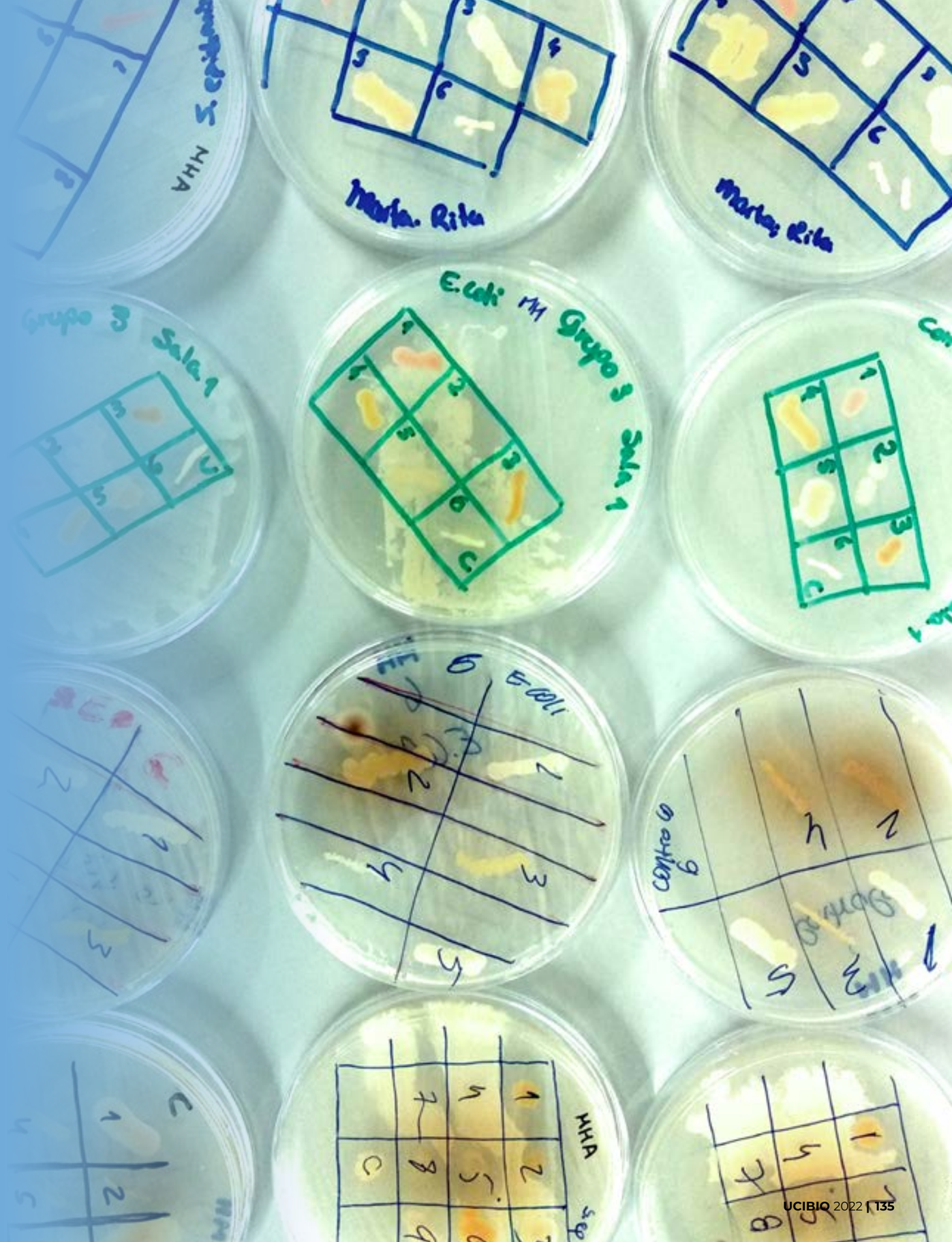
WEBSITE

The Culture Collection of Porto is a bacterial culture collection comprising strains from different genera, obtained since 1992. Their biological origin is very broad, including bacterial isolates from different niches, although mainly from humans. Type strains of recent described species, isolates well characterized in resistance and virulence features, as well as human genitourinary microbiome are included in CCP collection. The corresponding genomes and metadata are available for several isolates. In this way, the biological resources of CCP may serve the needs of various R&D activities.

CCP is embedded in the Laboratory of Microbiology, Department of Biological Sciences, Faculty of Pharmacy University of Porto and includes a research team internationally renowned for its contributions to improve the bacterial biodiversity knowledge and bacterial taxonomy. CCP plays a key role for the translation from basic research to applications with its comprehensive collection of biological resources and its unique expertise in the areas of cultivation, identification, taxonomy/ phylogeny, characterization, and conservation. CCP intends to act in network with other Portuguese and foreign collections, valuing costumer's needs and supplying high quality products and services.



9. Seminars & Conferences



BIOSEMINARS@UCIBIO

Jan 19, 2022	Joana Bugalhão, "Unveiling the host cell targets for the *Chlamydia trachomatis* protein IncL"; Juliana Oliveira, "Plastic Biodegradation by marine-derived actinobacteria".
Feb 16, 2022	Diana O. Ribeiro, "Targeting protein-carbohydrate interactions in plant cell wall biodegradation: The power of carbohydrate microarrays"; Bruno Fonseca, "Endogenous cannabinoid levels as potential biomarkers for assessing female reproductive health".
Mar 16, 2022	Ana Pontes, "A case of adaptation driven by subtelomeric genes in *S. cerevisiae*"; Inês Mollet, "Screening for new therapeutic targets in duodenum against type 2 diabetes".
Apr 20, 2022	Daniela Barreiro, "Electrochemical characterization of cytochrome c2 from *Neisseria gonorrhoeae*"; Ana M. Gonçalves, "New insights on catechol-O-methyltransferase stabilization for biointeraction studies with potential Parkinson Disease inhibitors".
May 18, 2022	Joana Fradinho, "Bacterial Phototrophic Technologies for Resource Recovery from Wastewaters and Gas Streams"; Ana Catarina Silva, "Optimizing lipid nanoparticles formulations for nose-to-brain delivery using the quality by design (QbD) approach".
Jun 15, 2022	Bárbara Gonçalves, "A new target inside an old molecule: glutamate amidation of peptidoglycan"; Ana Catarina Silva, "Droplet amplification of nucleic acids - from concept towards the clinics".
Jul 20, 2022	Inês Gonçalves, "The role of MsmX and YurJ in *Bacillus subtilis* carbohydrate uptake: two better than one?"; Margarida Silva, "Quercetin liposomes: a potential anti-inflammatory treatment for hepatic ischemia and reperfusion injury".
Sep 21, 2022	Inês Gonçalves, "CbcL: a gate for electrons in Geobacter´s electroactive network"; Carlota Pascoal, "Unravelling the affected immunological mechanisms in Phosphomannomutase 2- Congenital Disorder of Glycosylation (PMM2-CDG)".
Oct 19, 2022	Bárbara Silva, "Enantioselectivity of drugs in toxicokinetics and toxicodynamics"; Gonçalo Teixeira, "Unraveling Odorant-binding proteins manufacturing".
Nov 16, 2022	Francisca Xara-Brasil,, "Depicting novel tumour cell states through single-cell transcriptome profiles"; Raquel Costa, "Deciphering human-microbiome glyco-code: an integrative approach to uncover protein-glycan interactions in the gut environment".
Dec 21, 2022	Madalena Missionário, "Marine shallow waters as climate change hotspots - multi-omics approaches unravel fish response patterns across latitudes, seasons and climate scenarios".

CONFERENCES, SEMINARS & COURSES

Jan 16, 2022	Ana Luísa Carvalho, Angelina Palma, Benedita Pinheiro, Filipa Marcelo, Paula Videira. "14th GLUPOR - International Meeting of the Portuguese Carbohydrate Group".
Jan-Dec, 2022	Ângela Novais. Seven webinars cycle organized by ESGEM study group from ESCMID
Mar 15, 2022	Maria Reis, Nídia Lourenço. " Closing the Loop – Transforming paper milling side streams into high value prebiotics and bioplastics: An Industrial Collaboration"
Apr 04, 2022	Ana R. Freitas, Carolina Amorim, Diana Dias da Silva, Juliana Faria, Ricardo Dinis-Oliveira. "I International Congress of APCF-TOXRUN"
Apr 20, 2022	Susana Gaudêncio. "14th National Organic Chemistry Meeting & 7th National Medicinal Chemistry Meeting "
May 09, 2022	Pedro Tavares, Alice S. Pereia. "RaBBiT Meeting 2022"
May 24, 2022	Susana Gaudêncio. "5th Ocean4Biotech Workshop"
May 31, 2022	Paula Videira, Mariana Barbosa. "ProDGNE Lisbon Meeting"
Jul 05-08, 2022	Patrícia H. Brito. " 7th Annual Meeting of the International Society for Evolution, Medicine, and Public Health"
Jul 10, 2022	Ana Luísa Carvalho. (co-organizer) " 7th European Crystallographic School"
Sep 08-09, 2022	Mário Diniz, Paula Videira, Ricardo Lagoa. " Biosystems in Toxicology and Pharmacology – Current challenges (BTP 2022)"
Sep 12-29, 2022	Ana Rita Grosso, Patrícia Brito, Pedro Costa, Arménio Barbosa, Sérgio Sousa. Free course on Computational Biosciences using HPC systems
Sep 14-17, 2022	Ângela Novais. "13th International Meeting on Epidemiological Markers"
Sep 28-29, 2022	Eurico Cabrita, Ana Sofia Ferreira, Marta Corvo, Sonia Menezes. "Benchtop NMR: from Academia to Industry"
Oct 17-19, 2022	Ana R. Freitas, Patrícia Antunes. " Microbiologia 2022"
Oct 27, 2022	Juliana Faria. " PhD Day 2022 - Biomedical Sciences - CESPU"
Nov 23, 2022	Luísa Peixe. " ESCAIDE 2022"

10. PhD & MSc Theses

PhD Theses

1. **Ana Cláudia Viana de Almeida**. "Molecular studies of mineralization and iron release in bionanocages". 2022-11-11. Program: RABBIT, FCT NOVA. Supervisors: Alice S. Pereira & Pedro Tavares
2. **Ana Patrícia Teixeira Pontes**. "The genomics of microbe domestication - Testing the hypothesis of secondary domestication events in *Saccharomyces cerevisiae*". 2022-07-07. Program: Biologia, Especialidade em Microbiologia. Supervisors: José Paulo Sampaio & Paula Gonçalves
3. **Andreia Lúcia do Nascimento Pinto**. "New methods for the study of Primary Ciliary Dyskinesia". 2022-02-02. Program: Biologia, Especialidade em Biologia Celular. Supervisors: Susana Santos Lopes, Jaime Mota & Thomas Burgoyne
4. **Bárbara Vitorino Gonçalves**. "A new target inside an old molecule: glutamate amidation of peptidoglycan ". 2022-12-21. Program: Biologia, FCT NOVA. Supervisors: Rita Sobral & Jaime Mota
5. **Bruno Campos**. 2022-12-21. Program: Ciências dos Alimentos. Supervisors: Mário Diniz,Paulina Mata & JP Noronha
6. **Cátia Figueiredo**. 2022-10-14. Program: Biologia, Ecologia das alterações globais. Supervisors: Mário Diniz & Joana Raimundo
7. **Cinthia Barroco**. "Unraveling the host specificity within *Streptococcus dysgalactiae* subsp. *dysgalactiae*". 2022-07-15. Program: Biologia, FCT NOVA. Supervisors: Alexandra R. Fernandes & Rosario Mato
8. **Clara Isabel Rodrigues Leandro**. "Development of Phage Cocktails Against Bacteria Associated to Hospital-Acquired Pneumonia". 2022-12-12. Program: Biologia, FCT NOVA. Supervisors: Carlos de São José & Isabel Sá Nogueira
9. **Ermelinda Santos Silva**. "Caracterização clínica e bioquímica da colestase "fisiológica" nos recém-nascidos prematuros - um estudo prospectivo realizado na segunda maior Maternidade Portuguesa". 2022-03-21. Program: Ciências Biomédicas, ICBAS. Supervisors: Alice Santos SIlva
10. **Fernando Ramos Silva**. "Use of bio-waste for polyhydroxyalkanoates (PHA) biosynthesis: enhanced accumulation towards a sustainable and economical bioprocess". 2022-12-20. Program: Engenharia Química e Bioquímica, Especialidade em Engenharia Bioquímica. Supervisors: Gilda de Sousa Carvalho Oehmen & Maria Ascensão Reis
11. **Francisco Leisico**. "Unravelling the reaction mechanism of glutamate amidation in *Staphylococcus aureus* peptidoglycan". 2022-07-06. Supervisors: Teresa Santos-Silva & Maria João Romão
12. **Inês Isabel Serrano Pereira**. "CteG, a *Chlamydia trachomatis* protein involved in host cell lytic exit ". 2022-12-14. Program: Biologia, FCT NOVA. Supervisors: Jaime Mota
13. **Joana da Silva Figueiredo**. "Strategies to prevent the timely sub-cellular localization of the capsule synthetic machinery in *Streptococcus pneumoniae*". 2022-05-19. Program: Biociências Moleculares, FCT NOVA. Supervisors: Sérgio Filipe & Mariana Gomes Pinho
14. **Joana Margarida Nunes Bugalhão**. "Identification and characterization of IncL: a *Chlamydia trachomatis* protein associating with host cell lipid droplets and 14-3-3 proteins ". 2022-02-25. Program: Biociências Moleculares, FCT NOVA. Supervisors: Jaime Mota
15. **João Pedro Leitão Guerra**. "Biophysical and biochemical characterization of proteins involved in transition metals homeostasis". 2022-07-29. Program: RABBIT, FCT NOVA. Supervisors: Pedro Tavares & Alice S. Pereira
16. **José Pedro Malanho da Silva**. "Ultra-high resolution structure determination of transition metal substituted human carbonic anhydrase 2 - inhibitor complexes". 2022-06-14. Program: Química, Especialidade de Química Física. Supervisors: Maria dos Anjos Lopes de Macedo, Carlos Geraldes & Claudio Luchinat
17. **Lia Filipa Alvarez Pereira Mota Costa**. "Evaluating female fertility: follicular fluid biomarkers of oocyte quality". 2022-07-21. Program: Ciências Farmacêuticas, FFUP. Supervisors: Irene Rebelo & Bruno Fonseca
18. **Magdalena Ksiezarek**. "Comprehensive urinary microbiota profiling: towards a better understanding of female urinary tract in health and disease". 2022-01-05. Program: Ciências Farmacêuticas, FFUP. Supervisors: Luísa Peixe, Filipa Grosso & Svetlana U Perovic
19. **Manuel João de Almeida Albuquerque Brandão Matos**. "Artificial scaffolds for affinity-triggered bioseparations". 2022-01-13. Program: Bioengenharia (MIT), FCT NOVA. Supervisors: Cecília Roque & Ana Pina
20. **Maria João Quitoles de Oliveira**. "NanoSERS Microfluidics platform for rapid screening of infectious diseases". 2022-12-16. Program: Bioengenharia (MIT), FCT NOVA. Supervisors: Ricardo Franco, Prof. Hugo Águas (DCM - FCT-NOVA) & Prof. Hugh J. Byrne (DIT - Ireland)
21. **Mariana Matos**. "Polyhydroxyalkanoate (Pha) Biosynthesis From Fruit Waste At Pilot Scale: Productivity Maximisation And Polymer Tailoring". 2022-01-12. Program: Engenharia Química e Bioquímica. Supervisors: Maria Reis
22. **Patrícia Concórdio Reis**. "Development of new bioactive materials based on microbial exopolysaccharides of marine origin". 2022-09-30. Program: Engenharia Química e Bioquímica . Supervisors: Filomena Freitas & Maria Reis
23. **Rafaela Alexandra Palma Cruz**. "The impact of biomass withdrawal strategy on polyhydroxyalkanoate (PHA) productivity in mixed cultures". 2022-03-24. Program: Engenharia Química e Bioquímica, Especialidade em Engenharia Bioquímica. Supervisors: Maria Ascensão Miranda Reis & Adrian Oehmen
24. **Rita Francisco**. "Novel insights into biological and clinical research on Congenital Disordes of Glycosylation through a People-centric approach". 2022-02-16. Program: Biologia, FCT NOVA. Supervisors: Paula Videira & Vanessa Ferreira
25. **Sara Maria Pereira Alves Cunha**. "Improving the Treatment of Neurodegenerative Disorders by means of Lipid Nanoparticles Formulations for Intranasal/ Direct Nose-to-Brain Administration". 2022-07-27. Program: Ciências Farmacêuticas, FFUP. Supervisors: Ana Catarina Silva, José Manuel Sousa Lobo, Ben Forbes & Helena Amaral
26. **Sílvia Baptista**. "Development and characterization of cosmetic applications for FucoPol". 2022-09-30. Program: Engenharia Química e Bioquímica . Supervisors: Filomena Freitas
27. **Sofia Nogueira**. "Unhealthy eating habits at a young age: impact on inflammatory response, oxidative stress and neuroendocrine function". 2022-12-22. Program: Metabolismo - Clínica e Experimentação. Supervisors: Bruno Fonseca
28. **Srdana Kolakovic Oliveira Barreiros**. "Investigation of key operational factors impacting phosphorus removal and recovery from wastewater treatment plants". 2022-01-17. Program: Engenharia Química e Bioquímica, Especialidade em Engenharia Bioquímica. Supervisors: Maria Reis; Adrian Oehmen & Maja Turk Sekulic
29. **Thaise da Silva Martins**. "Inflammatory pathways in granulosa cells: exploring pharmacological significance of chalcones". 2022-07-22. Program: Ciências Farmacêuticas, FFUP. Supervisors: Irene Rebelo & Bruno Fonseca
30. **Virgínia Carvalho**. "Nutrient removal by a microalgal-bacterial consortium as a means to reduce the aeration demand in wastewater treatment.". 2022-01-14. Program: Química Sustentável, FCT NOVA. Supervisors: Joana Fradinho & Maria Reis

MSc Theses

1. **Alana Bonfim**. "Evaluation of the stability of flavouring agents in oral pharmaceutical vehicles". 2022-12-06. Program: Controlo da Qualidade. Supervisors: Isabel Martins de Almeida
2. **Alícia Candeias**. "A molecular view on how a commensal bacterium thrives in the human gut". 2022-12-05. Program: Bioquímica, FCT NOVA. Supervisors: Ana Luísa Carvalho & Angelina Palma
3. **Alicia Tostão**. "Insights into the copper tolerance in *Staphylococcus aureus*". 2022-01-19. Program: Microbiologia Médica. Supervisors: Sofia Pauleta & Rita Sobral
4. **Amedeo Ficocelli**. "Polyhydroxyalkanoates production from salted food waste using mixed microbial cultures". 2022-06-01. Program: Chemical and Process Engineering. Supervisors: Maria Reis, Bruno Marreiros & Monica Carvalheira
5. **Ana Catarina Laço Fanico**. "Influência da amidação do peptidoglicano na resistência à lisozima em *Staphylococcus aureus*". 2022-01-17. Program: Genética Molecular e Biomedicina, FCT NOVA. Supervisors: Rita Sobral
6. **Ana Luísa Benavente**. "Development of an in vitro model of mucinous tumors". 2022-11-28. Program: Biotecnologia, FCT NOVA. Supervisors: Filomena Freitas
7. **Ana Luísa de Castro Vieira**. "Leucemia mielóide crónica - Do diagnóstico à monitorização da doença". 2022-12-15. Program: Análises Clínicas, FFUP. Supervisors: Alice Santos Silva & Luís Belo
8. **Ana Rita Pinto Monteiro**. "Alzheimer's disease: unraveling the biological activity of novel synthetic compounds targeting tau hyperphosphorylation and the amyloid-beta pathway". 2022-12-16. Program: Toxicologia Analítica Clínica e Forense. Supervisors: Renata Silva & Fernando Remião
9. **Ana Rita Tavares Henriques**. "*In vitro* evaluation of telomere length in neuronal cells exposed to therapeutic and recreational opioids". 2022-11-30. Program: Toxicologia Analítica Clínica e Forense. Supervisors: João Pedro Silva, Félix Carvalho & Helena Carmo
10. **Ana Sofia Barradas Dalot**. "Plasmonic Nanostars for Sensitive SERS-based immunodetection". 2022-12-20. Program: Biotecnologia, FCT NOVA. Supervisors: Ricardo Franco & Hugo Águas
11. **Ana Sofia da Costa Almeida**. "Semi-preparative enantioresolution, racemization and enantioselectivity studies with MDPV and binding affinity studies with synthetic cathinones". 2022-12-05. Program: Toxicologia Analítica Clínica e Forense. Supervisors: Carla Fernandes & Fernando Remião
12. **Ana Teresa Loureiro Brinca**. "Metabolomic analysis of infertility biomarkers in follicular fluid by solid-phase microextraction and gas chromatography- mass spectrometry". 2022-11-11. Program: Bioquimica. Supervisors: Luís Passarinha and Eugénia Gallardo
13. **André Luz**. "Caracterização da composição de exossomas excretados a partir de modelos celulares 2D e 3D derivados de células de carcinoma colorretal sensíveis ou resistentes à doxorrubicina". 2022-01-19. Program: Genética Molecular e Biomedicina, FCT NOVA. Supervisors: Catarina Roma-Rodrigues & Alexandra Fernandes
14. **André Meireis**. "Lysosomal targeting and photothermal effect of antibody functionalized gold nanoparticles in colorectal cancer cells". 2022-12-16. Program: Genética Molecular e Biomedicina, FCT NOVA. Supervisors: Pedro V Baptista and Alexandra R Fernandes
15. **Anilton João Andrade Ianga**. "Isolamento específico de actinomicetes spur das ilhas Canárias - caracterização taxonomica e avaliação do potencial antimicrobiano". 2022-02-25. Program: Química Bioorgânica, FCT NOVA. Supervisors: Susana Gaudêncio & Rita Sobral
16. **António Carvalho**. "Tackling metastasis with gold nanoparticles: inhibition of intercellular communication mediated by cancer cells derived exosomes". 2022-01-19. Program: Genética Molecular e Biomedicina, FCT NOVA. Supervisors: Catarina Roma-Rodrigues & PV Baptista
17. **António Maria Gonçalves de Mesquita Guimarães**. " Population structure, virulence and antibiotic resistance of *Streptococcus agalactiae* colonizing non-pregnant women"". 2022-02-21. Program: Ciências Biomédicas, IHMT. Supervisors: Filipa Grosso
18. **Arianna Nurrito**. "Marine proteins for the production of bio-based materials". 2022-03-03. Program: Biotecnologia, FCT NOVA. Supervisors: Margarida Dias & Ana Cecília Roque
19. **Bárbara Alexandra Almeida Sousa**. "Panorama das intoxicações em Portugal: o que mudou com a pandemia da Covid-19?". 2022-07-28. Program: Mestrado integrado em Ciências Farmacêuticas. Supervisors: Márcia Carvalho
20. **Bárbara André Alves**. "Novel alkylaminophenols as antibacterial agents against *Staphylococcus aureus* infections". 2022-02-25. Program: Genética Molecular e Biomedicina, FCT NOVA. Supervisors: Alexandra Nunes (INSA) & Rita Sobral
21. **Beatriz Costa**. "Nova metodologia para o diagnóstico e monitorização do adenocarcinoma ductal pancreático". 2022-01-12. Program: Genética Molecular e Biomedicina, FCT NOVA. Supervisors: Alexandra Fernandes & PV Baptista
22. **Beatriz Filipe**. "Estudo do efeito antiproliferativo de complexos de vanádio (IV) em células tumorais". 2022-11-14. Program: Genética Molecular e Biomedicina, FCT NOVA. Supervisors: Alexandra R. Fernandes & Pedro V. Baptista
23. **Beatriz L. Pereira**. "New insights on the pathomechanism of GNE myopathy: proposing an immune-mediated response". 2022-12-06. Program: Genética Molecular e Biomedicina, FCT NOVA. Supervisors: Paula Videira and Mariana Barbosa
24. **Beatriz Maria Dias Ramos**. "Implementation in the clinical practice of quantitative analysis of antidepressant drugs in patients with suspected psychotropic drug intoxication". 2022-11-21. Program: Toxicologia Analítica Clínica e Forense. Supervisors: Helena Carmo (co-supervisor)
25. **Benedetta Colaiori**. "Impact of Japanese beetles (*Popillia japonica Newman*) on the polyphenolic and aromatic profile of two grape varieties grown in Italy (Nebbiolo and Erbaluce)". 2022-04-27. Program: MSc Degree in Pharmaceutical Chemistry and Technology. Supervisors: Joana Pinto (co-supervisor)
26. **Bernardo Lucas de Jesus Raimundo**. "Development of fluorescent *Streptococcus pneumoniae* strains optimized for bacteria-host cells interaction studies". 2022-12-07. Program: Genética Molecular e Biomedicina, FCT NOVA. Supervisors: Sergio Filipe
27. **Carolina Beatriz Cunha Pisoeiro**. "Evaluation of the metabolomic response of renal cell carcinoma cells to sunitinib and pazopanib by NMR metabolomics". 2022-12-13. Program: Toxicologia Analítica Clínica e Forense. Supervisors: Joana Pinto, Márcia Carvalho & Maria de Lourdes Bastos
28. **Carolina Borges Ferreira**. "Evaluation of Quaternary Ammonium Surfactants as prophylatic options for *Streptococcus agalactiae* infections". 2022-01-12. Program: Genética Molecular e Biomedicina, FCT NOVA. Supervisors: Alexandra Nunes (INSA) & Rita Sobral
29. **Carolina Jesus**. "Influence of a nisin-biogel on virulence factors expression by *Staphylococcus aureus* isolates from Diabetic Foot Infections". 2022-01-15. Program: Genética Molecular e Biomedicina, FCT NOVA. Supervisors: Manuela Oliveira & Rita Sobral
30. **Carolina Lobato Freitas**. "Neurodevelopmental toxicity induced by exposure to ADB-FUBINACA and AMB-FUBINACA". 2022-11-28. Program: Ciências Forenses. Supervisors: Diana Dias da Silva & João Pedro Silva
31. **Carolina Teixeira de Carvalho Peixoto Machado**. "Clinical and forensic signs resulting from exposure to toxic elements". 2022-05-20. Program: Mestrado integrado em Medicina. Supervisors: Ricardo Dinis Oliveira
32. **Catarina Cardoso Pires**. "Remote Ischemic Conditioning (RIC) against ischemic stroke: functional validation of conditioned plasma in human cells". 2022-12-05. Program: Genética Molecular e Biomedicina, FCT NOVA. Supervisors: Helena Vieira
33. **Catarina de Jesus Martins Alves**. " Multitask NBDs Of Bacterial ABC Type I importers: Characterization of protein-protein interactions". 2022-01-26. Program: Bioquímica, FCT NOVA. Supervisors: Isabel Sá-Nogueira & Lia Godinho
34. **Catarina Guerreiro Simões**. "Carbon monoxide-mediated pro-regenerative and non-inflammatory microglial phagocytosis: towards clearance of dead neurons". 2022-12-06. Program: Genética Molecular e Biomedicina, FCT NOVA. Supervisors: Helena Vieira
35. **Catarina Simões**. "Biologia Estrutural e Molecular de uma Proteína de Virulência de *Chlamydia trachomatis*". 2022-01-28. Program: Microbiologia Aplicada. Supervisors: Jaime Mota & Cristiano Mota
36. **Cátia Soares**. "Decoding the Molecular Recognition of Sialic Acid-Containing Glycans by Siglecs". 2022-01-17. Program: Bioquímica, FCT NOVA. Supervisors: Filipa Marcelo & Helena Coelho
37. **Chiara Nasuti**. "Cloning, Isolation and Characterization of ApbE from *Marinobacter hydrocarbonoclasticus*". 2022-10-01. Program: Bioquímica, FCT NOVA. Supervisors: Sofia Pauleta
38. **Daniela do Carmo Teixeira**. "Study of the immune responses induced by a *Toxoplasma gondii*

membrane extract using the mice model". 2022-11-11. Program: Biomedicina Molecular. Supervisors: Margarida Borges

39. **Diana Sofia Ferreira Tavares.** "The role of GSH signaling in mitophagy induced by reactive oxygen species: potential target for neuroprotection in stroke?"". 2022-12-06. Program: Genética Molecular e Biomedicina, FCT NOVA. Supervisors: Helena Vieira
40. **Cátia Alexandra Oliveira Soares**. "Decoding the molecular recognition of sialic acid-containing glycans by Siglecs". 2022-01-17. Program: Bioquímica. Supervisors: Filipa Margarida Barradas Morais Marcelo
41. **Diego Wiechers de Carvalho**. "Bioengineered Gold Nanostars For One-Pot Separation and Immunodetection of a Recombinant Malaria Antigen". 2022-02-03. Program: Bioquímica. Supervisors: José Ricardo Ramos Franco Tavares
42. **Edgar Ramalho.** "Application of macroalgae from the Portuguese coast in functional foods: biochemical and chemical characterization". 2022-02-03. Program: Biotecnologia, FCT NOVA. Supervisors: Mário Diniz & Bruno Leite
43. **Ellen Joyce Bizzo Nascimento**. "Revisão sistemática e metanálise de medicamentos constituídos por polímeros sensíveis a estímulos disponíveis no mercado". 2022-11-30. Program: Tecnologia Farmacêutica. Supervisors: Maria Helena dos Anjos Rodrigues Amaral
44. **Filipa Leal Silva**. "Preparações semissólidas cutâneas contendo colagénio para a regeneração da pele". 2022-11-10. Program: Tecnologia Farmacêutica. Supervisors: Maria Helena dos Anjos Rodrigues Amaral
45. **Flávia Meireles Costa**. "The effects of delta-9-tetrahydrocannabinol administration in the regulation of female rat sociosexual behaviour". 2022-05-09. Program: Medicina. Supervisors: Bruno Fonseca
46. **Francisca Xara-Brasil**. "Depicting novel tumour cell states through single-cell transcriptome profiles". 2022-11-28. Program: Biomedical Engineering. Supervisors: Claudia da Silva
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